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GLOBALIZATION, LOCATION AND LOCALIZATION OF MANUFACTURING EMPLOYMENT, AND URBAN WAGES IN MEXICO

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GLOBALIZATION, LOCATION AND LOCALIZATION OF MANUFACTURING EMPLOYMENT, AND URBAN WAGES IN MEXICO

by

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Dedication

To my family, with love and immense gratitude:

Stipica, my husband;

Guille and Eduardo, my parents;

and my sister and her family (Isabel, Ricardo, Montserrat, Diego, and Sebastián).

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Globalization, Location and Localization of Manufacturing Employment, and Urban Wages in Mexico

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This study explores urban wage disparities that are derived from the location and localization of manufacturing employment within a context of expanding globalization processes and mechanisms. Indeed, a core objective of the dissertation is to study the role that globalization plays in the contraction or expansion of urban wage disparities that are associated with the location and/or localization patterns of manufacturing activity. Location points to the proximity or accessibility of a metropolitan or urban area where firms (and their workers) are located to domestic and/or to foreign demand markets, and localization refers to the co-location or concentration of firms (and workers) within a same industrial sector in geographic space. The information obtained from the study has important policy implications for the economic development of a country's urban landscape and fills the gap in our knowledge of how globalization affects urban economies.

The case of Mexico is analyzed in this study. Data come primarily from the National Survey of Urban Employment for the years 1992 to 2004 and the National Survey of Occupation and Employment for the years 2005 to 2010, and is supplemented by author-defined data constructs and other external data. Urban wages are estimated following an augmented Mincerian wage model that accounts for worker, firm, and urban characteristics. The findings reveal that the location of industrial activity matters more than its localization to explain wage disparities across urban areas in Mexico. The moderating

influence of globalization appears also to be stronger on the effect of location on urban wages than the effect of localization on urban wages. In addition, results point to a moderating effect in the capacity of industrial agglomerations to generate externalities that is derived from their proximity or accessibility to demand markets; globalization appears to influence this relationship as well. Findings also reveal some gender differences.

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Chapter 1: Introduction

This dissertation explores urban wage disparities derived from the location and localization of manufacturing employment within a context of expanding globalization processes and mechanisms.[1] A core objective of the dissertation is to study the role that globalization plays in the contraction or expansion of urban wage disparities that are associated with the location and/or localization patterns of manufacturing activity. Location points to the proximity or accessibility of a metropolitan or urban area to domestic and/or to foreign demand markets, and localization refers to the co-location or concentration of firms (and workers) within a same industrial sector in geographic space (i.e., a metropolitan or urban area). The information obtained from the study has important policy implications for the economic development of a country's urban landscape and fills the gap in our knowledge of how globalization affects urban economies. This dissertation uses the case of the manufacturing industry in Mexico as it provides a special opportunity to conduct this empirical investigation in light of the dramatic embrace of globalization by the Mexican manufacturing industry after major shifts in international economic policy during the 1980s and early 1990s. The study is conducted at the preferred geopolitical scale: the metropolitan area or, in its absence, the principal urban-area.

This chapter begins with an overview of the motivation for studying market accessibility and spatial concentration patterns of industrial activity as sources of urban wage disparities in the context of increasing trade openness and globalization, and identifies areas of research that this dissertation contributes to advance. It follows with a brief introduction of the Mexican case. Continues with a discussion of the policy relevance

[1] Globalization mechanisms may be economic, social, or cultural, and examples of these mechanisms include: international trade, capital flows, transnational corporations, multilateral institutions, international media, and foreign travel, among others (Stallings 2002: pp. 9-12).

of this research. The next section specifies the main dissertation objectives and outlines the contributions of the study. The chapter concludes with an outline of the dissertation.

DISSERTATION MOTIVATION

The last several decades have been marked by increasing globalization that some claim has resulted in growing income disparity within countries (e.g., Foellmi and Oechslin 2010, Alderson and Nielsen 2002). This income disparity has been observed to have an important skills component that has favored skilled labor relative to non-skilled workers (e.g., Chiquiar 2008, Rodríguez-Oreggia 2005, Hanson 2004). However, given the tendency of economic activity to concentrate in geographic space (e.g., Silicon Valley), this income disparity within countries that is associated with increasing levels of globalization would also appear to have an important spatial component (e.g., Castro Lugo and Félix Verduzco 2010, Jordaan 2009, Ge 2006). Nevertheless, the geographical dimension of the relationship between globalization and income disparity within countries remains largely understudy because of data limitations, particularly at the urban level. This dissertation aims to fill the gap in our knowledge of how globalization affects disparities across urban economies, with a focus on wage disparities.

Because spatial wage disparities within countries can have negative demographic, socio-economic, political, and environmental impacts (e.g., Lee 2009), national governments are constantly looking for ways to increase their ability to influence known sources of spatial wage disparities, one of which is the economic geography of the country. In this context, it becomes crucial for policymakers to be able to understand the driving forces behind the location and co-location of economic actors as well as related effects, so that they can refine existing and develop new policy tools to achieve their spatial development goals. Understanding the role of globalization in moderating these processes and effects is also significant in the context of increasingly globalizing economies, and more so, since globalization is known to affect the economic geography of countries (refer to Appendix G for sample literature). At a subnational level, state and local governments are interested in information on the main economic drivers as well as on the sources of comparative advantage and disadvantage of their respective jurisdictions, so that they can pursue policies that may improve the population's wellbeing and assure the future prosperity of the jurisdictions. Understanding the sources of spatial wage disparities associated with the economic geographic of urban areas is, therefore, important for national, state, and local policymakers in the context of their efforts to achieve the aforementioned objectives.

Two literatures exist offering competing explanations of the sources of differences in the location and co-location (concentration) of industries in geographic space (and, relatedly, of differences in wages across geographic space). These literatures have dominated the field for several decades. Urban economic literature (UE) attributes the concentration of firms to localized advantages in the form of productivity gains and cost reductions that arise from mechanisms that are only available to firms that concentrate and interact in geographic space. These mechanisms include the sharing of knowledge and ideas across workers from different firms, the local availability of a larger pool of similarly-skilled labor and input suppliers that arises from the scale of the concentration, and competition across firms. New Economic Geography literature (NEG) attributes the concentration of firms instead to firms' location decisions that are based on the economic advantages in the form of cost reductions and increasing economies of scale from locating in geographic areas with better access or with proximity to consumer markets. For the UE, industrial concentrations arise because there are localized advantages to firms from their localization or concentration in geographic space. Under the NEG, industrial concentrations arise because firms with similar consumer markets who want economic benefits from improved access or proximity to these markets co-locate.

The economic advantages of the location and co-location decisions of firms under the UE and NEG models are not only limited to firms but also translate to economic advantages for their workers, and as a result, these economic advantages become contributing factors in the development of wage disparities over space. In the UE model, productivity gains translate to wage gains for workers given that in competitive markets wages reflect marginal productivity. It follows that wages increase with productivity, and, thus, that wages will be higher in locations with more productive industrial concentrations (Rosenthal and Strange 2004). In the NEG model, the wages of workers in a firm are determined by the accessibility or proximity of the firm to its consumer market. In this model, firms with better access or closer proximity to their consumer markets are willing to pay workers higher wages since they are benefiting from lower costs of production (Hanson 2001, Krugman 1991b). Therefore, locations whose firms have better access or closer proximity to consumer markets will exhibit higher wages. The location and concentration of economic actors, therefore, matter for labor outcomes (wages) within and across geographic areas. In light of this, understanding the economic space and spatial economic processes becomes imperative to develop policies that may influence positively labor outcomes as well as the economic development of geographic areas.

More recently, with the strengthening of globalization processes and mechanisms, a new body of literature has emerged that is focused on examining the effects of globalization at a subnational level. This literature points to a potential relationship between globalization and regional wages, and observes that the mechanisms by which a geographical area is exposed and integrated to global processes may generate space-based (globalization) externalities that could conceivably influence the productivity of firms and, therefore also, the wages of workers in a region (e.g., Jordaan 2009). The overall effect of globalization externalities on regional productivity and wages is assumed in the literature to be positive, although the direction of the effect still remains a "contentious area of inquiry and policy debate" (Mullen and Williams 2007).

Whereas the UE, NEG, and the Globalization Externalities literature (GE) have developed mostly independent of each other, there are elements in the literatures that acknowledge their interrelationship. The NEG acknowledges that globalization influences the location and concentration of production—and, therefore, of employment—by expanding the set of demand markets firms serve. Largely overlooked in the UE is the role of globalization in measuring localization externalities, yet a review of both literatures (i.e., UE and GE) would reveal that the sources of globalization and localization externalities are similar (i.e., input sharing, labor pooling, knowledge spillovers, and competition). Still, the relative importance of each body of literature in explaining urban wage disparities as well as the implications for their intersection remain largely unknown. Finding a way of unifying the lessons or ideas from these three literatures holds the potential for providing new insights and advancing the field of study of urban wage disparities. This is, therefore, the approach that I take in this dissertation.

Empirically, countries like Mexico, in which profound and marked processes of globalization have taken place in recent history, offer a fertile ground in which to examine critically and to evaluate the insights of the UE, NEG, and GE to identify aspects of these literatures that could be used to build a more cohesive and comprehensive explanation of urban wage disparities derived from the location and localization of economic activity within a context of expanding globalization processes and mechanisms. My dissertation, therefore, focuses on the Mexican case, but lessons learned would be equally informative for a similar analysis of other countries (e.g., China, Brazil, and Turkey).

An Introduction to the Mexican Case

The mid-1980s marks a shift in the political economy of Mexico. After four decades of implementing import substitution and industry protection policies through import tariffs, licensing, and export controls, the federal government, in a short period of time, engaged in intense multilateral and bilateral trade negotiations and undertook the rapid removal of trade barriers. This shift in policy was an attempt to reactivate the Mexican economy after the macroeconomic shocks it encountered during the early 1980s.

Accordingly, Mexico initiated an important process of trade liberalization and globalization, which consisted of two major stages. In 1985, Mexico reduced considerably and unilaterally barriers to imports, removed a variety of restrictions placed on foreign investors, and announced its entry into the General Agreement on Tariffs and Trade

(GATT)—becoming a member in 1986. In 1994, the North American Free Trade Agreement (NAFTA) between the United States, Mexico, and Canada was implemented and was followed by a series of multilateral and bilateral trade agreements between Mexico and multiple other economies, such as the European Union—a trade agreement that was implemented in 2000. Currently, Mexico is among the top ten economies holding the most commercial relations with the rest of the world (Gil Camacho 2013).

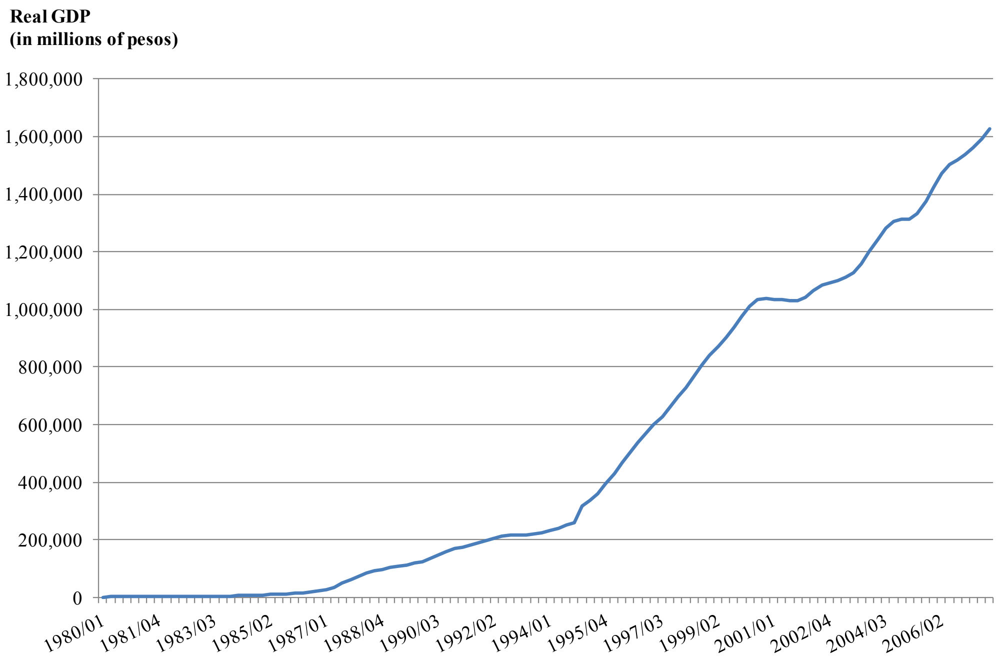
These trade agreements rapidly removed trade barriers like taxes and tariffs that had been previously applied to trade and value-added manufacturing, consolidating the country's process of liberalization started in the mid-1980s. The implementation of NAFTA, in particular, has been viewed as the beginning of the pinnacle of the country's trade liberalization and accelerated globalization efforts. Indeed, Figure 1.1 shows the dramatic economic gains to the Mexican economy from the country's trade liberalization process, as measured by real GDP from 1980 to 2007, with clear positive inflexion points in 1985 and, most significantly, in 1994. (Appendix A offers further indication of the resulting effects of trade liberalization for manufacturing in Mexico, focusing on a series of figures and tables displaying increasing Mexican exports regardless of region of destination, manufacturing sector, and type of establishment.)

Surging exports, both from national and foreign manufacturing firms in Mexico, as well as inward foreign direct investment were not the only changes occurring in the country as a result of the trade liberalization process. Trade liberalization, in fact, coincided with a significant sectoral and spatial reorganization of employment in Mexico, indicating a shift in manufacturing production and employment from the core region of the country to the periphery and in some cases to areas where previous policies and processes had not had sufficient economic influence, like Mexico's northwestern and north-central states.[2] Research has acknowledged that the relationship between the geographical redistribution

[2] Refer, for example, to Castro Lugo and Félix Verduzco (2010), Hernández González (2009), Hanson (1998a, 1998b, 1996), Pérez Cruz and Vela Peón (2008), Jiménez Godínez (2008), Mendoza Cota (2003), Aguayo and Salas Páez (2002), Baylis et al. (2009), and De León Arias (2008). Chapter 4 of this dissertation also offers an extensive discussion.

of manufacturing activity in Mexico and trade reform was non-spurious.[3] Research has further acknowledged that regions more exposed to globalization exhibited an increase in overall wage levels relative to other regions of the country (e.g., Chiquiar 2008, Hanson 2004). However, except for few studies (e.g., Castro Lugo and Félix Verduzco 2010, Castro Lugo 2007), the effect of globalization on urban wages in Mexico is largely unknown. This dissertation addresses this gap in the literature by using wage data on urban workers.

Figure 1.1: Real Gross Domestic Product per Trimester, 1980-2007



Source: Own elaboration using INEGI's Economic Information Bank with data from the *Dirección General de Contabilidad Nacional y Estadísticas Económicas*. Values are in millions of 1993 Mexican pesos.

[3] For a review of this literature refer to Appendix G.

POLICY RELEVANCE

The study of how the patterns of economic geography in a country affect the economic outcomes of urban areas and urban workers is basically a study to understand the spatial factors that contribute to the comparative economic advantages and disadvantages of urban areas (and local workers) with implications for urban development, industrial development, and transportation planning policies, among others, that are targeted to urban areas that structurally lag behind. The spatial heterogeneity of economic activity and economic outcomes inevitably leads to spatial economic disparities which may play an important role in the political and economic stability of a country and which cannot be addressed (or be even evaluated to see if they need to be addressed) unless one understands the sources behind them. Developing properly targeted policies that create urban environments conducive to private investment, which can promote job creation and help bring economic improvement to urban areas and local workers, thus narrowing development gaps between urban areas, requires a thorough understanding of these sources. This dissertation offers an opportunity for policy makers to understand three sources of spatial economic disparities: the location decisions of economic activity, the localization or spatial concentration patterns of economic activity, and the presence of globalization forces and mechanisms in the economy. Specifically, the dissertation focuses on manufacturing activity in urban economies, location points to the proximity or accessibility of an urban area to domestic and/or to foreign demand markets, and localization refers to the co-location or concentration of firms (and workers) within a same industrial sector in an urban area.

The development and growth of urban areas depend on the ability of the urban areas to attract and to retain economic actors (both firms and workers). With this in mind, it is important to know the characteristics that make urban areas attractive for private investment. I focus in this study on whether accessibility or proximity to consumer markets is one such characteristic, that is, whether there is a locational advantage to urban areas of having a high market potential that makes these urban areas attractive to economic actors.

If there is indeed a locational advantage from better access or closer proximity to consumers markets, there is conversely also a locational disadvantage from lesser access or proximity. The presence of these imbalances across geographic space that are associated with differential access to consumer markets is an opportunity for the implementation of policies aimed at building local capacities that can minimize disadvantages and foster the long-term development of disadvantaged areas, seeking the reduction of local components of spatial economic disparities. In this context, the local capacities of disadvantaged areas may be built through the provision of better networks of public infrastructure that intend to make physical proximity to consumer markets an irrelevant characteristic of the development and growth of advantaged urban areas at the expense of the disadvantaged. Therefore, knowing whether accessibility or proximity to consumer markets is a locational characteristic of urban areas that makes them more attractive to economic actors and that ensures their development is relevant to the design of infrastructure planning policies as well as for fiscal investment decisions related to the provision of networks of public infrastructure. A large array, however, of other policy instruments have been used in the past to try to influence the location decisions of footloose economic actors, including fiscal subsidies and free trade zones.

Localized positive externalities generated by the spatial concentration of economic activity have been shown to play a significant role in urban development, urban growth, and industrial location. Specifically, these positive externalities reduce costs and enhance the efficiency and productivity levels of workers and firms, contributing, accordingly, to increase the earning potential of workers, to firms' growth, and to the persistent concentration of economic actors in geographic space over time. These positive externalities are, therefore, both static and dynamic that offer economic advantages that influence present conditions and contribute to local development and growth (e.g., Rosenthal and Strange 2004; Henderson 2003, 1997; Henderson et al. 2001; Glaeser et al. 1992). Indeed, the advantages to workers and firms that arise from their spatial proximity are considered important determinants of urban scale as well as of the industrial and labor market composition and scale *within* geographical space (Hanson 2001, Ellison and

Glaeser 1997). These externalities are also considered important determinants of productivity and wage differentials *across* geographical space due to their importance for generating and/or exacerbating spatial heterogeneity in the distribution of productive resources. From a policy perspective, understanding the causes and effects of localized externalities associated with industrial concentrations is important to determine when the level of spatial concentration is insufficient or excessive as well as how localized positive externalities can be created and sustained with the objective of fostering the viable development of urban areas and minimizing economic disadvantages.

Introducing the area of globalization to the analysis of how the patterns of economic geography in a country affect the economic outcomes of urban areas is essential given that globalization can influence the economic geography of a country along with its related economic outcomes and prospects. The current body of knowledge, however, is centered on the effects of globalization on the economic geography and related economic outcomes of regions and states, with little information available that is relevant to urban areas. Without a comprehensive understanding of how globalization affects urban economies where profound and marked processes of globalization have taken place in recent history, the development of effective, targeted policies that impact urban economies becomes constrained. This dissertation fills a gap in the available knowledge of how globalization affects urban economies.

DISSERTATION OBJECTIVES

Five major objectives of this dissertation are to:

1. Trace the historical patterns of location and localization of manufacturing activity across Mexico's urban landscape;
2. Examine the behavior of urban wages to patterns over time of location and localization of manufacturing activity in the country;

3. Determine the contribution of the patterns of location and localization of manufacturing activity to wage disparities across urban areas in Mexico;
4. Investigate the role that globalization plays in the contraction or expansion of urban wage disparities that are associated with the location and/or localization patterns of manufacturing activity; and
5. Differentiate the analysis by gender.

To achieve these objectives, I rely on literatures that offer an explanation for urban wage disparities, including primarily the literatures of localization economies, demand-market access, and globalization externalities. In addition, I use a rich dataset on urban workers that combines two consecutive national employment surveys over a nineteen-year period and is supplemented by author-defined data constructs and other external data. Specifically, data come mostly from two successive surveys of households in Mexico: (1) the National Survey of Urban Employment for the years 1992 to 2004—the last year the survey was conducted—and, its replacement, (2) the National Survey of Occupation and Employment for the years 2005 to 2010. These datasets are uniquely suited for this research as they are the only spatially-representative surveys for Mexico that provide detailed annual labor market data—on employment and wages, among other data—for individuals residing in the country's principal metropolitan and urban areas. I combine both surveys to provide in this study an urban-level analytical portrait of the behavior of wages to patterns of location and spatial concentration of manufacturing activity in the country over a period that spans two decades in Mexico's economic history characterized by trade reforms, trade openness, and increasing globalization trends. This is possible to do because the data within and across surveys are considered, in general, technically equivalent and comparable.

I follow earlier literature and use an augmented Mincerian model of wages that linearizes the relationship between worker wages and the key elements of analysis in this study (i.e., the location and localization of manufacturing activity) along with worker characteristics, firm of employment characteristics, and characteristics of the local labor market. I also use a before-and-after analytic approach in the style of a non-experimental difference-in-difference methodology to investigate the role that globalization plays in the contraction or expansion of urban wage disparities that are associated with the location and/or localization patterns of manufacturing activity, placing the implementation of the North American Free Trade Agreement (NAFTA) as a source of variation in the importance that firms attribute to global markets and in the exposure of workers and firms to globalization mechanisms. This approach focuses on NAFTA as arguably Mexico's most important policy instrument on the country's road towards trade liberalization and global-markets integration.

This study contributes to the literature in three significant ways. First, the study introduces a more comprehensive examination of the space-based sources of urban wage disparities in a country. It does this by incorporating to the analysis of urban wages competing and complementing theories that are often not analyzed in tandem because of data unavailability or contextual limitations as well as novel data measures of location and localization of economic activity. This allows for a greater theoretical and empirical understanding of the mechanisms behind the unevenness in the spatial distribution of economic activity and income. It further offers researchers and policymakers a better understanding of the spatial factors that may contribute to narrow or to exacerbate economic disparities across geographic space in developing economies, like Mexico's, in which profound processes of economic liberalization and globalization have taken place over the last few decades.

Second, the study introduces a new approach to model localization externalities. This approach allows for the study of localization externalities to become an examination of urban economies as opposed to a sole examination of industries or economic sectors. This approach is possible because of the measure of industrial localization that I use to conduct the dissertation analysis.

Finally, this dissertation contributes to further our understanding of the differential effects of manufacturing location and localization on urban wages by gender. It also advances the current body of knowledge on a yet unsettled issue of whether within-gender wage differentials expand or contract due to trade liberalization and globalization processes.

DISSERTATION OUTLINE

The dissertation consists of eight chapters. For organization purposes, the chapters are grouped in four parts except for this introductory Chapter 1. Following, I outline the contents of each part and chapter.

Part I provides the research framework in two chapters. In *Chapter 2*, I present the theoretical framework and relevant prior research available. Specifically, I explore in this chapter the multiple explanations offered by the literature for the existence of wage disparities across urban areas. In line with my research objectives, I give special attention to the literatures of localization economies, demand-market access, and globalization externalities, but address place-based explanations as well. In *Chapter 3*, I present the conceptual model, data, and methodology that I use to conduct my empirical research along with their respective limitations.

Part II offers in two chapters the contextual framework of the study through an analytic discussion of the spatial landscape of manufacturing in Mexico and the macro policies that have contributed to its formation. This part is critical to understand the historical patterns of spatial industrial development in the country and to inform the descriptive and quantitative analytic strategies of my dissertation research. In *Chapter 4*, I discuss the influence of import-substitution and trade-liberalization policies in the historical development of urban manufacturing industrialization in Mexico. In *Chapter 5*, I describe the spatial development of manufacturing employment across urban areas in the country during the decades of the 1990s and 2000s. This exercise contributes to the contextual understanding of the employment concentration patterns of major manufacturing subsectors across Mexico's urban space, extending the available body of knowledge.

Part III presents the descriptive and inferential analyses of my dissertation research. In *Chapter 6*, I explore descriptively for the case of Mexico the relationship between urban wages and various known determinants of urban wage disparities that are relevant to my main research inquiry. Differences across gender as well as the plausible moderating effects of globalization processes are investigated. In *Chapter 7*, I estimate urban wages for male and female workers in Mexico. Consistent with my research objectives, I focus in this chapter on four elements as sources of urban wage variation: the spatial concentration of manufacturing employment across subsectors, an urban area's access to demand markets, the strengthening of globalization processes in the country, and the elements' interactions.

Part IV consists of a concluding chapter, designated as *Chapter 8*. In this chapter, I offer a summary of my research findings as well as the theoretical and policy implications of these findings. In addition, I discuss the contributions and limitations of the study, and end the chapter with a proposal for future research.

PART I: RESEARCH FRAMEWORK

Chapter 2: Theoretical Background and Prior Research on Urban Wage Disparities

The purpose of this chapter is to explore the multiple explanations offered in the literature for the existence of wage disparities across urban areas. In line with my dissertation's research objectives, I begin by presenting the literatures that offer a framework for analyzing the potential contributions of industrial concentrations *within* geographic space to wage disparities *across* geographic space in an economic environment, like Mexico's, that is increasingly influenced by globalization processes. For this purpose, I discuss the literatures of localization economies, demand-market access, and globalization externalities. I continue by addressing other factors known in the literature to explain urban wage disparities. Placed-based characteristics are at the center of these explanations and include: an urban area's scale and diversity, the educational composition of its population, the local availability of amenities, the characteristics or condition of its labor market (i.e., the rate of unemployment), and the characteristics of its product market (i.e., firm characteristics). Overall, the theoretical perspectives presented here encompass and integrate literature from various fields of research, namely urban economics, economic geography, and international economics.

LOCALIZATION ECONOMIES AND URBAN WAGES

The tendency of people and firms to co-locate or concentrate in geographical space has been widely study and observed by the literature. Attempts to explain this tendency are often based on the premise that urban and industrial agglomerations would not occur if there were no tangible benefits derived from these concentrations. It is argued in the literature that the agglomeration of workers and firms yields localized advantages that are generated from their interaction and that are unavailable to others who choose to locate in more isolated locations. These space-based positive externalities, or *agglomeration economies*, reduce costs and enhance the efficiency and productivity levels of workers and firms, contributing, accordingly, to increase the earning potential of workers, to firms' growth, and to the persistent concentration of economic actors in geographic space over time.

Agglomeration economies are, therefore, both static and dynamic externalities that offer economic advantages that influence present conditions and contribute to local development and growth (e.g., Rosenthal and Strange 2004; Henderson 2003, 1997; Henderson et al. 2001; Glaeser et al. 1992). Indeed, the advantages to workers and firms that arise from their spatial proximity are considered important determinants of urban scale as well as of the industrial and labor market composition and scale *within* geographical space (Hanson 2001, Ellison and Glaeser 1997). Agglomeration economies are also considered important determinants of productivity and wage differentials *across* geographical space due to their importance for generating and/or exacerbating spatial heterogeneity in the distribution of productive resources.

The discourse on agglomeration economies can be traced back to the writings of Alfred Marshall (1890), who studied the advantages of a successful industrial district in the United Kingdom. He observed that firms that were surrounded by other firms in the same industry within the same steel district grew faster, identifying, in this way, gains to firms that were unique to their agglomeration. Marshall's theoretical foundation of agglomeration economies establishes that workers and firms experience *external economies* and *increasing returns* when they agglomerate and interact in close geographical proximity.[4]

Whereas for Marshall (1890) and other of his contemporaries (e.g., Glaeser et al. 1992, Romer 1986, Arrow 1962) space-specific or localized advantages are generated by the spatial concentration and interaction between economic agents within the same

[4] For a complete survey of the theoretical foundations of agglomeration economies refer to Rosenthal and Strange (2004) and Duranton and Puga (2004).

industry,[5] for another school of thought based on Jacobs (1969) these advantages are instead generated by the concentration and interaction between economic agents of different industries but who are located within the same geographic space. The former are referred to as *localization economies* and the latter as *urbanization economies*. But whether localized advantages are in fact generated between economic agents within the same industry, or between economic agents of different industries but within the same geographic space, or between a combination of both is still a source of empirical inquiry. Following the research objectives of this dissertation, however, I focus my theoretical and empirical arguments on localization,[6] while not failing to regard the theoretical and empirical importance of urbanization, which is discussed later in this chapter as an alternative explanation to spatial wages disparities.

Channels of Externalities

According to Marshall (1890), localization economies arise because industry-specific firms that concentrate in geographic space are able to take advantage of any or a combination of three factors: *labor pooling, input sharing,* and *knowledge* or *technological spillovers*. These factors, argues Marshall (1890), reduce costs and allow firms and workers to gain productive efficiencies and, with that, to improve their productivity. It follows from the economic theory of competitive markets, where labor is paid the value of its marginal productivity, that wages will increase with productivity and, thus, that wages will be higher in more productive locations (Rosenthal and Strange 2004). Porter (1998, 1990) further proposes another factor, *competition*, as a source of localization economies.[7] Following, I

[5] An industry is composed of firms engaged in the same economic activity, with similar productive processes and demand markets.

[6] Localization and spatial concentration are terms used interchangeably throughout the dissertation.

[7] While Porter's (1998, 1990) model of localized externalities generated from the spatial concentration of interconnected firms has developed within the business discipline and outside of the disciplines of urban economics and economic geography, where localization economies have developed, Porter's concept of

discuss each of the channels or sources of localization economies as well as how they contribute to generate localized productivity and wage gains.

As Marshall highlights, "a localized industry gains a great advantage from the fact that it offers a constant market for skill" (Marshall 1890, p.271). Overman and Puga (2010) argues that industries whose firms experience more idiosyncratic volatility in employment will have a tendency to concentrate in places where there is a large number of workers with the type of skills that the firms demand. Labor pooling in this context allows firms to adjust more efficiently to periods of low and high labor demand with modest pressure on wages (O'Sullivan 2007, Krugman 1991b). Likewise, labor pooling implies that similarly skilled workers may easily move between firms—within the same geographic area—in response to firms' adjustments to employment levels that are uncorrelated across firms.[8] As Cohen and Morrison Paul (2009) notes, this lowers not only workers' risk of unemployment but also job search costs; their already acquired industry-specific skills additionally facilitate their hiring. In this manner, a large concentration of industry-specific employers also provides workers with an incentive to invest in locally-demanded skills to facilitate their employability, resulting not only in closer skill matches between workers and firms but also on labor skill specialization (Rotemberg and Saloner 2000, Baumgardner 1988, Marshall 1890). In an industrial concentration, where similar firms compete for similarly-skilled workers, these workers would be guaranteed to receive a fair return on their industry-specific human capital investment (Rotemberg and Saloner 2000).[9]

Labor market pooling, therefore, not only increases a firm's access to skilled labor but also a workers' access to jobs that better match their skills. It follows then that labor market pooling generates costs reductions for firms—as access to a large pool of skilled labor facilitates a firms' matching and hiring processes and minimizes the need for worker

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cluster externalities and Marshall's localization economies are similar and have increasingly been integrated across each other's disciplines.

[8] This would be assuming, following Combes and Duranton (2006), that workers are more likely to change jobs within the same local labor market than to move to another market.

[9] In this context, however, where firms belonging to one industry are spatially concentrated and demand similarly-skilled workers, the availability of job opportunities in competing firms might discourage firms to invest in worker training (Andini et al. 2013).

training—and for workers—as job search is less costly and results in closer firm-worker matches. Accordingly, these closer firm-worker matches generate production efficiencies and productivity advantages for firms and, in response, higher wages for workers within the industrial concentration.[10] Better firm-worker matches allow workers to become better employed, appropriately skilled for the local product market, more efficient, and more productive, and as a result to earn higher wages.

Input sharing has been found to be positively correlated to industrial concentration (Holmes 1999). Economies of scale in input production and cost-savings advantages drive this relationship (Morrison Paul and Siegel 1999, Bartlesman et al. 1994). First, firms have a tendency to locate close to their suppliers to reduce the transport costs of inputs (Ellison et al. 2010). Additionally, localization generates the scale necessary to sustain a local market of specialized-inputs suppliers that are able to produce these inputs at a more efficient scale and at a lower cost of production by taking advantage of internal economies of scale (Cohen and Morrison Paul 2009). Localization, therefore, facilitates the emergence of specialized suppliers in the local market (Holmes 1999, Marshall 1890), since it provides suppliers with an incentive to adapt and to specialize because of the large number of specialized producers who consume their goods and who, therefore, create the necessary—although not sufficient—conditions for their survival and growth (Marshall 1890). In this sense, upstream suppliers and downstream buyers gain efficiencies from local market demand and supply linkages. These efficiencies would, therefore, be reflected in higher productivity and wage levels for the localized firms.

Formal and informal interactions across workers with industry-specific skills that are concentrated in geographic space give rise to knowledge and technological externalities or spillovers that generate industry-specific productivity and wage advantages. These localized, industry-specific externalities are often assumed to be related to labor skill or R&D intensity (Morrison Paul and Siegel 1998, Audretsch and Feldman 1996) and are

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[10] Diamond and Simon (1990) argue that higher wages may also be the result of a premium paid to workers because of the higher risk of unemployment in specialized regions, where the lack of industrial diversity and job opportunities for workers with industry-specific skills would be few in the short run.

facilitated by the spatial proximity of firms and workers of the same industry (Glaeser et al. (1992). As knowledge or technological know-how can often be only passed through face-to-face contact, it is more likely to be passed the smaller the geographic distance between firms. And although some have suggested that in modern times geographic proximity should not affect knowledge transmission (Krugman 1991a), others have emphasized that knowledge, unlike information, is best conveyed through physical proximity (Audretsch 1998, Von Hippel 1994, Glaeser et al. 1992). High-technology or knowledge-intensive firms, like for example those in Silicon Valley, locate near one another to learn and to speed their rate of innovation (Saxenian 1996). In fact, empirical evidence of higher urban productivity, wages, and innovation resulting from the spatial concentration of knowledge-intensive industries—those most likely to generate knowledge spillovers—has been reported in the literature (e.g., Echeverri-Carrol and Ayala 2010, 2009).

Porter (1998, 1990) argues that spatial proximity between competing economic agents triggers dynamism and stimulates growth. Specifically, in Porter's view, local competition forces economic agents in geographic concentrations of interconnected firms to improve their productivity and efficiency. In addition, it also fosters rapid learning and innovation in firms across the industrial concentration. In this manner, Porter highlights the role of local competition as a source of productivity gains in spatially-concentrated industries.

Empirical Background

Studies on localization economies and their effects on productivity and wages are numerous and are characterized by a broad variety of methodological approaches. A review of the literature reveals, for example, the use of a wide variety of measures of local industrial scale or industrial spatial concentration to capture localization economies; examples of these measures include location quotients, indices of spatial concentration, Gini coefficients, and indices of horizontal clustering, among others. The regional geo-political level of analysis also varies, ranging from the county, city, or metropolitan area level to the state or regional level. The country of analysis varies as well across the literature (e.g., United States, Canada, Mexico, Japan, Sweden, Finland, Great Britain, the Netherlands, France, Brazil, Korea, Indonesia, and China, among others). But regardless of the methodological variability observed, productivity and wage gains tied to the geographic concentration of an industry (i.e., localization economies), particularly manufacturing, are considered among the most robust empirical findings (Wheeler 2007).[11]

Three major groups of studies exist within this literature. One group consists typically of earlier studies, with some exceptions, that examine the impact of localization economies on productivity by estimating production functions using cross-sectional aggregate regional data or data aggregated by industry.[12] The second group consists of more recent studies that increasingly use disaggregated data at the firm or worker level to estimate production or wage functions.[13] This most recent analytic approach employing micro-level data offers multiple advantages; it can better represent firm optimizing behavior as assumed by economic theory, provide greater data variability, and possibly reduce multicollinearity and aggregation bias resulting from unobserved heterogeneity (Griliches and Mairesse 1998). The third group consists of studies that analyze the dynamic implications of localization economies with particular focus on the impact of localization on productivity and employment growth.[14]

[11] While findings on localization economies are robust, the literature does seem to agree that localization economies are restricted to short distances (Graham 2009, Rosenthal and Strange 2003), which implies that empirical analyses on the effects of industrial concentration at the regional level, as opposed to the county or urban level, may not capture the full extent of the localization economies.

[12] E.g., Ciccone (2002), Ciccone and Hall (1996), Lee and Zang (1998), Sveikauskas et al. (1988), Henderson (1986), Nakamura (1985), Moomaw (1985, 1983, 1981), Sveikauskas (1975), and Aaberg (1973), among others.

[13] E.g., Echeverri-Carroll and Ayala (2010, 2009, 2007), Graham (2009), Rosenthal and Strange (2008), Graham and Kim (2008), Combes et al. (2008), Wheeler (2007, 2001), Mion and Naticchioni (2005), Henderson (2003), Wheaton and Lewis (2002), and Rauch (1993), among others.

[14] E.g., Day and Ellis (2013); Baldwin et al. (2010); Broersma and Oosterhaven (2009); Fingleton et al. (2007, 2006, 2004); Henderson et al. (1995); and, Glaeser et al. (1992), among others.

Further review of this literature shows that the accurate identification and measurement of localization economies depends significantly on decreasing the potential bias of confounding factors that may be associated both with spatial productivity and wage disparities, and with the concentration of economic activity in geographic space. Multiple potential confounding factors exist and are discussed later in this chapter as alternative explanations of spatial wage disparities, such as the characteristics of local firms like establishment size. The most prominent of these factors, namely urban density and the local endowment of human capital, are both spatial elements related to the agglomeration of people and firms that, similar to industrial concentration, generate space-based externalities that are also known to influence local productivity and wage levels. As I explain later in this chapter, urban density contributes to generate urbanization economies while an area's endowment of human capital contributes to generate localized human-capital externalities. Accordingly, the literature on localization economies often accounts for these and other plausible confounding factors in empirical estimations to minimize the potential for omitted-variable bias.

While considerable variability exists in the results across studies as well as across analyzed industries, the empirical evidence does offer support for localization economies and their impact on the productivity, wages, and growth of spatially-concentrated industries that are independent of other confounding localized externalities and their effects. Rauch (1993), for example, finds that not only are the wages of workers positively correlated with the local concentration of economic activity in U.S. cities, but also that workers in U.S. cities with a large concentration of human capital are more productive and, thus, display larger wages than workers in cities with average or lower than average levels of education; these results are also consistent with those of Glaeser and Maré (2001). Day and Ellis (2013), for example, reports growth benefits to spatially-concentrated manufacturing industries across Indonesian districts from localization but not from urbanization economies. For manufacturing industries in Korean cities, Lee and Zang (1998) finds also evidence of productivity advantages from localization but not of urbanization economies. Henderson (1986) also finds weak evidence of urbanization economies but positive localization economies using industry level data for U.S metropolitan areas and Brazilian cities.

Some studies, on the other hand, find larger effects from urbanization economies, such as Fan and Scott (2003) for provinces in China, or differential effects across industrial sectors. Graham (2009), for example, finds evidence of positive externalities on the productivity of British firms arising from the proximity of own industry employment in 13 of the 27 sectors as well as positive urbanization economies in 14 of the 27 sectors included in the analysis. Henderson and Kuncoro (1996) finds in Indonesia localization effects in textiles, non-metallic minerals, and machinery sectors, and urbanization effects in the wood, furniture, and publishing sectors. In Japanese cities, Nakamura (1985) finds that while light industries experience more productive advantages from urbanization, heavy industries instead experience more productive advantages from localization economies. In a study of 487 countries, Henderson (2003) also finds weak evidence of urbanization effects on manufacturing productivity but benefits from localization economies in high-tech industries although not in machinery manufacturing industries.

Studies on localization economies and their effects on wages further offer support for localization economies that are independent of other confounding localized externalities. Both Wheaton and Lewis (2002) as well as Echeverri-Carroll and Ayala (2010, 2009), for example, find that workers are indeed more productive and earn higher wages in U.S. metropolitan areas with a large concentration of firms in the same industry, regardless of the size of the metro area. These results are consistent both for manufacturing industries (Wheaton and Lewis 2002) as well as for high-technology industries (Echeverri-Carroll and Ayala 2010, 2009). Using data on individual workers across Dutch regions. Groot et al. (2014) finds evidence to support a positive effect of localization economies on wages but also a negative effect of urbanization economies on wages. In addition, Combes et al. (2011), and Hanink et al. (2012) find evidence of wage effects related to localization and urbanization economies in China. Combes et al. (2011) specifically uses data on individual workers across Chinese cities, and Hanink et al. (2012) uses county-level data on Chinese manufacturing.

ACCESS TO DEMAND MARKETS AND URBAN WAGES

The Urban Economic literature, under which the theory of agglomeration economies has developed, highlights the relationship between localized externalities arising from the spatial proximity of economic agents and local productivity and wage levels. It also highlights the relationship between the location decision of economic actors and the existence of localized externalities. A "somewhat rival model", as Fingleton and Longhi (2013) describes it, namely the New Economic Geography (NEG), posits instead that industrial agglomerations arise because the location of economic activities is influenced by elements that are uniquely internal to firms (Krugman and Livas 1996).[15] Specifically, the theoretical model of the New Economic Geography outlines consumer-market accessibility along with the presence of economies of scale in transportation and trade costs as elements that reinforce spatial patterns in the distribution of economic activity and, with that, spatial patterns of wage disparities.

The NEG model, therefore, highlights comparative costs and access to consumer markets as determinants of the location decisions of firms (Krugman and Hanson 1993). The NEG claims that as long as it is possible to reduce unit costs as production increases, attaining increasing economies of scale, there will be incentives for firms to concentrate (Fujita 1988, Krugman 1991a). As part of production costs, firms look at transportation costs incurred from the shipping of goods from their place of production to their place of consumption, and since these costs increase with distance, firms will try to minimize these costs by locating near a large market or near the market they serve. In this context, the location decision of firms will depend on the relative importance that firms place on transport costs and access to markets. The theoretical framework of the NEG, therefore, links costs incurred by trade, such as transportation costs, and firm-level scale economies

[15] Fingleton and Longhi (2013) discusses the current, disjointed state of the urban economic theory of agglomeration economies and the NEG. The authors argue that "what we have currently is a separation between different and somewhat rival models of explanation [of economic agglomeration] which have not as yet been fully reconciled into a single, cohesive, and integrated theory."

to explain industrial agglomeration. Firms co-locate in a city if scale economies are larger than trade costs; firms disperse to other cities if trade costs are larger than scale economies.

Accordingly, the NEG model relates wages to market access. This is contrary to the urban economic theory of agglomeration economies, which relates wages to employment density. Specifically, the NEG model poses that the wages of workers in a firm are determined by the accessibility of the firm to its consumer market. This access, in turn, is a function of the costs of conducting trade between the location of the firm and the location of its consumer market (Fingleton and Longhi 2013) as well as of the size of the consumer market and the competition for the market (Fingleton 2006). Lower costs, larger markets, and less competition, therefore, imply better market access which itself implies higher wages for workers (Fingleton 2006). In this manner, the NEG theory establishes the existence of a wage gradient, where workers in firms located closer to their demand market earn higher wages relative to those in firms that are located further away, or alternatively, where firms located in cities or regions close to their consumer markets are willing to pay workers higher wages since they are benefiting from, for example, relatively low transportation costs (Hanson 2001, Krugman 1991b).

Nominal wages will, therefore, be relatively low in regions with relatively high transport costs to markets and high in regions with relatively low transport costs to markets (Hanson 1998a). In this context, the NEG model has implications also for wage gradients across geographic space if similar firms choose to co-locate in areas that provide them with better access to their consumer markets. In places, therefore, where these firms concentrate, wages will be higher. As Brülhart (1998, p. 795) explains, a "NEG-type agglomeration is observationally equivalent to agglomeration driven by endowments, only the former type of agglomeration produces a spatial wage structure where wages decrease monotonically as one moves away from industrial centres."

One of the most significant contributions of the theoretical model of the NEG, developed by Paul Krugman (1991a), is that it created a bridge between two "*de facto*" "separate disciplines", namely international trade and economic geography (Ottaviano 2011), where the analysis of the effects of trade liberalization and globalization on the spatial distribution of productive resources could be analyzed. Assume a closed economy, where the internal market would be the predominant source of consumer demand for domestic production. In an attempt to reduce the costs to transport their products to their consumer markets, firms would choose to locate in or near the largest cities, where product demand will be comparably large (Krugman and Livas 1996, Krugman 1991b). In this context, therefore, firms co-locate and agglomerate in large cities because their scale economies are larger than their transportation costs. As a result, Krugman (1991b) notes that a closed economy stimulates the development of large cities and industrial centers.

As trade barriers are eliminated, through trade liberalization reforms and other globalization processes, external demand for domestic goods increases. If this demand is sufficiently large, it may serve as an incentive to firms with a comparative advantage in foreign markets to relocate to areas with closer access to their external markets, such as border cities—or where infrastructure is sufficient to allow them easy access to the markets—as a method to decrease transportation, and overall production, costs (Hanson 1998b, 1996; Krugman and Livas 1996).[16] Once the economy is opened, economic forces work against maintaining the traditional agglomeration centers formed under a closed-economy—this would happened, though, only if these centers are in fact not close to the new external consumer markets. In the context of the NEG, therefore, trade liberalization and globalization would influence the location of production within a country by expanding the set of markets firms serve (Hanson 2001).

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[16] Hanson (1998b) and Krugman and Livas (1996) are two of the most well-known empirical studies that test the theoretical implications of the NEG within the context of trade liberalization. These authors examine the impact of trade reform on the spatial and sectoral organization of economic activity using the case of Mexico as a natural experiment. Mexico offers the authors a relatively clean case study as it transitioned from a closed to an opened economy in a short period of time. Hanson (1998b), for example, addresses two relevant questions: is it possible to attribute empirically the pattern of excessive pre-trade-reform agglomeration in Mexico City to high-trade barriers? And, has the pattern of regional economic growth in Mexico changed following trade reform? Using state-level industrial data and distance to markets—both to Mexico City and to the U.S.—as proxy for transportation costs and, therefore, for access to markets, Hanson (1998b) finds that indeed prior to trade reform only access to Mexico City was relevant for state employment growth, while access to the U.S. market becomes only significant after trade reform. Empirically, the implication of this evidence is that access to markets and transportation costs do seem to influence the location and co-location decisions of firms at least for the case of Mexico.

Implied in my earlier discussion are the implications of the NEG model for the scale of cities. Krugman and Livas (1996) argues that not only the location but also the size of a city are conditioned by the magnitude of trade barriers. As the authors state, the existence of a "giant metropolis is [in fact] an unintended by-product of import-substitution policies, and will tend to shrink as developing countries liberalize." The lower these barriers are, the higher the probability of a city to expand. Krugman (1991a) argues that once relocation and spatial concentration patterns are established, there are forces that determine the local permanence of economic agents, among which external economies of scale—as the types proposed by the Urban Economic theory of agglomeration—and a continued access to the markets are included. In other words, as the city and its industrial base expand the interaction of transportation costs and scale economies as well as localized externalities generate self-reinforcing processes that stimulate further industry relocation to the city and, thus, industrial and urban agglomerations (Hanson 1998a, Krugman 1991a, Fujita 1988). The implication of this self-reinforcing process is, therefore, that urban wages may not be determined solely by either localized externalities or consumer-market accessibility but rather by some combination of both factors. Market accessibility, in addition, may influence the strength of localized externalities.

Empirical Background

The current state of knowledge arising from NEG literature offers support that regional variation in wages can be explained by NEG theory. Indeed, there is substantial empirical evidence that wages increase with market access, even though this evidence seems to indicate a stronger empirical relationship between wages and market access when the analysis is conducted at the regional level (e.g., López-Rodríguez et al. 2011; Breinlich 2006; Head and Mayer 2006; Hanson 2005, 1997; Mion 2004; Roos 2001; Davis and Weinstein 2001) rather than at the local level (Fingleton 2006), where market access seems to have less explanatory power on wages.

Although there is strong evidence of the relationship between wages and market access, a key challenge in the empirical literature has been to establish that this association is causal. To address this challenge, the literature has often taken advantage of the implications of NEG theory in the context of trade liberalization and globalization processes, and use these processes as a source of exogenous variation in market access to determine causality (e.g., Wolf 2007, Overman and Winters 2006, Tirado et al. 2002, Hanson 1997). An influential work, namely Hanson (1997), uses Mexico's trade liberalization of 1985 as a natural experiment that changes the relative market access of regions, re-orienting economic activity from domestic production to export-oriented production and, hence, from Mexico City to the Mexico-U.S. border. Under this context, Hanson (1997) predicts that changes in the location of production would lead to a reorientation of the regional wage gradient previously centered in Mexico City toward the Mexico-U.S. border. The author examines this prediction by estimating state manufacturing wages relative to national wages as a function of distance to Mexico City and the Mexico-U.S. border. Using data from the Industrial Census (for the years 1965, 1970, 1975, 1980, 1985, and 1988), the author finds results that are consistent with the NEG wage model, where wages are negatively correlated with distance to markets.

Even though using micro-level data would be the more preferred method of analysis to investigate the potential effect of market access on spatial wages,[17] most of the empirical evidence available is based on aggregate-level data. One exception to this is, for example, Combes et al. (2011), who evaluates the role that city characteristics play on the wages of local workers in China and finds evidence that suggests a positive relationship between market access and urban wages. While the authors do not specifically use a measure of

[17] The advantages of using micro-level data in the analysis of wages is well established. According to Griliches and Mairesse (1998), micro-level data can provide greater data variability, can better represent optimizing behavior assumed from microeconomic theory, and can reduce multicollinearity as well as aggregation bias that result from unobserved heterogeneity. In this sense, the use of aggregated data on spatial units is unable to allow for the full identification of firm- or individual-level heterogeneity and its influence on wage levels. And given that the sorting of workers matters since it explains most of the impacts of spatial externalities on the wage distribution, the use of aggregate data or even the use of firm-level data alone pose an analytical limitation.

market access in their study, they do compare the wages of workers located in cities across the most industrialized provinces in China (i.e., cities in Guangdong province and coastal regions)—where the most market-oriented reforms have been pushed the farthest—with the wages of workers located in cities in more inland provinces. Controlling for worker, firm, and locational characteristics, the authors find that wages are significantly lower the more inland the workers are located. Among the locational characteristics included in this analysis are measures of urbanization and localization economies whose results offer in addition supporting evidence that urban wages are determined by a combination of localized externalities and market access.

GLOBALIZATION EXTERNALITIES AND URBAN WAGES

Existing literature points to a potential relationship between globalization and regional wages. This literature observes that the mechanisms by which a geographical area is exposed and integrated to global processes may generate space-based externalities that could conceivably influence the productivity of firms and, therefore also, the wages of workers in a region[18]—hereafter, these mechanisms are refer to as globalization mechanisms[19] and the related externalities as globalization externalities or spillovers. Whereas the theoretical literature generally assumes the overall effect of globalization externalities on regional productivity and wages to be positive, this issue still remains a "contentious area of inquiry and policy debate" (Mullen and Williams 2007), more so since there is a dearth of literature that explores the regional dimension of globalization externalities. The reason for this is that the literature is often constrained by the availability of data measures that are objectively quantifiable and that may capture globalization mechanisms at a sub-national level, especially at the urban level. The regional literature,

[18] Refer to Jordaan (2009) for an extensive discussion of this literature.

[19] As noted in Chapter 1, globalization mechanisms may be economic, social, or cultural, and examples of these mechanisms include: international trade, capital flows, transnational corporations, multilateral institutions, international media, and foreign travel, among others (Stallings 2002: pp. 9-12).

as a result, often focuses its attention on the analysis of the economic impact of multinational enterprises and inward foreign direct investment (FDI) on regional economies as these data for some countries is available at the regional or state level.

The general argument, considering the FDI literature for example, is that the presence and operations of FDI firms—or firms that use foreign direct investment—in a host regional economy generates externalities or spillovers that affect the efficiency or productivity (and wages) of local non-FDI firms—or domestic firms that do not use FDI.[20] Thus, for instance, if the assumption is that this effect is positive, then the argument is that the presence of FDI firms in the regional economy creates positive externalities that spill over to non-FDI firms, generating in this manner localized efficiency gains that increase the productivity and wages of non-FDI firms within the same regional economy.[21] This argument assumes that FDI firms are on average more efficient or productive than non-FDI firms; however, it is important to note that empirical results across relevant studies are often contradictory.[22] Whereas this argument is focused on FDI externalities, this same argument could be extrapolated to externalities related to the local presence of other globalization mechanisms, such as for example domestic firms engaged in competitive international trade.

According to the literature, it is the absorptive capacity of firms—that is, the ability of firms "to recognize the value of new, external [knowledge], assimilate it, and apply it to commercial ends" (Cohen and Levinthal 1990)—that allows globalization externalities to occur (e.g., Jordaan 2009; Wang 2007; Barrios et al. 2004; Schiff et al. 2002; Engelbrecht 2002, 1997; Das 2002; Nelson and Pack 1999; Coe et al. 1997; Cohen and Levinthal 1990). Given that human capital is considered in this context the vehicle for knowledge transfer and diffusion (Engelbrecht 1997), the level of absorptive capacity of firms will depend on

[20] Let us remember that for this effect to be considered an externality, FDI firms must not be fully compensated or penalized for their effect on non-FDI firms.

[21] As previously discussed, the assumption that wages increase with productivity comes from the economic theory of competitive markets where labor is paid the value of its marginal productivity (Rosenthal and Strange 2004).

[22] For a brief discussion of the relevant literature refer to Hijzen et al. (2010).

the skill intensity of their labor force (Das 2002) or on their level of technological development (Jordaan 2009, p. 4). It is believe, therefore, that globalization externalities in a region will only materialize when these factors are sufficiently high across purely domestic local firms, with the implication that the higher these factors are, the higher the ability of these firms to benefit from globalization externalities. There is empirical evidence (Jordaan 2009, p. 178), however, that suggests that large technological differences across firms—that is, large technological gaps between, for example, FDI firms and non-FDI firms—actually stimulate rather than hinder positive globalization externalities.[23]

Largely overlooked in the literature is the relationship between globalization externalities and agglomeration economies. Indeed, whereas there is some evidence of localized globalization externalities, that is, spillovers to pure domestic firms from the spatial proximity of firms engaged in foreign transactions, the literature's discussion on the spatial dimension of globalization externalities is limited, in particular in regards to the nexus of localized globalization externalities with other space-based externalities even though there are elements that would indicate a relationship between globalization externalities and other localized externalities, such as localization economies, urbanization economies, and human-capital externalities. Several studies, for instance, indicate that FDI firms are attracted to regions within host economies that contain competitive concentrations of economic activity (e.g., Hilber and Voicu 2009; He 2008; Crozet et al. 2004; Head et al 1999, 1995). Agglomeration forces, therefore, appear to be important elements of the business environment of FDI firms as well as suggest that the relation between agglomeration economies and FDI externalities, or globalization externalities, might be important (Jordaan 2009, p. 5; He 2008). In addition, the literature seems to indicate that both globalization externalities and agglomeration economies are derived from similar sources, namely input sharing, labor pooling, knowledge spillovers, and competition. It follows from this similarity then that the spatial proximity and sources that facilitate agglomeration economies may also facilitate and enhance the generation and

[23] Refer to Jordaan (2009, pp. 26-30) for a review of the literature on absorptive capacity.

transmission of globalization externalities. In this context, agglomeration economies may in fact facilitate and enhance globalization externalities (Jordaan 2009, p. 31).

Channels of Externalities

The literature points to four ways by which the local presence of globalization mechanisms may affect regional productivity and wages: *competition*, *inter-firm linkages*, *labor pooling*, and *demonstration effects* (e.g., Jordaan 2009, pp. 14-19; Mullen and Williams 2007). Assume a local economy with two types of firms. One type consists of firms that are engaged in foreign transactions, such as FDI firms, input-importing firms, or exporting firms, among others, and which I will refer henceforth in this section as *global firms*. The second type consists of firms that are not engaged in any kind of foreign transaction and which I will refer henceforth in this section as *purely-domestic firms*. Assume also that global firms are more productive by virtue of their access and exposure to a larger range of external technologies and production practices. Under this context, the presence of global firms in a local economy might force purely-domestic firms to become more efficient and productive—that is, to become more competitive—to "catch up" to global firms and be able to compete for domestic or foreign market share (e.g., Driffield 2001). Higher competition, therefore, forces higher productivity levels among purely-domestic firms, which in turn implies higher wages for their workers.

The literature, in addition, notes that the transactions of global firms with local suppliers may possibly influence the productivity and efficiency levels of suppliers as well as the quality of their products if there is a need for them to satisfy higher production standards, which in this case would be those of global firms relative to those of purely-domestic firms. As a result, these transactions or linkages would not only affect the quality and levels of production of local suppliers but also of purely-domestic local firms that use the suppliers' products as intermediate goods in their own production processes. The use of competitive and productive inputs would, therefore, be expected to improve the productivity of purely-domestic firms along with the quality and competitiveness of their products. Additionally, one could also expect that the presence of global firms might offer purely-domestic firms an access way to global supply chains.

The local presence of global firms, moreover, may also provide purely-domestic firms with the ability to hire local workers trained by global firms. Were local workers, for instance, to substitute their jobs at global firms for jobs at purely-domestic local firms, their skills and experiences gained by working at global firms would transfer with them. This may potentially benefit purely-domestic firms if indeed production practices in global firms are more efficient or conducive to higher productivity levels or better, more competitive products than those in purely-domestic firms.

Finally, the literature points to possible knowledge spillovers or demonstration effects, where purely-domestic firms in the local economy learn about new technologies or better production practices from several sources, for example, by observing global firms in the local economy and their products, from informal face-to-face contact among workers, and from regional business associations, trade unions, and journals, among others. Consider a global firm, for example, that introduces a new, more productive, foreign technology to its production process. Because of their spatial proximity to global firms, purely-domestic firms learn about this technology and its benefits and use this knowledge to improve upon their own production process without compensating the global firm for this transferred of knowledge.[24] This spillover of knowledge is, therefore, considered a globalization externality.

Empirical Background

The theoretical literature emphasizes the potential role of globalization mechanisms in generating externalities that are a source of regional productivity and wage gains, yet the

[24] The lack of compensation occurs because there exists no market mechanism that may capture the flow of knowledge across firms (Jordaan 2009, p. 13).

evidence surrounding their actual existence and magnitude remains mixed. The largest source of knowledge comes from industry- or plant-level studies that analyze the spillover effects of globalization mechanisms, such as trade and FDI, on productivity for an individual host economy or a small group of host economies.[25] With some exceptions (e.g., Keller 2004, 1998; Aitken and Harrison 1999; Blomstrom and Sjoholm 1999), studies overall offer evidence that supports the existence of positive globalization externalities.

Results from aggregate-level studies on trade externalities generally indicate that trade does promote North-North, North-South, and South-South positive technological spillovers that enhance overall productivity levels, though Keller (2004, 1998) does offer some contradictory evidence. Wang (2007), for instance, studies whether trade promotes North-South and South-South technological spillovers at the industry level using data from 16 manufacturing industries in 25 developing countries and finds evidence of both North-South and South-South technological spillovers that have an impact on total factor productivity, with the former being stronger than the latter. Similarly, technological spillovers through trade have been found to have important regional dimensions for the case of, for example, NAFTA (Schiff and Wang 2003) as well as for the case of Mexico, Korea, and Poland (Schiff and Wang 2004).

Results from aggregate-level studies on FDI externalities are mixed. Barrios et al. (2004) attributes this variability to the different criterions used in the literature to classify firms as foreign affiliates as well as to differential levels of absorptive capacity of pure-domestic firms across the various samples analyzed. However, Jordaan (2009, p. 24) also attributes this difference to the methodological development of the field of research along with improvements in data availability. His review of the literature reveals, for example, that earlier cross-sectional studies often offer more optimistic results on the existence of FDI externalities than the more recent literature which employs panel data and offers

[25] For an extensive review of the literature on FDI externalities refer to Jordaan (2009). Examples of studies on trade externalities include: Wang (2007), Lumenga-Neso et al. (2005), Schiff and Wang (2004, 2003), Schiff et al. (2002), Engelbrecht (2002, 1997), Coe and Hoffmaister (1999), Lichtenberg and Van Pottelsberghe de la Potterie (1998), Keller (2002, 2000, 1998), Coe et al. (1997), and Coe and Helpman (1995), among others.

evidence at times of positive, at time of negative, and at other times of insignificant FDI externalities. Other findings in this literature are as notable as the direction of the effect of FDI externalities. For example, whereas Haskel et al. (2007, 2002) find evidence of productivity-enhancing FDI externalities across manufacturing firms in the U.K. from the presence of foreign-owned plants, these externalities seem to be only evident along industry lines and not along regional lines. Haskel et al. (2007), in addition, find evidence to suggest that FDI spillovers actually take time to permeate to domestic plants. Aitken and Harrison (1999) finds evidence for Venezuela which indicates that the impact of FDI on productivity only benefits small FDI firms. Otherwise, the authors find that FDI negatively affects the productivity of domestically-owned plants.

Evidence of the existence of productivity- or wage-enhancing globalization externalities across regions within host countries is limited and inconclusive; urban studies are instead seemingly inexistent. Whereas some authors find evidence that a larger presence of firms engaged in foreign transactions stimulates the productivity of purely domestic firms within a regional economy, others do not.[26] Mullen and Williams (2007), for example, examines how inward FDI impacts manufacturing productivity in select industries across U.S. regions, looking specifically at the effect that foreign manufacturing affiliates may have on the productivity of domestic manufacturing firms. Mullen and Williams find that domestic firms in areas with a comparatively larger presence of foreign affiliates do not exhibit any differential productivity gains than other areas. In the case of Mexico, for instance, while Jordaan (2009) identifies positive intra-industry FDI externalities in the Mexican manufacturing sector at the national level, at the state level the author observes that foreign participation in the manufacturing sector generates instead negative externality effects among Mexican firms. Jordaan (2009, p. 177) attributes this contradictory finding to two plausible explanations: the possibility that FDI firms may be generating a negative regional competition effect, and alternatively, that the presence of

[26] Refer to Jordaan (2009, pp. 32-37) for a review of the regional literature on globalization externalities.

FDI firms may be driving up the prices of regional inputs, resulting in lower cost efficiency for Mexican firms.

In addition, despite indications of a relationship between globalization externalities and other localized externalities, few studies exist that analyze the effect of industry agglomeration or geographical proximity on globalization externalities. Findings from these limited body of work do, however, indicate that agglomeration does indeed appear to have a positive effect on globalization externalities, in particular, that agglomeration enhances positive globalization externalities (e.g., Jordaan 2009, De Propis and Driffield 2006, Barrios et al. 2006). Jordaan (2009, p. 179) further qualifies this finding based on his state-level analysis of Mexico and discusses evidence that indicates that positive globalization externalities, specifically FDI externalities, only occur in the case of industries characterized "by a simultaneous high level of agglomeration and a large technology gap." Having said this, Jordaan (2009) also finds that agglomeration may not only promote positive globalization externalities but negative globalization externalities. He finds evidence that suggests that agglomeration promotes negative FDI externalities between FDI firms and Mexican supplier firms. In fact, based on his analysis, Jordaan (2009) argues that whether "agglomeration can foster positive or negative FDI effects" depends on each region. He finds evidence, for example, where agglomeration in border states promotes positive externalities and agglomeration in Mexico City promotes instead negative externalities. Space-based characteristics indeed seem to confound and influence globalization externalities.

ALTERNATIVE EXPLANATIONS FOR THE EXISTENCE OF URBAN WAGE DISPARITIES

In the following section, I discuss briefly other explanations presented in the literature for the existence of wage disparities across urban areas. Placed-based characteristics are at the center of these explanations and include: an urban area's scale and diversity, the educational composition of its population, the local availability of amenities, the characteristics or condition of its labor market (i.e., the rate of unemployment), and the characteristics of its product market (i.e., firm characteristics).

Urban Scale, Urban Diversity, and Urbanization Economies

Empirical evidence suggests that workers in denser urban areas are on average more productive than their counterparts in less dense urban areas and, as a result, earn also on average higher wages. This result rests on the assumption that, in competitive markets, labor is paid the value of its marginal productivity and that, even without perfect competition, wages will be higher in more productive locations (Rosenthal and Strange 2004). The existence of urban productivity gains or urban wage premia—depending on the methodological approach employed, that is, using either production functions or wage equations, respectively—is well documented in the literature, and its presence is often accepted as evidence of urbanization economies.[27] Urbanization economies are economic efficiencies and benefits—that is, positive externalities—that are related to the density, either of scope or scale, depending on the theoretical perspective, as is explained below, of economic actors in the urban area where they operate (Glaeser et al. 1992).

It is presumed, for example, that denser areas facilitate the matching process between employers' needs and workers' skills across all firms in the urban area and, in so doing, improve the efficiency of their production processes, increasing both firms' productivity and workers' wages (Quigley 1998). In the same manner, it also presumed that denser environments facilitate and encourage the interaction and exchange of ideas (e.g., best production and managerial practices) between local workers, similarly generating productivity advantages for local firms and higher wages for local workers. This exchange of ideas, furthermore, is assumed to foster innovation as well as employment and city growth (Jacobs 1969).

[27] Eberts and McMillen (1999) review the earlier papers (i.e., 1970s to 1980s), while more recent writers review the later literature (Rosenthal and Strange 2004, Halfdanarson et al. 2010, Combes et al. 2010)

Dense urban areas also imply economies of scale for firms in product and labor markets given the large number of local consumers and the large pool of local labor available (Quigley 1998, Duranton and Puga 2000). Accordingly, dense urban areas may, for example, have the ability to reduce frictional unemployment and dampened employment fluctuations across all industries in the urban area (Simon 1988), thereby, reducing related costs for firms. Because of economies of scale, dense cities have also the ability to reduce the cost of public goods. Consequently, they are able to offer, for example, extensive and better public infrastructure to all local firms relative to smaller cities, potentially leading these firms to incur lower production costs. If firms, therefore, have a cost incentive to concentrate in urban areas that provide advantages to all firms regardless of industry, it follows that this concentration would result in urbanization economies (Abdel-Rahman 2000).

Urbanization economies are, therefore, economies of scale that are external to an industry but internal to an urban area.[28] But whether the wage and productivity advantages or other benefits described earlier stem from urban scale or urban diversity is a question that remains unresolved in the empirical literature (Fu and Hong 2011). Following Hoover (1937), some authors argue that urbanization economies are determined only by the size of an urban area's economy and not its industrial composition and, therefore, measure urbanization economies by a city's population or employment level (e.g., Aaberg 1973; Shefer 1973; Sveikaukas 1975; Kawashima 1975; Fogarty and Garofalo 1978; Moomaw 1981, 1985, 1988; Nakamura 1985; Tabuchi 1986; Henderson 1986; Sveikaukas et al. 1988; Louri 1988; Lee and Zang 1998; Rosenthal and Strange 2004; among others). Productivity studies suggest that a doubling of city size increases productivity—wages—by between 3 and 8 percent for a large range of city sizes (Rosenthal and Strange 2004).

Jacobs (1969), instead, suggests that it takes a diverse urban environment—one that exhibits variety in its industrial composition—to generate place-based externalities that

[28] The general theoretical model of urbanization economies distinguishes positive external economies from negative external economies. The former reflect agglomeration and give rise to a wage premium while the latter reflect congestion and give rise to a wage discount.

increase the productivity of local workers and firms. According to the author, a diverse urban environment is a determinant not only of a city's ability to generate new jobs but also fundamental to foster the exchange of knowledge across economic agents as well as innovation in cities. In this context, while it is true that the size of a city may be closely related to its industrial composition, and that this industrial composition is more likely to become more diverse as city scale increases, it also true that city size does not necessarily imply industrial diversity (Fu and Hong 2011). Otherwise, two similarly-sized cities would have to have a similar degree of industrial diversity and show similar productivity effects (Fu and Hong 2011), which would not explain why some cities grow while others do not. Jacobs (1969) argues that urban diversity is essential for city growth, but on the contrary, city scale may not be a sufficient condition for urban diversity given the theoretical arguments behind the specialization and diversification of cities (e.g., Henderson 1974, Abdel-Rahman 1990, Abdel-Rahman and Fujita 1993).

Following Jacobs (1969), the literature has advanced various measures of diversity to capture urbanization economies—often referred in the literature as Jacobs externalities. Among the measures advanced are, for example, the Hirschman-Herfindahl Index, the G index advanced by Ellison and Glaeser (1997), and the diversification index in Broersma and Oosterhaven (2009), among others. Results in this literature often indicate a correlation between urban diversity and labor productivity (e.g., Broersma and Oosterhaven 2009, Ciccone and Hall 1996, Henderson et al. 1995)

Implied in the previous discussion is the potential dynamic nature of urbanization economies. This refers not only to the fact that urbanization economies develop over time but also that their effects have implications for urban development and growth (e.g., Rosenthal and Strange 2004, Duranton and Puga 2001, Henderson 1997, Henderson et al. 1995, Glaeser et al. 1992). Rosenthal and Strange (2004) explain the temporal dimension of externalities in the following manner: "an agent's interaction with another agent at a point in the past continues to have an effect on productivity in the present." This effect, however, may decrease with time (or temporal distance). Consider Henderson (1997) as an example. The author observes, using U.S. data by county, that increased industrial diversity affects employment in the county persistently for at least the length of his analytic time horizon, which suggests that the effect of urbanization economies on employment in U.S. counties at a point in time may be observed for longer than eight or nine years after. In this manner, a cross-sectional analysis of urbanization economies, therefore, may only capture evidence of current, rather than also long-term, agglomeration effects.

As with the analysis of localization economies, studies on the effects of urban density on wages often face the challenge of having to deal with issues of selection bias in their estimation of the wage equation (e.g., Combes et al. 2010, Gould 2007, Yankow 2006, Glaeser and Maré 2001). An urban area's population, for example, could be an endogenous variable as individuals with more ability might tend to self-select to locate in the largest cities. If big cities pay more because they attract the most able workers, a significant portion of the large-city wage premium is then likely to be a return to unobservable skills. However, regardless of the methodology employed by the literature to address the potential for ability bias (e.g., instrumental variables analysis, panel data models, two-stage regression analysis), findings do conclude that urban wage differences are not simply the result of higher-ability workers self-selecting to live in denser cities, but that dense cities actually make workers more productive.

Local Endowment of Human Capital

Research suggests that differences in wages across urban areas may be the result of spatial differences in the skill composition of the workforce. Specifically, the literature suggests that the accumulation of human capital in geographical space may generate significant knowledge externalities or spillovers that influence the productivity and wages of all local workers (e.g., Rauch 1993, Moretti 2004b, Henderson 2007, and Rosenthal and Strange 2008) as well as the area's technological innovation and growth (Simonen and McCann 2008, Storper and Venables 2004, Wheaton and Lewis 2002). These localized human-capital externalities arise from the sharing and learning of knowledge and skills that occur among workers in close geographical proximity through formal and informal interactions (Rauch 1993).

Empirical studies typically proxy urban human-capital externalities with several indicators, such as the average level of education and experience in a city (e.g., Rauch 1993), local employment in skills-intensive industries (e.g., Echeverri-Carroll and Ayala 2009), or patents as a measure of urban innovations (e.g., Echeverri-Carroll and Ayala 2011, Audretsch and Feldman 1996, Jaffe et al. 1993). Rauch (1993), for example, presents empirical evidence that comparable individuals tend to earn higher wages in US metropolitan areas with higher average levels of education. Specifically, the author finds that increasing the average level of education in the metropolitan area by one year raises an individual worker's wages by 3.3 percent. On the other hand, raising labor experience results in smaller but still positive effects on wages. Other studies also find that a city's average levels of education and/or experience are significant determinants of labor productivity (Ciccone and Hall 1996; Glaeser and Maré 2001; Moretti 2004a, 2004b; Glaeser and Saiz 2004; Rosenthal and Strange 2008). Results are similar when looking at the literature that uses either local employment in skills-intensive industries or patents to capture human-capital externalities. For instance, Echeverri-Carroll and Ayala (2011) finds that a doubling of the human capital density (i.e., patents per 10,000 inhabitants) in a metropolitan area results in approximately a 2 percent increase in average individual hourly wages.

The main challenge of these empirical studies has been to disentangle the 'true' effect of human-capital externalities on labor productivity and wages from the sorting effects and unobserved individual or spatial heterogeneity (Echeverri-Carroll and Ayala 2011). For example, if unobservables lead 'smarter' individuals to self-select to locate in cities with an already large number of educated workers. Many studies address ability selection bias by finding 'good' instrumental variables for average level of education or by using fixed-effects models that account for individual unobservables (e.g., Echeverri-Carroll and Ayala 2009, 2011; Moretti 2004b; Acemoglu and Angrist 2000). With some exemptions (e.g., Acemoglu and Angrist 2000), these studies in general find evidence consistent with localized human-capital externalities (e.g., Echeverri-Carroll and Ayala 2009, 2011).

Other studies have stressed the importance of accounting for agglomeration economies to separate the effect of human-capital externalities on labor productivity and wages from that of other types of knowledge spillovers, particularly those arising directly from urbanization or localization processes (e.g., Echeverri-Carroll and Ayala 2011, 2010, 2009; Henderson 2007; Wheeler 2007). As previously discussed, the former are directly related to human-capital stock, while the latter are related to the density of economic activity. The inconsistent results obtained by the few studies that undertake this approach highlight the importance of distinguishing between the effects (e.g., Echeverri-Carroll and Ayala 2011, 2010, 2009; Rosenthal and Strange 2008; Wheeler 2007; Ciccone and Peri 2006). Ciccone and Peri (2006), for example, finds little evidence of human-capital externalities (measured by the change in a city's average schooling) but definitive evidence of agglomeration effects (measured by the log change in a city's employment) in its Mincerian wage equations. On the other hand, Rosenthal and Strange (2008) obtains strong evidence of an urban wage premium (measured by the number of workers at different concentric rings) and human capital spillovers (measured by the number of college-educated workers at different concentric rings) in separate Mincerian log wage equations.

Local Amenities

The unevenness in the supply of local amenities is a factor that, according to the literature, may explain wage disparities across urban areas (Roback 1982, Rosen 1979). This literature argues that, on average, the presence of urban amenities dampens labor wages for otherwise identical urban areas. An urban amenity is a desirable characteristic that increases the relative attractiveness of an urban area, and for which workers who favor the amenity may be willing to forgo higher wages in return for access to it.[29] Conversely, workers may require a wage premium in the absence of the desirable amenity or in the presence of a disamenity. This wage premium could be interpreted as a compensating differential for working in low-amenity urban areas. Roback (1982), for example, finds that labor earnings across U.S. metropolitan areas are positively correlated to crime rate, pollution, hot days, total snowfall, and cloudy days. These results suggest that firms are willing to pay workers a wage premium in urban areas with higher levels of crime, pollution, and poor weather, or alternatively, that workers require a wage premium to live and to work in areas with relatively higher levels of such disamenities.

Urban amenities, however, may also influence labor productivity, thereby influencing in this manner the wage level. That is, higher labor productivity should be reflected in higher wages, and lower productivity in lower wages. The basic argument is not only that urban amenities may make workers directly more productive by enhancing their quality of life (Roback 1982, Rosen 1979), but also that these amenities may influence the composition of local residents as well as industries by attracting to the area highly productive workers and firms (e.g., Diamond 2015, Shapiro 2006, Moretti 2004b, Florida 2002, Rauch 1993), and in this manner, influencing labor productivity and the wage level in the urban area. Indeed, the literature indicates that amenities are becoming a more important determinant of where people choose to live (Rappaport 2008, 2007; Rappaport and Sachs 2003; Florida 2002).

Local Labor-Market Conditions: The Unemployment Rate

[29] Urban amenities may be natural, historical, cultural, social, or economic, and examples include clean air, clean water, temperate climate, coastal location, appealing physical topography, good public transportation infrastructure, low crime, low unemployment, parks and recreational facilities, quality education, public libraries, museums, monuments, theaters, restaurants, shopping centers, among many others. It is assumed here that these amenities are non-exclusive public goods, so that everyone in the urban area has access and benefits equally from them.

There is extensive empirical support for the inverse relationship between urban wages and local unemployment conditions. (For detailed surveys, refer to Blanchflower and Oswald (2005), and Nijkamp and Poot (2005)). This inverse relationship suggests that when an urban area's unemployment level is low, firms are willing to pay workers a higher wage rate on average as an incentive for workers to avoid shirking. On the other hand, a high unemployment level in the urban area would allow employers to pay a lower wage rate as, in this case, workers would be willing to accept lower wages for fear of unemployment.

Local Firm Characteristics: The Size of the Firm

Firm characteristics, and in particular establishment scale, have been shown in the literature to condition the manner in which firms concentrate in geographic space. Manufacturing firms in larger urban areas, for example, tend to be larger than manufacturing firms in smaller urban areas (Lehmer and Möller 2010). Also, large manufacturing plants, regardless of the industry, tend to concentrate in space more than smaller manufacturing plants (Li et al. 2012, Lafourcade and Mion 2007, Wheeler 2006, Barrios et al. 2006, Holmes and Stevens 2002, Kim 1995).

Firm size has also been shown to influence a firm's ability to benefit from agglomeration externalities. Jacobs (1961) argues that firm size is a determinant of the magnitude in which urbanization economies—a reflection of urban diversity, according to the author—affect a firm's productivity. As the author notes, it is small firms rather than large firms that often benefit more from the urban diversity that is an intrinsic characteristic of large cities and that, according to Jacobs (1969), fosters innovation and growth. The reason for this, Jacobs explains, is that large firms, for instance, have a tendency to be self-sufficient, while smaller firms often depend on the external local industrial environment for the supply of intermediate inputs. Chinitz (1961) and Duranton and Puga (2000) agree and note that diversity fosters innovation which, in turn, often benefits more young and small firms. Contrary to Jacobs (1961), Damijan and Konings (2013) finds that, while micro- and small-sized firms do benefit from all types of agglomeration externalities, it is large-sized firms—which possess more absorptive capacity—those more likely to thrive in contexts with strong urbanization economies because of the inherent diverse environment and the higher potential for interactions across industries. Li et al. (2012) further adds that manufacturing firms are more likely to become larger by locating close to larger-sized firms rather than by locating simply close to a large number of firms.

In this context, where firms spatially sort, it is conceivable for the characteristics of firms to contribute to generate wage and productivity differentials across geographic space. Indeed, large firms seem to play an important role in explaining higher productivity levels in urban areas after controlling for urban scale (Lehmer and Möller 2010). Large firms also tend to pay higher wages than smaller firms (Lehmer and Möller 2010). Firm size also seems to condition the intensity of localization economies (e.g., Nakamura 2012, Wheeler 2006). Nakamura (2012), for instance, finds that localization economies are derived from the local concentration of various sizes of firms not of homogenous-sized firms and, in particular, not from the local concentration of only small-sized firms. And, as the author notes, it is the agglomeration of various sizes of firms—in contrast to the agglomeration of homogenous-sized firms—that is an important contributor to firm productivity.

CONCLUSION

This chapter has explored the multiple explanations offered in the literature for the existence of wage disparities across urban areas. In line with my dissertation's research objectives, I presented the literatures that offer a framework for analyzing the potential contributions of industrial concentrations *within* geographic space to wage disparities *across* geographic space in an economic environment, like Mexico's, that is increasingly influenced by globalization processes. For this purpose, I discussed the literatures of localization economies, demand-market access, and globalization externalities. In addition, I also addressed other factors known in the literature to explain urban wage disparities.

A review of the key literature reveals that trade liberalization and globalization processes add several layers of complexity to the study of urban wage disparities, specifically when these relate to localization economies. In the first place, the literature shows that both globalization externalities and localization economies are derived from similar sources (i.e., input sharing, labor pooling, knowledge spillovers, and competition). It follows then that in an increasingly globalizing context, like Mexico's is, the potential presence of globalization externalities might confound the true effect of localization economies on urban wages and vice versa. In addition, the theoretical discussion of demand-market access further poses that globalization influences the location and concentration of production—and, therefore, of employment—by expanding the set of demand markets firms serve. In this manner, any potential effect that proximity or access to demand markets may have on urban wages may be confounded by constantly increasing globalization processes. Finally, the literature also points to a nexus between agglomerations economies, both of localization and urbanization, and the market accessibility of local firms with implications for their joint determination of urban wages. Accounting for these complex interactions is, therefore, important to fulfill the objectives of my research.

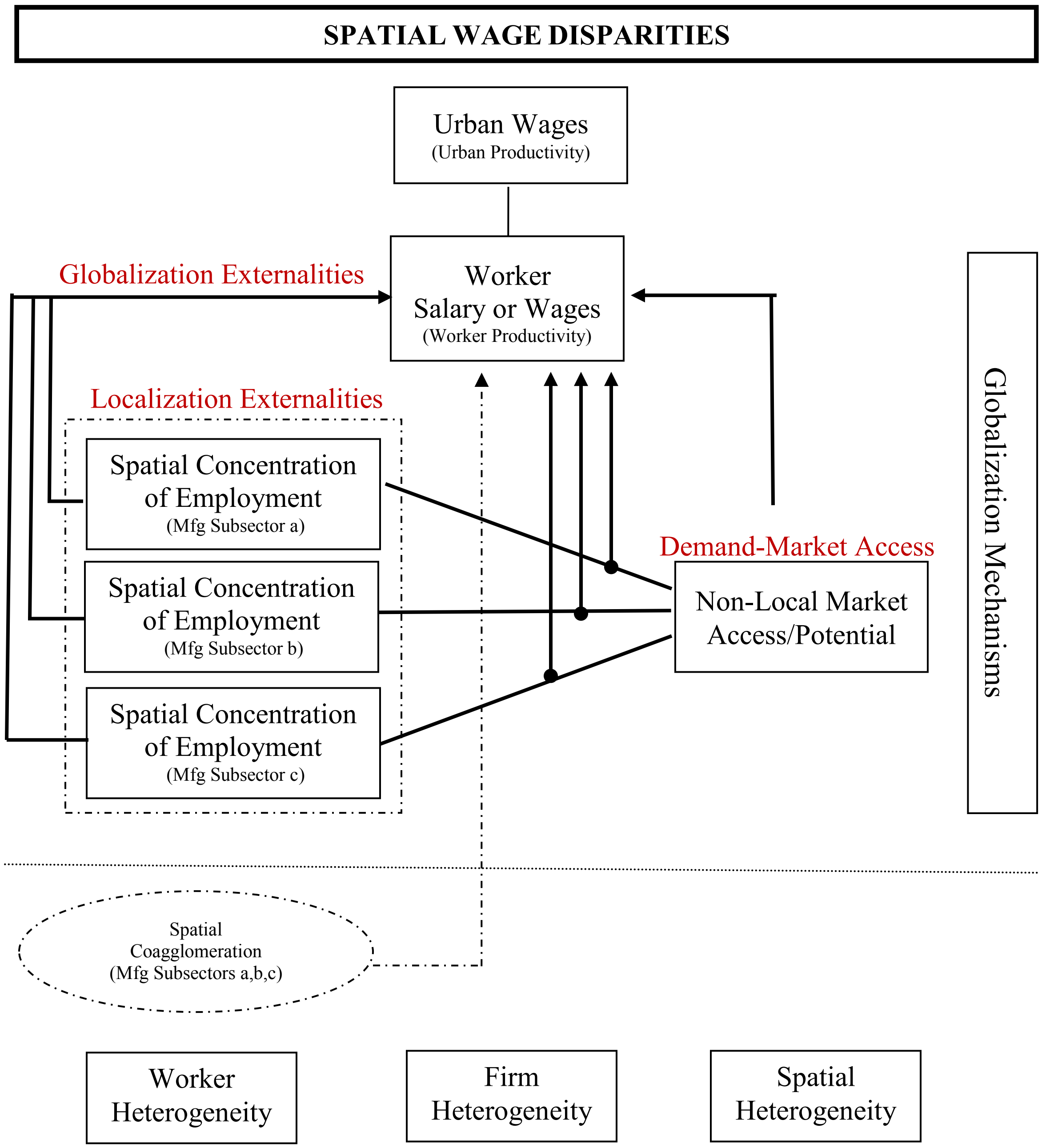
Chapter 3: Data and Methodology

Chapter 3 presents the data and methodology employed in the dissertation to address the research objectives. The organization of Chapter 3 is as follows. First, the chapter presents, in line with the theoretical background and literature review introduced in Chapter 2, the conceptual model that guides the dissertation analysis. Next, the chapter introduces the analytic strategy and corresponding empirical considerations, followed by a comprehensive description of the data employed to conduct the analyses in the study. This section is followed by a description of how the analytic strategy is implemented in the study based on the characteristics of the data. The chapter continues with a presentation of key analytic measures as well as other data measures employed. (Appendix C presents a general descriptive examination of the data measures). The chapter closes with some brief concluding remarks.

CONCEPTUAL MODEL

Following the theoretical background and literature review presented in Chapter 2, I introduce in this section the conceptual model guiding the analyses that are conducted in this study to address the research objectives: (1) to investigate whether the spatial concentration and location of manufacturing employment may explain wage disparities across urban areas in Mexico, and (2) to investigate if and to what extent Mexico's rapid integration to global markets through trade liberalization and other globalization processes has contributed to expand or to contract the potential wage disparities across urban areas in Mexico associated with the spatial concentration of manufacturing employment and its relative location to demand markets. A diagram of the conceptual model is presented in Figure 3.1.

Figure 3.1: Conceptual Model



Source: Own elaboration.

The literature agrees that the mechanisms behind industrial localization are one way to explain the observed unevenness in the spatial distribution of economic activity and income (Henderson et al. 2001). Agglomeration theory posits that it is the size of the externalities generated by these agglomeration mechanisms that determines the magnitude of spatial economic disparities. New Economic Geography theory further points to demand-market accessibility along with the presence of economies of scale in transportation and trade costs as elements that reinforce spatial patterns in the distribution of economic activity and spatial economic disparities. In line with this, the conceptual model focuses on two sources of wage variation across space: the spatial concentration of manufacturing employment and the spatial accessibility to consumer markets. Accordingly, it is the two aforementioned theoretical frameworks—both of which relate wages to the characteristics of the local labor market—that allow me to investigate whether the localization and relative location to demand markets of manufacturing employment explains wage disparities across urban areas in Mexico. Their corresponding empirical literatures additionally provide the general guiding structure that is behind the identification and definition of the analytic measures employed here to address this research objective.

Following agglomeration theory, the first working hypothesis in this study is that localization economies derived from the spatial concentration of manufacturing employment are a way to explain the observed unevenness in the spatial distribution of wages in Mexico. The second hypothesis is based on the theoretical model of the New Economic Geography (NEG) and the assumption that the relative position of the urban areas in Mexico with respect to demand markets for local production also contributes to explain spatial wage disparities in the country. The third hypothesis considers that the contribution to spatial wage disparities in Mexico of both localization economies and the local advantages derived from access to demand markets can be moderated when these factors interact with each other. To the best of my knowledge, neither a theoretical framework nor empirical evidence has ever been provided to support this interaction hypothesis or establish the potential nature of the relationship and the mechanisms behind it. I, therefore, leave this hypothesis as an empirical matter to be analyzed in this study as well as one with a potential theoretical contribution.

In the conceptual model presented in Figure 3.1, the first working hypothesis is represented by a measure of spatial concentration of manufacturing employment. I argue here that a sufficiently large local concentration of manufacturing employment generates enough localized externalities—that is, localization economies—to have an observed effect on the wages of local workers. (Refer back to Chapter 2 for a discussion of the underlying mechanisms through which localization economies affect workers' wages). Through geographical space, different concentrations of manufacturing employment would yield localization economies of potentially different magnitude, generating spatial wage disparities. I argue that the localization economies resulting from the spatial concentration of manufacturing employment may be decomposed into additive parts, each of which may be attributed to a specific manufacturing subsector present in the local economy. In this context, the wage level of an urban worker is the result of a combination of localization economies derived from sufficiently large local concentrations of employment from each manufacturing subsector present in the local economy. The localization economies attributed to each manufacturing subsector may be, moreover, of the same or of different magnitude, denoting different levels of localization economies that may be generated because of the intrinsic differences across manufacturing subsectors. A prior review of the literature of localization economies at the subsectoral level—where localization economies are estimated separately by subsector—indicates that the magnitude of these scale economies often vary by subsector. I, therefore, anticipate that, at the urban level of analysis, localization economies will vary in magnitude as well across subsectors. It follows, hence, as shown in the conceptual model, that the measure of spatial concentration of manufacturing employment should be disaggregated by manufacturing subsector. In this context, the resulting localization economies across subsectors are hypothesized to have an effect on the wages of local workers of unknown magnitude that varies by subsector. The different levels of manufacturing employment concentration across space would, therefore, be expected to generate corresponding wage disparities across space.

In the conceptual model, localization economies across subsectors do not reflect inter-subsector economies, only own-subsector economies. Inter-subsector economies may be the result of the spatial coagglomeration between subsectors because of perceived advantages derived from the coagglomeration. The conceptual model ascertains that to measure localization economies across manufacturing subsectors as well as their observed effects on wages appropriately, the potential presence of coagglomeration externalities should be determined and, if necessary, isolated from the analysis of localization economies and urban wage disparities. The assumption here is that the potential effects derived from the local economic structure—the mix of manufacturing subsectors in the local economy—may be isolated from the estimation of pure own-subsector localization economies and their effects on worker and urban wages. In this context, the relative specialization or diversification of the urban economies in terms of the various manufacturing subsectors is not relevant, except as a control for the appropriate identification of own-subsector localization economies. The analysis of coagglomeration across manufacturing subsectors within the context of this study is left for future research.

The second working hypothesis, based on the theoretical model of the New Economic Geography (NEG) and the assumption that the relative position of urban areas with respect to demand markets for local production contributes to explain spatial wage disparities, is represented by a measure of an urban area's access to consumer markets that demand local products—and which may also be described as a measure of the potential demand market (for local products) that may be accessible to an urban area. The demand market is assumed to be non-local, but its source is not pre-established. In this manner, the demand market may be domestic (i.e., non-local) or foreign, and access may not necessarily reflect direct but also indirect forms of access. For example, I speculate, considering a foreign consumer-demand market, that direct access to a foreign market via land ports is comparable to indirect access to the foreign demand market via the use of maritime ports and shipping lines for the delivery of local products.

This working hypothesis states that the proximity or access to demand markets has a direct effect on urban wages. This is explained, according to the review of the literature in Chapter 2, by the fact that firms located in cities or regions close to their consumer or industrial markets are willing to pay workers higher wages since they are benefiting from relatively low transportation or trade costs that are reflected on lower production costs. In this context, the theoretical background presented in Chapter 2 predicts that urban wages should be higher in urban areas with proximity or access to demand markets, and comparatively lower in urban areas that are further away from the demand markets or with relatively less ease of access to them. In this manner, the theoretical model dictates an empirical relationship where urban wages increase with spatial proximity or market accessibility and decrease with remoteness or lack of access. Accordingly, spatial wage disparities are the result of the relative geographical position of urban areas with respect to demand markets for local production. In the context of this study, local production refers to local manufacturing production.

The third working hypothesis explores the intersection of the aforementioned theoretical frameworks and is represented in the conceptual model by the interactions of the subsector-specific spatial concentrations of employment and market access. I argue here that the magnitude of subsector-specific localization economies and the corresponding observed effects on urban wages may be moderated by access to demand markets. While neither a theoretical framework nor empirical evidence exists to support this interaction hypothesis or establish the potential nature of the relationship or the mechanisms behind it, I argue that it is conceptually possible to assume that the strength of localization economies may be linked to local access to demand markets. Otherwise one would not necessarily observe the persistent permanence of industrial concentrations in border regions, like the U.S.-Mexico border, where presumably wages are consistently higher relative to other regions because of the proximity to demand markets. When physical proximity becomes irrelevant—for example, when infrastructural improvements are such that physical distance to markets is irrelevant—only efficiencies that are unique to the interaction of spatial concentration and market access would explain industrial permanence. I further argue, as reflected in the conceptual model, that each of the specified interactions has a direct effect on urban wages and, consequently, on urban wage disparities. The investigation of the existence, strength, and direction of the interactions are an empirical pursuit of the study.

The literature review in Chapter 2 reveals that the characteristics of local workers and local firms as well as the diversity of local economic structures (i.e., the characteristics that are unique to each urban space) not only play a role in the wage determination process of workers in urban areas but also on the quality and magnitude of the local concentration of employment. The conceptual model, therefore, argues that measures that allow the researcher to account for worker, firm, and spatial heterogeneity become necessary elements in an analytic model of wages and spatial concentration of employment to isolate confounding effects from the main empirical results.

Figure 3.1 further illustrates an additional element that hypothetically contextualizes and influences the key empirical relationships in the model, and that is the presence of globalization mechanisms and globalization externalities. The theoretical discussion of globalization externalities presented in Chapter 2 shows that both globalization externalities and localization economies are derived from similar sources (i.e., competition, input sharing, labor pooling, and knowledge spillovers). It follows then that in an increasingly globalizing context, like Mexico's is, the potential presence of globalization externalities might confound the true effect of localization economies on urban wages and vice versa. The theoretical discussion of demand-market access, also in Chapter 2, further poses that globalization influences the location and concentration of production—and, therefore, of employment—by expanding the set of demand markets firms serve. In this manner, as globalization processes develop or change so would one expect any potential effect that proximity or access to demand markets may have on urban wages to develop or to change as well. I hypothesize, therefore, that globalization processes influence the magnitudes of both the empirical relationship of the spatial concentration of manufacturing employment across subsectors with urban wages as well as that of market access with urban wages. Influential works (Hanson 1996, 1997) provide support for this argument as they find empirical evidence for Mexico at the regional level that indicates that trade liberalization processes do yield intense spatial variation in the contribution of regional accessibility to demand markets and the regional location of production to the spatial wage gradient. Whether this variation exists at the urban-scale is an empirical pursuit of the dissertation analysis.

Finally, the directionality of the effects presented in the conceptual model and denoted by arrow direction is not exhaustive as there are elements in the literature that indicate that the causal relationship may be bidirectional (i.e., simultaneous). However, this study primarily focuses on the relationships as presented in the model, although it also attempts to empirically curtail the potential simultaneity bias that may arise from the possible simultaneous causal relationships among the elements in the analysis.

EMPIRICAL STRATEGY AND CONSIDERATIONS

Spatial Concentration of Employment, Market Access, and the Mincerian Analysis of Wages

Most authors employ augmented Mincerian wage functions after Mincer (1974), using micro level data at the firm or at the individual level, to estimate the size of space-based externalities (e.g., agglomeration or human capital externalities) in the labor market. The advantages of micro-level data, according to Griliches and Mairesse (1998), are that they can provide greater data variability, can better represent optimizing behavior assumed from microeconomic theory, and can reduce multicollinearity as well as aggregation bias that result from unobserved heterogeneity. In this sense, the use of aggregated data on spatial units is unable to allow for the full identification of firm- or individual-level heterogeneity and its influence on wage levels. And given that the sorting of workers matters since it explains most of the impacts of spatial externalities on the wage distribution, the use of aggregate data or even the use of firm-level data alone pose an analytical limitation. This dissertation examines the research questions using data at the lowest possible level of analysis, the individual level, augmented with firm- and spatial-level data.

The earliest attempt in the literature to quantify space-based externalities using the Mincerian approach, as noted in Halfdanarson et al. (2010**)**, is Rauch (1993). Here, Rauch examines a measure of human-capital externalities by employing an amenity model that is based on Roback (1982). The author investigates the impact of aggregate levels of human capital (i.e., measured in average years of education and experience in a worker's city) on individual wages and explores the possibility of omitted variable bias by accounting for the presence of local amenities (i.e., cultural activity, weather, and population). Glaeser and Maré (2001) and, more recently, Di Addario and Patacchini (2008) and Echeverri-Carroll and Ayala (2011) similarly use wage data, within the context of the Mincerian wage function augmented with a measure of urbanization, to investigate the wage premium paid to workers in larger cities. Wheaton and Lewis (2002) test the impact of labor-market scale on workers' wages by using not only measures of city size and urbanization but also measures of employment concentration in a worker's same industry of employment and a worker's same occupation of employment. Echeverri-Carroll and Ayala (2010, 2009) explore urban wage differentials and gender wage differentials, respectively, resulting from the spatial concentration of high-technology industries. In addition to the Mincerian model of wages, the aforementioned studies also incorporate the amenity model proposed by Roback (1982) and employed in Rauch (1993).

There is a dearth, however, on empirical research investigating the effects of demand-market access on wages using individual level data. The studies that exist have relied on data at the national, regional, state, and urban level using average income or wages (e.g., Mayer 2009; Breinlich 2006; Head and Mayer 2006; Redding and Venables 2004; Hanson 2005, 1997). Redding and Venables (2004), for example, estimates a model of economic geography using cross-country data on per capita income, bilateral trade, and the relative price of manufacturing goods—controlling for a wide range of country characteristics, including economic, geographical, social, and institutional characteristics—and find evidence that access to markets is quantitatively important in explaining cross-country variation in per capita income. Mayer (2009) also shows that market potential at the aggregate and industry levels for all countries in the world is a powerful driver of per capita income and average wage variation. His analysis extends the findings of Redding and Venables (2004) from the cross-sectional to the time-series context. Hanson (2005), using data on U.S. counties, finds also a strong relationship between market access and nominal wages. Hanson (1997), examining state manufacturing wages relative to national wages as a function of access to markets and using Industrial Census data for Mexico, finds that the differential access of urban areas to the end-markets of local industrial production contributes to the creation of urban wage differentials.

Consequently, as with most wage studies of space-based externalities, my analysis proceeds from a common framework, based on Mincer (1974), in which the logarithm of hourly wages or earnings is regressed on a set of core explanatory variables consistent with human capital theory to assess the individual gains from accumulated education and labor experience. I augment this set with additional control measures that account for individual heterogeneity, firm-of-employment heterogeneity, and the diversity of local economic structures, as well as with the key measures that serve the purpose of my research.[30] Using a relative measure of spatial concentration based on Echeverri-Carroll and Ayala (2010, 2009), Echeverri-Carroll et al. (2007), and DeVol (1999), I introduce a novel approach for estimating localization economies by subsector as introduced in the conceptual model where I argue that the localization economies resulting from the spatial concentration of manufacturing employment may be decomposed into additive parts, each of which may be attributed to a specific manufacturing subsector present in the local economy. Extending the current state of the research on the effects of market access on wages, I investigate this relationship within the Mincerian wage-estimation context, employing individual-level data. Additionally, as discussed in the conceptual model, I investigate also within this methodological context the empirical contribution of the interaction between localization

[30] Implicit in this approach is the assumption that each control variable is predetermined or at least generated independently of the error term.

economies and market access on urban wages—a theoretical and empirical question that to the best of my knowledge has not been analyzed.

In line with this, the general specification of the linear Mincerian wage model used in this study to address the research objectives takes the following general form:

$$W_{i,m(i)} = SC_{d,m(i)}{}'\beta + MA_{m(i)}{}'\gamma + SC_{d,m(i)} * MA_{m(i)}{}'\rho + IC_i'\delta + FC_i'\theta + LC_{m(i)}{}'\pi + \alpha + \varepsilon_i \qquad \text{(Eq. 1)}$$

where the wages, $W_{i,m(i)}$, of worker i residing in the urban area m are a linear function of a vector of individual characteristics of workers, IC_i, a vector of characteristics related to the worker's firm of employment, FC_i, a vector of characteristics describing the urban area m where worker i resides, $LC_{m(i)}$, an intercept, α, an error term, ε_i, and the key analytic regressors represented by a vector of relative measures of spatial concentration for each manufacturing subsector d in the urban area m where worker i resides to identify localization economies, $SC_{d,m(i)}$, a vector of variables that account for the accessibility to demand markets or market potential of the urban area m where worker i resides, $MA_{m(i)}$, and an interaction of these vectors, $SC_{d,m(i)} * MA_{m(i)}$.

The strategies by which I investigate if and to what extent Mexico's trade liberalization and globalization processes influence the potential relationship between the localization and relative location to demand markets of manufacturing employment and urban wage disparities are several. While the better strategy would be to compare wage differences across three groups of workers—those employed by FDI firms, those employed by domestic firms that export or that import its inputs, and those employed by pure domestic firms—with the idea that workers in firms that are more engaged or exposed to foreign transactions would be more productive and, therefore, earn higher wages, the data that would make this strategy possible is not available at the individual level of analysis, only at the firm level. As described earlier in this section, using individual-level data is critical in the analysis of localization economies and spatial wages disparities, and therefore

I rely on alternative strategies to investigate the moderating influence of globalization processes.

Theoretically, the market access hypothesis offers an opportunity to account, to a certain extent, for the influence of globalization in the analysis as it allows me to account for the contribution to wages of an urban area's access to foreign demand markets. The interaction hypothesis further explores this contribution as it relates the wage advantages obtained from an urban area's access to foreign demand markets to localization economies. Empirically, the influence of globalization mechanisms in the study is introduced through a before-and-after (non-experimental) research design comparing years of accelerated export expansion and globalization exposure (i.e., from the mid-1990s onward) to years prior—when globalization strategies are very limited or non-existent. While this approach serves mostly to accomplish a research objective of the study, the approach also aids in disentangling empirically the effects of market access on wages from other leading sources of wage differentials such as locational fundamentals (e.g., natural endowments) or local institutions, a key challenge of the empirical literature as noted by Redding (2010). The premise is that globalization processes (i.e., trade liberalization processes), as noted in Hanson (1996, 1997), yield intense spatial variation in the regional location of production and in the importance placed by firms to access domestic- and foreign-consumer markets, that allows for the empirical disentanglement from other sources of spatial wage disparities of the effects of the spatial concentration of production as well as of market access. Under this context, I analyze the differences observed across manufacturing subsectors as effects should be observably more pronounced in export-intensive subsectors relative to less export-intensive subsectors[31].

A second empirical strategy that introduces the role of globalization in the analysis does exit and is used as a robustness check of the empirical results presented in Chapter 7. This strategy exploits the empirical fact, at least for the case Mexico, that the firms most

[31] According to Figures A.6 and A.7 in Appendix A, export-intensive subsectors would include: Metallic, Machinery, and Equipment Products; Oil, Chemical, and Plastic Products; and, Textile and Leather Products.

exposed to globalization are often large-sized firms.[32] Consequently, urban wage variation from localization economies and market-access advantages, in particular if it relates to exposure to globalization processes, should be more pronounced in an analysis of large-sized firms relative to an analysis of all firms. This third strategy is, however, conducted simply as an empirical exercise given that the results may be biased by scale effects. The results of the exercise are presented in Appendix F.

Accordingly, the general specification of the linear Mincerian wage model used in this study (i.e., Equation 1) is adapted as follows:

$$\begin{aligned} W_{i,m(i)}^{t} = {} & {SC_{d,m(i)}^{t}}'\beta + (Post * SC_{d,m(i)}^{t})'\vartheta + {MA_{m(i)}}'\gamma + (Post * MA_{m(i)})'\tau + \\ & + (SC_{d,m(i)}^{t} * MA_{m(i)})'\lambda + (Post * SC_{d,m(i)}^{t} * MA_{m(i)})'\rho + {IC_{i}^{t}}'\delta + \\ & + {FC_{i}^{t}}'\theta + {LC_{m(i)}^{t}}'\pi + {T_{i}}'\omega + \alpha + \varepsilon_{i}^{t} \qquad \text{(Eq. 2)} \end{aligned}$$

where *t* denotes variation over time and *Post* is a binary variable that discriminates the empirical relationships observed in a time period prior to globalization with those of a time period when globalization processes and mechanisms are at play. *Post* interacts with the key variables of analysis: a vector of relative measures of spatial concentration for each manufacturing subsector *d* in the urban area *m* where worker *i* resides to measure localization economies, $SC_{d,m(i)}$, a vector of variables that account for the accessibility to market or market potential of the urban area *m* where worker *i* resides, $MA_{m(i)}$, and the vectors' interaction.

[32] Firms most engaged in international transactions share several common characteristics that differentiate them from purely domestic firms (Ottaviano 2011). For example: they are bigger, more skilled-intensive, more innovative, have better access to capital markets, and find it easier to withstand the transaction costs associated with international transactions, among others.

Empirical Considerations

Two potential sources of endogeneity are identified in standard econometric specifications related to agglomeration economies of urbanization, of localization, or from local human-capital endowments: simultaneity bias and omitted variable bias. Omitted variable bias, or unobserved heterogeneity, arises when important features that impact both the independent regressors and the outcome variable are not explicitly accounted for in the model specification, such as unobserved individual (e.g., ability), sectoral (e.g., production technology), or spatial characteristics (e.g., local natural resources, local climate or geology, local infrastructure, local public services) (Combes et al., 2010). Omitted variable bias leads estimated agglomeration effects to be potentially over- or underestimated. The most common approach employed by the literature is the use of longitudinal estimation techniques employing panel data (e.g., Fingleton and Longhi 2013). While appropriate panel data does not exist for the Mexican context, my model specification incorporates an exhaustive, yet relevant, list of control variables to minimize the potential for omitted variable bias in the analysis.

Simultaneity bias stems from the potential uncontrolled reverse causal relationship that may exist between wages and measures of agglomeration and market accessibility. The underlying assumption in this study is that local agglomeration mechanisms and market access have an effect on urban wages. However, it is also plausible to assume the reverse and observe, for example, the influence that past wage levels have exerted on current local agglomeration levels or on the type of local agglomerations present—that is, on the industries present or on the composition of the population or workforce. As I described in the previous section, the use of the before-and-after (non-experimental) research design comparing years of accelerated export expansion and globalization exposure is an approach, following influential work by Hanson (1996, 1997), that is used to curtail simultaneity bias in the results of the empirical analysis.

Alternatively, the most common approach to deal with simultaneity bias in the context of agglomeration economies is to use long-lag variables as instruments using instrumental variables estimation techniques (e.g., Echeverri-Carroll and Ayala 2011, 2010; Combes et al. 2010, 2008; Rice et al. 2006; Ciccone and Hall 1996). While novel, the use of instrumental variables to account for endogeneity has strict data requirements that are seldom satisfied. In the course of developing this dissertation research, I explored extensively the use of long-lag variables within the context of instrumental variables estimation but found serious data limitations as all of the data explored was available only at the state level.[33] As an alternative, following the findings in Henderson (1997), I opted to account for earlier patterns of urban industrial concentration directly in the wage model, using the only available and relevant historical variable that I was able to obtain—the *historical percentage of local manufacturing employment*. Data for this variable was obtained from the Mexican General Census of Population in 1970.

DATA AND SAMPLE

The study is conducted using cross-sectional data for the years 1992 to 2010 on three units of analysis: the worker, the firm, and the urban area. Data come primarily from two combined, successive surveys of households in Mexico: (1) the National Survey of Urban Employment for the years 1992 to 2004—the last year the survey was conducted—and, its replacement, (2) the National Survey of Occupation and Employment for the years 2005 to 2010. These datasets are uniquely suited for this research as they are the only spatially-representative surveys for Mexico that provide detailed annual labor market data—on employment and wages, among other data—for individuals residing in the country's principal metropolitan and urban areas. Although these surveys are not longitudinal, both can be and are arrayed in this study to conduct a pseudo-longitudinal analysis that describes wages and industrial concentration patterns across metropolitan and

[33] The data explored as potential historical instruments came from the Mexican National Institute of Statistics and Geography (i.e., Census of 1900, 1910, 1921, 1930, 1940, 1950, and 1970) as well as from published survey studies from the early 1990s (i.e., Garza 1992).

principal urban areas over time. Thus, I combine both surveys to provide an urban-level analytical portrait of wage disparities, localization economies, and market-access advantages in manufacturing employment that spans a period of two decades in Mexico's economic history characterized by trade reforms, trade openness, and increasing globalization trends. This is possible to do because the data within and across surveys are considered, in general, technically equivalent and comparable. The surveys are referred, henceforth, in this research by their Spanish acronyms, ENEU and ENOE, respectively, and, when relevant, the sample is referred to as the *general analytic sample*.

The ENEU and the ENOE are household surveys conducted by the Mexican National Institute of Statistics and Geography (INEGI by its Spanish acronym) and are a joint project between this Institution and the Mexican Ministry of Labor and Social Prevention. The ENEU is first conducted in 1987—and revised multiple times thereafter—with the objective to gather statistical information about the occupational, demographic, and economic characteristics of the urban population in Mexico, allowing for an in-depth analysis of urban labor issues. Along with information on the socio-demographic characteristics of each member of the household, the survey contains detailed employment information on household members' primary and secondary jobs with several questions on occupational status, type and characteristics of employment, sector of employment, number of hours worked per week, monthly wages, unemployment status and duration, social security contributions, among other questions. While data exist for the years 1987 through 1991, I have opted not to include these data in the dissertation analysis given that a very limited sample of metropolitan and principal urban areas is included in these survey years (i.e., 16 compared to 28 and up to 44 geographical units during later years). These data's inclusion in the analysis would raise significantly the possibility of introducing methodological selection bias in the empirical results because of lack of information from potentially key local labor markets.

In 2005, the ENEU is replaced by the ENOE. This new survey merges the thematic characteristics of the ENEU and the National Survey of Employment (ENE by its Spanish acronym)—the ENEU's rural counterpart—and updates some of these earlier surveys' conceptual, methodological and procedural guidelines to implement best-practice and standardized criterions developed by international organisms, like the Organisation for Economic Co-operation and Development, the International Labor Organization, and the United Nations' Delhi Group. The objective of the updates is to facilitate data comparability across time and countries and to capture more precisely labor market characteristics—including unemployment, underemployment, the informal sector, precarious employment, and the non-governmental and non-profit sectors, among others—using the most recently adopted definitions and measurement criteria (INEGI/STPS 2005: pp. 8, 23-24).

Methodologically, both surveys use a rotating-panel design where sample units are divided in equally-sized panels that are brought in and out of the sample periodically. This design allows for a continuous survey in which a fraction of the sample is replaced at regular intervals. In the case of the ENEU and the ENOE, the samples are divided in five, equally-sized independent panels of household units who are interviewed on five different occasions, once each quarter of the year for five consecutive quarters, with one of the panels (i.e., 20% of the sample) brought out of the sample and substituted for a new panel of households every quarter. This design allows researchers to observe not only trends over time across cross-sections of households, using the continuous nature of the surveys, but also to trace changes to the internal structure of the households that occur over the course of the five quarters that these households are present in the survey sample. Given as my objective is not to capture or to control for these structural changes within the household units, I disregard the surveys' panel feature and instead use only data on all households present in the surveys at the same point in time each year. Specifically, I use data on all households present in the survey sample during the third quarter of every year—referred also as the third-quarter rotation group. By adopting this approach, I obtain a sample of annual cross-sections of households that is free of seasonal influences. My analysis, however, is carried out, as previously mentioned, using the survey data on individual household members (i.e., workers) not on household units.

Sample Characteristics

The general analytic sample is comprised of male and female wage and salary workers with a strong attachment to the labor market and, therefore, those whose earnings are most likely to be directly influenced by spatial economic patterns and globalization processes. Following the labor economics literature, these workers include those aged 18 to 64 (the year prior to the legal age of retirement), working full time for pay in their primary job the week prior to the survey (i.e., at least 35 hours per week),[34] and neither self-employed nor members of a cooperative. The sample, moreover, is limited to workers with non-missing responses in survey questions about key socio-demographic and economic characteristics, including educational attainment, age, marital status, migration status, head of household status, occupation, industry, size of firm of employment, and monthly income. To be able to appropriately estimate localized externalities from the spatial concentration of manufacturing employment, I follow Henderson (1986) and further limit the general analytic sample to workers in manufacturing industries only.[35] While the data may reflect only manufacturing employment and wages, conclusions may be drawn and extrapolated to the urban scale.

The sample is also limited to formal-sector workers engaged in formal employment for two reasons. First, the ability of the informal sector to generate and/or benefit from agglomeration economies is not yet well understood. Some empirical evidence suggests that urban informality may in fact undermine these scale economies. (Refer, for example, to Amin (1994) and Harris (2012) for further discussion.) Second, research also points to the mostly domestic-market orientation of manufacturing production from unregistered,

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[34] I use primarily data on *usual hours worked per week in the primary job* to identify full-time workers. In cases, however, where these data are not available, we use instead data on *hours worked last week in the primary job*. For the years 1987 to 1993, the ENEU does not provide a survey instrument that accounts for usual hours worked. For this time period, we use, therefore, data on actual hours worked to identify our sample of full-time workers.

[35] As Lee and Zang (1998) explains, citing Henderson (1986), it is critical to estimate scale economies on an industry basis rather than as an aggregate production function for the city since this aggregate production function can only have urbanization economies.

informal firms. Martínez et al. (2005: p. 301), for instance, offers the case of textiles manufacturing firms in Puebla as an example. By limiting the sample to formal-sector workers in formal employment, I am excluding establishments that operate in the informal production market and with a high likelihood of serving mostly the domestic consumer market. This allows me to further focus the analysis on manufacturing employment with a relative stronger and more direct exposure to globalization and mitigate potential confounding factors in the analysis. Nevertheless, research on how informal and formal sectors of the economy may differentially benefit from and/or be hurt by agglomeration mechanisms, and how employment in strictly domestic-oriented firms is influenced by globalization processes is essential to comprehend fully urban processes of economic growth and/or stagnation, especially in countries like Mexico with a historically large urban informal labor market and with an increasing exposure to global markets.[36] For that reason, I expect an analysis of informality within the context of this research to be part of my future research agenda.

Following international standards for defining and measuring informality (ILO 2012, 2003, 1993), I define formal employment in the formal sector as that which is covered under a legal or regulatory framework with consideration to the type of economic unit utilizing the employment. In this manner, I refer to formal-sector, formal employment as that which is performed through legally-registered economic units[37] and by workers with access to any of the following legally-mandated employment benefits:[38] (1) social security

[36] Refer to Roberts (1994) for a discussion of the informal sector in both the general and the Mexican contexts. The author's discussion is relevant to this dissertation to understand not only the informal sector in Mexico but also how this sector operates within Mexico's globalization context, in particular, that which pertains to the maquiladora industry.

[37] Registered economic units include: government institutions, decentralized state businesses, private-sector companies or businesses, cooperatives, unions, non-governmental organizations, non-profit organizations, educational, health, and religious institutions, and any other economic unit with name or legal registration. They exclude: unregistered and unnamed businesses as well as family and personal businesses.

[38] The ENEU and the ENOE limit the definition of formality applied in this study in two ways. First, one cannot ascertain using the surveys that both, the economic unit and the worker, comply with income tax regulations as would be the case under strict economic- and labor-formality conditions. Second, one is unable to corroborate that the workers in the sample are in fact not just entitled through their primary job to the legally-mandated employment benefits but are also in a position to claim and use them. It might be the case that workers waive their rights to employment benefits in lieu of higher take-home pay, which in practice

and health care through the Mexican Institute of Social Security (IMSS by its Spanish acronym) or the State's Employees' Social Security and Social Services Institute (ISSSTE by its Spanish acronym), (2) pension funds managed by Mexico's System of Savings for Retirement (SAR by its Spanish acronym) or Retirement Funds Administrators (AFOREs by its Spanish acronym), or (3) housing credits provided by institutions such as INFONAVIT (the Spanish acronym for the Institute of the National Fund for Workers' Housing), FOVISSSTE (the Spanish acronym for the ISSSTE Housing Fund) and FONHAPO (the Spanish acronym for the National Trust Fund of Popular Housing).[39]

Geographical Coverage of Sample

I use the metropolitan-area scale or in its absence the principal urban-area scale—not the municipal scale—to characterize urban labor markets in this study.[40] The rationale follows that urban labor markets and, for that matter, also urban economic processes are not constrained by geopolitical boundaries, particularly not in cities comprised by multiple municipalities as are many large cities in Mexico, like Monterrey, Guadalajara and Mexico City, among others. In these cases, the municipalities, which are spatially proximate to each other but may or may not be geographically contiguous, sustain intense socio-economic interactions that generate a labor market and economic processes that exceed the limits of any one municipality—consider, for instance, workers who reside in one

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would define these workers as informal employees. In this case, the ENEU and the ENOE do not allow one to make this distinction.

[39] From 1987 to 1992, a question on access to pension funds is not included in the ENEU and, therefore, is not considered in our measure of formal-sector, formal employment for this period. Furthermore, starting in 2006, the ENOE no longer asks individuals whether or not they have access to housing credits and/or pension funds as benefits from either their primary or secondary job. Therefore, formal employment in the formal sector from 2006 to 2010 is measured in this study according to a worker's access to health care through (1) IMSS, (2) ISSSTE, or (3) state-based ISSSTE (e.g., ISSSTELEON, ISSEMYM). Finally, we exclude from our measure of formal employment in the formal sector other legally-mandated employment benefits, such as paid annual leave and the Christmas bonus (known in Mexico as a*guinaldo*), because we are not able to ascertain by these benefits alone the formal nature of the employment.

[40] The urban coverage of the ENEU and the ENOE consists not only of metropolitan areas but also of principal urban areas in the case where metropolitan areas have not been defined for the urban agglomeration.

municipality but work in another municipality within the same metropolitan area. In this manner, agglomeration mechanisms and externalities are not bounded by municipal limits, although distance does play a limiting role on the magnitude of scale economies that result from the agglomeration of economic activity. The literature has found that agglomeration economies decrease with distance (Rosenthal and Strange 2003; Duranton and Overman 2005; Rice et al. 2006). Conducting the analysis at the municipal level would ignore the organic and dynamic relationship that exists between economic units in neighboring municipalities within a metropolitan or urban area and that defines the local urban labor market in its entirety.

Based on the geographical coverage of the ENEU and ENOE surveys, the general analytic sample of male and female full-time formal workers is distributed across a range of 28 to 36 metropolitan and principal urban areas in Mexico depending on the survey year. Table 3.1 shows the total number of metropolitan areas covered in the general analytic sample per year for all years, and Table 3.2 lists the metropolitan and principal urban areas covered overall in the analysis by author's regional divisions. (For reference, Map B.1 in Appendix B maps Mexico's official federal entities and the author's regional divisions, and Map B.2, also in Appendix B, maps the metropolitan and principal urban areas in the analysis.) Data on workers residing in 28 specific metropolitan and principal urban areas are consistently available across both surveys during the sample years (i.e., 1992 to 2010). Data on workers residing in additional 6 to 8 metropolitan and principal urban areas are also consistently available in the ENEU between 1992 and 2002.[41] Given the geographically-inconsistent nature of the data, I carry out the analysis on two data samples grouped according to metropolitan- and urban-area data availability. One sample includes data on 34 to 36 metropolitan and principal urban areas from 1992 to 2002 and is used to analyze spatial wage disparities in the short run. And the other sample includes data on 28

[41] Individual data from additional 8 metropolitan and principal urban areas covered in either the ENEU or the ENOE's full microdata samples were excluded from consideration in the general analytic sample because data for key years in the analysis were not collected for those geographical units. The excluded metropolitan and principal urban areas are: Cancún, Cd. del Carmen, Celaya, Irapuato, La Paz, Mexicali, Pachuca, and Tlaxcala.

metropolitan and principal urban areas from 1992 to 2010 and is used to analyze spatial wage disparities in the short- and long-runs. I explain the practical implementation and analytical basis for using this approach later in the chapter. For a complete overview of the ENEU's and ENOE's full-sample geographical coverage by year, region, and metropolitan area refer to Table B.1 in Appendix B.

Table 3.1: Geographical Coverage of the General Analytic Sample

Survey	Time Period	Metropolitan and Principal Urban Areas
ENEU	1992	34
	1993 – 2001	36
	2002	35
	2003 – 2004	28
ENOE	2005 – 2010	28

Source: Own elaboration.

The geographical units in the general analytic sample represent some of the most economically important and largest metropolitan and urban areas in Mexico as well as a large fraction of the urban population in the country. Indeed, I estimate using Mexican Census of Population data for the years 1990, 2000, and 2010 that the geographical coverage of the general analytic sample represents approximately between 79 and 89 percent of Mexico's urban population depending on the survey year observed. In particular, I estimate that, for survey years for which geographical coverage ranges between 34 and 36 urban areas, the percentage of the urban population represented is approximately between 86 and 89 percent. In the same manner, I estimate that, for survey years in which the coverage consists of 28 urban areas, the percentage of the urban population represented is approximately between 79 and 80 percent. Given the representativeness of the general analytic sample, the results of the analysis are, therefore, expected to be generalizable across Mexico's urban space.

Table 3.2: Metropolitan and Principal Urban Areas in the Study by Author's Regional Divisions

Northeastern Region	*North Central Region*	*Northwestern Region*
Chihuahua, Chih.	Aguascalientes, Ags.	Culiacán, Sin.
Durango, Dgo.	Colima, Col.	Hermosillo, Son.
Monclova, Coah.	Guadalajara, Jal.	Tepic, Nay.
Monterrey, N.L.	León, Gto.	
Saltillo, Coah.	Manzanillo, Col.	
Tampico, Tamps.	Morelia, Mich.	*Mexico City*
Torreón, Coah.	Querétaro, Qro.	Mexico City
Zacatecas, Zac.	San Luis Potosí, S.L.P.	
South Central Region	*Southern Region*	*Northern Border*
Acapulco, Gro.	Campeche, Camp.	Cd. Juárez, Chih.
Coatzacoalcos, Ver.	Mérida, Yuc.	Matamoros, Tamps.
Cuernavaca, Mor.	Oaxaca, Oax.	Nuevo Laredo, Tamps.
Orizaba, Ver.	Tuxtla Gutiérrez , Chis.	Tijuana, B.C.
Puebla, Pue.	Villahermosa, Tab.	
Toluca, Edo. Mex.		
Veracruz, Ver.		

Source: Own elaboration.

An aspect of the geographical coverage of the sample that also merits mention is the fact that the spatial delineation of some of the metropolitan areas represented has changed over time. This occurs when emerging or growing neighboring municipalities in the sphere of influence of a central or core municipality are annexed to the metropolitan area. In the context of the general analytic sample, 17 of the 36 metropolitan areas represented had municipalities annexed over the course of the sample period.[42] As a result, these metropolitan areas may not be strictly comparable over time. Any increasing population and employment trends across time periods—including increases in the spatial concentration of industries—in any of these metropolitan areas may simply reflect municipal annexation rather than be the result of demographic (e.g., fertility and migration) and/or economic (e.g., the establishment of new firms) processes. Nevertheless, I find that annexed municipalities are few and relatively very small in terms of population—estimated using the full ENEU and ENOE weighted samples—and, therefore, their contribution to spatial processes is assumed to be generally trivial for analytical purposes.

Classification of Manufacturing Subsectors

Six major manufacturing groups are analyzed in this study. Table 3.3 presents the author's group classification for the manufacturing subsectors in the study as well as the short name by which the subsectors are referred by henceforth.

42 These metropolitan areas include: Chihuahua, Coatzacoalcos, Cuernavaca, Guadalajara, León, Mexico City, Monclova, Monterrey, Morelia, Mérida, Oaxaca, Orizaba, Puebla, Saltillo, Tampico, Toluca, and Veracruz.

Table 3.3: Classification of Major Manufacturing Subsectors in the Analysis

Manufacturing Subsectors	Short Name
Food, beverages, and tobacco products	Food
Textiles (including garment) and leather products	Textiles
Electronic and electric components; communications and measurement equipment	Electronics
Transportation equipment, parts, and components	Transportation
Metallic products; machinery and equipment	Machinery
Oil and lead, chemical, and plastic products; mineral, non-metallic products	Chemicals

Source: Own elaboration.

Sample Size

The unweighted general analytic sample for all years consists of 188,292 formal-sector full-time workers in manufacturing of which 68.7 percent (129,380) are males and 31.3 percent (58,912) are females. Table 3.4 provides the size of the unweighted and weighted samples by year across gender. As is expected, there is an increasing representation in the sample over time of female workers relative to male workers (i.e., about 26.9 percent in 1992 compared to 32.5 percent in 2010, using weighted estimates). This trend is consistent with documented increases in the rate of labor force participation among women in Mexico (e.g., García Sainz and Rendón Gan, 2004). Tables B.2 and B.3 in Appendix B provide the weighted samples for men and women, respectively, for the general analytic sample disaggregated by year, region, and metropolitan area. As previously stated, the sample excludes informal-sector full-time workers in manufacturing, which we estimate—for the same characteristics as the formal-sector employment workers—to amount for all years to an unweighted sample of 30,934 individuals of which 69.9 percent (21,620) are males and 30.1 percent (9,314) are females. The estimates reveal that full-time manufacturing employment in Mexico is mostly a formal-sector occurrence, as for every informal-sector full-time worker (i.e., male or female) there are 6 formal-sector workers.

Table 3.4: Unweighted and Weighted Samples by Gender, 1992-2010

	Unweighted					Weighted				
	Male		Female		Total	Male		Female		Total
Year	#	%	#	%	#	#	%	#	%	#
1992	7,612	71.0	3,103	29.0	10,715	987,472	73.1	363,326	26.9	1,350,798
1993	7,649	72.8	2,865	27.2	10,514	985,496	72.8	367,910	27.2	1,353,406
1994	7,590	71.7	3,000	28.3	10,590	1,041,743	70.7	431,197	29.3	1,472,940
1995	7,023	70.3	2,960	29.7	9,983	890,901	70.6	370,138	29.4	1,261,039
1996	7,506	69.9	3,227	30.1	10,733	964,060	70.2	409,664	29.8	1,373,724
1997	8,218	69.2	3,657	30.8	11,875	1,045,129	69.6	455,428	30.4	1,500,557
1998	9,462	68.4	4,376	31.6	13,838	1,317,925	68.9	595,582	31.1	1,913,507
1999	10,953	68.8	4,958	31.2	15,911	1,346,834	69.1	601,673	30.9	1,948,507
2000	11,537	67.5	5,566	32.5	17,103	1,442,742	67.4	696,702	32.6	2,139,444
2001	10,685	68.2	4,992	31.8	15,677	1,368,545	67.3	663,698	32.7	2,032,243
2002	9,632	68.2	4,483	31.8	14,115	1,310,993	68.1	615,025	31.9	1,926,018
2003	5,601	68.1	2,620	31.9	8,221	1,042,124	68.7	474,061	31.3	1,516,185
2004	4,164	68.3	1,931	31.7	6,095	1,063,642	70.0	455,839	30.0	1,519,481
2005	4,238	66.9	2,100	33.1	6,338	840,493	66.4	424,459	33.6	1,264,952
2006	4,050	65.9	2,095	34.1	6,145	836,355	64.5	460,354	35.5	1,296,709
2007	3,920	65.0	2,114	35.0	6,034	840,624	64.9	455,182	35.1	1,295,806
2008	3,503	65.1	1,881	34.9	5,384	792,245	65.6	415,733	34.4	1,207,978
2009	2,942	67.5	1,416	32.5	4,358	687,198	67.7	328,460	32.3	1,015,658
2010	3,095	66.4	1,568	33.6	4,663	731,970	67.5	352,440	32.5	1,084,410
Total	129,380	68.7	58,912	31.3	188,292	19,536,491	68.6	8,936,871	31.4	28,473,362

Source: Own elaboration.

IMPLEMENTING THE CONCEPTUAL MODEL AND ANALYTIC STRATEGY BASED ON DATA CHARACTERISTICS

Based on the analytic strategy discussed and the characteristics of the available data, the study is conducted on collapsed (i.e., pooled) annual cross-sections of data on individual workers, their firm of employment, and their local labor market of residence (which is, assumingly, also their local labor market of work). To accomplish the analytic objectives of this study, the analysis follows, as previously explained, an augmented general Mincerian model of wages that linearizes the relationship between worker wages and the key elements of analysis in the study (i.e., the spatial concentration of subsectors of manufacturing employment, urban area's accessibility to demand markets, and their interaction) along with worker characteristics, firm of employment characteristics, and the spatial characteristics of the local labor market. As a result, the analytic strategy employs Ordinary Least Squares (OLS) regression, accounting for the plausible correlation of unobservable characteristics (i.e., robust clustered standard errors) by metropolitan area and year.[43] The analysis is conducted on males and females separately. The reason for this is threefold: first, to follow the Labor Economics literature which argues that the structure of the wage determination process for male and female workers is essentially different; second, that little is known about the differential effects by gender of industrial and urban agglomerations on urban wages, although the literature points to significant differential effects (Fingleton and Longhi 2013, Echeverri-Carroll and Ayala 2010, Fernandez and Su 2004); and third, to advance the current body of knowledge on a yet unsettled issue of whether within-gender wage differentials expand or contract due to trade liberalization and globalization processes (Aguayo Tellez 2011).

As mentioned earlier, the investigation of the role played by globalization mechanisms in moderating the described linear relationship enters not only through the analysis of market access in the empirical model but also through a before-and-after analytic approach in the style of a non-experimental difference-in-difference methodology, where the linear relationship is contrasted between a period of moderate export expansion (i.e., the years 1992 and 1993) to a period of accelerated export expansion and globalization

[43] While alternative estimation procedures, such as hierarchical linear models (HLM), might be more appropriate for an analysis that consists of multi-level data as the one conducted in this dissertation, the intense computational requirements of the empirical model do not allow me to proceed with HLM estimation. Furthermore, under the HLM context, the before-and-after (non-experimental) research design that is methodologically essential as well as empirically relevant to conduct the analysis—as previously explained—cannot be incorporated when using annual cross-sections of data.

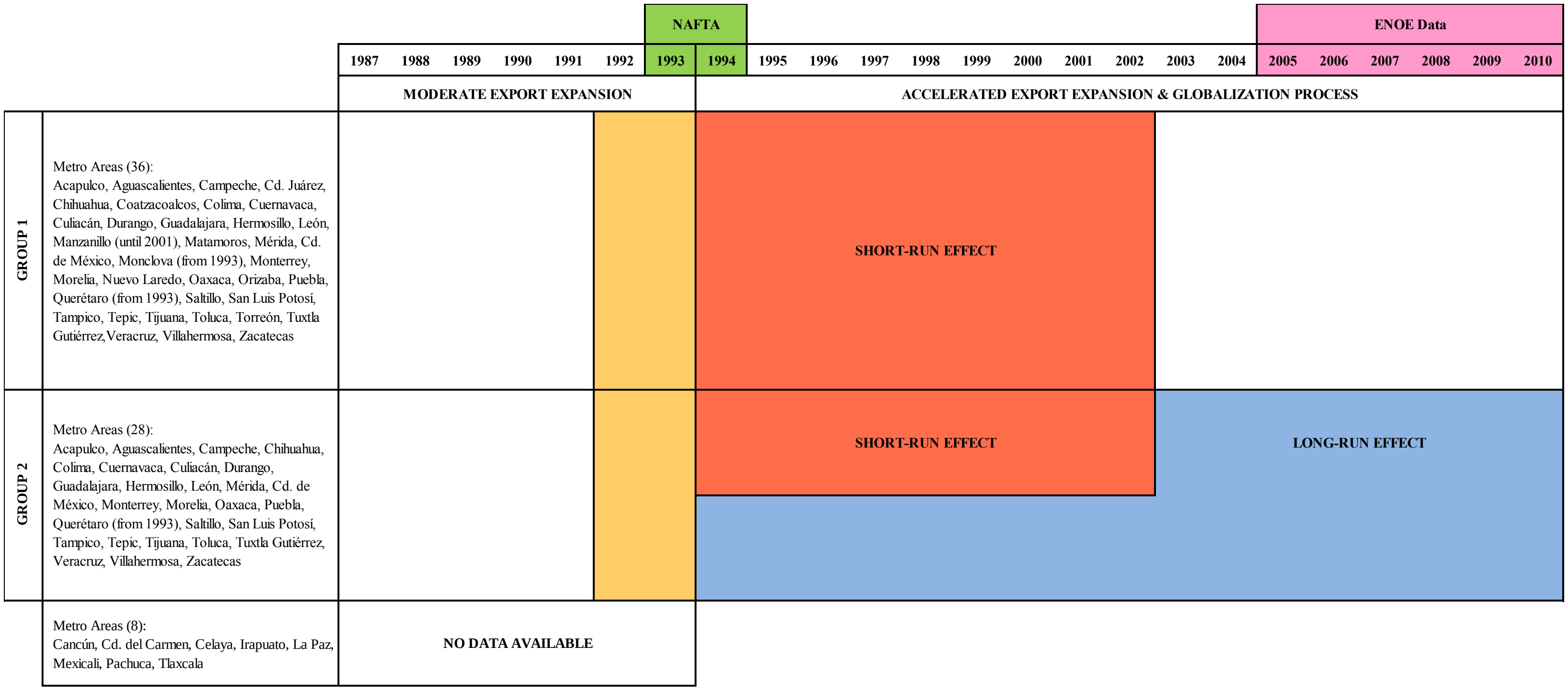
processes (i.e., from 1994 to 2010). While Mexico's trade liberalization process started in 1985 with Mexico's signing of the General Agreement on Tariffs and Trade (as is described in Chapter 4), the explosive immersion of Mexico's manufacturing production in global markets, including that of the United States, did not occur until after the implementation of the North America Free Trade Agreement in 1994. This observed delay offers an analytical basis for using the available data for the years 1992 and 1993 to serve as a period describing economic patterns before Mexico's global-markets-oriented manufacturing boom of the mid-1990s and beyond. Additionally, as explained earlier in this chapter, whereas this approach serves mostly to accomplish an objective of the study—the analysis of the key question of inquiry within Mexico's globalizing context—the approach also aids in disentangling empirically the effects of market access on wages from other leading sources of wage differentials such as locational fundamentals (e.g., natural endowments) or local institutions, a key challenge of the empirical literature as noted by Redding (2010).

The results obtained from the practical implementation of the conceptual model—based on data availability and linear-model estimation—have two considerations. First, the estimates obtained from the Mincerian wage models would represent historic means—means over multiple years of data. Second, this implementation is considered an empirical necessity given the influence on Mexico's economy of sudden, and often unpredictable, changes in internal and external economic trends. Multiple of these changes are observed within the period of analysis (i.e., 1992 to 2010)—refer to Figures A.1 to A.3 in Appendix A.

Figure 3.2 presents a diagram detailing the practical implementation I pursue to conduct the Mincerian wage analysis given the characteristics of the general analytic sample, particularly its uneven geographical coverage over time. The analysis is conducted on two data samples grouped according to metropolitan- and urban-area data availability. One sample (Group 1) includes data on 34 to 36 metropolitan and principal urban areas from 1992 to 2002 and is used to analyze spatial wage disparities in the short run. The *short-run analytic sample* is used to analyze empirically the contribution of spatial concentrations of manufacturing employment and market access to workers' wages and, therefore, to urban wage disparities in the short-run as Mexico changed its international economic policy and firms adjusted to this change, making use of the greatest number of available geographical units in the data. The other sample (Group 2) includes data on 28 metropolitan and principal urban areas from 1992 to 2010 and is used to analyze spatial wage disparities in the short- and long-runs. Similarly to the short-run sample, the *short/long-run analytic sample* is used to analyze empirically the contribution of spatial concentrations of manufacturing employment and market access to workers' wages and, therefore, to urban wage disparities in the short-run as well as the long-run as Mexico changed its international economic policy and firms adjusted to this change. The descriptive and inferential analyses presented in Chapters 5, 6, and 7 rely on results obtained from both analytic samples to offer a more comprehensive and multidimensional study of the research questions. Whereas the analytic sample composed of 36 urban areas provides a larger geographical coverage, the analytic sample composed of 28 urban areas provides a longer-term panorama. The threshold separating short-run and long-run effects in the analysis is an arbitrary designation based on the years for which data is no longer available for some metropolitan and principal urban areas.

As mentioned, the before-and-after approach focuses on the North American Free Trade Agreement (NAFTA) as arguably Mexico's most important policy instrument on the country's road towards trade liberalization and global-markets integration. The research premise places NAFTA as a source of variation in the importance that firms attribute to local accessibility to foreign and domestic consumer markets as well as a source of variation in the exposure of workers and firms to globalization mechanisms.

Figure 3.2: Practical Implementation of the Conceptual Model using an Unbalanced Panel of Metropolitan and Principal Urban Areas



Source: Own elaboration based on the methodological approach and data availability from the ENEU and the ENOE.
Note: The list of metropolitan areas that are included in Group 1 but excluded from Group 2 are: Cd. Juárez, Coatzacoalcos, Manzanillo, Matamoros, Monclova, Nuevo Laredo, Orizaba, and Torreón.

DATA MEASURES

The following are the data measures employed in the descriptive and inferential analyses that follow in Chapters 5, 6, and 7.

Dependent Variable

The dependent variable used in the Mincerian wage models is the natural logarithm of real hourly wage. Hourly wages are calculated by dividing monthly income by monthly hours of work. The latter is a construct of the survey variable *usual hours worked per week in the primary* job—or *hours worked last week in the primary job*, depending on the availability of the variable in the survey year—multiplied by the 52 work weeks available in a year and then divided by the 12 months in a year. I use the national consumer price index by metropolitan and principal urban areas reported by INEGI to account for inflation and, thus, make yearly wage values comparable across time as well as place.[44] The baseline year used is 2010, so that wages are expressed in 2010 Mexican pesos. The natural logarithm of real hourly wages is then obtained from the construct of real hourly wages.[45] By its nature, the dependent variable excludes wage values that equal to zero. I also opted

[44] The consumer price index is originally presented in a monthly format and, therefore, yearly averages were calculated to obtain annual index values. For metropolitan or principal urban areas for which index data does not exist for certain years, I imputed for those years the annual average index value for the region where the urban area is located (i.e., Northwest for Tepic, Northeast for Durango, North-Central for Manzanillo and Queretaro, South-Central for Cuernavaca, and South for Campeche and Oaxaca). This data is also reported by INEGI in a monthly format and, therefore, annual averages were calculated as well. For metropolitan or principal urban areas for which index data does not exist at all, I imputed the pertinent data from that of a neighboring municipality that is part of the urban conglomerate as defined by INEGI (2011). That is, I imputed the index data from Matamoros to Nuevo Laredo both areas which are located in the state of Tamaulipas, from Monclova to Saltillo in the state of Coahuila, from Tepatitlan to Manzanillo in the State of Jalisco, from Cordoba to Coatzacoalcos and Orizaba in the state of Veracruz, from Toluca in the State of Mexico to Pachuca in the state of Hidalgo, and from Tapachula to Tuxtla Gutierrez in the State of Chiapas.

[45] As is customary in empirical work in labor economics, the dependent variable takes the logarithmic form because the resulting estimated coefficients have a nice percentage interpretation.

to exclude small values of the variable which I identify as natural logarithmic values that are negative.

Key Analytic Independent Variables

Spatial Concentration of Employment in Manufacturing Subsectors

While many measures of spatial concentration have been advanced in the literature to capture and to estimate localization economies under the theoretical context of agglomerations, I follow Echeverri-Carroll and Ayala (2010, 2009) and Echeverri-Carroll et al. (2007) and use in this dissertation the Milken Institute's *High-Tech Pole Index* developed in DeVol (1999) and adapt it here to the manufacturing-employment context. In its original form, this index is a composite measure of high-tech spatial concentration that denotes technology production centers or "Tech-Poles". The original measure combines two elements in a multiplicative fashion, the high-tech location quotient with the share of national high-tech output. The location quotient is, characteristically, calculated as a measure of a region's economic base in a given industry or sector with respect to a larger context. In DeVol (1999), the specific industry refers to the high-technology sector and the larger context refers to the United States.

The unique advantage of this measure lies in its ability to incorporate several elements, and often used measurements, of spatial industrial concentration, allowing, therefore, its comprehensive examination. Implied in the measure is the existence of two dimensions, vertical and horizontal, to spatial concentration. The vertical spatial dimension or vertical density refers to the relative size of the industrial sector in the local economy compared to, for example, a national average. An example of a measure that captures vertical density is the classic location quotient. The horizontal spatial dimension or horizontal density refers to what proportion the industrial subsector in an area represents of the total for the nation. An example of a measure that captures horizontal density is the share of local to national sector-specific employment. Combined together, both elements yield DeVol's (1999) composite measure, and the multiplicative fashion by which they are combined implies the equal empirical importance of both elements.

The analysis of spatial industrial concentration employing measures that only capture vertical or horizontal density but not both poses disadvantages and yields deceptive results. As DeVol (1999) explains, employment location quotients—to offer an example of location quotients—compare the value of an industrial sector as a share of total employment in a local labor market relative to the same estimate for the larger context (e.g., the nation). In this manner, location quotients are an effective method to show the relative importance of an industry to a local economy. Their drawback, however, is that location quotients do not adjust for the size of the local economy relative to others in the larger context. In not doing so, small local labor markets, for example, with very few large plants may yield a large location quotient, presenting a misleading perspective of the importance of smaller-sized economies in the larger context. Using shares of national employment for the analysis of spatial industrial concentration can be a deceptive measure as well because a very large local economy can rank high simply because of its size.

Guided by the aforementioned literature and discussion, I adapt the index presented in Echeverri-Carroll and Ayala (2010, 2009) and Echeverri-Carroll et al. (2007) and use it in this study as a comprehensive measure of the relative spatial concentration of full-time, formal employment—regardless of gender—in manufacturing subsectors that combines the location quotient (the degree of subsector-specific manufacturing employment concentration in a metropolitan or principal urban area's economy) with the area's share of national subsector-specific manufacturing employment in a multiplicative fashion.[46] As this index is a relative measure of spatial concentration, I am able to use it in the manner described in the conceptual model and represented in the empirical models. Therefore, the annual *Spatial Concentration Index* of employment for each manufacturing subsector *M*

[46] The index is not gender-specific as there is no reason to assume that processes generating localization externalities (i.e., input linkages, labor pooling, and knowledge spillovers) differ by gender.

used henceforth in this dissertation is calculated for each year and each metropolitan or principal urban area *MA* in the sample as:

$$Spatial\ Concentration\ Index_M = \left[\frac{\%\,E_{M,MA}}{\%\,E_{M,T}}\right] * \left[\frac{E_{M,MA}}{E_{M,T}}\right] * 100 \qquad \text{(Eq. 3)}$$

where $\%E_{M,MA}$ denotes the percentage of the weighted amount of full-time formal-sector workers employed in manufacturing subsector *M* in metropolitan or principal urban area *MA*; $\%E_{M,T}$ denotes the percentage of total weighted employment of full-time formal-sector workers in manufacturing subsector *M* in all metropolitan or principal urban areas in the analytic sample; $E_{M,MA}$ denotes the weighted amount of full-time formal-sector workers employed in manufacturing subsector *M* in metropolitan or principal urban area *MA*; and, $E_{M,T}$ denotes the total weighted employment of full-time formal-sector workers in manufacturing subsector *M* in all metropolitan or principal urban areas in the analytic sample. The measure is multiplied by 100 for scaling purposes. The index is also transformed to natural logarithmic form to stabilize the variability in the data. By construction, therefore, metropolitan and principal urban areas with spatial concentration indices with value of zero are excluded from the empirical wage model.

As an analytical exercise, I calculated the Location Quotient and the Spatial Concentration Index—computed using the data from the short-run and short/long-run analytic samples—for all manufacturing subsectors and compare those using correlation coefficients. Table 3.5 presents the results of this exercise. While correlation coefficients between both measurements are high (i.e., between 0.77 and 0.91) for three of the manufacturing subsectors, namely textiles, electronics, and transportation, it is evident that there is not a one-to-one correspondence between both measurements for any of the manufacturing subsectors. And for some, the correlation is low. This exercise exposes the potential informational advantages of using the Spatial Concentration Index, instead of other less comprehensive measures like the Location Quotient as many authors often do, at least for the case of manufacturing employment in Mexico.

Table 3.5: Correlation Coefficient between the Location Quotient and the Spatial Concentration Index by Manufacturing Subsector

	LOCATION QUOTIENT											
	Short-term Analytic Sample (36 LLM)						Short/Long-term Analytic Sample (28 LLM)					
SPATIAL CONCENTRATION INDEX	Food	Textiles	Electronics	Transportation	Machinery	Chemicals	Food	Textiles	Electronics	Transportation	Machinery	Chemicals
Food	0.327						0.377					
	0.000						0.000					
Textiles		0.770						0.855				
		0.000						0.000				
Electronics			0.837						0.897			
			0.000						0.000			
Transportation				0.770						0.913		
				0.000						0.000		
Machinery					0.688						0.649	
					0.000						0.000	
Chemicals						0.512						0.450
						0.000						0.000

Notes: LLM denotes Local Labor Markets. P-values are reported below the correlation coefficients. Industry short titles presented refer to the following manufacturing subsectors: (1) food, beverages and tobacco products; (2) textiles and leather products; (3) electronic and electric components, communications and measurement equipment; (4) transportation equipment, parts, and components; (5) metallic products, machinery and equipment; (6) oil and lead, chemical, and plastic products, mineral, non-metallic products.
Source: Own elaboration using the short-run and short/long-run analytic samples.

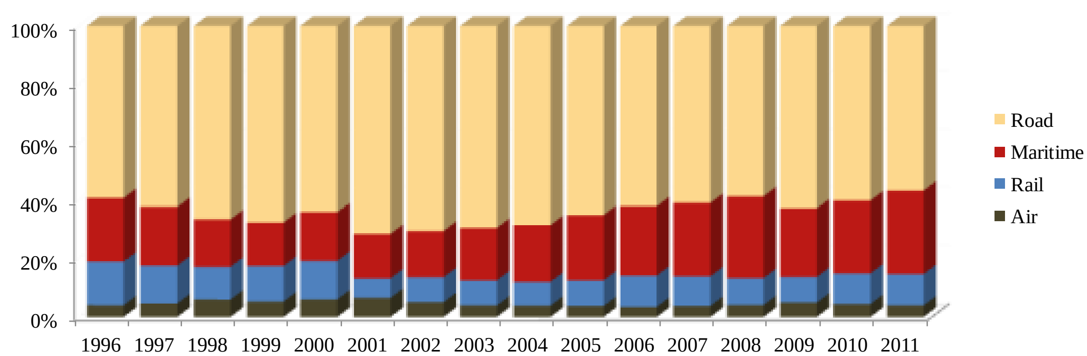
Access to Markets—Domestic and Foreign

To capture the wage effects of market access outlined in the theoretical NEG model, which assumes that wage advantages arise as firms have an incentive to locate in local labor markets with good—referring to low-cost—access to either domestic- or foreign-consumer markets because of strong demand linkages, I use direct distance variables as measures of the costs, either of transportation or production, incurred in accessing demand markets both domestic and foreign. A number of studies have established the relationship between distance and transport costs (Hummels 2001, 2000; Venables 2006). These studies argue not only that transport costs increase directly with distance, but that the implied increases in transit times as a result of the increases in distance—because of, e.g., traffic or road tolls, among other examples—impose additional transaction costs that increase the firms' total costs of production in delivering goods to the market.

Additionally, although improvements in transportation infrastructure and logistic services may decrease the relevance of physical distance to consumer markets for both firms' location decisions and successful domestic or foreign trade, some authors still ascertain its importance, particularly as it pertains to firms engaged in foreign trade (e.g., Basevi and Ottaviano 2002, Elbadawi et al. 2006, Gries et al. 2009). Moreover, as Gries et al. (2009) posit, it is not only physical distance to the foreign market that is important but also physical distance to the preferred port through which goods are exported. Neglecting the relationship between the spatial concentration of export industries and export ports may, as the authors argue, "limit our understanding of the degree to which different subnational regions within a country benefit—or suffer—from export-oriented growth strategies and globalization" (Gries et al. 2009). Given that the United States accounts for a large share of exports from Mexico (e.g., approximately 84 percent of total exports on average between 1993 and 2012, according to Mexico's Ministry of Economy using data from the Bank of Mexico) and that more than half of the value of these exports has traditionally been transported by road, it is therefore not surprising that the literature on the spatial concentration of manufacturing firms and employment in Mexico has focused its discussion on access to land ports, specifically centering the focus on access to U.S.-Mexico land-border ports or crossing points. Relatively little theoretical and empirical work has addressed the role that access to maritime ports can play on spatial concentration as well as on labor productivity and wages; and, to my knowledge, no literature exists that addresses this issue in the Mexican context.

However, as Figure 3.3 shows, maritime transportation of exports has gained importance in Mexico over time. Indeed, from 1996 to 2011, maritime transportation increased its share of the total value of transported exports by about 6.3 percentage points (from 21.8 percent in 1996 to 28.1 percent in 2011), with the highest increase observable during the 2000s decade. The reasons behind this increase may be attributed to several factors, for example: increasing trade with the rest of world, which as Figures A.7 and A.8 in Appendix A show increased significantly during the 2000s decade, and increasing manufacturing and exports of heavy merchandise, such as automobiles and machinery, which as Figures A.3, A.5, and A.6 in Appendix A illustrate are industries which have shown remarkable growth since NAFTA was implemented.

Figure 3.3: Share of Exports Value by Mode of Transportation, 1996-2011



Source: Own elaboration using data from the Database on North American Transportation Statistics from Mexico's Ministry of Communications and Transportation (2013a).

In view of the previous discussion, the distance variables that I use in this study to investigate the role that access to markets plays on urban wages and spatial wage disparities in Mexico include: (1) distance from the central municipality in the metropolitan or principal urban area to the *nearest large market* (i.e., Mexico City, Guadalajara, Monterrey), (2) distance to the *nearest major U.S.-Mexico border crossing*, and (3) *difference in distance to the nearest major maritime port* in the Gulf of Mexico and to nearest major maritime port in the Pacific Coast. The latter variable is calculated as the distance to the nearest maritime port in the Gulf of Mexico minus the distance to the nearest maritime port in the Pacific Coast.[47] All of the distance variables are expressed in kilometers, denote shortest road distance, and come from the *Traza tu Ruta – Punto a Punto* program provided by the Ministry of Communications and Transportation (SCT by its Spanish acronym). Additionally, distances are based on year 2013 road data as earlier data, or data that track and portray the evolution of transportation networks and corresponding distances across time, are not available. While this poses important empirical limitations to the research—(1) methodologically, because non-time varying predictors in the model may capture the effects of unobservable or omitted non-time varying elements (e.g., local natural resources) and, therefore, confound the predictor's estimated effects on the dependent variable, and (2) analytically, because the loss of information may underestimate or overestimate the results in the analysis—the theoretical foundation, analytic importance, and potential contribution to the general research context, I belief, far exceed the limitations imposed by the lack of more appropriate data.

Large markets include the metropolitan areas of Mexico City, Guadalajara, and Monterrey. Not only are these metropolitan areas the largest in the country but are also historically known as important consumer-demand markets for nationally-produced manufacturing products (see, e.g., Bannister and Stolp 1995, Hanson 1998b). To construct

[47] The *difference in distance* variable was calculated and is employed to minimize the introduction into the empirical model of relatively strong correlations among the variables distance to nearest large market, distance to nearest major maritime port in the Gulf of Mexico, and distance to nearest major maritime port in the Pacific Coast (i.e., 0.80 in the case of nearest large market and maritime port in the Pacific Coast, and 0.73 in the case of the nearest large market and maritime port in the Gulf of Mexico). Appendix Table B.4 presents the correlation coefficients across the distance variables in the analysis.

the other distance variables, I selected the eight cities with the most important U.S.-Mexico border land-crossing ports, the cities with the two most important maritime ports in the Gulf of Mexico, and the cities with the two most important maritime ports in the Pacific Coast. Major U.S.-Mexico border land-crossing ports are those located in the cities of Nuevo Laredo, Matamoros, Reynosa, Tijuana, Mexicali, Ciudad Juarez, Piedras Negras, and Nogales; major maritime ports in the Gulf of Mexico are those located in the port cities of Veracruz and Altamira; and, major maritime ports in the Pacific Coast are those located in the port cities of Lazaro Cardenas and Manzanillo.

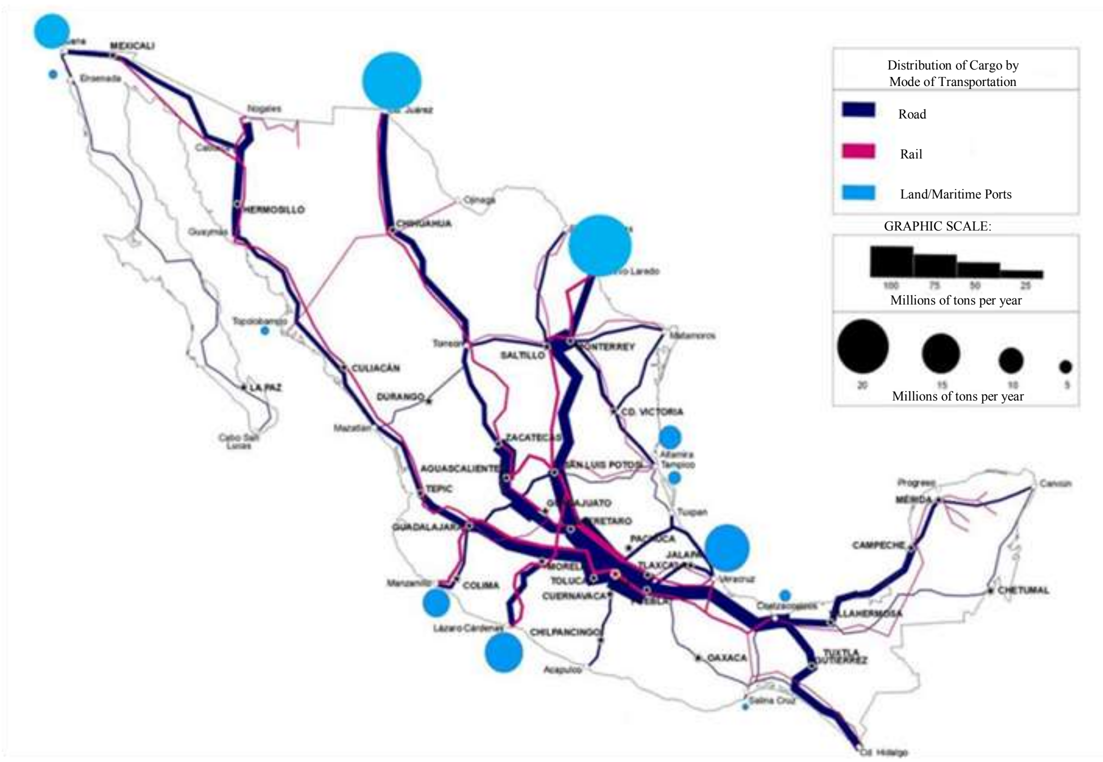
The selection of these major land and maritime port cities was based on several elements. Findings in Boske et al. (2009) indicate that the land port cities of Tijuana, Nogales, Ciudad Juarez, Nuevo Laredo, and Reynosa as well as the maritime port cities of Altamira, Manzanillo, Lazaro Cardenas, Veracruz, and Tampico account for most foreign trade in the country. Citing a 2008 interview with Juan Jose Erazo Garcia, Project Director of Technical Coordination of Intermodal Planning Road Infrastructure at the SCT, the authors note that these "10 borders represent 81% of Mexico's foreign trade" (Boske et al. 2009: p. 233). Indeed, data on the number of commercial trucks that crossed the U.S.-Mexico border in 1995 as well as in 2010, obtained from the Border Crossing Searchable Database from the Bureau of Transportation Statistics from the U.S. Department of Transportation, identify the land-border crossings points in the cities of Nuevo Laredo, Matamoros, Reynosa, Tijuana, Mexicali, Ciudad Juarez, Piedras Negras, and Nogales as the eight with the continuously highest number of truck crossings among all twenty two U.S.-Mexico land-border crossing points operating as of 2010, accounting on average for approximately 92 percent of all truck crossings from Mexico to the United States.[48] As a result, I added to the list of principal land-port cities in Boske et al. (2009), the cities of Matamoros, Mexicali, and Piedras Negras. Additionally, using data on national export freight movement in seaports from the SCT (Ministry of Communications and Transportation 2013b), I find that the largest maritime ports, as measured by tons exported

[48] Data available at:
http://transborder.bts.gov/programs/international/transborder/TBDR_BC/TBDR_BC_QuickSearch.html

in 2001 and 2008 using containers or loose cargo (and excluding grains, petroleum and derivatives and other fluids), are located in the cities of Manzanillo and Lazaro Cardenas in the Pacific Coast, and in the cities of Veracruz and Altamira in the Gulf of Mexico. On average, approximately 87 percent of total national movements of cargo for exports, excluding fluids, were conducted in ports within these four cities. We exclude the port city of Tampico, included in the list of cities in Boske et al. (2009), because of its declining importance and lower ranking relative to the other two Gulf of Mexico ports based on the movement-of-cargo data from the SCT.

An important caveat with the use of distance variables is, however, the fact that while it would make basic economic sense for establishments to locate close to demand markets or to use the nearest land or maritime ports to export their goods so as to minimize costs of production (i.e., transportation costs), other characteristics influence these business decisions as well. Economies of scale in transportation costs (Mills 1967)—the cost and productivity advantages of transporting goods in large quantities or over longer distances at one time—play a key role in the decision-making process. Also, the port used and transport route followed for the movement of cargo depend not only on distance but also on other elements, such as the amount and type of merchandise transported, port and toll tariffs, the quality of local connectivity networks, product destination, destinations served by transport companies, and infrastructural changes over time, among many others. Older highways, for example, may raise fuel costs and increase vehicle depreciation (Boske et al. 2009: p. 131). In which case, the use of transportation networks of poor quality, even if their use means shorter distances to the consumer market or to the land or maritime port for foreign transport, may not be a cost-effective decision for commercial purposes. On the other hand, larger distances over better-quality transportation networks may be a more cost-effective solution for businesses. Map 3.1 illustrates the previously discussed caveat. The map presents the distribution of cargo flows across Mexico's transportation network using available data for the year 2007. It reveals indirectly, among other things, the presence of exporting firms in central Mexico and neighboring regions and their use of the national transportation infrastructure to move manufactured products towards international markets using both land and maritime ports.

Map 3.1: Cargo Flow Distribution across Mexico's Transportation Network (2007)



Source: Erazo and Cuan (2010) with data from the Sub-Secretariat for Transportation, Coordinator General for Ports and Marine Merchants.

Control Variables

Time-Specific Fixed Effects

The collapsing of the data over multiple years as described in the analytic strategy forces the empirical models in the analysis to include year-specific fixed effects in the form of yearly binary indicators that exclude a reference year. These binary indicators are intended to capture annual *national* employment and economic trends as well as the annual variability in the sample distribution of the ENEU and ENOE over time.

Individual Characteristics of Workers

The Mincerian analysis accounts for multiple observable characteristics of individual workers known in the literature to affect wages. These characteristics include: *educational attainment* (i.e., represented by binary indicators of whether the individual completed a high school education, has attended some college courses or technical or vocational courses, has completed a technical or vocational degree, or whether the individual has a college degree, with the reference category being whether the individual has less than a high school education or no education at all), *potential experience and its squared term* (i.e., with potential experience measured as age minus a construct of years of education[49] minus six), *marital status* (i.e., represented by a binary indicator of whether

[49] To construct the continuous variable *years of education*, I make the assignation according to the following general rules. I assign 0 years of education to individuals that reported not to know how to read or to write or who, while knowing how to read or to write, did not attend or pass a formal education program. I assign 1 to 6 years of education based on the years of primary education completed, 7 to 9 years based on the years of secondary education completed, 10 to 12 years based on the years of preparatory education completed, 13 to 16 years based on the years of college education completed, and 17 to 20 years based on the years of graduate education completed. Additionally, I assign 8, 11, or 14 years based on whether the individual responded to have attended but not completed a technical or vocational program in which the background scholastic qualifications are primary education, secondary education, or preparatory education, respectively. Moreover, I assign 9, 12, or 15 years based on whether the individual responded to have attended and

the individual is married or in a civil union), *head of household status* (i.e., represented by a binary indicator of whether the individual is the head of the household), *migration status*[50] (i.e., represented by a binary indicator of whether the individual recently migrated to the metropolitan area), and *occupation* (i.e., represented by binary indicators of whether the individual is engaged in either of the following occupations: professional or technical, services or sales, and managerial or administrative, with manual occupations being the reference category).

Characteristics of the Firm and Subsector of Employment

As described earlier in the literature review conducted in Chapter 2, firm characteristics may condition not only the manner in which firms concentrate in space but also a firm's ability to benefit from agglomeration economies. As a result, the econometric analysis also accounts for various characteristics describing the workers' firm and subsector of employment in the local labor market. These characteristics include the *size of the firm* of employment (i.e., represented by binary indicators of whether the individual works for either a micro- or small-sized firm, or for a medium-sized firm, with the reference

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completed a technical or vocational program in which the background scholastic qualifications are primary education, secondary education, or preparatory education, respectively. Finally, I assign 10 years of education to individuals who responded to have attended a superior normal school program, which traditionally has a duration of 4 years and a background scholastic requirement of secondary education. Some adjustments to the general rules of assignation, however, had to be made according to the survey and survey year given their variability across time.

[50] Lehmer and Möller (2010), citing Glaeser and Maré (2001), note that the urban environment may lead to "dynamic external effects" that make workers more productive over time. One might consider as an example of such environment one where localized knowledge spillovers are abundant, such as an urban area with a high concentration of high-tech employment, resulting in higher productivity levels for workers over time and, thus, higher wages (see, for example, Echeverri-Carroll and Ayala (2010, 2009, 2007)). It is feasible to assume, based on this scenario, that wages of recent migrants to the urban area could be lower than those of long-term residents that have been exposed to localized externalities for a longer period of time (see, for example, Echeverri-Carroll and Ayala (2009). I include the variable *migration status*, therefore, to account for the potential that recently migrated workers might be at a wage disadvantage compare to long-term residents of the urban area.

category being whether the individual works for a large-sized firm), and the *weighted percentage of formal-employment workers with a college degree* in the manufacturing subsector and local area where the worker is employed.

I define *firm size* according to the official firm stratification parameters for manufacturing firms in Mexico published by the Diario Oficial de la Federación on June 30, 2009 (DOF 2009). Micro-sized firms are those with 10 employees or less; small-sized firms are those that employ between 11 and 50 workers; medium-sized firms are those that employ between 51 and 250 workers; and, large-sized firms are those that employ more than 250 workers. Additionally, the variable *weighted percentage of workers with a college degree* is gender-specific and is used according to the gender of the sample employed in the analytic wage model. In which case, for the analysis of male wages, I employ the variable which consists of the percentage of *male* workers with a college degree, and, for the analysis of female wages, I employ the variable which consists of the percentage of *female* workers with a college degree. In this manner, I account for wage-differentials driven, in each of the manufacturing subsectors of employment, by both localized patterns of gender-specific skill bias in labor demand (e.g., Acemoglu 2003) and knowledge externalities, the latter of which may confound, as previously noted in Chapter 2, the estimation of localization economies.

Finally, I also include in the models the variable principal *industrial subsector* under which the firm of employment operates (i.e., represented by binary indicators for five of the six manufacturing subsectors included in the analysis, with the textiles and leather products manufacturing subsector being the reference category). With this variable, I account for inter-industry wage differentials (e.g., Bartel and Sicherman 1999).

Characteristics of the Metropolitan or Urban Area of Employment

To ensure that the results of the empirical model are derived from localization economies and market-access effects that are specific to each manufacturing subsector in the analysis and not driven by other characteristics that may describe the geographic space where the firm of employment is located, I include the following variables in the Mincerian analysis of wages based on the review of the literature presented in Chapter 2: the *natural logarithm of annual population* in the metropolitan or principal urban area to account for urbanization economies, *average years of education* of all full-time formal-sector workers in the metropolitan or principal urban area to account for localized human-capital externalities, *pairwise coagglomeration indices* among local manufacturing subsectors to account for the extent of localized manufacturing coagglomeration in the metropolitan or principal urban areas, and the *historical percentage of local manufacturing employment* for the year 1970 in the central municipality that conforms the metropolitan or principal urban area of reference to account for dynamic agglomeration economies.

In this dissertation, I do not intend to argue what the precise definition of urbanization economies should be. I simply follow, as most authors do in qualitatively similar studies (refer to Chapter 2), the theoretical perspective that the overall scale of a city captures and accounts for urbanization economies or diseconomies. I, therefore, calculate and use the *natural logarithm of annual population* in the metropolitan or principal urban area to distinguish productivity effects derived from the urban scale from those derived from industrial localization. Following the standard definition of population set by INEGI and using data from the third-quarter rotation groups from the ENEU for the years 1992 to 2004 and the ENOE for the years 2005 to 2010, the local annual population for each metropolitan or principal urban area is estimated as the annual weighted number of persons captured by the survey,[51] both national and foreign, that typically reside in the selected survey households during the survey year. The natural logarithm of the estimated local annual population is then obtained from the construct of local annual population. The measure is transformed to natural logarithmic form to stabilize the variability in the data.

To account for human-capital externalities, I follow Rauch (1993) and others (Eaton and Eckstein 1997, Black and Henderson 1999, Glaeser and Maré 2001) and use

[51] Both the ENEU and the ENOE only capture individuals ages 12 and over. Therefore, population estimates exclude individuals younger than 11 years of age.

the variable annual a*verage years of education* of all full-time formal-sector workers in the metropolitan or principal urban area. This variable is an annual weighted aggregate of human-capital endowments across each local labor market unit based on the previously-defined construct *years of education*. All full-time formal-sector workers in each metropolitan or principal urban area are considered in the measure regardless of their industry of employment—whether extractive, manufacturing, commerce, or services.

To isolate the pure spatial-concentration effect of each manufacturing subsector on wages as well as its interaction with market access and this interaction's effect on wages from effects derived from the coagglomeration of multiple manufacturing subsectors, I estimate and incorporate in the wage analysis an index of coagglomeration. Following Ellison and Glaeser (1997), Ellison et al. (2010), and Gabe and Abel (2013), I define the *pairwise index for the coagglomeration* of manufacturing subsectors *k* and *l* as:

$$Coagg_{k,l} = \frac{(s_{i,k}-t_i)(s_{i,l}-t_i)}{(1-\sum_{i=1}^{n} t_n^2)} \qquad \text{(Eq. 4)}$$

where i refers to each metropolitan or principal urban area 1 through n; $s_{i,k}$ *or* $s_{i,l}$ is the weighted share of full-time formal-sector employment in manufacturing subsector k or l, respectively, in metropolitan or principal urban area i; and, t is the metropolitan or principal urban area's weighted share of total full-time formal-sector manufacturing employment. In total, 15 pairwise index variables denoting coagglomeration combinations derived from the 6 manufacturing subsectors in the analysis are included in the wage models.

Based on the theoretical implications of the existence of dynamic externalities and their influence on urban development and growth (e.g., Henderson 1997), I include in the empirical wage model a historical variable that describes the manufacturing structure of the local economy at a time prior to the period of analysis. Henderson (1997) observes, for example, that localization economies have dynamic properties with effects that typically last for about six years. In the case of urbanization economies, the author finds that the effects persist for about eight or nine years—the end of his analytic time horizon. The use of historical variables, as noted earlier, has often been used in the literature to account for the potential endogenous nature of spatial industrial concentrations and urban agglomerations using an instrumental variables methodology (e.g., Combes et al. 2010). In the absence of strong historical data and data in general to conduct instrumental variables analysis with robust results across model specifications, as previously discussed in this chapter, I employ this historical variable as a solution to account for earlier patterns of local industrial and urban development that may have influenced spatial patterns of development observed since 1992. The variable use in the analysis is the *historical percentage of local manufacturing employment* in the central municipality of the metropolitan or principal urban area of reference. The variable is the share of manufacturing employment to total employment in the central municipality of the metropolitan or principal urban area of reference. Data for this variable come from the Mexican General Census of Population in 1970. Similar data at the local level for earlier time periods is not available. Additionally, local data disaggregated by manufacturing subsectors is also not available until the 1980 Census of Population, which I believe does not provide sufficient lag relative to the time period of analysis.

Following Fingleton and Longhi (2013), I additionally control for the local annual *unemployment rate*. By doing so, I account for *local* labor shocks that are not captured by the year-specific fixed effects that are included in the Mincerian models. Moreover, with this variable, I also account for the negative relationship between wages and unemployment that has been extensively observed by the literature as I have described in Chapter 2. Following the standard definition of the unemployment rate set by INEGI and using data from the third-quarter rotation groups from the ENEU for the years 1992 to 2004 and the ENOE for the years 2005 to 2010, the local annual unemployment rate for each metropolitan or principal urban area is calculated as the estimated annual number of working-age unemployed individuals in the local labor market divided by the estimated annual working-age local labor force. The annual local labor force is estimated as the sum of the working-age employed and unemployed individuals in the local labor market for each year of the sample.[52] The working age includes the ages of 18 through 64 years, and all figures represent weighted values. Finally, the variable is gender-specific and is, therefore, calculated for each gender separately and used according to the gender of the sample employed in the analytic wage model. That is, for the analysis of male wages, I employ the variable which consists of the local unemployment rate of *male* workers, and, for the analysis of female wages, I employ the variable which consists of the local unemployment rate of *female* workers.

CONCLUSION

This chapter has presented the conceptual model and analytic strategy followed throughout the empirical chapters of the dissertation, and the rich data employed to address the primary research objectives: (1) to investigate whether the localization and relative location (with respect to domestic and foreign markets) of manufacturing employment explains wage disparities across urban areas in Mexico, and (2) to investigate if and to what extent Mexico's rapid integration to global markets through trade liberalization and other globalization processes has contributed to expand or to contract the potential wage disparities associated with the localization and relative location of manufacturing employment across urban areas in Mexico. This chapter has also highlighted methodological and data limitations of the research.

[52] The employed are defined as: those individuals who in the reference week of the survey indicated to have worked for at least one hour during the week to produce goods or services in exchange for salary or wages; those individuals who indicated not to have worked during the reference week for any reason, but who were guaranteed employment upon their return to work within a four-week period; or, those individuals who in the reference week indicated to have worked for at least one hour during the week without salary or wages in a family or non-family business. The unemployed are defined as those individuals who are not employed, as previously defined, but who actively searched for employment opportunities in the two months prior to the reference week of the survey. To be considered unemployed, these individuals should also be available for immediate employment.

PART II: CONTEXTUAL FRAMEWORK—MACRO POLICIES AND THE SPATIAL LANDSCAPE OF MANUFACTURING IN MEXICO

Chapter 4: Import Substitution, Trade Liberalization, and the Geography of Manufacturing Activity in Mexico

The mid-1980s marks a shift in the political economy of Mexico. After decades[53] of implementing import substitution and industry protection policies through import tariffs, licensing, and export controls, the federal government, in a short period of time, engaged in intense multilateral and bilateral trade negotiations and undertook the rapid removal of trade barriers. This shift in policy was an attempt to reactivate the Mexican economy after the macroeconomic shocks it encountered during the early 1980s. But trade liberalization became also a policy instrument which, according to the literature, served to reshape the economic geography of the country. This process led to the spatial redistribution of, particularly, manufacturing employment and, with this, to the development of secondary urban centers—many of which had been excluded from the industrialization process of earlier decades.

This chapter traces primarily the historical development of urban manufacturing industrialization in Mexico under the import substitution model of development, that is, before the implementation of trade liberalization reforms and the country's resulting engagement in globalization. It also presents a discussion on the geography of manufacturing industrialization in the country after trade liberalization. It relies on a review of relevant available literature, and provides a discussion of earlier policy instruments designed to redistribute industrial production in the country but that often failed to be effective. This chapter is critical not only to understand historical patterns of industrial development in the country that the data used in this study cannot provide—that is, patterns prior to 1992, the first year represented by the data—but also to support the descriptive and quantitative analytic strategies that follow in Chapters 5, 6, and 7.

[53] The year 1940 marks the beginning of the implementation of the economic-development model in Mexico known as import-substitution.

INDUSTRIALIZATION IN MEXICO UNDER IMPORT-SUBSTITUTION

Industrialization in Mexico prior to trade reform (i.e., between 1940 and 1985) took place over two distinct periods.[54] The first (1940-1965) is characterized by the concentration of economic activity in the largest cities of the country (i.e., Mexico City, Monterrey, and Guadalajara) but particularly in central Mexico, where Mexico City,[55] and not its nearby secondary cities, is at the forefront of this process of increased spatial concentration. During this period, for example, Mexico City accounted for almost half of the nation's manufacturing employment and production along with 41 percent of its domestic manufacturing investments (Jiménez Godínez 2008: p. 23; Vleugels 1990: p. 57). The second period (1965-1985) observes a movement of manufacturing production into secondary cities in central and peripheral states. Yet, this process of deconcentration and decentralization of economic activity "did not reach every region or city, nor did industrial development occur with equal intensity" (Vleugels 1990: p. 69).[56]

Following, I discuss some of the factors which, according to the literature, explain the accelerated industrial concentration of manufacturing production since the 1940s in Mexico City as well as, to some extent, in other large cities in the country and that are the result of the economic strategy of import-substitution.[57] Afterwards, I trace the industrialization process of the periphery.

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[54] For a historical overview of Mexico's economic policies and economic development prior to and during the state-led industrialization period from 1940 to 1982 refer to Moreno-Brid and Ros (2009).

[55] By Mexico City, I refer to the Metropolitan Area of Mexico City, which consists of the Federal District and a conurbation of municipalities from the states of Mexico and Hidalgo.

[56] Spatial theory defines deconcentration as the industrial development of secondary cities in the core area of a country, which for Mexico is the central region, and decentralization as that occurring in urban areas in the periphery.

[57] For a comprehensive review of the nature of the concentration of industry in Mexico City refer to Vleugels (1990) and Garza (1980).

Mexico City and the Concentration of Economic Activity (1940-1965)

Location theory offers one of the leading explanations of the industrial dominance of Mexico City and large cities, like Monterrey and Guadalajara, over the course of the import-substitution industrialization process in Mexico. This explanation is based on the presence of agglomeration economies resulting from the concentration of people and firms in these cities.[58] Krugman and Livas Elizondo (1996) contend that trade protection and the import-substitution model stimulated the development of large cities in developing countries. The authors argue that to the extent that barriers to trade are considerable, the internal market becomes predominant and the presence of agglomeration economies, thus, stimulates the concentration of population and employment. The rationale is that firms will spatially concentrate if there are benefits derived from this agglomeration. Hence, where there are increasing returns to scale, industry will agglomerate (Hanson 2001). Sources of increasing returns to scale include: the size, availability and diversity of labor and product markets, economies of scale, knowledge externalities, and industrial linkages, among others. These are the factors that contributed to the industrial concentration in, for example, Mexico City. Nonetheless, it is fair to say as well that the centuries-long relative dominance of the city in the national economic and political structure is also a factor that stimulated the area's rapid urbanization and industrialization processes.

Import-substituting industrialization by nature favors industrial concentration in major urban areas at the expense of regional industrial development because firms will choose to locate close to the consumer markets they serve (Vleugels 1990: p. 60; Krugman and Hanson 1993). The reason for this is that industrial growth under this economic regime is almost exclusively dependent on the internal market. Thus, to minimize transportation costs, firms choose to locate in regions with the largest concentrations of population. Large cities are, therefore, favored since they are able to provide firms easy access to sufficiently

[58] A theoretical overview of spatial agglomeration and agglomeration economies is presented in Chapter 2.

large domestic markets. In 1972, for example, Mexico City alone represented 51 percent of the domestic demand for manufacturing products (Vleugels 1990: p. 61).

Additionally, large urban agglomerations are favored because they offer firms sizable markets of skilled and unskilled labor. It was Mexico's urbanization process during the second and third quarters of the twentieth century that allowed for a rapidly growing labor supply to satisfy the labor demand generated from industrial expansion (Morales 2008: p. 104). And it was the presence of numerous educational institutions—a locational advantage of large urban areas—in Mexico City which aided industrial expansion by increasing the city's supply of educated labor to meet industry demand. By the 1970s, 40 percent of the country's professional and technical workers resided in Mexico City (Vleugels 1990: p. 61). The increasing concentration of educated-workers in the city was met in the firms by higher productivity levels, higher profit margins, increasing economies of scale, and a higher relative marginal rate of return to investment compared to other areas of the country (Ward 1998: p. 28; Vleugels 1990: p. 61). According to Rauch (1993), these effects were to be expected as the spatial concentration of human capital, at least for the case of U.S. cities, results in productivity gains. In a more general sense, Ciccone and Hall (1996) further assess, from the U.S. case as well, that it is the close interaction of workers—such as is the case in urban agglomerations—that also increases labor productivity. Thus, the industry gains observed in Mexico City during this period served to attract to the area added investments in manufacturing. In fact, Mexico City was able to concentrate by the 1970s a large percentage of the nation's industrial entrepreneurs—56 percent—and with them their investment capital, which further contributed to the area's economic dynamism and industrial concentration (Vleugels 1990: p. 61).

But large cities in Mexico, and particularly Mexico City, were not only sources of product and labor markets to firms; they were also sources of suitable infrastructure to accommodate industrial development. During the first half of the twentieth century, few were the cities in the country that could provide firms with appropriate infrastructure for industrial production and development. Mexico City was one such place where continuous investment in infrastructure was the result of the city's central role within the country's political, economic, and urban structure (Vleugels 1990: pp. 49, 58, 60). Indeed, the city was favored at the expense of other regions with significant public investment in large-scale infrastructure projects, including highway transportation systems, access to energy sources like oil and electricity, improved water and drainage systems, among others (Ward 1998: p. 31). An analysis of public spending in infrastructure in Mexico from 1958 to 1970 additionally reveals that federal investment during this period was primarily directed toward the most developed federal entities or those with exploitable natural resources (e.g., State of Mexico, Mexico City, Nuevo León, Coahuila, Chihuahua, Jalisco, Puebla, and Veracruz) (Vleugels 1990: pp. 80-81). It is, therefore, to be expected that the unequal spatial distribution of public investment only contributed to intensify the concentration of the Mexican manufacturing industry in a few areas of the country.

The Periphery: Industrial Deconcentration and Decentralization (1965-1985)

The increased concentration of industrial production in Mexico City occurred at the expense of the industrial growth of secondary cities in central Mexico and elsewhere in the country—that is, except for a few cities like Monterrey, Guadalajara, Puebla and León which had a long tradition in manufacturing production, and Veracruz and Tampico because of their coastal location and the presence of oil industries. Not until the mid-1960s could one observe a slight shifting trend. Manufacturing employment in cities within the central region, such as Querétaro, Puebla, Cuernavaca, Irapuato, and Toluca, increased, while manufacturing employment in Mexico City began to fall (Vleugels 1990: pp. 54-55). The reduction in industry concentration became more pronounced after 1970 when industrial production expanded principally to the central region outside Mexico City. Two other trends are also apparent during this period: the growth of northern border cities and the establishment of new industrial centers outside of the central region.

The industrial growth of border cities in the north during this period is linked to the termination of the Bracero Program in 1964 and the implementation of the Border

Industrialization Program (BIP) in 1965 (Rodríguez 2003: pp. 67-68; Vleugels 1990: p. 73). Started in 1942, the Bracero Program consisted in authorizing the temporary, legal migration of Mexican men to the United States to work on short-run, primarily agricultural labor contracts. As this program ended, former Bracero migrants returned to Mexico and located primarily in border cities. However, the growing population of the cities under the presence of weak economic structures only contributed to generate a severe unemployment problem. In an attempt to address this problem, the federal government implemented the BIP. This program introduced the *maquiladora* scheme to Mexico and, with this, allowed foreign-owned manufacturing plants, known as *maquiladoras*, to import components duty free and later to export the final assembled products to the United States, also tax free, at a lower cost of production—given Mexico's lower cost of labor relative to the United States and short distance to the U.S. market. At first, the policy was such that *maquiladoras* could only be located in the immediate border area but with certain spatial restrictions. Firms were only authorized to operate within a twenty-kilometer zone from the U.S.-Mexico border and near cities with customs facilities. This policy limited industrial expansion to the border cities of Ciudad Juarez, Piedras Negras, Ciudad Acuña, Nuevo Laredo, Reynosa, and Matamoros. This statute changed by 1972, allowing *maquiladoras* to locate anywhere in Mexico except in Mexico City, Monterrey, and Guadalajara, although *maquiladoras* still managed to establish themselves in these three large urban areas. This move is what Leslie Sklair (1993) refers to as the "march to the interior," where export-oriented *maquiladoras* shifted production to interior areas of the country in search for lower labor wages, militancy, and turnover. Nevertheless, as Rodríguez (2003: p. 68) notes, "even with additional incentives to relocate to Mexico's interior, [*maquiladoras* remained] predominantly in the border region and in border states."

Cities outside of the central region whose industrial activities expanded during this period were mostly state capitals (e.g., San Luis Potosí, Aguascalientes, Saltillo, Torreon, and Durango). Their industrial development at the time was by and large the result of federal and state investments in infrastructure, secured to a greater extent through their political status as capital cities. But two other factors also contributed to the cities' development, an expanding *maquiladora* sector outside of border cities and less restrictive legislation towards foreign capital investments (Vleugels 1990: p. 74).

Finally, as mentioned earlier, since the mid-1960s, one is able to observe a changing trend in the industrial concentration of Mexico City—a spatial deconcentration process of the industry, particularly manufacturing, away from the historical core and into secondary cities within the central region. This relocation pattern is often explained in the literature as a result of the costs associated with the excessive agglomeration of industry in Mexico City. Several authors consider that the high level of industrial concentration in the capital area created, over time, significant urban disamenities (e.g., diseconomies of scale, pollution, higher transportation costs, elevated wages, and congestion) that raised the cost for firms of locating in the metropolitan area (Krugman and Livas 1996, Hanson 1998b, Mendoza Cota 2003). Lower competitiveness levels, then, gave way to industrial dispersion from the core to secondary cities.[59] The strategic location of these cities close to Mexico City, allowed them to still serve the regional market, while avoiding the high costs of production and disamenities of the metropolitan area. Nevertheless, the deconcentration of economic activities to the central region consisted mostly of production plants, as firms' headquarters often stayed in Mexico City (Vleugels 1990: p. 75). Control of local industrial production in the secondary cities, thus, still remained in the metropolitan area.

Other explanations may exist for the spatial employment shifts described in the previous paragraph. The federal government implemented multiple industrial deconcentration and decentralization policies during the 1970s and 1980s—but eliminated thereafter—in an attempt to reduce manufacturing concentration in Mexico City, stimulate the economic development of other regions, and reduce spatial economic disparities in the country. These policies largely relied on regionally-differentiated fiscal and financial incentives, investments in infrastructure, and subsidized prices of energy and public services. The largest incentives and benefits were granted to new or relocating firms

59 But as Krugman (1991b) notes, even with incentives for firms (e.g., better access to markets, knowledge and technological externalities) to relocate to alternate urban centers, this process of dispersion from the center to the periphery should not necessarily imply total deconcentration of the core region, as is evident in Mexico.

whenever the firm's new location was considered a priority zone to receive public sector intervention for its development. To discourage further urban concentration in the three largest metropolitan areas, no incentives were granted to firms locating in Mexico City, Guadalajara, or Monterrey. It has been suggested, however, that the effects of these policies on the regional distribution of industry have been limited or counterproductive.[60] Nonetheless, although qualitative research projects have been undertaken to evaluate the effects of these policies, to my knowledge, no quantitative analysis exists that isolates econometrically, from other plausible explaining factors, the effects of the industrial deconcentration strategy on the spatial distribution of economic activities across regions.

An example among the industrial deconcentration policies implemented during the 1970s is a decree by President Echeverria (1970-1976) to provide differentially across regions tax incentives (e.g., import tax reduction, real estate tax, tax on trade income, among other) to firms engaging in new industrial investments. As mentioned earlier, Mexico City, Monterrey, and Guadalajara were excluded from providing these fiscal and industrial incentives to firms. Secondary cities close to these large metropolitan areas (e.g., Tlaquepaque, Zapopan, Toluca, Cuernavaca, Puebla, and Querétaro) offered some incentives, but cities in the periphery offered the most (e.g., 60 to 100 percent in tax reductions). However, Vleugels (1990: p. 97) exposes the ineffectiveness of this policy based on data from the Ministry of Public Works. He finds that of the 918 firms in Mexico City that reported a changed in location, only 12 relocated to other cities in the country, and the rest simply relocated somewhere else inside the metropolitan area. It has been argued that the incentives granted were simply too small for firms to consider relocating away from the major metropolitan areas (Tamayo Flores 2000).

The administration of President López Portillo (1976-1982), under the National Industrial Development Plan, implemented also a policy of regionally-based fiscal incentives and energy rates to stimulate industrial decentralization in the country. Under this policy, tax credits and energy subsidies were given primarily to firms who wished to

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[60] For a comprehensive list and analysis of industrial deconcentration and decentralization policies during the 1970s and 1980s refer to Vleugels (1990) and Aguilar Barajas (1993).

locate in cities in one of two groups: (1) in the industrial ports of Tampico and Coatzacoalcos, both located in the Gulf of Mexico, and Salina Cruz and Lazaro Cardenas, both located on the Pacific Coast, and (2) in municipalities located in coastal regions, in the northern border cities, and in interior cities located at junctions of the national transportation highway system. This policy also allocated public sector infrastructure investment funds to the two groups of cities to foster further industrial development. However, as that of his predecessor, this policy too was unsuccessful. One of the arguments explaining the inadequate results of this policy is that too many cities (i.e., over 100) had to share limited public-sector funds (Vleugels 1990: p. 103; Aguilar Barajas 1993: p. 143). It is clear that, under such conditions, this policy could not be expected to be effective in creating strong urban industrial centers in the periphery.

The most important national policy instrument developed to decentralize industrial activities in Mexico City and diminish regional inequalities in the country was the creation in 1971 of the Industrial Parks and Cities Program. Through this program, government entities built and administered across the country—mostly outside of urban industrial cities—a system of fully-serviced, artificial industrial spaces with relatively highly-developed infrastructures. The idea was that through the creation of these parks and cities the location of firms would be regulated and decentralization encouraged. Nevertheless, this too became an unsuccessful industrial decentralization policy. Garza (1990) notes that even with the 130 parks and cities in existence by 1986, manufacturing production was still disproportionally concentrated in Mexico City. In fact, Mexico City and its immediate area of economic influence—the central states of Mexico, Puebla, Querétaro, Tlaxcala, and Morelos—concentrated most of the industrial parks in the country. Aguilar Barajas (1993), therefore, concludes that this program contributed, although at a limited level, to the industrial deconcentration, but not to the decentralization, of industrial production in Mexico.

In spite of the patterns of industrial dispersion described in this section, Aguilar Barajas (1993: p. 18) observes that by 1980—five years before the initial phase of trade liberalization—still only 5 states in Mexico accounted for more than half of the Gross

Domestic Product (GDP), 25 percent alone attributed to Mexico City. Pérez Cruz and Vela Peón (2008) also note, for the same year, that 44 percent of the manufacturing industry remained concentrated in Mexico City and the State of Mexico. That is, almost half of the industry was located in 2 out of the 32 federal entities. The state of Nuevo León concentrated 9 percent of the industry and the state of Jalisco 6 percent. This means that sixty percent of the industry was located in the major urban areas of Mexico. Hanson (1998a) further estimates that only 11.3 percent of the national manufacturing employment was located in northern, excluding the immediate border region, and southern states. This is noteworthy as these states alone account for 40.5 percent of Mexico's land area. Nevertheless, the literature observes that by 2003 Mexico City retained only 25 percent of its 1980 manufacturing industrial base (Pérez Cruz and Vela Peón 2008). Among the states that reportedly captured the relocating firms are Chiapas, Guanajuato, Guerrero, Michoacán, Oaxaca, Quintana Roo, San Luis Potosí, Sinaloa, Tabasco, Veracruz and Zacatecas.

REGIONALIZATION OF TRADE: THE SPATIAL INDUSTRIAL STRUCTURE FOLLOWING TRADE LIBERALIZATION IN 1985

In an attempt to reactivate its economy in the midst of the debt crisis and collapse of the price of oil during the mid-1980s, Mexico initiated an important process of trade liberalization and globalization, which consisted of two major stages. In 1985, Mexico reduced considerably and unilaterally barriers to imports, removed a variety of restrictions placed on foreign investors, and announced its entry into the General Agreement on Tariffs and Trade (GATT)—becoming a member in 1986. In 1994, the North American Free Trade Agreement (NAFTA) between the United States, Mexico, and Canada was implemented and was followed by a series of multilateral and bilateral trade agreements between Mexico and multiple other economies, such as the European Union—a trade agreement that was implemented in 2000. These agreements consisted of the rapid removal of trade barriers where taxes and tariffs that had been previously applied to trade and value-added manufacturing were eliminated. This strategy further consolidated the country's process of liberalization started almost a decade earlier, and, in fact, the implementation of NAFTA has been viewed as the beginning of the pinnacle of the country's trade liberalization and accelerated globalization efforts.

A review of the literature reveals that trade liberalization coincided with a significant sectoral and spatial reorganization of employment in Mexico.[61] Regardless of the measure employed to quantify descriptively the spatial changes in production after the opening of the economy (e.g., share of manufacturing employment, GDP per capita, location quotients), the results are similar and seem to indicate a shift in manufacturing production and employment from the core region of the country to the periphery and in some cases to areas where previous policies and processes had not had sufficient economic influence, like northwestern and north-central states.

Hanson (1998a), for example, observes from relative employment shares that between 1980 and 1993 manufacturing employment shifted significantly away from Mexico City and into states bordering the United States. Based on his calculations, Mexico City's share of national manufacturing employment fell from 44.4 percent to 28.7 percent,[62] while that of the northern border states increased from 21 to 29.8 percent. These trends in the spatial transformation of the manufacturing industry, however, were not homogeneous across industries (Hanson 1998b, Aguayo and Salas Páez 2002, Pérez Cruz and Vela Peón 2008, Castro Lugo and Félix Verduzco 2010). Hanson (1998b) reports, for example, that annual average employment growth by industry in the border region relative to the nation as a whole for the period 1985 to 1993 ranged from -1.0 percent in basic metals manufacturing—the only industry with negative employment growth in the region—to 5.8 percent in chemicals manufacturing, with the latter along with textiles and

61 Refer to Castro Lugo and Félix Verduzco (2010), Hernández González (2009), Hanson (1996, 1998a, 1998b), Pérez Cruz and Vela Peón (2008), Jiménez Godínez (2008), Mendoza Cota (2003), Aguayo and Salas Páez (2002), Baylis et al. (2009), and De León Arias (2008).

62 This decline occurred even when total employment in the metro area decreased only by 1.9 percent (Hanson 1998a).

metal products manufacturing—all highly export-oriented sectors—reporting the largest employment growth. For Mexico City, though, employment growth was negative across all manufacturing industries except two (i.e., chemicals and basic metals manufacturing).[63]

But the northern region was not the only one that experienced manufacturing employment growth after trade liberalization; the literature reports that some central and north-central states (i.e., the periphery) did as well. Castro Lugo and Félix Verduzco (2010), for example, estimates employment location quotients by sector for wage and salary workers across cities in Mexico for the years 1992 and 2002 and finds that the concentration of manufacturing employment, particularly in highly exportable sectors like metal products as well as machinery and equipment manufacturing, in cities in the border, northern, and north-central regions increased over the period. And similarly to what is reported earlier, the spatial dispersion of these industries across regions varied by sector. Among the manufacturing industries that relocated to cities in the northern region are metal products, general machinery and equipment, electrical motors, and equipment to generate, transform, and use electric energy. Among those that relocated to cities in the north-central and central regions are food, beverage, and tobacco products, auto parts, leather and textile products, and chemical industries.[64]

Additionally, Dávila Flores (2004) ranks states using a measure of relative change in manufacturing employment participation across the period 1980-1998, and his ranking corroborates the trends described in the previous paragraphs. Whereas Mexico City reports the largest decrease in relative employment participation, states with the largest or moderate increase include those that border the United States—with the states of Chihuahua and Baja California reporting the largest increase, while the states of Coahuila,

[63] While Hanson's (1998a, 1998b) period of analysis indeed captures some of the effects of trade liberalization, his study does not capture those resulting from the accelerating phase of the process, after 1994.

[64] Castro Lugo and Félix Verduzco (2010) refers also to other industrial trends across areas: Mexico City's economic structure became more specialized in the services sector, particularly, financial, social, and personal services; cities in the southern region experienced not only a concentration in the services sector but also in the food, tobacco, and beverages manufacturing sector, noting the absence of metal products and machinery and equipment manufacturing in the region; and finally, the cities in the Pacific experience a higher concentration of services particularly those related to tourism and construction sectors.

Sonora, and Tamaulipas report a moderate increase. However, Dávila Flores (2004) reports that Mexico City was not the only federal entity showing a decreasing trend in employment participation during the period of analysis; the author finds that the State of Mexico and the state of Nuevo León did as well.[65] In addition, the author reports that other non-border states also showed large or moderate increases in relative employment participation. These states include: Aguascalientes, Durango, and Guanajuato in the north-central region of the country; Morelos, Puebla, and Tlaxcala in central Mexico; and, the state of Yucatán in southeastern Mexico.

The same results are observed when relative per capita GDP participation by region is analyzed (Hernández González 2009; BBVA Bancomer 2001). Hernández González (2009) uses this measure to assess descriptively, for the period from 1980 and 2004, the effects of trade liberalization on the regional development of the country, in particular, the manufacturing sector. The following trends emerge from this analysis. First, the border and periphery states experienced increasing GDP participation over the whole period, yet the rate of increase for each region varied over time when analyzing shorter time segments. To be precise, the rate at which the participation of border states increased was slow during the 1980-1985 period (i.e., prior to trade liberalization), more rapid during the 1985-1993 period (i.e., the first wave of trade liberalization), and slightly slower again but still increasing rapidly after 1993 (i.e., the second wave of trade liberalization). In contrast, the periphery experienced a higher rate of increased participation during the 1980-1985 and 1993-2004 periods but slower during the 1985-1993 period. Thus, it would appear that the initial effects of the liberalization of trade were felt across regions at different times, or conversely, firms adjusted to trade at different rates, plausibly depending on sector and location. The second trend that emerges from the author's analysis is that the central region, composed of Mexico City and its contiguous states, experienced over the whole period a

[65] It is important to note that the decrease in relative manufacturing employment participation observed in these federal entities does not reflect a decrease in total employment. On the contrary, there is clear evidence of the growing tertiarization of the economic structure of these states, but expressly in the metropolitan areas of Monterrey and Mexico City (Ward 1998: p. 28; Dávila Flores 2004; Castro Lugo and Félix Verduzco 2010; Jiménez Godínez 2008: p. 28).

rapid decrease in per capita GDP participation and that the rate of decrease accelerated after 1985—after the initial stages of trade reform—consistent with the hypothesis explored in the literature that not only did diseconomies of agglomeration contributed to the decline in the concentration of manufacturing employment in the central region but also trade reform.

Morales (2008: pp. 110, 113, 115) agrees that the economies of the central and northern-border regions have been the most energized by trade liberalization, particularly by NAFTA. Since 1994, this region is characterized by the highest per capita income after Mexico City and the highest growth rate relative to other regions in the country. In this respect, Baylis et al. (2009) shows how the output per capita of regions close to the border with the United States relative to those further away has grown faster since NAFTA came into effect.

CONCLUSION

This chapter has traced primarily, although briefly, the historical development of urban manufacturing industrialization in Mexico under the import substitution model of development. It has also presented a discussion on the geography of manufacturing industrialization in the country after the implementation of trade liberalization reforms and the country's resulting engagement in globalization. The review of the literature presented in the chapter has revealed several trends as well as limitations of the current available research which are critical to understand historical patterns of industrial development in the country that the data used in this study cannot provide and to guide the descriptive and quantitative analyses that follow in Chapters 5, 6, and 7. The trends are summarized as follows.

First, import-substitution industrialization stimulated the development of manufacturing production in the largest urban areas in Mexico. Second, the historical concentration of manufacturing jobs in Mexico City has been steadily decreasing over time since the mid-1960s. This trend is argued to be the result not only of agglomeration diseconomies arising from the excessive spatial concentration of economic activities in Mexico City but also of trade liberalization efforts which shifted the orientation of manufacturing production from a domestic- to an export-oriented model making urban areas closer to foreign markets more attractive to firms. Little is known about whether evidence of agglomeration diseconomies extends to other large cities in the country, like Monterrey and Guadalajara.

Third, manufacturing industrialization in urban areas with proximity to the United States—the largest recipient of exports from Mexico—is not a direct outcome of the opening of the economy in the mid-1980s but instead the result of the Border Industrialization Program and its subsequent inland-expansion initiative. Nevertheless, trade liberalization reforms did contribute to further consolidate the spatial concentration of manufacturing production in areas with relative proximity to the U.S. consumer market. Fourth, the second wave of Mexico's trade liberalization and globalization efforts—starting with the implementation of NAFTA—seemingly contributed to the development of sector-specific manufacturing employment in areas of the country other than the U.S.-Mexico border region and its immediate vicinities, such as in north-central and central states. Lastly, while the existing literature has looked at the spatial concentration of manufacturing employment across Mexico, there is a dearth of research focusing on the concentration of manufacturing employment at the urban level—as opposed to the most often observed unit of analysis, the state—and over a long-term horizon covering multiple years within the second phase of Mexico's globalization process.

Chapter 5: The Geography of Manufacturing Employment across Urban Areas in Mexico, 1992-2010

This chapter describes the spatial development of manufacturing employment by major subsectors across urban Mexico during the 1990s and 2000s decades. This exercise contributes to the contextual understanding of employment concentration patterns across manufacturing subsectors along Mexico's urban space during the 1990s and 2000s decades using metrics that have not previously been used in the literature to describe the spatial concentration patters of Mexico's manufacturing industry. In this manner, the exercise extends the limited body of knowledge on the localization of subsector-specific manufacturing employment at the urban level during the second phase of Mexico's globalization process—the years following the implementation of NAFTA.

The organization and methodological details for the descriptive analysis presented in Chapter 5 are as follows. The first section describes the localization patters of manufacturing employment by subsector using the spatial concentration index defined in Chapter 3. I use both analytic samples to provide the most extensive analysis possible. For tractability purposes, however, this descriptive analysis is only conducted for selected years. The years included do not constitute directly years of domestic or global economic instability. For each subsection, a summary version of the corresponding full table found in Appendix D is presented. The summary tables present the urban centers in the data with the highest concentration of manufacturing employment for each subsector and highlight some notable trends.[66]

[66] The following descriptive analysis is based on Appendix Tables D.1 through D.12 in Appendix D. Appendix Tables D.1 through D.6 present the spatial concentration index in natural logarithmic form and the corresponding relative ranking for selected years (i.e., 1992, 1997, and 2002) for each urban area in the short-run analytic sample. To make the indices fully comparable across the selected years, three metropolitan areas (i.e., Queretaro, Monclova, and Manzanillo) in the sample were not considered in the estimation of the spatial concentration indices presented in these tables as data for these metropolitan areas were not available for some of the years included in the descriptive analysis. For the purposes of this part of the analysis, therefore, the short-run analytic sample is composed of 33 metropolitan and principal urban areas instead of 36. Appendix Tables D.7 through D.12 present the spatial concentration index in natural logarithmic form and

The second section summarizes the spatial concentration patterns of manufacturing employment in Mexico across subsectors in relation to proximity to demand markets as well as multiple space-based characteristics defined in Chapter 3. These characteristics include urban scale, local endowment of human capital, and manufacturing experience, and their analysis contributes to identify elements that, according to the literature, may confound the results of my empirical analysis. For the purpose of the descriptive analyses presented in this section, I use the short/long-run analytic sample. Also, for tractability purposes, I present data only for selected years covering the span of the 1990s and 2000s decades. The selected years do not constitute directly years of domestic or global economic instability.

THE LOCALIZATION OF MANUFACTURING EMPLOYMENT ACROSS SUBSECTORS

Food, Beverage, and Tobacco Products Manufacturing

Employment in this manufacturing subsector is, as might be expected given the domestic-driven demand nature of the industry, persistently concentrated in the largest metropolitan areas in the country, namely Mexico City, Guadalajara, and Monterrey. (Refer to Table 5.1.) Indeed, the three metropolitan areas have remained, relative to other urban areas, the primary centers of employment in the food, beverage, and tobacco products industries during the 1990s and 2000s decades. While Mexico City maintains the top ranking throughout most of the period of analysis, the concentration of employment in this subsector in the metropolitan area is observed to experience a decreasing trend that lasts up to the year 2010, when the employment concentration levels surpass those of

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the corresponding relative ranking for selected years (i.e., 1992, 1997, 2002, 2007, and 2010) for each urban area in the short/long-run analytic sample. To make the indices fully comparable across the selected years, the metropolitan area of Queretaro was not considered in the estimation of the spatial concentration indices presented in these tables as data for this metropolitan area were not available for 1992. For the purposes of this part of the analysis, therefore, the short/long-run analytic sample is composed of 27 metropolitan and principal urban areas instead of 28.

1992—the year which exhibits the highest reported level for the metropolitan area throughout the period of analysis. The observed decreasing trend is consistent with findings in earlier literature presented in Chapter 4 which describe patterns of spatial deconcentration and decentralization of employment away from Mexico City.

Guadalajara, instead, is seen to gain jobs in this manufacturing subsector relative to other urban areas during the 1990s decade and the early years of the 2000s decade—period of increasing population in the metropolitan area—but loses jobs during the mid- to late 2000s decade—when its population growth decelerated. Additionally, the metropolitan area of Monterrey is consistently ranked third during the period of observation, reporting employment gains throughout most of the period but losing jobs significantly as well as its ranking by the end of the 2000s decade to other growing urban areas in the country, such as Toluca and San Luis Potosi in Central Mexico.

In addition to the largest urban markets, other metropolitan and principal urban areas in the country also concentrate significant (i.e., well above-average) levels of employment in this industrial subsector. These urban areas are spread geographically across the country and include, for example, Orizaba, Toluca, and Puebla in south-central Mexico, San Luis Potosi in north-central Mexico, Torreon in northeastern Mexico, and Merida in southern Mexico. Notwithstanding the importance of these urban centers, the data shows that all metropolitan and principal urban areas in the analytic samples have some level of manufacturing production of food, beverages, or tobacco products. This would be expected, as previously mentioned, given the nature of this manufacturing subsector which is traditionally driven by domestic demand.

While slight variations in the rankings and the employment concentration levels of the urban areas in the analytic samples are observed over time, it is evident from the data that major spatial shifts in the concentration of employment in the food, tobacco and beverage industries have not occurred within the period of analysis. An exception is the metropolitan area of Chihuahua in northeastern Mexico, which experiences a gradual increase in employment concentration in this industrial subsector, especially during the 2000s decade. Its ranking improved significantly, regardless of the analytic sample employed as reference. Table 5.1 shows, for instance, that in 1992 Chihuahua ranked seventeenth out of the twenty-seven metropolitan and principal areas included in this analysis using the short/long-run analytic sample, sixteenth in 1997, twelfth in 2002, ninth in 2007, and seventh in 2010. This is the direct result of a government-led, export-oriented cluster-development policy that started with the program *Chihuahua Siglo XXI*—put into action by the state government during the 1990s as part of the State's Development Plan under the administration of Governor Francisco Barrio (1992-1998)—and continued with the more current programs *Chihuahua Now* and *Chihuahua Mexico Industrial*—which bring together different actors from the government, private, and academic sectors to promote the attraction of foreign direct investment to the state and to foster the development of industrial clusters (OECD 2012, Casalet et al. 2011). Several manufacturing subsectors were identified as priority industries of focus for the state's export-oriented cluster-development strategy; these include, among others, processed foods, automotive, and electronics manufacturing subsectors.

Table 5.1: Urban Areas with the Highest Concentration of Manufacturing Employment in Food, Beverage, and Tobacco Products Industries according to the Short-Run and Short/Long-Run Analytic Samples

SHORT-RUN ANALYTIC SAMPLE

1992			1997			2002		
Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index
Mexico City	**1**	**3.73**	**Mexico City**	**1**	**3.44**	**Guadalajara, Jal.**	**1**	**3.46**
Guadalajara, Jal.	**2**	**2.66**	**Guadalajara, Jal.**	**2**	**3.00**	**Mexico City**	**2**	**3.33**
Monterrey, N.L.	**3**	**2.20**	**Monterrey, N.L.**	**3**	**2.52**	**Monterrey, N.L.**	**3**	**2.42**
Orizaba, Ver.	4	1.96	San Luis Potosi, S.L.P.	4	1.76	Toluca, Edo. Mex.	4	2.01
Toluca, Edo. Mex.	5	1.66	Merida, Yuc.	5	1.54	San Luis Potosi, S.L.P.	5	1.56
Merida, Yuc.	6	1.52	Orizaba, Ver.	6	1.34	Torreon, Coah.	6	1.45
Torreon, Coah.	7	1.37	Toluca, Edo. Mex.	7	1.27	Orizaba, Ver.	7	1.42
San Luis Potosi, S.L.P.	8	1.20	Puebla, Pue.	8	0.94	Merida, Yuc.	8	1.27
Puebla, Pue.	9	1.16	Hermosillo, Son.	9	0.85	Puebla, Pue.	9	0.70
Culiacan, Sin.	10	0.86	Torreon, Coah.	10	0.78	Tampico, Tamps.	10	0.42
…			…			…		
Chihuahua, Chih.	**20**	**-0.38**	**Chihuahua, Chih.**	**18**	**-0.07**	**Chihuahua, Chih.**	**14**	**0.26**

SHORT/LONG-RUN ANALYTIC SAMPLE

1992			1997			2002			2007			2010		
Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index
Mexico City	**1**	**3.81**	**Mexico City**	**1**	**3.54**	**Guadalajara, Jal.**	**1**	**3.56**	**Mexico City**	**1**	**3.45**	**Mexico City**	**1**	**3.84**
Guadalajara, Jal.	**2**	**2.74**	**Guadalajara, Jal.**	**2**	**3.11**	**Mexico City**	**2**	**3.43**	**Guadalajara, Jal.**	**2**	**3.32**	**Guadalajara, Jal.**	**2**	**2.97**
Monterrey, N.L.	**3**	**2.28**	**Monterrey, N.L.**	**3**	**2.62**	**Monterrey, N.L.**	**3**	**2.52**	**Monterrey, N.L.**	**3**	**2.61**	Toluca, Edo. Mex.	3	2.23
Toluca, Edo. Mex.	4	1.74	San Luis Potosi, S.L.P.	4	1.87	Toluca, Edo. Mex.	4	2.11	Toluca, Edo. Mex.	4	2.36	San Luis Potosi, S.L.P.	4	1.81
Merida, Yuc.	5	1.60	Merida, Yuc.	5	1.64	San Luis Potosi, S.L.P.	5	1.67	Merida, Yuc.	5	2.10	**Monterrey, N.L.**	**5**	**1.74**
San Luis Potosi, S.L.P.	6	1.27	Toluca, Edo. Mex.	6	1.37	Merida, Yuc.	6	1.38	San Luis Potosi, S.L.P.	6	1.19	Merida, Yuc.	6	1.40
Puebla, Pue.	7	1.24	Puebla, Pue.	7	1.05	Puebla, Pue.	7	0.81	Puebla, Pue.	7	1.05	**Chihuahua, Chih.**	**7**	**1.12**
Culiacan, Sin.	8	0.94	Hermosillo, Son.	8	0.95	Tampico, Tamps.	8	0.52	Hermosillo, Son.	8	0.81	Tampico, Tamps.	8	1.05
Aguascalientes, Ags.	9	0.84	Culiacan, Sin.	9	0.78	Hermosillo, Son.	9	0.46	**Chihuahua, Chih.**	**9**	**0.81**	Culiacan, Sin.	9	1.02
Hermosillo, Son.	10	0.77	Aguascalientes, Ags.	10	0.48	Tepic, Nay.	10	0.43	Culiacan, Sin.	10	0.75	Puebla, Pue.	10	0.71
…			…			…								
Chihuahua, Chih.	**17**	**-0.30**	**Chihuahua, Chih.**	**16**	**0.03**	**Chihuahua, Chih.**	**12**	**0.37**						

Source: Own elaboration using the short-run and short/long-run analytic samples. Indices are in natural logarithmic form. Only selected data are presented. Refer to Appendix Tables D.1 and D.7 for the complete data tables.

Textiles and Leather Products Manufacturing

The metropolitan area of Leon in north-central Mexico has historically, since Colonial times, dominated the manufacturing of leather products in the country, especially as it pertains to leather footwear manufacturing.[67] It is, therefore, not unexpected to observe, as Table 5.2 indicates, that this metropolitan area's concentration of employment in textile and leather products manufacturing is the highest in the country during the 1990s and 2000s decades, even considering evidence of the local industry's contraction in the years following the implementation of NAFTA. Over the 2000s decade, though, Table 5.2 depicts an industry that rebounded, expanded, and strengthened. Table 5.2 further identifies Mexico City as the urban center second to Leon in the rankings, followed consistently throughout the 1990s and 2000s decades by the metropolitan areas of Puebla in south-central Mexico as well as Guadalajara and Aguascalientes in north-central Mexico. Along with Leon, these four metropolitan areas have traditionally dominated and continue to dominate the demand for labor in the country in this manufacturing subsector.

Whereas large urban areas (i.e., Mexico City, Monterrey, and Guadalajara) have historically been and still are important centers of employment in the textiles subsector, there is a distinct observable pattern of spatial decentralization in these areas during the 1990s and 2000s decades in favor of other urban areas in the periphery. While the metropolitan areas of Mexico City and Guadalajara do not lose their positioning in the rankings observed in Table 5.2, the areas' estimated spatial concentration index values in logarithmic form do decrease over time. The metropolitan area of Monterrey, on the other hand, experiences a large loss in its ranking. In 1992, Monterrey occupies the fifth position with a spatial concentration index value between 2.18 and 2.26, depending on the analytic sample. The area's strong positioning at the time is the result of a long industrial history in textiles manufacturing that commenced in 1854 with the installation of the textile mill *La*

[67] Refer to Ortiz and Martínez (2000) for a historical synopsis of this industry's development in the urban area of Leon.

Fama de Nuevo León, followed in 1871 with that of *El Porvenir* and in 1874 with that of *La Leona* (Rojas Sandoval 2010), and that seemingly reached its peak in the early 1990s, diminishing in importance thereafter. By 2010, Monterrey occupies the eleventh position with a spatial concentration index value in logarithmic form of -0.84.

The metropolitan area of Puebla in south central Mexico occupies consistently the third position in the rankings of spatial concentration in the textiles and leather products manufacturing subsector regardless of the analytic sample observed. The general pattern of the spatial concentration of workers in the textiles subsector in Puebla, as Table 5.2 illustrates, indicates an index value that increases significantly in the immediate post-NAFTA years (i.e., from 2.66 logarithmic units in 1992 to 3.44 logarithmic units in 1997 as observed in the short/long-run analytic sample) as a result of the country's numerous free-trade agreements, starting with NAFTA, which increased foreign direct investment and employment opportunities in the area, but that decreases particularly during the early to mid-years of the 2000s decade primarily because of greater competition from China,[68] who after its entrance into the World Trade Organization in 2001 took "a leading market share in U.S. textile markets" (Knowledge@Wharton 2005), displacing the Mexican textile industry (Hernández Romero and Galindo Sosa 2006). According to Martínez et al. (2005: pp. 297-298), Puebla experienced in the 1990s an increase in export-oriented manufacturing employment particularly in the textiles and transportation subsectors. While textiles manufacturing has been strongly present in the area's federal entity since the second half of the nineteenth century, the most recent growth of the textile industry in the metropolitan area of Puebla, specifically, is in great part a consequence of the country's changing trade policy and increasing foreign capital investment during the 1990s, when the export-oriented manufacturing industry established itself as one of the most dynamic

[68] Factors that, according to Bair (2006) citing UNCTAD (2005), "dampened" the dynamism of export-oriented textile manufacturing not only in Puebla but in the entire country during the early years of the 2000s decade include: the economic slowdown in the United States, the growth of large transnational firms in Asia (e.g., China, South Korea, Taiwan) focused on "supplying the U.S. market with increasing volumes of apparel, and the reconfiguration of the global garment trade in anticipation of the phasing out of the MFA" (i.e., Multifiber Arrangement), a global quota agreement that regulated international trade in the textiles and apparel subsector from 1974 until its full phased out in 2005.

sources of manufacturing employment in the metropolitan area (Martínez et al. 2005, p. 298).[69]

The history of textile manufacturing in the metropolitan area of Aguascalientes is shorter than that of other areas like Monterrey or Puebla but nonetheless is as significant to the metropolitan area's economic development. Indeed, the 1940s decade observes the establishment of the first textile firms in the region. Yet, over time, the industrial subsector becomes the region's most important and distinctive feature (Gutiérrez Castorena and Gutiérrez Castorena 2006). Indeed, as observed in Table 5.2, the metropolitan area of Aguascalientes presents in 1992 a well-above average index value between 1.78 and 1.86 logarithmic points, depending on the reference sample, that shows the strength of the industrial subsector in the region before the peak of the trade liberalization process in Mexico. The implementation of NAFTA in 1994 further strengthens the spatial concentration of manufacturing employment in the textiles subsector in Aguascalientes, so that by 1997 the area's index value ranges between 2.07 and 2.27 logarithmic points, depending on the reference sample. During the 2000s decade, however, Aguascalientes experiences the same decreasing trend in textile-industry employment as observed in the case of Puebla as well as other urban centers.

Unlike what is observed in the analysis of the spatial concentration of employment in the food, beverage, and tobacco products manufacturing subsector, relatively more urban centers expectedly experienced changes in the spatial concentration of employment in the textiles and leather subsector after the implementation of NAFTA because of the relatively more export-oriented nature of the industry, as discussed in the introductory chapter. Undeniably, trade liberalization and globalization not only strengthened the spatial concentration of employment in the subsector in traditional textile centers across Mexico,

[69] Now, while it is true that a large number of garment manufacturing firms in Puebla serve the domestic market, Martínez et al. (2005, p. 301), citing local studies, points to the fact that most of these domestic-oriented firms are micro and small in size as well as unregistered and, thus, operate in the informal textile production market, which the analytic samples in this dissertation would not capture given their focus on formal-sector employment. Therefore, it is safe to assume that the analytic samples, at least for the case of Puebla, capture mostly export-oriented manufacturing employment in the textile and leather products subsector.

like the metropolitan areas of Leon, Aguascalientes, and Puebla but also contributed to the emergence of other textile-production centers looking to take advantage of the changing trade policy—urban areas such as Torreon in northeastern Mexico, Toluca in central Mexico, and Campeche in southeastern Mexico.

As observed in Table 5.2, relative employment demand in the urban area of Torreon in northeastern Mexico gained particular momentum in the years following NAFTA. The table shows that whereas in 1992 the urban area ranks eighth among the thirty-three metropolitan and urban areas in the short-run analytic sample with a concentration index value of approximately 1 logarithmic point, in 1997 and 2002 it ranks fourth with index values in both instances of approximately 2.9 and 2.8 logarithmic points, respectively.[70] The increase in the spatial concentration of employment in the textile industry over the course of the 1990s in the metropolitan area of Torreon, also known as the *Comarca Lagunera* region in the state of Coahuila, is the result of a successful state-government strategic plan—under the administration of governor Rogelio Montemayor Seguy (1993-1999)—to foster the development, under NAFTA, of export-oriented industrial clusters in various regions across the state by taking advantage of local industrial strengths to attract foreign and domestic investors to establish manufacturing operations in Coahuila.[71] In the case of the metropolitan area of Torreon, government incentives along with "the efficient promotion of the sub-region by the private-sector economic-development organization FOMEC" (*Fomento Económico Laguna de Coahuila)* "served as catalyst" for the development of the textile industry in the urban area (De Bell 2005, p. 123).

Hernández Romero and Galindo Sosa (2006) observes that while the origins of textile manufacturing in the State of Mexico date back to the middle of the nineteenth century, followed by a crucial moment in the industry's development in the state during the 1940s decade—the advent of import-substitution industrialization policies which increased the importance of the entity's proximity to Mexico City—the trade liberalization

[70] A long-term profile for this urban area is, however, not available in the data.
[71] According to De Bell (2005, p.117), the economic development experienced by the state of Coahuila since the 1990s is seemingly one of Mexico's most successful examples of trade liberalization policies.

context brought about the establishment of significant numbers of new textile firms across the state, operating with a clear orientation towards foreign markets. Indeed, Table 5.2 shows a significant increase in the spatial concentration of textile employment in the state capital, Toluca, over the 1990s and 2000s decades. Specifically, I observe from the short/long-run analytic sample that whereas the spatial concentration index for employment in the textiles subsector for the metropolitan area of Toluca is 0.69 logarithmic points in 1992, by 2010 the index has reached 2.61 logarithmic points.

Campeche in southeastern Mexico, on the other hand, remained among the urban areas with the lowest spatial concentration of employment in this subsector over the 1990s decade. However, during the 2000s decade, the garment industry in Campeche experienced significant growth, leading the city to become one of the urban areas in the country with the highest concentrations of employment in this subsector. As Table 5.2 indicates, based on data from the short/long-run analytic sample, Campeche's ranking improved rapidly from twenty-fourth place in 1997 to eighth place in 2002, remaining among the top ten urban areas with the highest concentration of textile employment during the 2000s decade. Manufacturing growth in Campeche as well as in other urban areas in the Yucatan Peninsula has been attributed to rising international trade coupled with the development and existence of the maritime port of the city of Progreso in the state of Yucatan. In fact, Pedro Pablo Zepeda Bermudez, current director of the Merchant Marine division of the Mexican Ministry of Communications and Transportation, refers to the port of Progreso as "the catalyst for economic development in southeast Mexico, particularly in the manufacturing and agro-industrial sectors" BNamericas (1999). Efforts in 1999 by the federal government to improve and to expand the port's operating capacity contributed to the development of the export-oriented textile industry in the urban area of Campeche. McCosh (1999) reports an investment by the federal government of approximately US$85 million in 1999 that is in part the result of the government's view of ports as "detonators of regional economic growth." Augustin Arroyo, Progreso's port director at the time, called the expansion fundamental to the region's economic growth for its ability to reduce transportation costs for firms. The strengthening of the garment industry in Campeche serves as an example of the success of this effort.

Urban areas that experienced relative losses in employment concentration levels in this manufacturing subsector include the metropolitan areas of Monterrey in northeastern Mexico and Ciudad Juarez in the northern border. As observed in Table 5.2, the spatial concentration indices for both urban centers decreased progressively throughout the 1990s and 2000s decades. Both urban areas were centers of textile manufacturing production in the country prior to NAFTA but lost their importance in the years following NAFTA. While Monterrey's relative ranking decreased gradually from fifth place in 1992 to eleventh in 2010, based on the short/long-run analytic sample, Cd. Juarez's instead appears to have drastically decreased from sixth place in 1992 to seventeenth in 2002. Unfortunately, data for Cd. Juarez is not available beyond the year 2002.

Table 5.2, along with Appendix Tables C.2 and C.8, offers an indication that textile and leather manufacturing employment in Mexico is primarily concentrated in urban areas outside of the northern border but with a history of production in this subsector. Increased development of the subsector in other metropolitan areas, such as Campeche, is seemingly being driven by improved access to export transportation outlets like the maritime port in the city of Progreso, Yucatan.

Table 5.2: Urban Areas with the Highest Concentration of Manufacturing Employment in Textiles and Leather Products Industries according to the Short-Run and Short/Long-Run Analytic Samples

SHORT-RUN ANALYTIC SAMPLE

1992			1997			2002		
Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index
Leon, Gto.	**1**	**4.20**	**Leon, Gto.**	**1**	**3.70**	**Leon, Gto.**	**1**	**4.25**
Mexico City	**2**	**3.74**	**Mexico City**	**2**	**3.52**	**Mexico City**	**2**	**3.40**
Puebla, Pue.	**3**	**2.58**	**Puebla, Pue.**	**3**	**3.24**	**Puebla, Pue.**	**3**	**3.12**
Guadalajara, Jal.	4	2.54	**Torreon, Coah.**	**4**	**2.87**	**Torreon, Coah.**	**4**	**2.80**
Monterrey, N.L.	**5**	**2.18**	Guadalajara, Jal.	5	2.16	Guadalajara, Jal.	5	2.20
Cd. Juarez, Chih.	**6**	**1.85**	Aguascalientes, Ags.	6	2.07	Aguascalientes, Ags.	6	1.98
Aguascalientes, Ags.	7	1.78	**Monterrey, N.L.**	**7**	**1.46**	Toluca, Edo. Mex.	7	1.49
Torreon, Coah.	**8**	**0.98**	Toluca, Edo. Mex.	8	0.98	Merida, Yuc.	8	1.15
Toluca, Edo. Mex.	9	0.61	Merida, Yuc.	9	0.93	Campeche, Camp.	9	0.72
Merida, Yuc.	10	0.50	Tijuana, B.C.	10	0.62	**Monterrey, N.L.**	**10**	**0.72**
…			**Cd. Juarez, Chih.**	**11**	**0.09**	…		
…			…			…		
Campeche, Camp.	25	-5.53	Campeche, Camp.	30	-6.65	**Cd. Juarez, Chih.**	**17**	**-0.78**

SHORT/LONG-RUN ANALYTIC SAMPLE

1992			1997			2002			2007			2010		
Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index
Leon, Gto.	**1**	**4.28**	**Leon, Gto.**	**1**	**3.90**	**Leon, Gto.**	**1**	**4.47**	**Leon, Gto.**	**1**	**5.21**	**Leon, Gto.**	**1**	**5.52**
Mexico City	**2**	**3.82**	**Mexico City**	**2**	**3.72**	**Mexico City**	**2**	**3.62**	**Mexico City**	**2**	**3.64**	**Mexico City**	**2**	**3.51**
Puebla, Pue.	**3**	**2.66**	**Puebla, Pue.**	**3**	**3.44**	**Puebla, Pue.**	**3**	**3.33**	**Puebla, Pue.**	**3**	**2.66**	**Puebla, Pue.**	**3**	**2.95**
Guadalajara, Jal.	4	2.63	Guadalajara, Jal.	4	2.36	Guadalajara, Jal.	4	2.41	Guadalajara, Jal.	4	2.20	Toluca, Edo. Mex.	4	2.61
Monterrey, N.L.	**5**	**2.26**	Aguascalientes, Ags.	5	2.27	Aguascalientes, Ags.	5	2.20	Toluca, Edo. Mex.	5	1.70	Guadalajara, Jal.	5	1.93
Aguascalientes, Ags.	6	1.86	**Monterrey, N.L.**	**6**	**1.67**	Toluca, Edo. Mex.	6	1.70	Aguascalientes, Ags.	6	1.39	Aguascalientes, Ags.	6	1.64
Toluca, Edo. Mex.	7	0.69	Toluca, Edo. Mex.	7	1.18	Merida, Yuc.	7	1.36	Merida, Yuc.	7	1.30	Campeche, Camp.	7	1.30
Merida, Yuc.	8	0.59	Merida, Yuc.	8	1.13	Campeche, Camp.	8	0.94	Campeche, Camp.	8	1.23	Merida, Yuc.	8	0.18
Cuernavaca, Mor.	9	0.49	Tijuana, B.C.	9	0.82	**Monterrey, N.L.**	**9**	**0.93**	Saltillo, Coah.	9	0.37	Tijuana, B.C.	9	0.06
San Luis Potosi, S.L.P.	10	0.19	Hermosillo, Son.	10	0.25	Tijuana, B.C.	10	0.03	**Monterrey, N.L.**	**10**	**0.36**	San Luis Potosi, S.L.P.	10	-0.27
…			…									**Monterrey, N.L.**	**11**	**-0.84**
Campeche, Camp.	19	-5.45	Campeche, Camp.	24	-6.45									

Source: Own elaboration using the short-run and short/long-run analytic samples. Indices are in natural logarithmic form. Only selected data are presented. Refer to Appendix Tables D.2 and D.8 for the complete data tables.

Electronic and Electric Components, and Communications and Measurement Equipment Manufacturing

As previously described in Chapter 4, the industrial development of Mexico's border states and, especially, of urban areas along the U.S.-Mexico border is primarily associated with three events in Mexico's economic history: the introduction of the *maquiladora* program in the late 1960s; the initiation of trade reforms during the 1985-1986 period; and, the implementation of NAFTA in 1994. These events not only contributed to the transitioning of the manufacturing sector in general from a domestic-oriented to an export-oriented industry but also to the development and consolidation of export-oriented manufacturing in the country's northern region given primarily its proximity to the United States. As a result, it is not unexpected to observe employment in electronics manufacturing, a highly export-oriented subsector in Mexico, to be predominantly concentrated in urban areas in northern Mexico, especially when considering that about 85 percent of the subsector's exports are destined to the U.S. market (Ministry of Economy 2012). Data presented in Table 5.3 for the years 1992, 1997, and 2002, using the short-run analytic sample, show the border cities of Tijuana, Matamoros, and Ciudad Juarez occupying persistently the three highest positions in the ranking of concentration indices, with the border city of Nuevo Laredo and the northeastern city of Chihuahua occupying also top positions in the ranking.[72] Additionally, Table 5.3 shows how the electronics subsector in northern cities seemingly excluded from the export-oriented industrialization process of earlier decades (e.g., Hermosillo in the northwest region of the country, or Torreon and Saltillo in the northeast) develops following NAFTA.

[72] While other border cities, like Reynosa in the state of Tamaulipas, may follow also the trends observed for cities like Tijuana, Matamoros, and Ciudad Juarez, the unavailability of data does not allow me to make analytical observations and/or conclusions regarding the characteristics of their labor and industrial markets. Moreover, the unavailability of more current data for the cities of Matamoros, Ciudad Juarez, and Nuevo Laredo present important limitations to this study, particularly since these cities have historically been important urban centers of export-oriented manufacturing.

One trend that may be observed in Table 5.3 is the growing strength of the electronics subsector in the border city of Tijuana relative to other cities. I observe, for example, based on data from the short-run analytic sample, that the spatial concentration index value for Tijuana in 1992 is 3.49 logarithmic points compared to Ciudad Juarez's index value of 4.66 or Matamoros' index value of 3.71. By 1997, however, while the index values of other border cities are slightly lower compared to their 1992 values, Tijuana's instead is significantly higher, increasing from 3.49 logarithmic points in 1992 to 4.89 points in 1997 and occupying as a result the top position in the ranking of spatial employment concentration indices in the subsector from 1997 onward. The increase in Tijuana's relative concentration of employment in the electronics subsector, and particularly in that which pertains to television manufacturing as well as other audio and video equipment, is associated with a significant increase in NAFTA-related FDI flows to Tijuana from Asian firms with market interests in the United States, especially firms of Japanese, Korean, and Taiwanese origins, such as Sony, Sanyo, Samsung, Hitachi, and JVC, among others (Ministry of Economy 2012). As Cañas and Gilmer (2009) note, Tijuana's strategic location in the Pacific Coast, allowing Asian firms ease of access to Asian suppliers, has been key to the subsector's increasing local development following NAFTA.

For the case of Chihuahua—the capital city of the state of Chihuahua in northeastern Mexico—Table 5.3 indicates a strong electronics subsector in the metropolitan area before the peak of the trade liberalization process in Mexico and a persistent, well-above average, growing sector in the years following. In fact, whilst the metropolitan area occupies consistently in all selected years in the analysis the sixth position in the ranking of concentration indices based on the short-run analytic sample and the fourth position based on the short/long-run analytic sample, Table 5.3 indicates an index value that increases over time. Based on data from the short/long-run analytic sample, the index value for Chihuahua increases as follows: from 2.53 in 1992 to 2.58 in 1997, 2.75 in 2002, 2.92 in 2007, and 3..38 in 2010. The growing concentration of electronics employment in Chihuahua over the 1990s and 2000s decade may be attributed in great part to positive economic externalities arising from the persistent concentration of the electronics subsector in the metropolitan area but also, as in the case of the concentration of food-products manufacturing employment, to a government-led, export-oriented cluster-development policy implemented by the state government in response to NAFTA as well as in response to the relaxation of barriers on FDI flows taking place since the mid-1980s. As described earlier, the cluster-development policy started with the program *Chihuahua Siglo XXI*—put into action by the state government during the 1990s as part of the State's Development Plan under the administration of Governor Francisco Barrio (1992-1998)—and continued with the more current programs *Chihuahua Now* and *Chihuahua Mexico Industrial*—which bring together different actors from the government, private, and academic sectors to promote the attraction of foreign direct investment to the state and to foster the development of industrial clusters, including that of the electronics manufacturing subsector (OECD 2012, Casalet et al. 2011).

As mentioned earlier, Table 5.3 shows how the electronics subsector in cities like Hermosillo in the northwest region of the country or Torreon and Saltillo in the northeast develops following NAFTA. Let us discuss, for example, the urban area of Saltillo. Based on data from the short/long-run analytic sample, the spatial concentration index for employment in the electronics subsector in Saltillo increases as follows: from -1.66 in 1992 to -0.33 in 1997, 0.76 in 2002, 0.12 in 2007, and 1.66 in 2010. As in the case of textiles manufacturing in Coahuila, the increase in the spatial concentration of employment in the electronics subsector in Saltillo over the course of the 1990s and 2000s decades, but particularly during the latter decade, may be in part the result of a successful state-government strategic plan—by the administration of governor Rogelio Montemayor Seguy (1993-1999)—to foster the development, under NAFTA, of export-oriented industrial clusters in various regions across the state by taking advantage of local industrial strengths to attract foreign and domestic investors to establish manufacturing operations in Coahuila.[73] However, while the strategic plan may have contributed to the development of

[73] According to De Bell (2005, p.117), the economic development experienced by the state of Coahuila since the 1990s is seemingly one of Mexico's most successful examples of trade liberalization policies.

the subsector in Saltillo, it did not do so as directly as one would expect given that the Montemayor administration chose not to promote actively the electronics subsector in the state as other urban areas in the country (e.g., Guadalajara, Ciudad Juarez, and Tijuana) had already an established electronics manufacturing base as well as a comparative advantage in the subsector relative to Saltillo (De Bell 2005, p.115). I deduce instead that the subsector inevitably developed in the urban area for two reasons. First, Saltillo's strong transportation manufacturing subsector, to be discussed in the next section, promoted the development of an electronics subsector to support the city's local auto manufacturing industry. As a result, the electronics-components manufacturing subsector developed. Second, Saltillo's proximity to the metropolitan area of Monterrey, which as we may remember is one of the urban areas with the highest concentration of employment in the electronics subsector, serves as a locational advantage to the urban area, especially for firms in search of lower production costs but with an eye for access to *local* suppliers, human capital, and technological know-how.

According to Table 5.3, employment in the electronics subsector is also highly concentrated in the three largest metropolitan areas in the country (i.e., Mexico City, Guadalajara, and Monterrey)—urban areas with the necessary human capital and organizational infrastructure, one which is composed of government, private, and academic actors working together, to support the development and growth of the subsector. But whereas there is a distinct observable pattern of further spatial concentration of electronics employment in Monterrey and Guadalajara over time, there is also a distinct observable pattern of spatial decentralization of electronics employment in Mexico City during the 1990s following the implementation of NAFTA, consistent with findings in earlier literature presented in Chapter 4 which describe patterns of spatial deconcentration and decentralization of employment away from Mexico City. Observe, for instance, how Mexico City occupies the second place in the ranking of spatial concentration indices in 1992 based on data from the short/long-run analytic sample with an index value of 3.89 logarithmic points, but drops to the fifth position in 1997 with an index value that is significantly lower at 2.01 logarithmic points. The metropolitan area remains in the fifth position thereafter with index values that range between 1.96 in 2002 and 2.15 in 2010. On the other hand, observe how Monterrey's index value increases from 3.06 in 1992 to 3.76 in 2010, based on data from the short/long-run analytic sample, and Guadalajara's from 2.12 in 1992 to 3.76 in 2010.

The significant growth of the electronics manufacturing subsector in the metropolitan area of Guadalajara, commonly referred to as Mexico's Silicon Valley, is noteworthy. Its history dates back to the 1960s decade with the opening of *Siemens* in 1962 as well as *Motorola de México* and *Industrias Mexicanas Burroughs* in 1968, all subsidiaries of multinational companies whose focus at the time is primarily the domestic market. This focus changes with the expansion of the *maquiladora* program outside of the border region in the 1970s, is followed during the 1980s by the establishment of major assembly, export-oriented firms, such as Kodak, IBM, and Hewlett-Packard, among others, and finds its most dynamic expansion in the metropolitan area during the 1990s decade with the implementation of NAFTA and rapid increases in related foreign direct investment (Jaén Jiménez and León Sánchez 2005). Indeed, as we may observed in Table 5.3, Guadalajara's electronics employment concentration index value increases significantly from 1.57 in 1992 to 2.65 in 1997 based on data from the short-run analytic sample. Along with trade liberalization policies, Merchand (2003) attributes this increase to state policies directed to foster industrial development in Jalisco. In 1995, the state government passes the Economy Promotion Law (i.e., Ley para el Fomento Económico) to reorient the industrialization scheme of the state from domestic-demand markets towards global trade markets, allowing a series of incentives and instruments designed to support export-oriented manufacturing in the state. And as Merchand (2003) describes, it was the electronics industry which took the most advantage of these benefits, particularly the industry related to computer equipment manufacturing, given its strong, established presence in the state and the metropolitan area of Guadalajara.[74]

[74] For a historical overview of the development of the electronics manufacturing subsector in the metropolitan area of Guadalajara refer to Jaén Jiménez and León Sánchez (2005) as well as Lüthje et al. (2013). Additionally, Lüthje et al. (2013) provides a brief overview of the subsector in the metropolitan area of Monterrey, Nuevo León.

While employment in the electronics subsector is, as we have observed in this section, primarily concentrated in urban areas with proximity to the U.S. market as well as in the largest urban areas, this subsector has also developed in some north central cities of the country, namely, the capital cities of Aguascalientes and San Luis Potosí. In particular, the subsector that has developed primarily in these cities is that which pertains to household appliances and, for San Luis Potosi, also that which pertains to electronic components for the auto industry. Data from Table 5.3, based on the short/long-run analytic sample, indicate a growing employment concentration index for the city of Aguascalientes over the years included in the analysis, particularly during the 2000s decade, and a variable but at times strong employment concentration index for San Luis Potosi, with alternating periods of spatial concentration and deconcentration. For both cities, however, the 2000s decade indicate a stronger and growing subsector. Gutiérrez Castorena and Gutiérrez Castorena (2006) attribute the growing strength of the subsector in Aguascalientes to the state's economic policy, characterized for attracting foreign capital, mainly, of Japanese and American origin, which contributed to a much needed local infrastructural development. The locational advantage of the state of San Luis Potosi, on the other hand, has contributed to the capital city's industrial development and industrial diversity. In fact, the state is considered one of the most diverse economies in the country. Among the locational advantages of San Luis Potosi are its equidistance to Mexico City, Guadalajara, and Monterrey, as well as its infrastructural connectivity and accessibility to eastern cities in the U.S.-Mexico border and to major Gulf and Pacific Coast maritime ports.

Table 5.3: Urban Areas with the Highest Concentration of Manufacturing Employment in Electric and Electronic Products Industries according to the Short-Run and Short/Long-Run Analytic Samples

SHORT-RUN ANALYTIC SAMPLE

1992			1997			2002		
Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index
Cd. Juarez, Chih.	**1**	**4.66**	**Tijuana, B.C.**	**1**	**4.89**	**Tijuana, B.C.**	**1**	**4.50**
Matamoros, Tamps.	**2**	**3.71**	**Cd. Juarez, Chih.**	**2**	**4.59**	**Cd. Juarez, Chih.**	**2**	**4.36**
Tijuana, B.C.	**3**	**3.49**	**Matamoros, Tamps.**	**3**	**3.69**	**Matamoros, Tamps.**	**3**	**3.39**
Mexico City	4	3.34	Monterrey, N.L.	4	2.80	Monterrey, N.L.	4	3.11
Monterrey, N.L.	5	2.50	**Guadalajara, Jal.**	**5**	**2.65**	**Guadalajara, Jal.**	**5**	**2.36**
Chihuahua, Chih.	6	1.98	Chihuahua, Chih.	6	2.04	Chihuahua, Chih.	6	2.08
Guadalajara, Jal.	**7**	**1.57**	Mexico City	7	1.47	Mexico City	7	1.30
Nuevo Laredo, Tamps.	8	1.39	Nuevo Laredo, Tamps.	8	1.37	Nuevo Laredo, Tamps.	8	1.26
San Luis Potosi, S.L.P.	9	1.15	Hermosillo, Son.	9	1.10	San Luis Potosi, S.L.P.	9	0.83
Hermosillo, Son.	10	0.01	San Luis Potosi, S.L.P.	10	0.18	Hermosillo, Son.	10	0.56
Torreon, Coah.	**11**	**-0.09**	…			…		
…			**Torreon, Coah.**	**12**	**0.05**	**Torreon, Coah.**	**12**	**0.14**
Saltillo, Coah.	**16**	**-2.21**	**Saltillo, Coah.**	**13**	**-0.87**	**Saltillo, Coah.**	**13**	**0.09**

SHORT/LONG-RUN ANALYTIC SAMPLE

1992			1997			2002			2007			2010		
Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index
Tijuana, B.C.	**1**	**4.04**	**Tijuana, B.C.**	**1**	**5.44**	**Tijuana, B.C.**	**1**	**5.16**	**Tijuana, B.C.**	**1**	**4.96**	**Tijuana, B.C.**	**1**	**4.28**
Mexico City	**2**	**3.89**	**Monterrey, N.L.**	**2**	**3.34**	**Monterrey, N.L.**	**2**	**3.77**	**Monterrey, N.L.**	**2**	**3.56**	**Guadalajara, Jal.**	**2**	**3.76**
Monterrey, N.L.	**3**	**3.06**	**Guadalajara, Jal.**	**3**	**3.19**	**Guadalajara, Jal.**	**3**	**3.03**	**Guadalajara, Jal.**	**3**	**3.54**	**Monterrey, N.L.**	**3**	**3.76**
Chihuahua, Chih.	4	2.53	Chihuahua, Chih.	4	2.58	Chihuahua, Chih.	4	2.75	Chihuahua, Chih.	4	2.92	Chihuahua, Chih.	4	3.38
Guadalajara, Jal.	**5**	**2.12**	Mexico City	5	2.01	Mexico City	5	1.96	Mexico City	5	2.18	Mexico City	5	2.15
San Luis Potosi, S.L.P.	6	1.70	Hermosillo, Son.	6	1.64	San Luis Potosi, S.L.P.	6	1.49	Aguascalientes, Ags.	6	1.21	San Luis Potosi, S.L.P.	6	2.14
Hermosillo, Son.	7	0.57	San Luis Potosi, S.L.P.	7	0.72	Hermosillo, Son.	7	1.23	San Luis Potosi, S.L.P.	7	0.92	**Saltillo, Coah.**	**7**	**1.66**
Aguascalientes, Ags.	8	-0.32	**Saltillo, Coah.**	**8**	**-0.33**	**Saltillo, Coah.**	**8**	**0.76**	Hermosillo, Son.	8	0.38	Aguascalientes, Ags.	8	1.43
Puebla, Pue.	9	-0.79	Toluca, Edo. Mex.	9	-0.38	Aguascalientes, Ags.	9	0.76	**Saltillo, Coah.**	**9**	**0.12**	Hermosillo, Son.	9	0.24
Toluca, Edo. Mex.	10	-1.05	Aguascalientes, Ags.	10	-0.61	Puebla, Pue.	10	-0.07	Toluca, Edo. Mex.	10	-2.56	Cuernavaca, Mor.	10	-2.05
…														
Saltillo, Coah.	**12**	**-1.66**												

Source: Own elaboration using the short-run and short/long-run analytic samples. Indices are in natural logarithmic form. Only selected data are presented. Refer to Appendix Tables D.3 and D.9 for the complete data tables.

Transportation Equipment, Parts, and Components Manufacturing Industries

As indicated by Table 5.4, employment in the transportation manufacturing subsector is concentrated primarily in urban areas in northern states as well as in the country's central manufacturing belt. Among the northern states, we find urban areas like Ciudad Juarez, Matamoros, and Nuevo Laredo in the immediate U.S.-Mexico border region, and urban areas like Saltillo, Chihuahua, and Monterrey, all interior state-capital cities (i.e., not immediate border cities) in northern border states, with high employment concentration levels.[75] What I identify as the central manufacturing belt is denoted by Mexico City as well as urban areas in central and north-central states such as the state-capital cities of Toluca, Puebla, San Luis Potosí, and Aguascalientes.[76]

As a highly dynamic and export-oriented manufacturing subsector[77]—where exports represent somewhere around 80 percent of the industry's total units of production with most of them (i.e., 90 percent) destined to the U.S. market (Covarrubias Valdenebro 2014)—the transportation subsector's concentration of employment is highest in urban areas with proximity to the U.S. market. As per the reason, let us remember that the industrial development of urban areas in Mexico's border states and, especially, of urban areas along the U.S.-Mexico border is, as previously explained in the section pertaining to the electronics subsector, primarily associated with three events in Mexico's economic

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[75] While other border cities, like Reynosa in the state of Tamaulipas, may follow also the trends observed for cities like Matamoros, Ciudad Juárez, and Nuevo Laredo, the unavailability of data does not allow me to make analytical observations and/or conclusions regarding the characteristics of their labor and industrial markets. Moreover, the unavailability of more current data for the cities of Matamoros, Ciudad Juarez, and Nuevo Laredo present important limitations to this study, particularly since these cities have historically been important urban centers of export-oriented manufacturing.

[76] Note that to make the data presented in Table 5.4 fully comparable across the selected years, the metropolitan area of Queretaro was not considered in the estimation of the spatial concentration indices presented since data for this metropolitan area were not available for 1992. If included, however, Queretaro would occupy the following positions in the ranking of indices based on data from the short/long-run analytic sample: fifth in 1997, eighth in 2002, fourth in 2007, and eighth in 2010.

[77] The transportation subsector represents in U.S. dollars about 23 percent of Mexico's total exports—surpassing oil exports, tourism, and remittances—and 31 percent of the country's total manufacturing exports (Covarrubias Valdenebro 2014, citing 2013 data from Mexico's Ministry of Economy).

history: the introduction of the *maquiladora* program in the late 1960s; the initiation of trade reforms during the 1985-1986 period; and, the implementation of NAFTA in 1994. These events not only contributed to the transitioning of the manufacturing sector in general from a domestic-oriented to an export-oriented industry but also to the development and consolidation of export-oriented manufacturing in the country's northern region given primarily its proximity to the U.S. market. The result, as may be observed, is a persistent high concentration of transportation-industry employment in northern Mexico. Data presented in Table 5.4 show, for example, Ciudad Juarez as the city with consistently the highest concentration of employment in the transportation subsector during the years 1992, 1997, and 2002, based on data from the short-run analytic sample. Second to Ciudad Juarez is persistently the metropolitan area of Saltillo in the northern state of Coahuila, followed in 1992 by Matamoros in the Texas-Mexico border and by the capital city of Chihuahua in 1997 and 2002. In addition, the metropolitan area of Monterrey as well as the city of Nuevo Laredo also present significant employment concentration levels in the subsector.

The implementation of NAFTA, as Table 5.4 illustrates, allowed for significant employment concentration shifts in the transportation manufacturing subsector across the country's northern urban areas. Whereas Table 5.4 indicates that relative employment concentration levels increased significantly between 1992 and 1997 for the cities of Ciudad Juarez, Saltillo, Chihuahua, and, to a lesser degree, for Nuevo Laredo relative to other years in the analysis, the table also indicates that relative employment concentration levels decreased for Matamoros and Monterrey. During the 2000s decade, several other trends may be observed based on data from the short/long-run analytic sample. For example, the spatial concentration index for the metropolitan area of Saltillo continued to increase, on average, during the 2000s decade. Chihuahua's, on the other hand, exhibits a loss throughout the decade, but manages to maintain its position (i.e., second) as one of the country's most important centers of employment for the transportation manufacturing subsector. Monterrey's position in the ranking of spatial concentration indices for the subsector as well as its index values following the implementation of NAFTA remain relatively stable over the years. Finally, two emerging urban concentrations of transportation manufacturing employment are observable in the data during the 2000s decade, that of the northwestern capital city of Hermosillo, Sonora as well as that of the border city of Tijuana, Baja California. As observed in Table 5.4 with data from the short/long-run analytic sample, the state capital of Sonora, while indicating a certain level of spatial concentration of employment in the subsector during the 1990s (i.e., ranked ninth out of 27 metropolitan and principal urban areas in the analytic sample with an index value of 0.68), presents its most dynamic shift in its relative national importance in the subsector during the mid- to late-2000s. In 2007, the city reports an index value of 2.59 logarithmic points and the fifth position in the ranking of concentration indices in the subsector, reporting similar values for 2010 (i.e., the sixth position in the ranking with an index value of 2.29 logarithmic points). The city of Tijuana, in turn, presents its most dynamic shift in the later years of the 2000s decade, reporting in 2010 an index value of 2.53 and a fifth position in the ranking of concentration indices.

The strength of the transportation manufacturing subsector, and particular of auto and auto-parts manufacturing, in the metropolitan area of Saltillo, Coahuila—referred also as the "Detroit of Mexico"—is notable. The subsector's development in the area dates back to 1979 when, under the administration of Coahuila Governor Oscar Flores Tapia (1975-1981), General Motors acquires over 2.6 million square meters of land in the municipality of Ramos Arizpe located within the boundaries of the metropolitan area. General Motors is then followed to the area by a series of foreign manufacturers and assembly plants, including Daimler Chrysler, that are as attracted to Saltillo's geography—in particular, its proximity and connectivity to the United States—and its skilled but inexpensive labor force as General Motors had once been (Praga 2010). Currently considered one of the most competitive transportation manufacturing clusters in Mexico, its success has been attributed to multiple factors, including large investments in infrastructure, numerous industrial parks that contribute to generate synergy within the subsector, high labor-force productivity, and employment training programs, and the many public policies that have been implemented over the years by the state government to support the local auto and auto-parts manufacturing industry (Castañeda 2014). Indeed, as I have reported earlier for the case of the textiles subsector in Torreon and that of the electronics subsector in Saltillo, the continuous consolidation of export-oriented manufacturing in the State of Coahuila, and in this case of auto and auto-parts manufacturing industries in Saltillo, is in part the result of the state-government's strategic plan, started by the administration of governor Rogelio Montemayor Seguy (1993-1999), to foster the development under NAFTA of export-oriented industrial clusters in various regions across the state by taking advantage of local industrial strengths to attract foreign and domestic investors to establish manufacturing operations in Coahuila. The auto manufacturing industry was one such subsector fostered in Saltillo by state policies seeking to take advantage of economic opportunities arising from trade liberalization policies. And in fact, the economic development experienced by the state of Coahuila since the 1990s is considered one of Mexico's most successful examples of trade liberalization policies (De Bell 2005, p.117).

As observed in Table 5.4, employment in transportation manufacturing is also highest among two cities in the state of Chihuahua, namely, Ciudad Juarez and the state's capital, the city of Chihuahua. While I can only provide analytic conclusions regarding the spatial concentration of employment in the subsector in the city of Chihuahua for both the 1990s and 2000s decades, as data for Ciudad Juarez is unavailable beyond 2002, it is clear from the data presented that both cities experienced significant increases in the relative spatial concentration of employment in the transportation subsector following NAFTA even as transportation-industry employment has been historically strong in both cities, as previously mentioned, since before NAFTA was implemented. The mechanics of the spatial concentration of employment in the subsector in the immediate years following NAFTA may be assumed, as described earlier for the foods and electronics manufacturing subsectors, to be the direct result of a government-led, export-oriented cluster-development policy that started with the program *Chihuahua Siglo XXI*—put into action by the state government during the 1990s as part of the State's Development Plan under the administration of Governor Francisco Barrio (1992-1998)—and continued with the more current programs *Chihuahua Now* and *Chihuahua Mexico Industrial*—which bring together different actors from the government, private, and academic sectors to promote the attraction of foreign direct investment to the state and to foster the development of industrial clusters (OECD 2012, Casalet et al. 2011). As previously mentioned, several manufacturing subsectors were identified as priority industries of focus for the state's export-oriented cluster-development strategy, and among these are the processed foods, automotive, and electronics manufacturing subsectors.

Composed of some of the oldest transportation manufacturing centers in Mexico, some emerging as early as the 1920s decade, the central manufacturing belt experienced significant shifts in the economic geography of manufacturing employment during the 1990s and 2000s decades. For example, a distinct, significant pattern of spatial decentralization is observed for Mexico City, Cuernavaca, and Toluca throughout the years presented in the analysis. Whereas Mexico City occupies the third position in the ranking of spatial concentration indices in the transportation subsector in 1992 with an index value of 3.43 logarithmic points based on data from the short/long-run analytic sample, in later years, the metropolitan area's position in the ranking falls gradually over time until it occupies the thirteenth position in 2010 with an index value of 0.67. The significant spatial decentralization pattern observed for Mexico City during the 1990s and 2000s decade is consistent with findings in earlier literature presented in Chapter 4 which describe patterns of spatial deconcentration and decentralization of employment away from Mexico City. In the case of Cuernavaca, the city occupies the seventh position in the ranking of spatial concentration indices in 1992, based on data from the short/long-run analytic sample, but by 1997, its position in the ranking drops significantly to thirteenth with an index value of -0.77, decreasing further over time. The capital city of the State of Mexico, Toluca reports a significantly above-average index value for the year 1992 (i.e., 3.42 logarithmic points), according to data from the short/long-run analytic sample, but its 1997 value is lower at 2.56 logarithmic points, even when its position in the ranking (i.e., fifth) is stable over the two reported years. While some recovery is observed for the early years of the 2000s decade, further decentralization is observed for employment in the transportation industry in Toluca in the later part of the 2000s decade.

Several other metropolitan areas in the central manufacturing belt instead show increasing relative concentrations of employment in the transportation manufacturing subsector over the 1990s and 2000s decade; all of which may be attributed to the country's trade liberalization process as local industries looked to take advantage of economic opportunities arising from trade liberalization policies. Measurable increases in the spatial concentration index values presented in Table 5.4 are observed for the south-central city of Puebla as well as for the north-central cities of San Luis Potosí and Aguascalientes, particularly following the implementation of NAFTA. The general pattern of the spatial concentration of workers in the transportation manufacturing subsector in Puebla, as Table 5.4 illustrates, indicates an index value that increases significantly in the immediate post-NAFTA years (i.e., from 3.11 logarithmic units in 1992 to 3.98 logarithmic units in 1997 as observed in the short/long-run analytic sample). According to Martínez et al. (2005: pp. 297-298), Puebla experienced in the 1990s an increase in export-oriented manufacturing employment particularly in the textiles and transportation subsectors. While automotive manufacturing has been present in the metropolitan area since the arrival of Volkswagen in 1964, the most recent growth of the transportation manufacturing subsector in Puebla is in great part a consequence of the country’s changing trade policy and increasing foreign capital investment during the 1990s, when the export-oriented manufacturing industry established itself as one of the most dynamic sources of manufacturing employment in the metropolitan area (Martínez et al. 2005, p. 298). Puebla's established supplier base and qualified labor supply along with its connectivity and ease of access to the port of Veracruz and to the U.S. market via highways make the metropolitan area's location strategic for the export-oriented automotive industry given Mexico's various free-trade agreements with multiple countries (OECD 2013).

The emerging and growing transportation manufacturing subsector in the capital cities of Aguascalientes and San Luis Potosí is also notable. Data from Table 5.4, based on the short/long-run analytic sample, indicate a growing relative employment concentration index for the city of San Luis Potosí over the years included in the analysis, particularly during the 1990s and early years of the 2000s decade. The spatial concentration index for employment in the transportation subsector in San Luis Potosí increases as follows: from 0.50 in 1992 to 1.23 in 1997, 2.24 in 2002, 2.58 in 2007, and 2.25 in 2010. Additionally, the data shows a much less pronounced, yet gradual increasing employment concentration for Aguascalientes relative to the observable trend for San Luis Potosí. Gutiérrez Castorena and Gutiérrez Castorena (2006) attribute the growing strength of the subsector in Aguascalientes to the state's economic policy, characterized for attracting foreign capital. The locational advantage of the state of San Luis Potosi, on the other hand, has contributed to the capital city's industrial development and industrial diversity. As previously mentioned, the state is considered one of the most diverse economies in the country. Among the locational advantages of San Luis Potosí are its equidistance to Mexico City, Guadalajara, and Monterrey, as well as its infrastructural connectivity and accessibility to eastern cities in the U.S.-Mexico border and to major Gulf and Pacific Coast maritime ports. As the state government of San Luis Potosí reports, the transportation manufacturing subsector is currently one of the most important industrial activities in the state with exports to various countries around the globe, including Argentina, Australia, Brazil, Canada, Colombia, Chile, China, Europe, Germany, Japan, Spain, South Korea, United States, and Venezuela.

Table 5.4: Urban Areas with the Highest Concentration of Manufacturing Employment in Transportation Equipment, Parts, and Components Industries according to the Short-Run and Short/Long-Run Analytic Samples

SHORT-RUN ANALYTIC SAMPLE

1992			1997			2002		
Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index
Cd. Juarez, Chih.	**1**	**4.38**	**Cd. Juarez, Chih.**	**1**	**5.07**	**Cd. Juarez, Chih.**	**1**	**5.12**
Saltillo, Coah.	**2**	**3.18**	**Saltillo, Coah.**	**2**	**3.79**	**Saltillo, Coah.**	**2**	**3.78**
Matamoros, Tamps.	**3**	**3.10**	**Chihuahua, Chih.**	**3**	**3.77**	**Chihuahua, Chih.**	**3**	**3.62**
Chihuahua, Chih.	4	3.06	Puebla, Pue.	4	3.31	Puebla, Pue.	4	2.59
Mexico City	5	2.97	Matamoros, Tamps.	5	2.56	Matamoros, Tamps.	5	2.52
Monterrey, N.L.	6	2.97	Monterrey, N.L.	6	2.26	Toluca, Edo. Mex.	6	2.27
Toluca, Edo. Mex.	7	2.96	Nuevo Laredo, Tamps.	7	2.15	Monterrey, N.L.	7	2.19
Puebla, Pue.	8	2.66	Toluca, Edo. Mex.	8	1.89	Nuevo Laredo, Tamps.	8	2.16
Nuevo Laredo, Tamps.	9	1.99	Mexico City	9	1.65	**San Luis Potosi, S.L.P.**	**9**	**1.46**
Cuernavaca, Mor.	10	1.53	Aguascalientes, Ags.	10	1.13	Mexico City	10	1.39
…			…					
San Luis Potosi, S.L.P.	**13**	**0.04**	**San Luis Potosi, S.L.P.**	**12**	**0.56**			

SHORT/LONG-RUN ANALYTIC SAMPLE

1992			1997			2002			2007			2010		
Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index
Saltillo, Coah.	**1**	**3.63**	**Saltillo, Coah.**	**1**	**4.46**	**Saltillo, Coah.**	**1**	**4.56**	**Saltillo, Coah.**	**1**	**4.39**	**Saltillo, Coah.**	**1**	**4.88**
Chihuahua, Chih.	**2**	**3.51**	**Chihuahua, Chih.**	**2**	**4.43**	**Chihuahua, Chih.**	**2**	**4.39**	**Chihuahua, Chih.**	**2**	**3.70**	**Chihuahua, Chih.**	**2**	**3.59**
Mexico City	**3**	**3.43**	**Puebla, Pue.**	**3**	**3.98**	**Puebla, Pue.**	**3**	**3.36**	**Puebla, Pue.**	**3**	**3.54**	**Puebla, Pue.**	**3**	**3.53**
Monterrey, N.L.	4	3.42	Monterrey, N.L.	4	2.93	Toluca, Edo. Mex.	4	3.05	Monterrey, N.L.	4	3.01	Monterrey, N.L.	4	3.06
Toluca, Edo. Mex.	5	3.42	Toluca, Edo. Mex.	5	2.56	Monterrey, N.L.	5	2.96	**Hermosillo, Son.**	**5**	**2.59**	Tijuana, B.C.	5	2.53
Puebla, Pue.	**6**	**3.11**	Mexico City	6	2.31	San Luis Potosi, S.L.P.	6	2.24	San Luis Potosi, S.L.P.	6	2.58	**Hermosillo, Son.**	**6**	**2.29**
Cuernavaca, Mor.	7	1.98	Aguascalientes, Ags.	7	1.79	Mexico City	7	2.16	Toluca, Edo. Mex.	7	2.26	San Luis Potosi, S.L.P.	7	2.25
Aguascalientes, Ags.	8	1.75	San Luis Potosi, S.L.P.	8	1.23	Aguascalientes, Ags.	8	1.62	Aguascalientes, Ags.	8	1.86	Aguascalientes, Ags.	8	2.06
Hermosillo, Son.	**9**	**0.68**	**Hermosillo, Son.**	**9**	**0.68**	Guadalajara, Jal.	9	1.04	Mexico City	9	1.57	Toluca, Edo. Mex.	9	1.78
San Luis Potosi, S.L.P.	10	0.50	Guadalajara, Jal.	10	0.30	Durango, Dgo.	10	-0.05	Tijuana, B.C.	10	0.38	Guadalajara, Jal.	10	0.95
			…			…			…			…		
			Cuernavaca, Mor.	13	-0.77	**Hermosillo, Son.**	**12**	**-0.26**	Cuernavaca, Mor.	13	-0.11	Mexico City	13	0.67
						Cuernavaca, Mor.	18	-2.01				Cuernavaca, Mor.	18	-2.54

Source: Own elaboration using the short-run and short/long-run analytic samples. Indices are in natural logarithmic form. Only selected data are presented. Refer to Appendix Tables D.4 and D.10 for the complete data tables.

Machinery and Metallic Products Manufacturing Industries

As observed in other manufacturing subsectors, the demand for machinery and metallic products manufacturing employment in Mexico is dominated by firms located in the three largest metropolitan areas in the country. Table 5.5 identifies Mexico City to be the metropolitan area with the highest spatial concentration index value in the year 1992 (i.e., 3.94 logarithmic points based on data from the short/long-run analytic sample), falling to the second highest in later years because of the growing relative importance of the subsector in the metropolitan area of Monterrey. A slight spatial decentralization pattern is, therefore, observed for Mexico City during the 1990s decade, consistent with findings in earlier literature presented in Chapter 4 which describe patterns of spatial deconcentration and decentralization of employment away from Mexico City.

As noted, Monterrey's relative spatial concentration of employment in the subsector strengthens over time, with its corresponding index values increasing as follows: from 3.57 logarithmic points in 1992 to 3.80 in 1997, 3.99 in 2002, 4.06 in 2007, and 4.14 in 2010. In the case of the metropolitan area of Guadalajara, Table 5.5 indicates increasing spatial concentration index values during the 1990s decade but decreasing values during the 2000s decade. So that in the 1990s Guadalajara occupies the third position in the ranking of spatial concentration indices in the machinery and metallic products manufacturing subsector, but in the mid- to late-2000s decade, Guadalajara falls to the fourth position after San Luis Potosi, who experiences a significant growth in the subsector during the 1990s and 2000s decades.

In addition to Mexico City, Monterrey, and Guadalajara, Table 5.5 indicates that firms in the metropolitan areas of Saltillo and Torreon in the state of Coahuila and San Luis Potosi in the state of San Luis Potosi also dominate the relative demand for employment in the machinery and metallic products manufacturing subsector throughout the years presented in the analysis.[78] Data from the short/long-run analytic sample indicate a strong machinery and metallic products manufacturing subsector in San Luis Potosi before the peak of the trade liberalization process in Mexico and a persistent, well-above average, growing subsector in the years following. Specifically, the spatial concentration index values for San Luis Potosi increase as follows: from 1.58 logarithmic points in 1992 to 1.96 in 1997, 2.28 in 2002, 3.00 in 2007, and 3.27 in 2010. Relative employment demand in the subsector in the metropolitan areas of Torreon and Saltillo in northeastern Mexico appears to gain some momentum in the immediate post-NAFTA years. Based on data from the short-run analytic sample presented in Table 5.5, I observe that the spatial concentration index values for both Torreon and Saltillo increase between 1992 and 1997, while remaining stable in later years. Whereas Torreon's index value increases considerably from 0.77 to 1.61 logarithmic points,[79] Saltillo's instead increases just slightly from 1.67 to 1.93 logarithmic points.

Table 5.5 underscores the significance of proximity to input sources in the industrial development of this manufacturing subsector. Indeed, the location of mines and deposits of iron ore and other metallic minerals may help to explain much of the localization of machinery and metal products manufacturing activities in the country. Cities like Monterrey in the State of Nuevo Leon or Saltillo, Torreon, and Monclova in the state of Coahuila occupy some of the highest positions in the rankings of spatial concentration indices of employment in the subsector because both states possess abundant deposits of these elements (Rojas Sandoval 1998). In fact, the country's earliest and among the most important manufacturing enterprises in the subsector are located in these metropolitan areas. *Fundidora Monterrey*, for example, the first steel mill in Mexico, was established in

[78] To make the indices of spatial concentration fully comparable across the selected years in the analysis presented in Table 5.5, the urban area of Monclova in the state of Coahuila is not included in the sample for the purpose of estimating the indices given that data for this urban area are not available for 1992. If included, however, the urban area would be ranked first in 1997 with an index value of 3.80 and third in 2002 with an index value of 2.94.

[79] A long-term profile for the metropolitan area of Torreon beyond the year 2002 is not available in the data.

Monterrey, Nuevo Leon in 1903. Likewise, *Altos Hornos de México* in Monclova, Coahuila and *Hylsa* in Monterrey were both established in 1942.

Table 5.5 also underscores the supporting role of the subsector in the development of the supply chain of the transportation manufacturing subsector. Cities with increasing stakes in the transportation subsector, like Saltillo, Puebla, San Luis Potosi, Ciudad Juarez, and Matamoros, to name some, consistently present some of the strongest and/or growing spatial concentration index values in the machinery and metallic products manufacturing subsector during the years presented in the analysis. In this manner, proximity to abundant deposits of iron ore and other metallic minerals along with a large and growing customer-base of manufacturing firms for machinery and metallic products, which have mostly developed as a result of NAFTA, appear to contribute to the development and consolidation of this subsector across urban Mexico.

Table 5.5: Urban Areas with the Highest Concentration of Manufacturing Employment in Machinery and Metallic Products Industries according to the Short-Run and Short/Long-Run Analytic Samples

SHORT-RUN ANALYTIC SAMPLE

1992			1997			2002		
Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index
Mexico City	**1**	**3.92**	**Monterrey, N.L.**	**1**	**3.59**	**Monterrey, N.L.**	**1**	**3.78**
Monterrey, N.L.	**2**	**3.55**	**Mexico City**	**2**	**3.30**	**Mexico City**	**2**	**3.13**
Guadalajara, Jal.	**3**	**2.44**	**Guadalajara, Jal.**	**3**	**2.32**	**Guadalajara, Jal.**	**3**	**2.81**
Saltillo, Coah.	4	1.67	Saltillo, Coah.	4	1.93	San Luis Potosi, S.L.P.	4	2.07
San Luis Potosi, S.L.P.	5	1.56	San Luis Potosi, S.L.P.	5	1.75	Saltillo, Coah.	5	1.72
Tijuana, B.C.	6	1.02	**Torreon, Coah.**	**6**	**1.61**	**Torreon, Coah.**	**6**	**1.68**
Torreon, Coah.	**7**	**0.77**	Puebla, Pue.	7	1.05	Puebla, Pue.	7	1.46
Veracruz, Ver.	8	0.72	**Cd. Juarez, Chih.**	**8**	**0.88**	**Matamoros, Tamps.**	**8**	**0.77**
Aguascalientes, Ags.	9	0.42	Tijuana, B.C.	9	0.78	**Cd. Juarez, Chih.**	**9**	**0.67**
Puebla, Pue.	10	0.31	**Matamoros, Tamps.**	**10**	**0.63**	Aguascalientes, Ags.	10	0.58
…			Veracruz, Ver.	11	0.36	…		
Cd. Juarez, Chih.	**12**	**-0.38**				Tijuana, B.C.	12	0.13
…						Veracruz, Ver.	13	-0.18
Matamoros, Tamps.	**14**	**-0.46**						

SHORT/LONG-RUN ANALYTIC SAMPLE

1992			1997			2002			2007			2010		
Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index
Mexico City	**1**	**3.94**	**Monterrey, N.L.**	**1**	**3.80**	**Monterrey, N.L.**	**1**	**3.99**	**Monterrey, N.L.**	**1**	**4.06**	**Monterrey, N.L.**	**1**	**4.14**
Monterrey, N.L.	**2**	**3.57**	**Mexico City**	**2**	**3.51**	**Mexico City**	**2**	**3.35**	**Mexico City**	**2**	**3.32**	**Mexico City**	**2**	**3.34**
Guadalajara, Jal.	**3**	**2.46**	**Guadalajara, Jal.**	**3**	**2.53**	**Guadalajara, Jal.**	**3**	**3.03**	**San Luis Potosi, S.L.P.**	**3**	**3.00**	**San Luis Potosi, S.L.P.**	**3**	**3.27**
Saltillo, Coah.	4	1.69	Saltillo, Coah.	4	2.14	**San Luis Potosi, S.L.P.**	**4**	**2.28**	Guadalajara, Jal.	4	2.52	Guadalajara, Jal.	4	2.47
San Luis Potosi, S.L.P.	**5**	**1.58**	**San Luis Potosi, S.L.P.**	**5**	**1.96**	Saltillo, Coah.	5	1.93	Saltillo, Coah.	5	1.91	Saltillo, Coah.	5	1.87
Tijuana, B.C.	6	1.04	Puebla, Pue.	6	1.27	Puebla, Pue.	6	1.68	Tijuana, B.C.	6	1.36	Tijuana, B.C.	6	1.15
Veracruz, Ver.	7	0.74	Tijuana, B.C.	7	1.00	Aguascalientes, Ags.	7	0.80	Puebla, Pue.	7	1.27	Puebla, Pue.	7	1.13
Aguascalientes, Ags.	8	0.44	Veracruz, Ver.	8	0.57	Toluca, Edo. Mex.	8	0.52	Aguascalientes, Ags.	8	0.33	Toluca, Edo. Mex.	8	0.65
Puebla, Pue.	9	0.33	Aguascalientes, Ags.	9	0.27	Tijuana, B.C.	9	0.34	Merida, Yuc.	9	-0.05	Aguascalientes, Ags.	9	0.21
Chihuahua, Chih.	10	-0.31	Chihuahua, Chih.	10	0.10	Veracruz, Ver.	10	0.03	Chihuahua, Chih.	10	-0.09	Chihuahua, Chih.	10	0.16
Toluca, Edo. Mex.	11	-0.41	Toluca, Edo. Mex.	11	-0.01				Toluca, Edo. Mex.	11	-0.11	Veracruz, Ver.	11	-0.03
									Veracruz, Ver.	12	-0.29			

Source: Own elaboration using the short-run and short/long-run analytic samples. Indices are in natural logarithmic form. Only selected data are presented. Refer to Appendix Tables D.5 and D.11 for the complete data tables.

Chemical and Non-Metallic Mineral Products Manufacturing

The chemical and non-metallic mineral products manufacturing subsector is characterized by the transformation of natural or synthetic elements that, once transformed, serve as inputs for other production processes or services. In this sense, the subsector not only plays a major part in the supply chain of multiple industries in Mexico but also functions as a platform to support the development and growth of these industries (León Islas 2004).[80] As a result, it is not surprising that employment in chemical and non-metallic mineral products manufacturing industries is first and foremost concentrated in the largest metropolitan areas of the country as these urban areas are the largest source of domestic demand for industries in this subsector. In this regard, Table 5.6 shows how Mexico City occupies persistently the first position in the ranking of concentration indices, followed by Monterrey and Guadalajara, based on data from the short/long-run analytic sample.

For these metropolitan areas, Table 5.6 specifically indicates a chemical and non-metallic mineral products manufacturing subsector that grows and contracts over time but with no observable pattern. For example, Mexico City shows a slight contraction of relative employment concentration in the subsector in 1997 (i.e., from 4.19 logarithmic points in 1992 to 3.83 logarithmic points in 1997 based on data from the short/long-run sample), but for all later years, it shows a rebound to its original 1992 value (i.e., from 3.83 in 1997 to 4.17 in 2010 based on data from the short/long-run sample). Monterrey and Guadalajara instead show higher index values for 1997 relative to the values in 1992, but in later years there are seemingly alternating periods of employment contraction and growth for both urban areas.

Notably, Monterrey's strong positioning in the ranking of spatial concentration indices presented in Table 5.6 is driven by its long industrial history in the subsector, particularly that which pertains to the cement and glass industries. The metropolitan area's history with the cement industry dates back to 1906 with the founding of *Cementos Hidalgo*

[80] For a thorough overview of the chemical industry in Mexico refer to Martínez (2012).

as well as with the opening of *Cementos Portland Monterrey* in 1920 and the merging of both enterprises in 1931 to form *Cementos Mexicanos* (CEMEX). CEMEX and its subsidiaries are currently some of the leading cement manufacturers and suppliers of ready-mix concrete and aggregates in the world. Monterrey's history with the glass industry dates back to the establishment of *Vidriera Monterrey*, in 1909. Now *Vitro*, the company is also one of the most important glass manufacturers in the world and the leader in Mexico.

Other urban areas with consistently high concentrations of employment in the chemical and non-metallic mineral products manufacturing subsector include the south central city of Coatzacoalcos in the state of Veracruz and the south central capital city of Toluca in the State of Mexico. Spatial concentration patterns for Coatzacoalcos indicate the growing relative importance of the subsector in the urban area over the 1990s decade, when the area's position in the ranking increases from the fifth to the second position, where it remains until at least 2002. Unfortunately, a long-term profile for Coatzacoalcos beyond the year 2002 is not available in the data. Patterns of the spatial concentration of employment in the chemical and non-metallic mineral products manufacturing subsector for Toluca indicate an above-average, yet relatively small, local subsector over the 1990s decade and a significantly growing one during the 2000s decade. That is, whereas Toluca occupies the eight position in the ranking of spatial concentration indices in the subsector during the 1990s based on data from the short/long-run analytic sample, the capital city advances to occupy the fourth position in the ranking during the 2000s decade. The high spatial concentration of chemical manufacturing employment in the south central city of Coatzacoalcos is anchored by the most important petrochemical industrial center in Mexico composed by *Pemex Petroquímica*, a subsidiary of state-owned Petróleos Mexicanos (PEMEX). Toluca's instead is anchored by the pharmaceutical industry, which is considered one of the major industrial activities in the State of Mexico (Pérez and Altamirano Estrada 2012)

During the time horizon of the analysis, three urban areas experienced significant relative employment loss in this manufacturing subsector, namely, Cuernavaca in the south central state of Morelos, the coastal city of Tampico in the northeastern state of

Tamaulipas, and the border city of Tijuana in the state of Baja California. Table 5.6 shows, based on data from the short/long-run analytic sample, that while Cuernavaca ranks fifth in the ranking of concentration indices in 1992, with an index value of 1.24 logarithmic points, by 2010, the area ranks twelfth, with an index value of -0.75 logarithmic points. The relative employment loss in the urban area occurs progressively over time during the 1990s and 2000s decades. Tampico, instead, shows relative employment gain from 1992 to 1997 but significant relative employment loss from 2002 onward. Shifts in the value of the spatial concentration index for Tampico over time are as follows based on data from the short/long-run analytic sample: 1.73 logarithmic points in 1992, 2.39 in 1997, 1.59 in 2002, -1.02 in 2007, and -0.62 in 2010. The evolution over time of the spatial concentration of employment in the chemicals subsector in Tijuana behaves similar to that of Tampico's, showing a slight relative employment gain from 1992 to 1997 (i.e., from 1.22 logarithmic points in 1992 to 1.30 logarithmic points in 1997) but relative employment loss from 2002 onward, especially during the later years of the 2000s decade (i.e., from 1.25 logarithmic points in 2002, to 1.09 in 2007, and 0.42 in 2010).

Table 5.6: Urban Areas with the Highest Concentration of Manufacturing Employment in Chemical and Mineral Products Industries according to the Short-Run and Short/Long-Run Analytic Samples

SHORT-RUN ANALYTIC SAMPLE

1992			1997			2002		
Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index
Mexico City	**1**	**4.15**	**Mexico City**	**1**	**3.70**	**Mexico City**	**1**	**3.92**
Monterrey, N.L.	**2**	**2.81**	**Coatzacoalcos, Ver.**	**2**	**3.50**	**Coatzacoalcos, Ver.**	**2**	**3.01**
Guadalajara, Jal.	**3**	**2.22**	**Monterrey, N.L.**	**3**	**3.06**	**Guadalajara, Jal.**	**3**	**2.73**
Tampico, Tamps.	4	1.69	Guadalajara, Jal.	4	2.77	Monterrey, N.L.	4	2.72
Coatzacoalcos, Ver.	5	1.42	Tampico, Tamps.	5	2.25	**Toluca, Edo. Mex.**	**5**	**1.69**
Cuernavaca, Mor.	6	1.20	Tijuana, B.C.	6	1.17	Tampico, Tamps.	6	1.50
Tijuana, B.C.	7	1.18	Saltillo, Coah.	7	0.82	Tijuana, B.C.	7	1.16
Saltillo, Coah.	8	0.90	Cuernavaca, Mor.	8	0.80	Saltillo, Coah.	8	1.06
Toluca, Edo. Mex.	**9**	**0.71**	**Toluca, Edo. Mex.**	**9**	**0.76**	**San Luis Potosi, S.L.P.**	**9**	**0.76**
Puebla, Pue.	10	0.18	**Leon, Gto.**	**10**	**0.45**	**Leon, Gto.**	**10**	**0.71**
San Luis Potosi, S.L.P.	**11**	**-0.09**	Orizaba, Ver.	11	0.32	Matamoros, Tamps.	11	0.01
Leon, Gto.	**12**	**-0.12**	…			Orizaba, Ver.	12	0.00
			…			…		
			San Luis Potosi, S.L.P.	**13**	**0.24**	Cuernavaca, Mor.	14	-0.05

SHORT/LONG-RUN ANALYTIC SAMPLE

1992			1997			2002			2007			2010		
Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index
Mexico City	**1**	**4.19**	**Mexico City**	**1**	**3.83**	**Mexico City**	**1**	**4.01**	**Mexico City**	**1**	**4.09**	**Mexico City**	**1**	**4.17**
Monterrey, N.L.	**2**	**2.85**	**Monterrey, N.L.**	**2**	**3.19**	**Guadalajara, Jal.**	**2**	**2.83**	**Monterrey, N.L.**	**2**	**3.06**	**Monterrey, N.L.**	**2**	**2.83**
Guadalajara, Jal.	**3**	**2.26**	**Guadalajara, Jal.**	**3**	**2.90**	**Monterrey, N.L.**	**3**	**2.81**	**Guadalajara, Jal.**	**3**	**2.11**	**Guadalajara, Jal.**	**3**	**2.80**
Tampico, Tamps.	**4**	**1.73**	**Tampico, Tamps.**	**4**	**2.39**	**Toluca, Edo. Mex.**	**4**	**1.78**	**Toluca, Edo. Mex.**	**4**	**1.71**	**Toluca, Edo. Mex.**	**4**	**1.61**
Cuernavaca, Mor.	**5**	**1.24**	Tijuana, B.C.	5	1.30	**Tampico, Tamps.**	**5**	**1.59**	Saltillo, Coah.	5	1.22	Leon, Gto.	5	1.33
Tijuana, B.C.	6	1.22	Saltillo, Coah.	6	0.95	Tijuana, B.C.	6	1.25	Tijuana, B.C.	6	1.09	San Luis Potosi, S.L.P.	6	1.03
Saltillo, Coah.	7	0.94	**Cuernavaca, Mor.**	**7**	**0.93**	Saltillo, Coah.	7	1.15	San Luis Potosi, S.L.P.	7	1.06	Saltillo, Coah.	7	0.98
Toluca, Edo. Mex.	**8**	**0.75**	**Toluca, Edo. Mex.**	**8**	**0.89**	San Luis Potosi, S.L.P.	8	0.85	Leon, Gto.	8	0.77	Tijuana, B.C.	8	0.42
Puebla, Pue.	9	0.22	Leon, Gto.	9	0.58	Leon, Gto.	9	0.80	Chihuahua, Chih.	9	0.44	Puebla, Pue.	9	0.04
San Luis Potosi, S.L.P.	10	-0.05	Puebla, Pue.	10	0.41	Puebla, Pue.	10	0.07	Merida, Yuc.	10	0.39	Merida, Yuc.	10	-0.32
Leon, Gto.	11	-0.08	San Luis Potosi, S.L.P.	11	0.37	**Cuernavaca, Mor.**	**11**	**0.04**	**Cuernavaca, Mor.**	**11**	**0.24**	**Tampico, Tamps.**	**11**	**-0.62**
									Puebla, Pue.	12	0.07	**Cuernavaca, Mor.**	**12**	**-0.75**
									Tampico, Tamps.	**13**	**-1.02**			

Source: Own elaboration using the short-run and short/long-run analytic samples. Indices are in natural logarithmic form. Only selected data are presented. Refer to Appendix Tables D.6 and D.12 for the complete data tables.

Space-Based Characteristics and the Localization of Manufacturing Employment across Subsectors: Some General Trends

Proximity to Demand Markets

Figures 5.1 through 5.3 describe, respectively, some general trends of the spatial concentration of manufacturing employment in Mexico across subsectors for selected years in relation to the three measures of market access or proximity defined in Chapter 3: (1) distance to the nearest major U.S.-Mexico border crossing, (2) difference in distance to the nearest major maritime port in the Gulf of Mexico and to nearest major maritime port in the Pacific Coast, and (3) distance from the central municipality in the metropolitan or principal urban area to the nearest large market (i.e., Mexico City, Guadalajara, Monterrey). All relationships presented are assumed to be linear and, therefore, I fit linear trend lines to the data to be able to better observe the potential direction of the relationships across time.

Figure 5.1 shows a tendency of manufacturing employment in the electronics, transportation, machinery, and chemicals subsectors to concentrate in urban areas closer to the U.S.-Mexico border. Employment in food manufacturing shows instead a tendency to concentrate in urban areas located away from the border. These observations are not surprising given the export-orientation of the former manufacturing subsectors and the domestic-orientation of the latter. Employment in textile manufacturing is, however, variable. Whereas for the 1990s employment in the industry shows a tendency to concentrate in urban areas that are located closer to the U.S.-Mexico border, for the 2000s the industry instead appears to concentrate increasingly away from the border.

Figure 5.2 shows trends related to the spatial concentration of manufacturing employment in Mexico across subsectors in relation to the differential proximity of urban areas to Gulf and Maritime ports. The interpretation of differential proximity is as follows: positive values indicate that an urban area is closer to a major maritime port in the Pacific

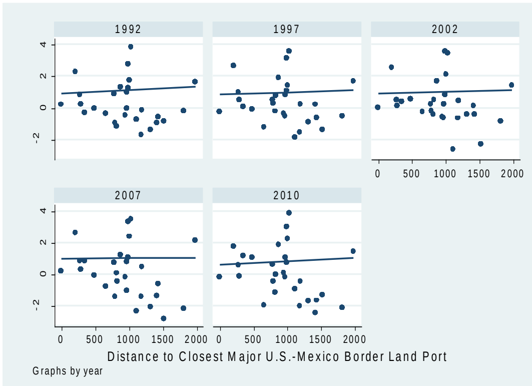
Coast; negative values indicate that an urban area is closer to a major maritime port in the Gulf Coast; and, a differential proximity value of zero indicates that an urban area is equidistant to major maritime ports in either coast. In this context, if the linear relationship between spatial concentration and differential proximity to maritime ports is positive, it would indicate a tendency of the manufacturing subsector to concentrate in urban areas closer to maritime ports in the Pacific Coast; if the relationship is negative, it would indicate a tendency of the manufacturing subsector to concentrate in urban areas closer to maritime ports in the Gulf Coast; if the relationship is flat, then the relative location of the urban areas to maritime ports in either coast is not relevant to the spatial concentration patterns of the manufacturing subsectors.

Figure 5.2 shows a constant tendency of employment in the machinery and chemical manufacturing subsectors to concentrate in urban areas closer to maritime ports in the Gulf Coast, which is not surprising given that the localization of these subsectors is typically conditioned by their proximity to raw materials (e.g., oil from the Gulf of Mexico, steel from northeastern states). Employment in transportation manufacturing also shows a tendency to concentrate in urban areas closer to ports in the Gulf Coast; however, this tendency decreases over time. Differential proximity to maritime ports seems to be irrelevant to the spatial concentration of food-manufacturing employment. Finally, the trends observed for textiles and electronics manufacturing employment show some variability over time. Textiles and electronics employment show both a general tendency to concentrate over time in urban areas closer to maritime ports in the Pacific Coast relative to the Gulf Coast, except during 2007 for the textiles subsector and 1997 for electronics subsector, when the tendency gravitates towards proximity to maritime ports in the Gulf Coast. The increasing relevance of an urban area's proximity to maritime ports in the Pacific Coast is noteworthy.

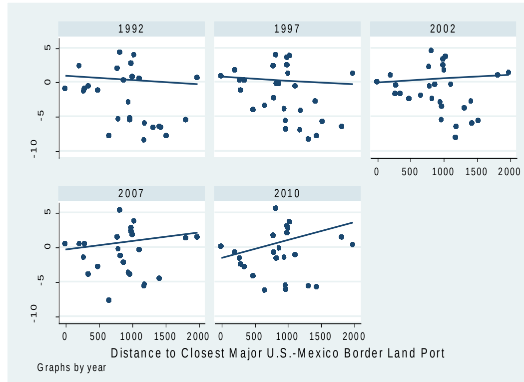
The trends observed in Figure 5.3, on the spatial concentration patterns of manufacturing employment in Mexico across subsectors in relation to an urban area's proximity to domestic-demand markets, show also significant variability. Food manufacturing employment, as expected, shows a constant tendency to concentrate close to large markets. Textile manufacturing employment, instead, shows a decreasing tendency to concentrate close to large markets. Let us also remember from Figure 5.1, the tendency of this manufacturing subsector during the 2000s decade to move similarly away from the border region. Electronics and transportation manufacturing employment show trends consistent with their becoming increasingly export-oriented. Whereas in 1992 employment in the electronics subsector shows a tendency to concentrate closer to large markets, from 1997 onwards the subsector shows a tendency to move actually away from large markets. The transportation subsector also shows a decreasing tendency over time to concentrate close to large markets, particularly from 1997 onwards. Employment in machinery and chemicals manufacturing both show a constant tendency to concentrate close to large markets.

Figure 5.1: Distance to Closest Major U.S.-Mexico Border Land Port and the Spatial Concentration of Employment by Manufacturing Subsector across Metropolitan and Principal Urban Areas—Short/Long-Run Analytic Sample

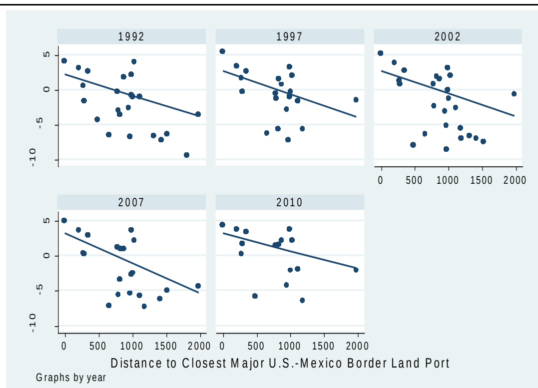
Food Manufacturing



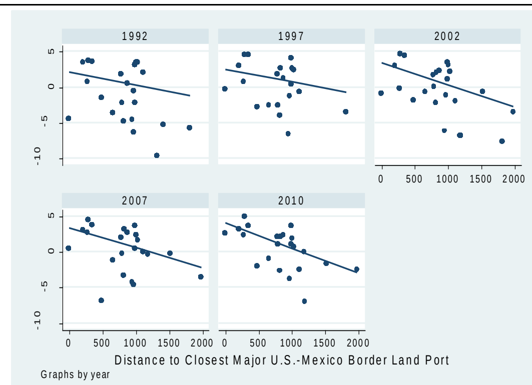
Textiles Manufacturing



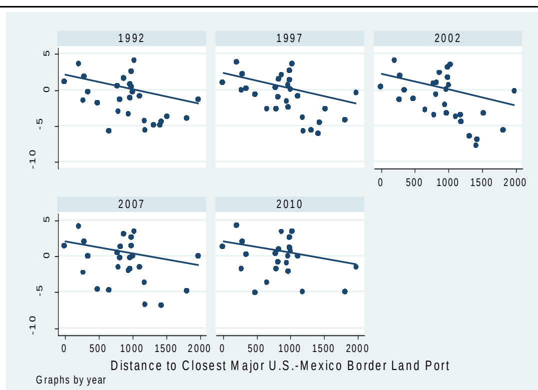
Electronics Manufacturing



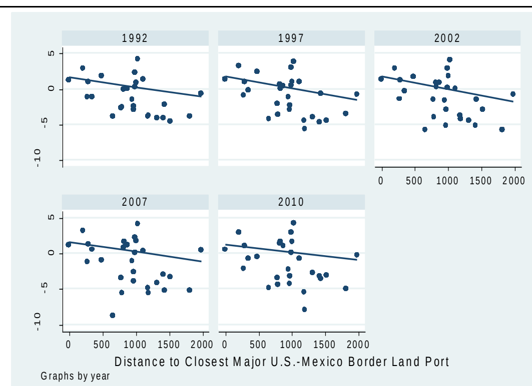
Transportation Manufacturing



Machinery Manufacturing



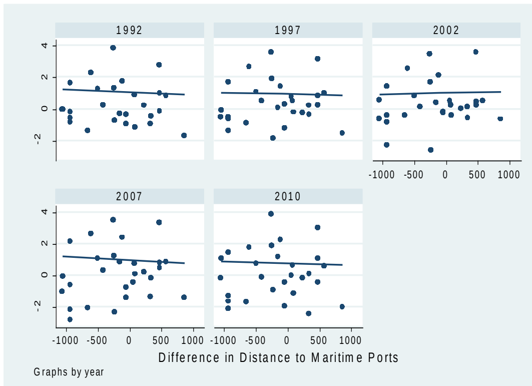
Chemicals Manufacturing



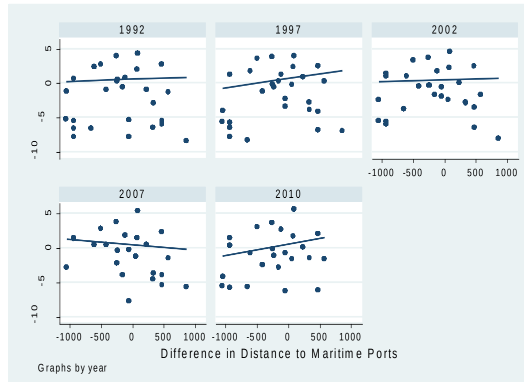
Source: Own elaboration using the short/long-run analytic sample of 28 metropolitan and principal urban areas. Spatial concentration indices are presented in natural logarithmic form.

Figure 5.2: Difference in Distance to Major Gulf and Pacific Coast Maritime Ports and Spatial Concentration of Employment by Manufacturing Subsector across Metropolitan and Principal Urban Areas—Short/Long-Run Analytic Sample

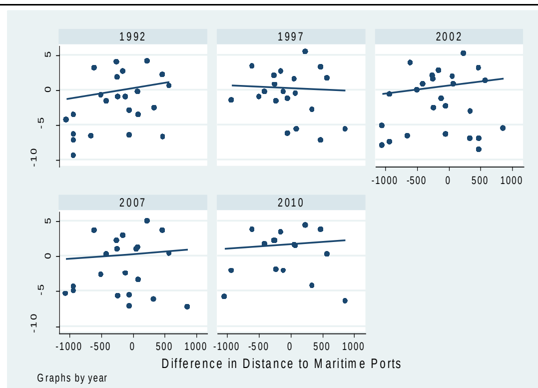
Food Manufacturing



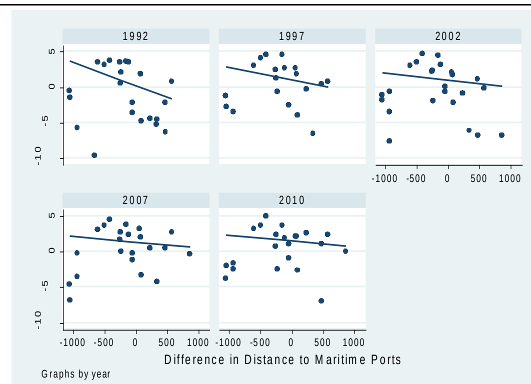
Textiles Manufacturing



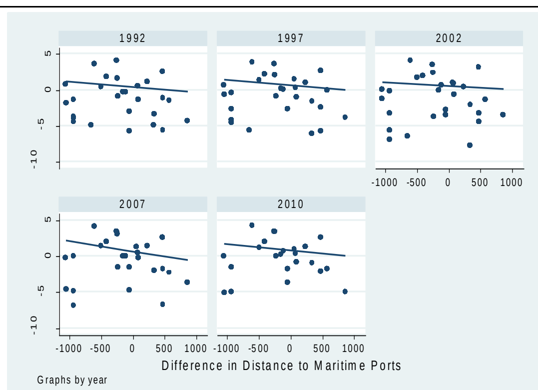
Electronics Manufacturing



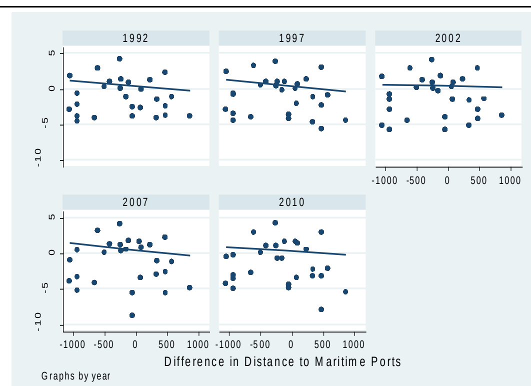
Transportation Manufacturing



Machinery Manufacturing



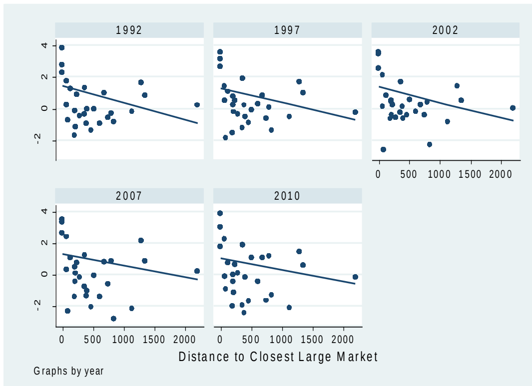
Chemicals Manufacturing



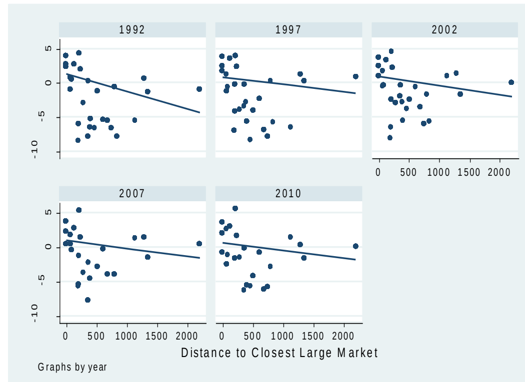
Source: Own elaboration using the short/long-run analytic sample of 28 metropolitan and principal urban areas. Spatial concentration indices are presented in natural logarithmic form.

Figure 5.3: Distance to Closest Large Market and the Spatial Concentration of Employment by Manufacturing Subsector across Metropolitan and Principal Urban Areas—Short/Long-Run Analytic Sample

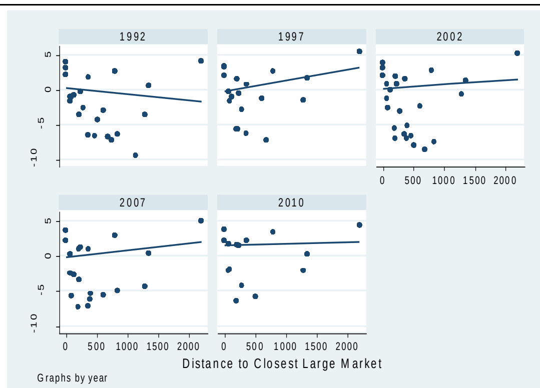
Food Manufacturing



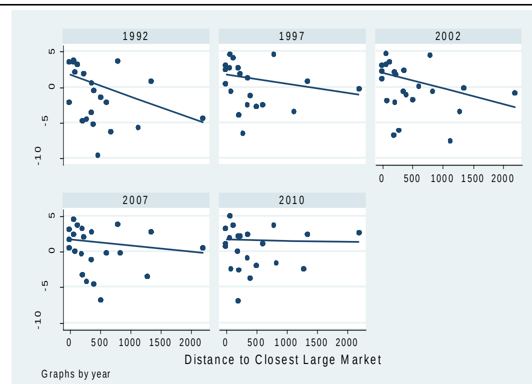
Textiles Manufacturing



Electronics Manufacturing

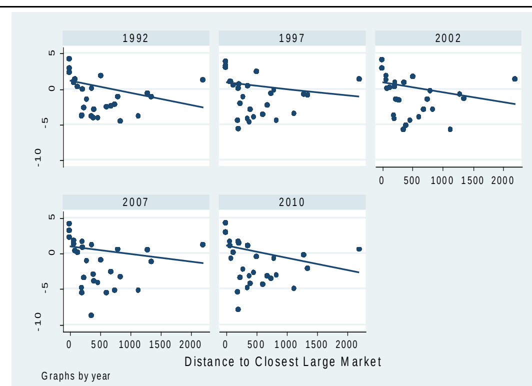


Transportation Manufacturing



Machinery Manufacturing

Chemicals Manufacturing



Source: Own elaboration using the short/long-run analytic sample of 28 metropolitan and principal urban areas. Spatial concentration indices are presented in natural logarithmic form.

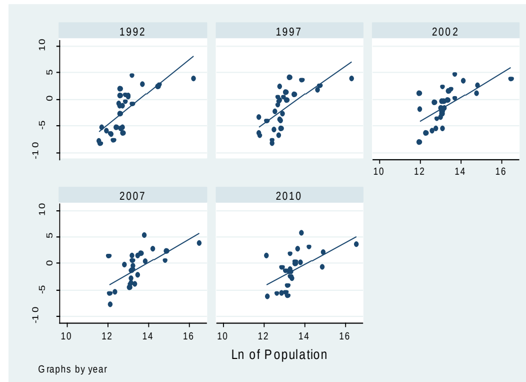
Urban Scale

Figure 5.4 presents the raw relationship between urban scale and the spatial concentration of full-time formal-sector manufacturing employment by industrial subsector for selected years. Both measures of analysis are presented in natural logarithmic form. Overall, Figure 5.4 shows that, for all selected years, the spatial concentration of employment across all manufacturing subsectors may be consistently larger in larger urban areas as indicated by the positive fitted raw linear relationships depicted. In this manner, Figure 5.4 suggests that employment concentration in Mexico across all industrial subsectors may possibly be influenced by urban scale. This is not surprising given the history of Mexico's urban industrial development as well as the analysis provided earlier in this chapter where I observed that Mexico's largest cities continue to be centers of manufacturing employment in the country.

Figure 5.4: Urban Scale and the Spatial Concentration of Manufacturing Subsectors across Metropolitan and Principal Urban Areas—Short/Long-Run Analytic Sample

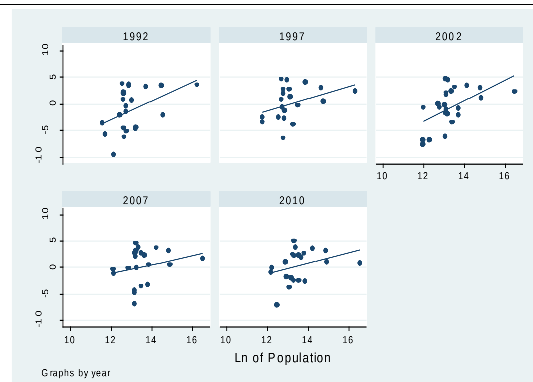
Food Manufacturing

Textiles Manufacturing

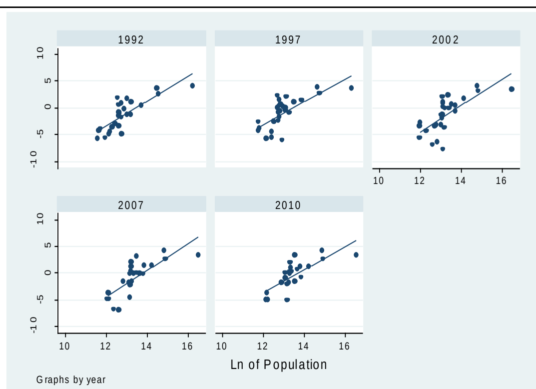


Electronics Manufacturing

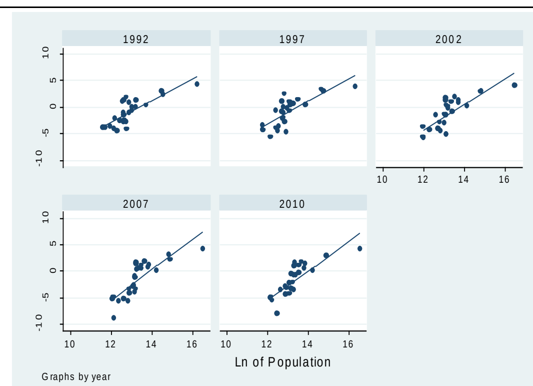
Transportation Manufacturing



Machinery Manufacturing



Chemicals Manufacturing



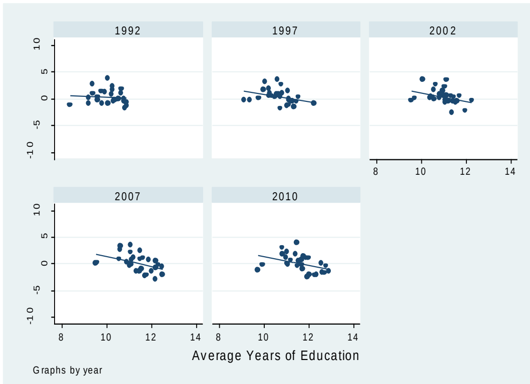
Source: Own elaboration using the short/long-run analytic sample. Spatial concentration indices and population are presented in natural logarithmic form.

Local Human-Capital Endowment

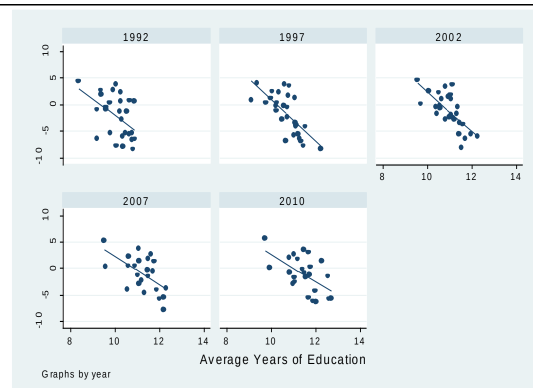
Figure 5.5 presents the raw relationship between local endowments of human capital, measured in average years of education in the urban area, and the spatial concentration of manufacturing employment by industrial subsector for selected years. Only the measure of spatial concentration is presented in natural logarithmic form. Figure 5.5 suggests that urban areas with the highest endowments of human capital are not necessarily those with the highest concentrations of manufacturing employment, as indicated by the negative slopes of the fitted linear trend lines, and that is the case for every industrial subsector in the analysis even when different slope gradients are evident. This is in fact consistent with data presented in Appendix Table C.4, which reports a tendency in manufacturing industries in Mexico to employ a substantially large percentage of low-skilled workers, or workers with low levels of educational attainment. As Appendix Table C.4 indicates, of all full-time, formal-sector manufacturing workers in the general analytic sample only 9.9 percent of female workers and 12.1 percent of male workers are college-educated.

Figure 5.5: Average Level of Education and the Spatial Concentration of Manufacturing Subsectors across Metropolitan and Principal Urban Areas—Short/Long-Run Analytic Sample

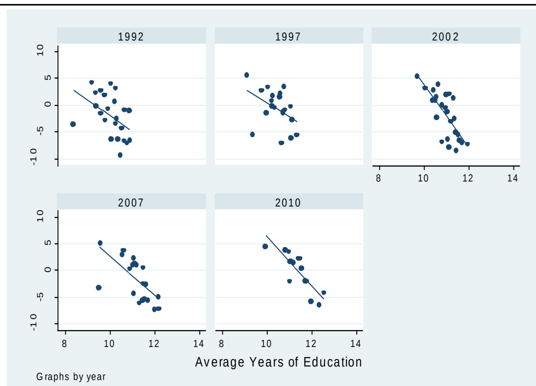
Food Manufacturing



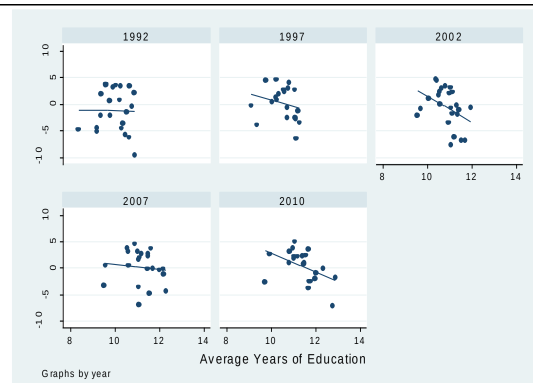
Textiles Manufacturing



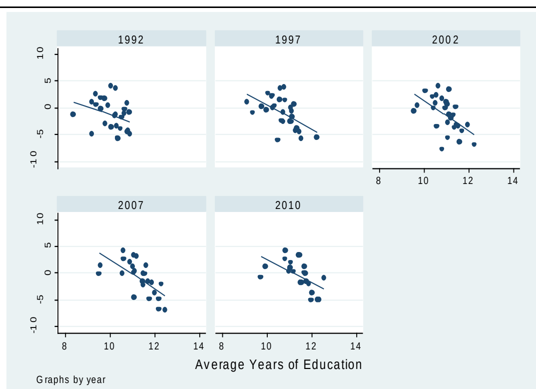
Electronics Manufacturing



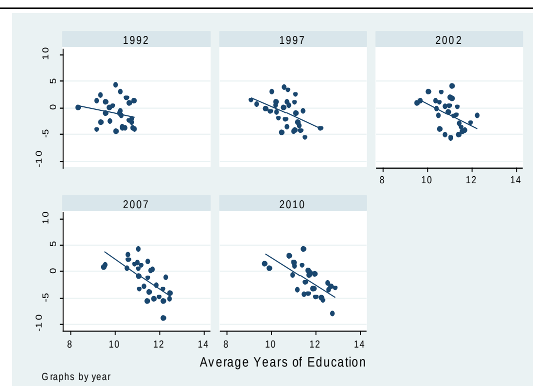
Transportation Manufacturing



Machinery Manufacturing



Chemicals Manufacturing

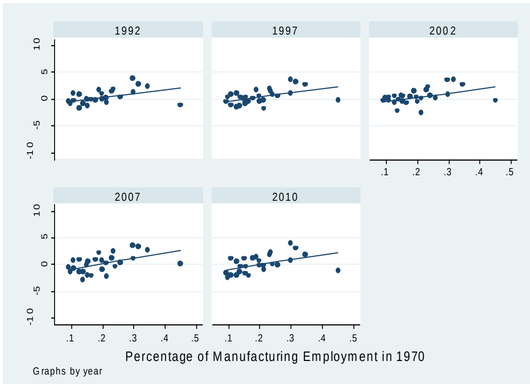
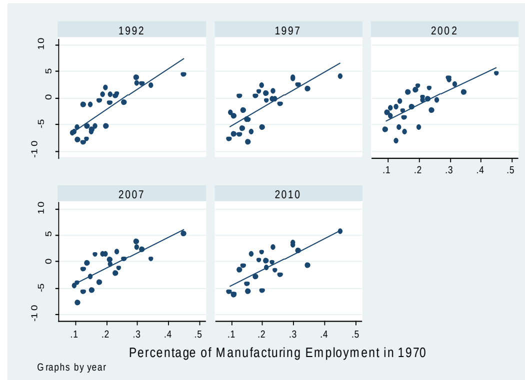
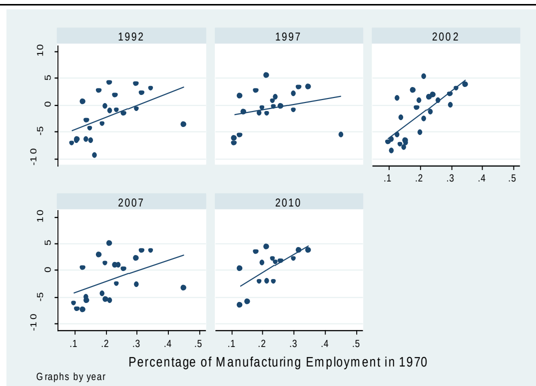
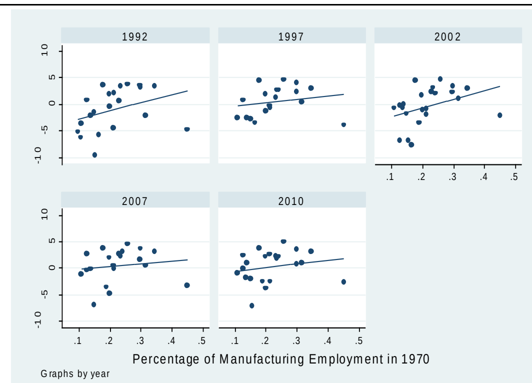
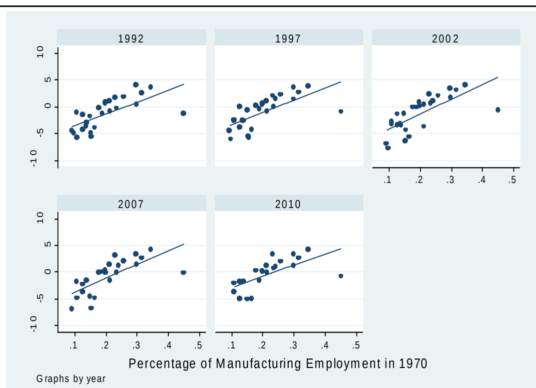
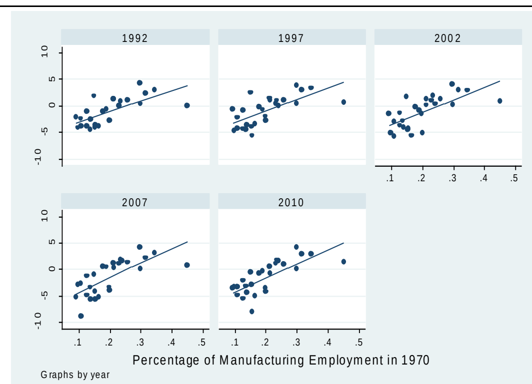


Source: Own elaboration using the short/long-run analytic sample of 28 metropolitan and principal urban areas. Spatial concentration indices are presented in natural logarithmic form.

Local Manufacturing Experience

Figure 5.6 presents the raw relationship between the total percentage of manufacturing employment in an urban area in 1970 and the spatial concentration of employment by industrial subsector for selected years. The spatial concentration measure is presented in natural logarithmic form. The figure shows that for all selected years the spatial concentration of employment across all manufacturing subsectors may be consistently larger in urban areas with a stronger history of manufacturing activity relative to areas whose percentage of total manufacturing employment in 1970 is relatively lower, as indicated by the positive fitted linear relationships depicted. This observation is not unexpected, given the history of Mexico's urban industrial development, and complements observations made earlier in this chapter of the fact that few new manufacturing poles of any industrial subsector have been developed since the 1990s as indicated by the data.

Figure 5.6: Historical Percentage of Manufacturing Employment (Year 1970) and the Spatial Concentration of Manufacturing Subsectors across Metropolitan and Principal Urban Areas—Short/Long-Run Analytic Sample

Food Manufacturing	**Textiles Manufacturing**
	
Electronics Manufacturing	**Transportation Manufacturing**
	
Machinery Manufacturing	**Chemicals Manufacturing**
	

Source: Own elaboration using the short/long-run analytic sample of 28 metropolitan and principal urban areas. Spatial concentration indices are presented in natural logarithmic form.

CONCLUSION

The descriptive analyses conducted in this chapter have revealed several general trends that I summarize as follows. The data employed in this study suggest that few metropolitan and principal urban areas in Mexico have emerged as new centers of employment of any manufacturing subsector during the second phase of Mexico's globalization process. Those few that have emerged, however, seem to have done so in direct response to economic opportunities arising from trade liberalization and globalization policies and are typically located in the northern and north-central regions of the country.

What is mostly observed in the data are patterns of persistent spatial concentration of employment of manufacturing subsectors in traditional urban centers with a solid and mature subsector-specific manufacturing base. These traditional manufacturing centers seem to consolidate further their relative ranking in the national hierarchy of subsector-specific manufacturing employment over the period of analysis as a direct result of economic opportunities arising from trade liberalization and globalization policies. Mexico's largest metropolitan areas as well as urban areas along the U.S.-Mexico border region, and urban areas in the periphery of Mexico City are among these traditional urban centers.

Still, a very narrow group of metropolitan or principal urban areas in Mexico persistently concentrate significant levels of employment of any manufacturing subsector, with the exception of food manufacturing employment which shows a tendency to be more spread across space relative to other manufacturing subsectors. Barring the city of Campeche, for example, the spatial concentration of employment of manufacturing subsectors in Mexico's southern region is negligible. The descriptive analysis conducted, moreover, indicates some patterns of coagglomeration of manufacturing subsectors as well as patterns of localization in urban areas with ease of access to demand markets. The relevance of an urban area's access to the U.S. market via land ports, to other foreign markets via maritime ports, and to domestic markets also comes through in the analysis.

PART III: URBAN WAGE DISPARITIES IN MEXICO

Chapter 6: Examining Urban Wage Disparities in Mexico

As discussed in Chapter 2, the literature offers multiple explanations for the existence of wage disparities across urban areas. Using the data described in Chapter 3, this chapter examines the relationship between urban wages and various determinants of urban wage disparities. In line with my dissertation's research objectives, I first examine the potential relationship between urban wages and the spatial concentration of employment across manufacturing subsectors, followed by the potential relationship between urban wages and urban areas' access/proximity to demand markets. Second, I examine the potential relationship between urban wages and alternative measures that may explain spatial wage disparities, including urban scale, an urban area's endowment of human capital, and an urban area's manufacturing experience.

Urban Wages and The Spatial Concentration of Manufacturing Employment across Subsectors

Does the unequal distribution of employment in manufacturing subsectors over space explain urban wage disparities in Mexico? To examine this primary research question in the study, I provide here a graphic analysis of the potential relationship between the spatial concentration of manufacturing employment by industrial subsector and urban wages. For each manufacturing subsector, Figure 6.1 illustrates the possible correlation of the spatial concentration of subsector-specific employment with the average hourly wages of full-time formal-sector manufacturing workers across urban areas, time, and gender, without taking into consideration potential confounding factors, such as the characteristics of workers, firms, and/or urban areas as well as historical patterns of development. These factors are accounted for in the econometric analysis presented in Chapter 7. In addition, the relationships examined here are assumed to be linear and, therefore, I fit linear trend lines to the data to observe better the direction of the relationships. Corresponding slope coefficients and significance levels of the linear trend lines depicted are provided for completeness.

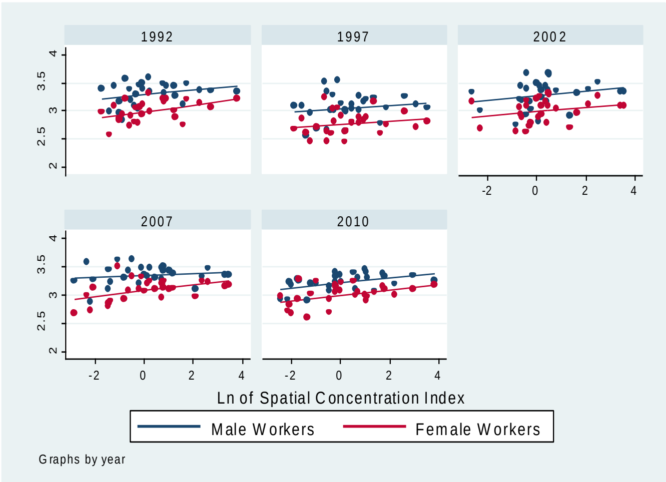
For this analysis, I employ the short/long-run analytic sample, as it allows me to conduct the descriptive examination across two decades. Figure E.1 in Appendix E, however, presents the graphic analysis for the short-run analytic sample. For tractability purposes, this graphic analysis is only conducted for selected years (i.e., short/long-run sample: 1992, 1997, 2002, 2007, and 2010; short-run sample: 1992, 1997, and 2002). The years included do not constitute directly years of domestic or global economic instability, although they do appear to reflect trends related to economic disturbances in earlier periods. The spatial concentration of employment is presented in natural logarithmic form and is measured using the spatial concentration index defined in Chapter 3. Average hourly wages are also presented in natural logarithmic form.

Data in Figure 6.1 present some descriptive evidence that workers in urban areas with higher concentrations of employment in some manufacturing subsectors (i.e., electronics, transportation, machinery, and chemicals) earn on average higher hourly wages than workers in urban areas with relatively lower concentrations of employment in the same subsectors, as observed by the positive linear relationships and corresponding statistical-significant slope coefficients depicted by Figure 6.1.[81] The descriptive evidence of higher wages is, however, observed only for some years in the analysis, and, as mentioned, only as it pertains to the spatial concentration of some manufacturing subsectors. In addition, the descriptive evidence is not always consistent across gender. The variability in the levels of significance of the slope coefficients—from highly to not statistically significant—within and across manufacturing subsectors, time, and gender suggest that the potential contribution to urban wage disparities of spatial concentration patterns across manufacturing subsectors in Mexico also varies along these dimensions and, thus, should be considered in its empirical analysis.

[81] This observation is notwithstanding the fact that raw average hourly wages are systematically lower for female workers relative to male workers across all years in the graphic analysis.

Figure 6.1: Spatial Concentration of Employment by Manufacturing Subsector and Average Urban Wages across Metropolitan and Principal Urban Areas for Selected Years—Short/Long-Run Analytic Sample

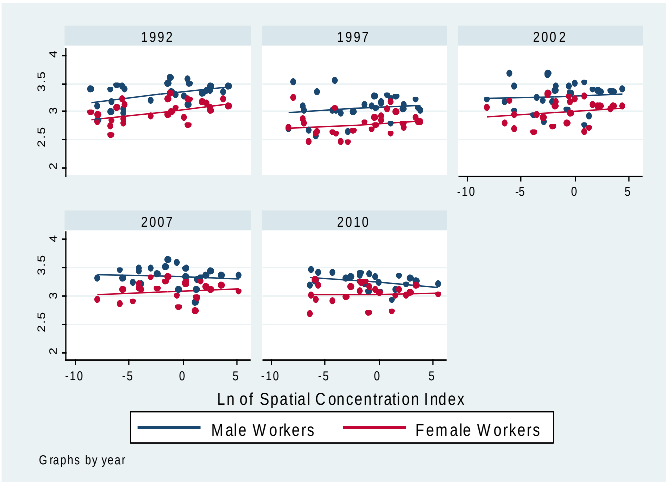
Food Manufacturing:



Slope Coefficients of Fitted Lines

Year	β-Male	β-Female
1992	0.040	0.058 **
1997	0.028	0.030
2002	0.042	0.041
2007	0.013	0.053 **
2010	0.045 ***	0.047 **

Textiles Manufacturing:



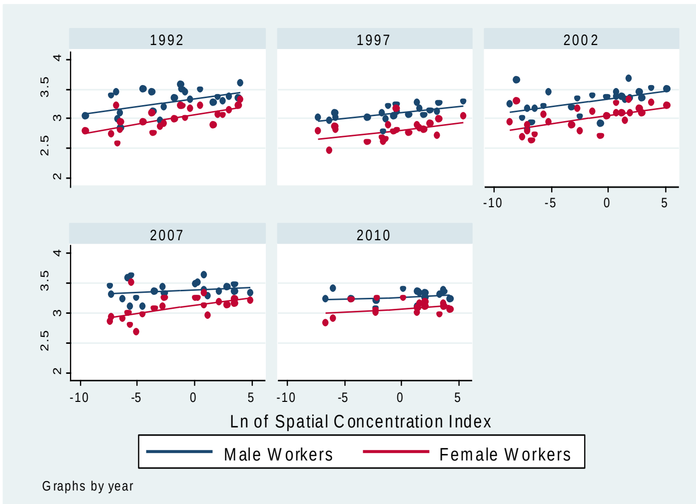
Slope Coefficients of Fitted Lines

Year	β-Male	β-Female
1992	0.023 **	0.023 ***
1997	0.011	0.011
2002	0.006	0.013
2007	-0.006	0.006
2010	-0.014 *	0.003

Continued

Figure 6.1 (Continued): Spatial Concentration of Employment by Manufacturing Subsector and Average Urban Wages across Metropolitan and Principal Urban Areas for Selected Years—Short/Long-Run Analytic Sample

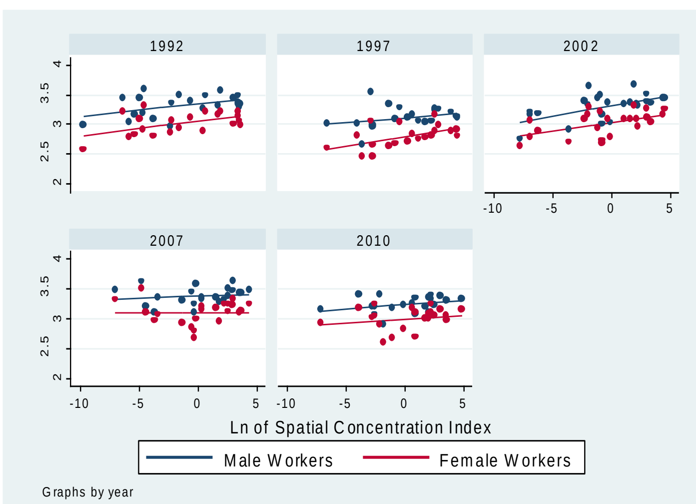
Electronics Manufacturing:



Slope Coefficients of Fitted Lines

Year	β-Male	β-Female
1992	0.026 **	0.032 ***
1997	0.019 **	0.022 **
2002	0.026 **	0.027 ***
2007	0.007	0.025 **
2010	0.007	0.012

Transportation Manufacturing:



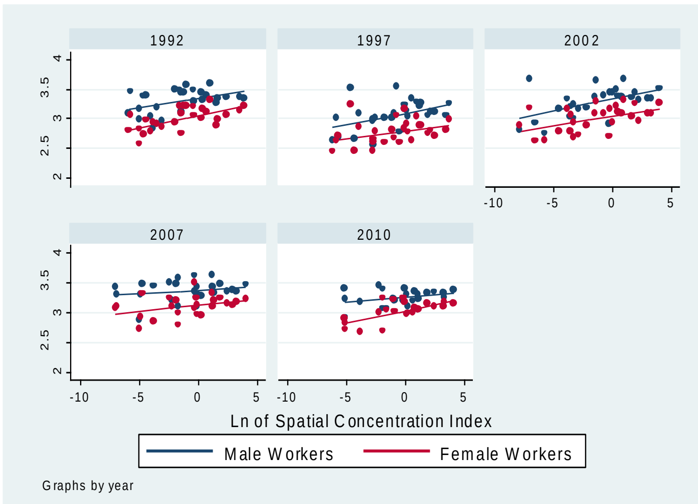
Slope Coefficients of Fitted Lines

Year	β-Male	β-Female
1992	0.020 **	0.024 **
1997	0.017	0.032 **
2002	0.035 ***	0.030 ***
2007	0.008	0.000
2010	0.014	0.014

Continued

Figure 6.1 (Continued): Spatial Concentration of Employment by Manufacturing Subsector and Average Urban Wages across Metropolitan and Principal Urban Areas for Selected Years—Short/Long-Run Analytic Sample

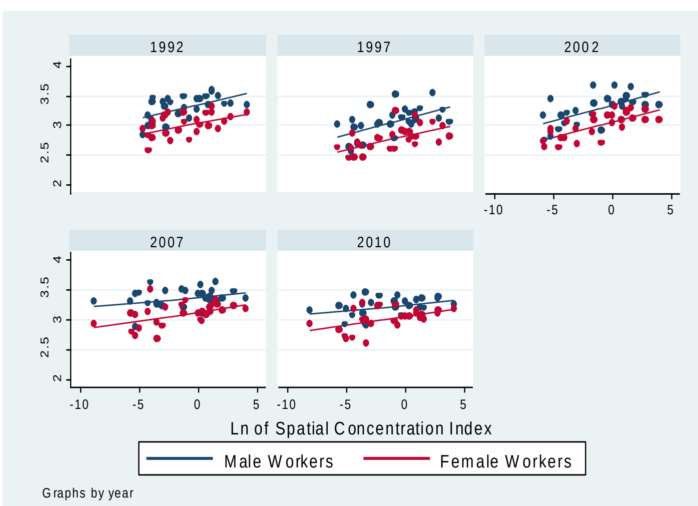
Machinery Manufacturing:



Slope Coefficients of Fitted Lines

Year	β-Male	β-Female
1992	0.030 **	0.040 ***
1997	0.038 **	0.026 *
2002	0.041 ***	0.034 ***
2007	0.011	0.020 *
2010	0.017	0.041 ***

Chemicals Manufacturing:



Slope Coefficients of Fitted Lines

Year	β-Male	β-Female
1992	0.044 ***	0.038 ***
1997	0.050 ***	0.044 ***
2002	0.054 ***	0.053 ***
2007	0.016 *	0.028 **
2010	0.019 **	0.030 ***

Source: Own elaboration using the short/long-run analytic sample of 28 metropolitan and principal urban areas. Spatial concentration indices and average hourly wages are presented in natural logarithmic form. The levels of statistical significance of the slope coefficients are represented as follows: *** $p \leq 0.01$; ** $p \leq 0.05$; and * $p \leq 0.10$.

Table 6.1: Statistical Significance of the Slope Coefficients Derived from the Descriptive Analysis in Figure 6.1.

	Male Workers					Female Workers				
	1992	1997	2002	2007	2010	1992	1997	2002	2007	2010
Food					***	**			**	**
Textiles	**				*	***				
Electronics	**	**	**			***	**	***	**	
Transportation	**		***			**	**	***		
Machinery	**	**	***			***	*	***	*	***
Chemicals	***	***	***	*	**	***	***	***	**	***

Source: Own elaboration using the short/long-run analytic sample of 28 metropolitan and principal urban areas. The levels of statistical significance of the slope coefficients are represented as follows: *** $p \leq 0.01$; ** $p \leq 0.05$; and * $p \leq 0.10$.

Following, I discuss the trends and present analytic implications from the observed variation of the slope coefficients presented in Figure 6.1, focusing in particular on the statistical significance of the coefficients which are summarized in Table 6.1. The raw data presented in Figure 6.1 and in Table 6.1 suggest that workers may benefit at times from locating in urban areas where certain manufacturing activities are spatially concentrated, supporting the view that the spatial concentration of employment in at least some manufacturing subsectors in Mexico potentially generates productivity-enhancing effects that may be associated with local learning processes as well as with the efficient-use of local resources and that are reflected in the wage level of local workers—or conversely, that are reflected in firm-level productivity.[82] In this sense, this descriptive analysis points to the potential presence of positive localized externalities associated with the spatial concentration of some manufacturing activities, namely, those related to the electronics, transportation, machinery, and chemicals subsectors. Hence, in a context such as Mexico's

[82] The estimation of firm-level productivity associated with the spatial concentration of subsector-specific manufacturing activities is beyond the scope of this dissertation. However, as I have previously mentioned, my study rests on the assumption that, in competitive labor markets, firms pay workers the value of their marginal productivity, and therefore, the wage level of workers reflects the productivity level of firms.

where the unequal distribution of these manufacturing activities across space prevails, as discussed in the earlier section in this chapter, positive localized externalities denote not only possible higher wages for workers in urban areas with higher spatial concentrations of employment in these specific manufacturing subsectors but also to possible wage disparities between these workers and those in urban areas without or with relatively smaller concentrations of employment in these specific manufacturing subsectors.

Let us discuss the case of the spatial concentration of employment in the chemicals industry. Figure 6.1 and Table 6.1 show that, for both male and female workers alike, all of the slope coefficients across the selected years are positive and consistently statistically significant, implying that full-time formal-sector manufacturing workers in urban areas with relatively larger concentrations of employment in this subsector earn on average higher wages. Additionally, as indicated in Figure 6.1, the slope coefficients appear to be larger for both male and female workers in the 1990s and the early years of the 2000s decade compared to the observed magnitude of the slope coefficients during the second half of the 2000s decade, although in both instances the slope coefficients seem to increase with time.

In contrast, the food and textile subsectors offer little evidence of localization economies associated with the spatial concentration of food or textile workers. In the case of the food products manufacturing subsector, Table 6.1 suggests that if indeed localization economies associated with the spatial concentration of employment in this industry exist, these may have developed until recently at the end of the 2000s decade, with some evidence of positive localized externalities in 1992 but only for women workers. On the other hand, in the case of the spatial concentration of textile employment, Figure 6.1 and Table 6.1 suggest that corresponding positive localization economies may have been present instead earlier in the 1990s decade, with little evidence of these externalities afterwards. And in fact, there is even a slight indication of the potential existence of negative localization externalities, or localization diseconomies, affecting the wages of male workers in the later years of the 2000s decade, as indicated by the negative sign of the slope coefficients for male workers in the years 2007 and 2010.

Figure 6.1 and Table 6.1 further present some indication of the presence of localization economies associated with the spatial concentration of electronics, transportation, and machinery manufacturing employment across Mexico's urban space. From Figure 6.1 and Table 6.1, we may observe that for male and female workers alike there is potential evidence of positive and statistically significant localized externalities up to the year 2002. Afterwards, only the wages of female workers seem to be influenced by these externalities, particularly those externalities associated with the spatial concentration of machinery manufacturing industries.

While Figure 6.1 and Table 6.1 offer some descriptive evidence of the potential presence of positive localization economies associated with the spatial concentration of various manufacturing activities, at this stage, this evidence is still inconclusive. Not only does this raw analysis reveal extensive variability across time and, to some extent, gender, but the role of potential confounding elements has yet to be established. Equally important, Figure E.1 and Table E.1 in Appendix E provide evidence that this variability may extend across analytic subsamples—with one possible exception, the analysis pertaining to the spatial concentration of employment in chemicals manufacturing—an indication that extrapolating the conclusions from any of the analytic samples to the other might not be appropriate to this analysis, particularly given the unbalanced representation of key urban areas across both samples.

In addition to assessing the potential contribution of the unequal distribution of employment in manufacturing subsectors over space to urban wage disparities in Mexico, another analytical pursuit of this dissertation relates to the potential moderating influence of trade liberalization and globalization processes on the existence, direction, and magnitude of this contribution. Based on the raw data presented in Figure 6.1 and Table 6.1, I do not observe any clear direct pattern which would lend support to the hypothesis that trade liberalization and globalization mechanisms have influenced or hindered the development of localization economies in Mexico. This observation is based on the fact that the magnitude and statistical significance of the slope coefficients related to the spatial concentration of employment in each subsector in the descriptive analysis are seemingly comparable across all corresponding time periods, particularly if we contrast the year 1992, which I have defined as representing the period in Mexico's economic history of moderate export expansion, to the years afterward, representing the period of accelerated export expansion and globalization processes in the country. An exception, however, may be the case of the spatial concentration of textile activities where I do observe that the slope coefficients are only statistically significant in the year 1992 but not afterwards. Likewise, I do not observe in the descriptive evidence any distinctive pattern between the highly export-oriented subsectors (i.e., transportation, electronics, and textiles) and the highly domestic-oriented subsectors (i.e., food) in support of the globalization hypothesis.

URBAN WAGES AND PROXIMITY TO DOMESTIC AND FOREIGN MARKETS

As previously stated in Chapter 3, a working hypothesis in this dissertation states that the proximity or access to demand markets has a direct effect on urban wages. This is explained, according to the review of the literature in Chapter 2, by the fact that firms located in cities or regions close to their consumer markets are willing to pay workers higher wages since they are benefiting from relatively low transportation or trade costs that are reflected on lower production costs. In this context, the theoretical background presented in Chapter 2 predicts that urban wages should be higher in urban areas with proximity or access to demand markets, and comparatively lower in urban areas that are further away from demand markets or with relatively less ease of access to them. In this manner, the theoretical model dictates an empirical relationship where urban wages increase with spatial proximity or accessibility and decrease with remoteness or lack of access.

An earlier study, Hanson (1997), supports this theoretical model in the Mexican context at the state level. Using Industrial Census data for the years 1965, 1970, 1975, 1980, 1985, and 1988, Hanson (1997) finds that nominal wages are highest near Mexico City and the U.S.-Mexico border. His findings suggest, then, that wages decrease with distance to Mexico City, which is a predominant source of domestic demand throughout all years in his analysis, and with distance to the United States, which becomes a predominant source of foreign demand after trade reform in 1985, at which time the effect of access to foreign markets on wages is observable on his analysis whereas previous to trade reform the effect is unobservable. The question I address here, using more recent data, is whether these findings are relevant in the urban context.

This section, therefore, provides a descriptive analysis of the potential relationship between average hourly wages and market access, both domestic and foreign, across urban areas in Mexico since the early 1990s, using this dissertation's short/long-run analytic sample. (Figures E.2, E.3, and E.4 in Appendix E present the graphic analysis for the short-run analytic sample.) As presented in Chapter 3, I use two measures to identify foreign-market access: (1) an urban area's distance to the nearest major U.S.-Mexico border land port, and (2) an urban area's differential proximity between the nearest major Gulf Coast and the nearest major Pacific Coast maritime ports. Additionally, I define domestic-market access as an urban area's distance to the nearest large market, identified as either Mexico City, Guadalajara, or Monterrey.

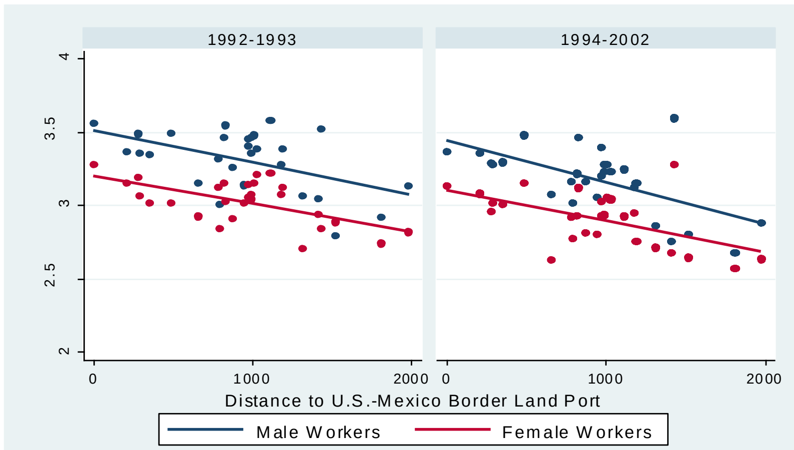
Following the additional pursuit of this dissertation research of assessing the role played by globalization mechanisms in moderating the key empirical relationships in my analytic wage model, the data is presented in this section in a format that contrasts the relationship between average hourly wages and the measures of market access across two periods of time: (1) the period of moderate export expansion in the country, which in my data is represented by the years 1992 and 1993, with (2) the period of accelerated export expansion, which is represented in the short-run by the 1994-2002 period and in the long-run by the 1994-2010 period. As I have mentioned previously, this approach focuses on the North American Free Trade Agreement (NAFTA) as arguably Mexico's most important policy instrument on the country's road towards trade liberalization and global-markets integration. As a result of this approach, therefore, local average hourly wages by gender are an average-of-average measure, where an urban area's average wage is averaged across time. This measure of wages is further presented in natural logarithmic form. Also, as in Figure 6.1, the relationship between average hourly wages and market access is assumed to be linear, and therefore, any corresponding graphic descriptive analysis to follow fits linear trend lines to the data to observe better the direction of the relationships across urban areas, gender, and time periods. Corresponding slope coefficients and significance levels of the linear trend lines depicted are also provided for completeness.

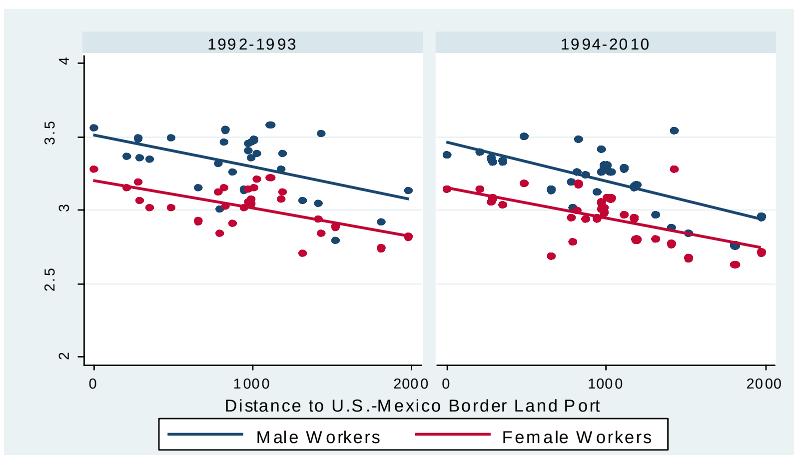
Figure 6.2 illustrates the potential relationship between an urban area's average hourly wage and its distance to the nearest major U.S.-Mexico border land port. As may be observed, data from Figure 6.2 depict a trend in which workers in urban areas closer to major U.S.-Mexico border-crossing points earn reportedly higher wages than workers in urban areas further away from border land ports. This is observed in the case of both male and female workers, across all periods in the analysis, given the highly statistically significant negative linear relationships depicted in the years before and after NAFTA is implemented. The observations from Figure 6.2 are consistent with the theoretical model described earlier, where urban wages increase with spatial proximity and decrease with remoteness from demand markets, which in this case refer to foreign demand markets.

In addition, we may note that the corresponding slope coefficients for male and female workers for the 1992-1993 period are not only statistically significant but also smaller compared to those for the 1994-2002 and the 1994-2010 periods. There are several reasons why this trend is not surprising. Let us remember first that Hanson (1997) finds evidence that wages decrease with distance from the United States in the years following the onset of trade liberalization in 1985 but not in the years prior, which indicates that a statistical significant slope coefficient for the 1992-1993 period is not unexpected, as this period does not represent the period before trade liberalization but rather the period before the process's consolidation with the implementation of NAFTA. Also, given the continuous strengthening of the export-oriented sector after the implementation of NAFTA and, particularly, that of the *maquiladora* sector in urban areas closer to the U.S. market, smaller slope coefficients in the years before and larger in the years after NAFTA are also to be expected. One would anticipate that as trade patterns with the United States continue to increase, the strategic locational importance of urban areas closer to the U.S. market would continue to increase over time as well, leading its resident labor force to benefit accordingly from this increasing gain. In this sense, Figure 6.2 describes how increasingly important access or proximity to foreign markets may have been at the onset of the globalization process and may continue to be to the wage determination mechanism within urban areas in Mexico.

Interestingly, though, we may also note that the slope coefficients for the 1994-2010 long-run period are smaller than those for the 1994-2002 short-run period. So that while there is an indication that proximity to the U.S. market has been and still is potentially a key component of the urban wage determination process in Mexico, it is apparent that the relevance of proximity may be decreasing with time. Indeed, it is expected that improvements in infrastructure along with economies of scale in transportation would decrease the cost advantages of proximity for export-oriented manufacturing firms.

Figure 6.2: Distance to Closest Major U.S.-Mexico Border Land Port and Average Urban Wages across Metropolitan and Principal Urban Areas—Short/Long-Run Analytic Sample





Slope Coefficients of the Fitted Lines

	1992-1993	1994-2002	1994-2010
Male	-0.000223 ***	-0.000283 ***	-0.000266 ***
Female	-0.000188 ***	-0.000212 ***	-0.000208 ***

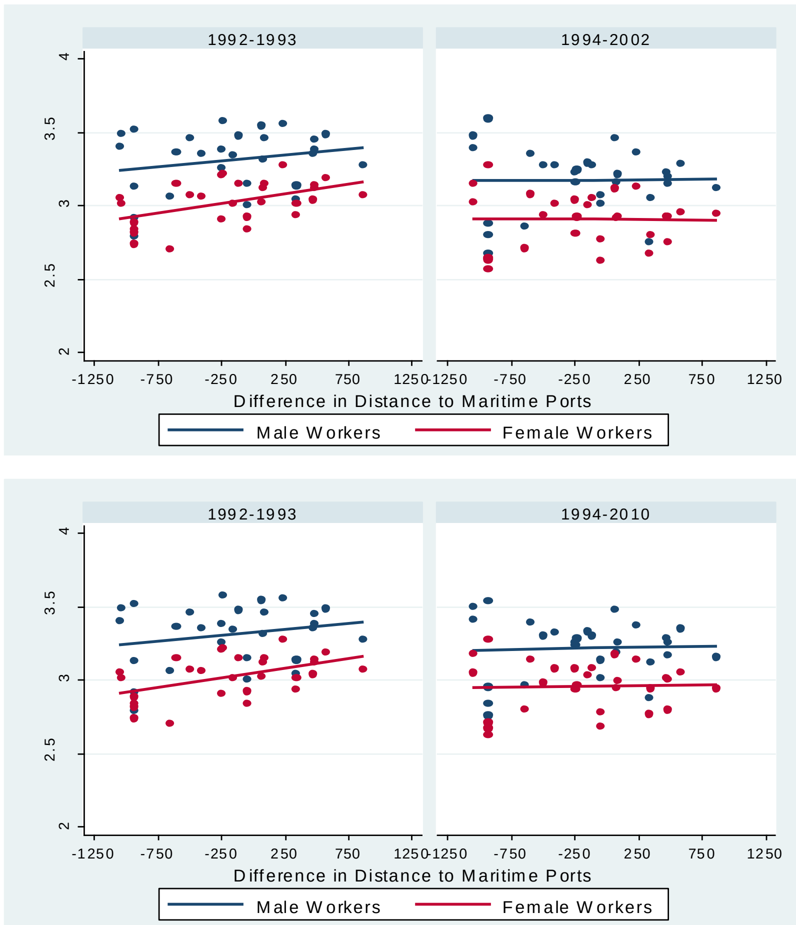
Source: Own elaboration using the short/long-run analytic sample of 28 metropolitan and principal urban areas. Average hourly wages are presented in natural logarithmic form. The period 1992-1993 depicts the years before Mexico's accelerated export expansion and globalization exposure, and the periods 1994-2002 and 1994-2010 depict the years after. The implementation of NAFTA marks the dividing threshold. The levels of statistical significance of the slope coefficients are represented as follows: *** $p \leq 0.01$; ** $p \leq 0.05$; and * $p \leq 0.10$.

Figure 6.3 presents the potential relationship between an urban area's average hourly wage and its differential proximity between the nearest major Gulf Coast and nearest major Pacific Coast maritime ports. The interpretation of differential proximity is as follows: positive values indicate that an urban area is closer to a major maritime port in the Pacific Coast; negative values indicate that an urban area is closer to a major maritime port in the Gulf Coast; and, a differential proximity value of zero indicates that an urban area is equidistant to major maritime ports in either coast. In this context, if the linear relationship between urban wages and differential proximity to maritime ports is positive and statistically significant, it would indicate that average wages are higher in urban areas located closer to maritime ports in the Pacific Coast relative to those in the Gulf Coast; if the relationship is negative and significant, then average wages are higher in urban areas located closer to maritime ports in the Gulf Coast; if the relationship is statistically insignificant, then the relative location of the urban areas to maritime ports in either coast is not relevant to the wage determination process of urban areas.

The trends observed in Figure 6.3 vary by gender. In the case of male workers, for example, Figure 6.3 indicates a potential positive but insignificant raw linear relationship between urban wages and differential proximity to maritime ports across all time periods. That is, Figure 6.3 suggests that wages may be higher for male workers in urban area's closer to any major maritime port in the Pacific Coast of Mexico relative to the wages of male workers in urban areas located farther away, although it also suggests that this difference may be very small or even insignificant. This observation is consistent across all the time periods in the analysis. For female workers, on the other hand, Figure 6.3 suggests that prior to the implementation of NAFTA, female wages are higher in urban areas proximate to major maritime ports in the Pacific Coast relative to the wages of female workers in urban areas located farther away, suggesting also that this difference is not insignificant. To the contrary, in the years after, the data suggest that this difference is instead negligible, given the statistical insignificance of the slope coefficients for the periods after the implementation of NAFTA. There is some indication, however, based on the sign of the slope coefficients for the short- and long-run periods after NAFTA, that whereas in the short-run an urban area's access to a major Gulf Coast maritime port may have been more relevant to the female wage determination process than an urban area's access to a major Pacific Coast maritime port, in the long-run, access to major maritime ports in the Pacific Coast may have been regaining some significance in regards to influencing the wage level of female workers, even though both trends may be very small.

Interestingly, Figure E.3 in appendix E offers alternative descriptive relationships as those observed in Figure 6.3 when considering the relationship between urban wages and differential proximity to maritime ports using the short-run analytic sample. The trends described in Figure E.3, for example, do not vary by gender. So consistently for both male and female workers, wages are higher in urban areas proximate to major maritime ports in the Pacific Coast during the years prior to the implementation of NAFTA, and in the years after, wages are higher in urban areas proximate to major maritime ports in the Gulf Coast. The data, however, still suggests that this difference across time periods is negligible, given the statistical insignificance of the slope coefficients.

Figure 6.3: Difference in Distance to Major Gulf Coast and Pacific Coast Maritime Ports and Average Urban Wages across Metropolitan and Principal Urban Areas—Short/Long-Run Analytic Sample



Slope Coefficients of the Fitted Lines:

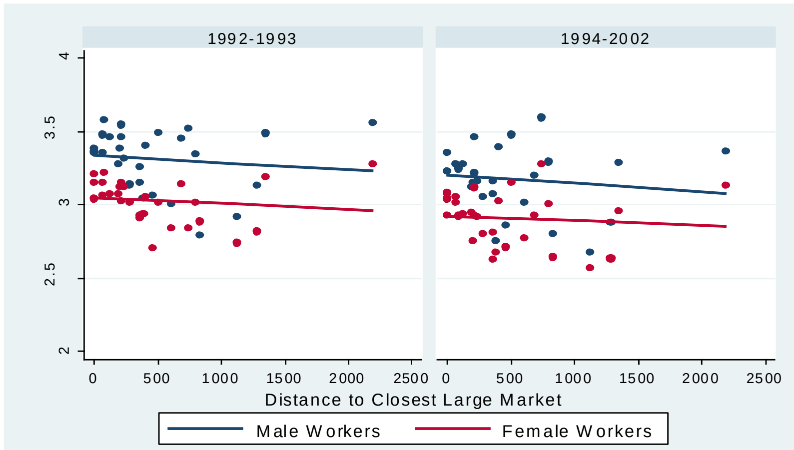
	1992-1993	1994-2002	1994-2010
Male	0.000078	0.000003	0.000013
Female	0.000130 ***	-0.000001	0.000011

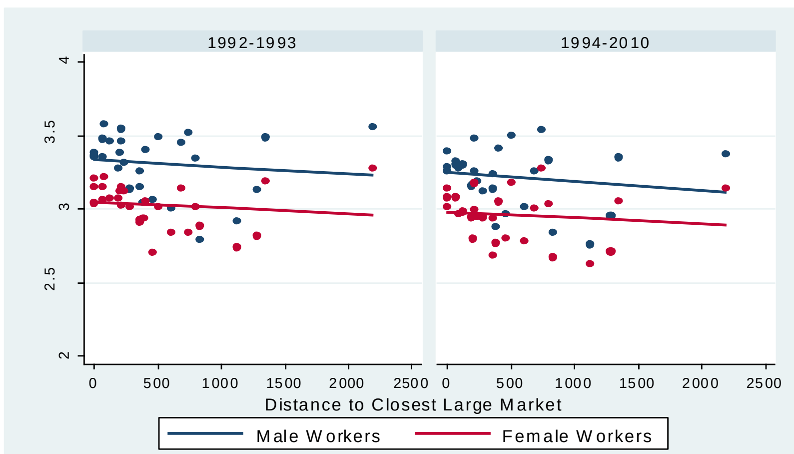
Source: Own elaboration using the short/long-run analytic sample of 28 metropolitan and principal urban areas. Average hourly wages are presented in natural logarithmic form. The period 1992-1993 depicts the years before Mexico's accelerated export expansion and globalization exposure, and the periods 1994-2002 and 1994-2010 depict the years after. The implementation of NAFTA marks the dividing threshold. The levels of statistical significance of the slope coefficients are represented as follows: *** $p \leq 0.01$; ** $p \leq 0.05$; and * $p \leq 0.10$.

Figure 6.4 presents the potential relationship between an urban area's average hourly wage and its distance to the nearest large market. Data in Figure 6.4 present a potentially negative relationship, so that workers in urban areas with closer proximity to large demand markets, that is, to Mexico City, Guadalajara, or to Monterrey, seem to earn on average higher wages than workers in urban areas located relatively further away from any of these metropolitan areas. But while the relationship is seemingly negative across time periods and higher for male workers compared to female workers, the effect of distance to large markets on wages is possibly very small. This may be observed in the insignificance of the slope coefficients presented. While the observations from Figure 6.4 are consistent with the theoretical model where wages increase with spatial proximity to demand markets—which in this case are domestic demand markets—the statistical insignificance of the coefficients suggests that proximity to Mexico's largest markets may not be as relevant to regional economies as reported in earlier studies such as Hanson (1997).

Two main empirical questions on the potential relationship between an urban area's average hourly wage and its market proximity or accessibility are addressed in Chapter 7. First, are the relationships that we have observed in this descriptive analysis similar after accounting for worker, firm, and urban-area characteristics? Second, how does the spatial concentration of manufacturing activities across subsectors influence the observed relationships?

Figure 6.4 Distance to Closest Large Market and Average Urban Wages across Metropolitan and Principal Urban Areas—Short/Long-Run Analytic Sample





Slope Coefficients of the Fitted Lines:

	1992-1993	1994-2002	1994-2010
Male	-0.000047	-0.000060	-0.000061
Female	-0.000037	-0.000031	-0.000039

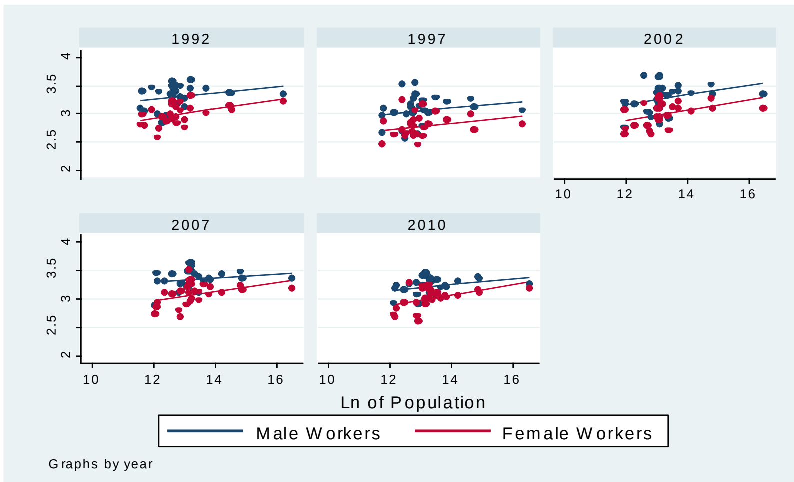
Source: Own elaboration using the short/long-run analytic sample of 28 metropolitan and principal urban areas. Average hourly wages are presented in natural logarithmic form. The period 1992-1993 depicts the years before Mexico's accelerated export expansion and globalization exposure, and the periods 1994-2002 and 1994-2010 depict the years after. The implementation of NAFTA marks the dividing threshold. The levels of statistical significance of the slope coefficients are represented as follows: *** $p \leq 0.01$; ** $p \leq 0.05$; and * $p \leq 0.10$.

Urban Scale

The literature agrees on the existence of an urban wage premium. As explained in Chapter 2, this means that workers in larger urban areas are more productive and, thus, earn higher wages than similar workers in smaller urban areas. As Figure 6.5 suggests, the case of Mexico is possibly not any different from studies on countries like the United States, Japan, and Korea, among others, that estimate positive wage returns to urban scale or density. Figure 6.5 presents the raw relationship between urban scale and local average wage by gender of full-time formal-sector manufacturing workers across metropolitan and principal urban areas in Mexico. Local average hourly wages are presented in natural logarithmic form. Urban scale is measured using the natural logarithm of population size as described in Chapter 3.

Overall, Figure 6.5 shows that, without taking into consideration other factors (e.g., the characteristics of workers, firms, and/or urban areas as well as historical patterns of development), formal-sector full-time manufacturing workers in larger metropolitan areas in Mexico seemingly earn on average higher wages than workers in smaller metropolitan areas. This is apparently true for both male and female workers given the positive relationship depicted by Figure 6.5 between the natural logarithm of population and average urban wages over time. Figure 6.5, however, shows that differences in the strength of the potential relationship between population and the average wage across gender may exist. First, the slopes of the fitted linear functions used to describe the potential relationship across time in Figure 6.5 are barely, and sometimes not, statistically significant for male workers while for female workers the relationship appears to be consistently positive and significant across time. Second, the linear relationships depicted show a tendency to be larger for female workers compared to male workers.

Figure 6.5: Urban Scale and Average Urban Wages for Male and Female Workers in Manufacturing across Metropolitan and Principal Urban Areas—Short/Long-Run Analytic Sample



Slope Coefficients of the Fitted Lines:

	1992	1997	2002	2007	2010
Male	0.055 *	0.052	0.082 *	0.035	0.051 *
Female	0.083 ***	0.055	0.089 **	0.080 **	0.093 ***

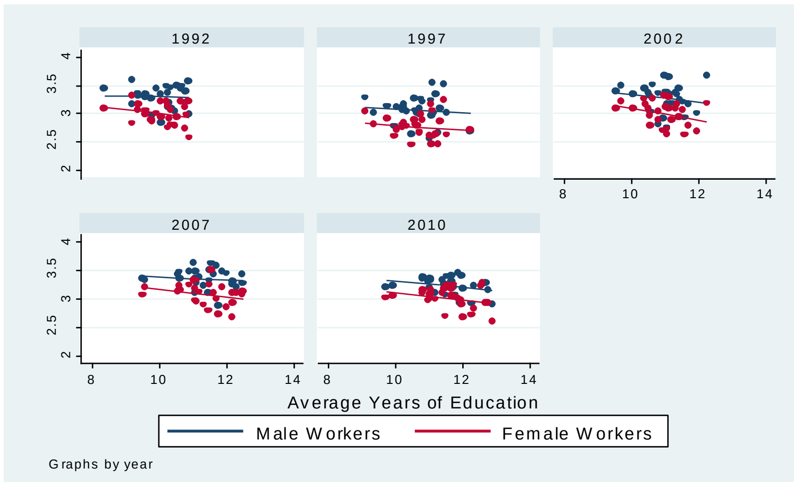
Source: Own elaboration using the short/long-run analytic sample. The levels of statistical significance of the slope coefficients are represented as follows: *** p ≤ 0.01; ** p ≤ 0.05; and * p ≤ 0.10.

Local Human-Capital Endowment

Figure 6.6 presents the raw relationship between the local human-capital endowment and the average wage of full-time formal-sector workers, by gender, across metropolitan and principal urban areas in Mexico during selected years. Average hourly wages are presented in natural logarithmic form. Local human-capital endowment is measured using average years of education in the urban area as described in Chapter 3.

Figure 6.6 depicts a potentially negative relationship between the average level of education in an urban area and the average wages of full-time formal-sector manufacturing male and female workers. In other words, I observe, without taking into consideration any other factors (e.g., the characteristics of workers, firms, and/or urban areas, as well as historical patterns of local human-capital development), that urban areas with higher aggregate levels of education tend to exhibit lower average hourly wages for full-time formal-sector manufacturing workers. This is contrary to theoretical expectations, where one would expect instead a positive relationship between the analytic measures, suggesting not only potentially unaccounted variables but also that economic forces other than externalities generated from the spatial concentration of human capital influence productivity in the Mexican manufacturing industry. Although, in fact, let us observe in Figure 6.6 that while the slopes of the fitted linear functions used to describe the potential relationship across time are negative in sign, they are not typically statistically significant. Halfdanarson et al. (2008) discusses the hypothetical possibility of negative human capital externalities, where schooling is interpreted by employers as a signal of productivity but with no actual effect on productivity. An example the authors provide assumes complementarity between human and physical capital. In the example, the authors pose that aggregate levels of human capital induce firms to invest in physical capital because of expectations that productivity gains from the collectively higher-skilled labor force and new capital will outweigh the investment costs in the long term. However, unrealized productivity gains from the skilled labor instead simply become costs incurred, which are then, in turn, passed on to the workers in the form of lower relative wages.

Figure 6.6: Average Years of Education and Average Urban Wages for Male and Female Workers in Manufacturing across Metropolitan and Principal Urban Areas—Short/Long-Run Analytic Sample



Slope Coefficients of the Fitted Lines:

	1992	1997	2002	2007	2010
Male	-0.009	-0.034	-0.064	-0.030	-0.057 *
Female	-0.062	-0.036	-0.109 *	-0.072 **	-0.064

Source: Own elaboration using the short/long-run analytic sample. The levels of statistical significance of the slope coefficients are represented as follows: *** $p \leq 0.01$; ** $p \leq 0.05$; and * $p \leq 0.10$.

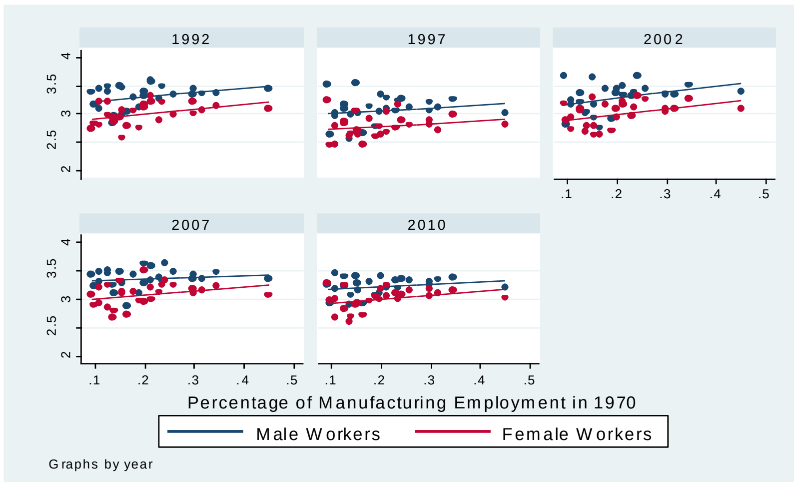
The quality of an urban area's labor force—its human-capital endowment—has traditionally been regarded as a key element for sustained economic growth. In this sense, urban areas with a better endowment of human capital are considered to have a greater development potential relative to urban areas with lower aggregate levels of human capital. As I have noted earlier in this dissertation, the public-good quality of human capital stimulates the diffusion of knowledge and technological development, generating externalities that enhance firm and worker productivity as well as contribute to industrial agglomerations.

However, several distinct observations follow from my descriptive analysis. Figure 6.1 implies that the spatial concentration of manufacturing employment may contribute to higher urban wages; this is observed at least in the case of certain manufacturing subsectors. However, Figure 6.6 suggests the possibility that higher urban wages are not the result of higher local aggregate levels of human capital. In fact, Figure 5.5 reveals the tendency of manufacturing industries across all subsectors to concentrate in urban areas with lower aggregate levels of human capital, an observation that is consistent with the traditionally low-skilled, labor-intensive manufacturing production in Mexico. Taken together, these descriptive observations suggest an inability of the manufacturing sector, given the educational attainment of its labor force, to support the development of localized externalities that are specifically associated to higher levels of educational attainment, possibly failing to contribute, in this manner, to sustained urban economic growth. Additional research, some of which is conducted in Chapter 7 and some of which is beyond the scope of this dissertation, is necessary to explore these descriptive observations further.

Local Manufacturing Experience

Following, I analyze descriptively the extent to which earlier patterns of manufacturing development across urban areas in Mexico influence *current* wages. The current time period reflects any of the selected years employed in this descriptive analysis (i.e., 1992, 1997, 2002, 2007, and 2010). Figure 6.7 presents the raw relationship between the local percentage of manufacturing employment in the year 1970, as described in Chapter 3, and the local average wage by gender of full-time formal-sector manufacturing workers across metropolitan and principal urban areas in Mexico. Local average hourly wages are presented in natural logarithmic form.

Figure 6.7: Historical Percentage of Manufacturing Employment (Year 1970) and Average Urban Wages for Male and Female Workers in Manufacturing across Metropolitan and Principal Urban Areas—Short/Long-Run Analytic Sample



Slope Coefficients of the Fitted Lines:

	1992	1997	2002	2007	2010
Male	0.724 **	0.525	1.007 **	0.336	0.469
Female	0.824 **	0.494	0.978 **	0.697 *	0.752 *

Source: Own elaboration using the short/long-run analytic sample. The levels of statistical significance of the slope coefficients are represented as follows: *** $p \leq 0.01$; ** $p \leq 0.05$; and * $p \leq 0.10$.

Figure 6.7 suggests that history matters within my analytic context and data. This may be observed by the positive relationships depicted by the linear trend lines across time and gender. Specifically, Figure 6.7 reveals that the total percentage of manufacturing employment in an urban area in 1970 may be positively correlated with the *current* average local wage for male and female full-time, formal-sector manufacturing workers. That is, male and female workers in urban areas with the largest total percentage of manufacturing employment in 1970 tend to earn on average higher wages relative to workers in areas with lower percentages of total manufacturing employment in 1970. Figure 6.7, however, shows that differences in the strength of the potential relationship between a city's historical manufacturing development and average wages across time periods may exist. Indeed, the slopes of the fitted linear functions used to describe the potential relationship across time are only strongly significant for the years 1992 and 2002, but barely, and sometimes not, statistically significant for the other years presented.

The positive relationship between earlier patterns of manufacturing development and current urban wages observed in Figure 6.7 is in line with the theoretical implications of the existence of dynamic externalities. This result combined with the observations drawn from Figure 5.10 suggest the necessity to account for historical patterns of industrial development in the empirical wage models presented in Chapter 7 for their potential confounding role on the relationship between the size of local manufacturing agglomerations and the magnitude of urban wages in my analysis. Of note is the fact that while the strength and magnitude of this potential confounding role is still inconclusive at this stage, the descriptive analysis implies that the effects arising from the dynamic properties of localization externalities in the case of Mexico may persist beyond two decades, considering that the historical data use in the analysis is for the year 1970 and the analytic sample runs from 1992 to 2010. Let us remember from Chapter 2 that Henderson (1997) finds that localization externalities have dynamic properties with effects that typically last for about six years.

CONCLUSION

This chapter has examined descriptively the relationship between urban wages and various determinants of urban wage disparities. The analysis on the potential relationship between the spatial concentration of manufacturing employment by industrial subsector and urban wages suggests that full-time formal-sector manufacturing workers may benefit from locating in urban areas where certain manufacturing activities are spatially concentrated. In this manner, the descriptive analysis points to the potential presence of positive localized externalities associated with the spatial concentration of some manufacturing activities, particularly those related to the electronics, transportation, machinery, and chemicals subsectors. Given the prevalent unequal distribution of these manufacturing activities across Mexico's urban space, as observed by the analysis presented in Chapter 5, positive localized externalities denote not only possible higher wages for workers in urban areas with higher spatial concentrations of employment in these specific manufacturing subsectors but also possible wage disparities between these workers and those in urban areas without or with relatively smaller concentrations of employment in these specific manufacturing subsectors. This descriptive analysis, in addition, offers little evidence to lend support to the hypothesis that trade liberalization and globalization mechanisms have influenced or hindered the development of localization economies in Mexico.

Moreover, the descriptive analysis of the potential relationship between average hourly wages and market access across urban areas in Mexico offers an indication that proximity to the U.S. market may be a key component of the urban wage determination process in Mexico over the 1990s and 2000s decade, with possible evidence that this proximity-premium increased with the implementation of NAFTA. Nevertheless, the analysis also offers an indication that the relevance for workers' wages of a city's proximity to the U.S. market may be decreasing with time. The analysis also indicates that in general wages may be potentially higher the closer an urban area is to a major Pacific Coast maritime port as well as the closer an urban area is to any one of Mexico's largest metropolitan areas; however, the data suggests that the magnitudes of these effects on wages might be trifling.

My examination of the potential relationship between urban wages and space-based characteristics that may alternatively explain spatial wage disparities suggests that urban scale, an urban area’s endowment of human capital, and an urban area’s manufacturing experience may contribute to wage disparities across urban areas in Mexico. This observation along with the potential relationships observed between these characteristics and the spatial concentration of employment by subsector indicates plausible confounding effects from the exclusion of these measures on the main results of the inferential analysis.

As a result, I find not only pertinent but necessary to account for these spatial characteristics in the quantitative empirical analysis that follows in Chapter 7 to minimize the potential for omitted variable bias in the analysis.

Finally, a consistent notable trend in the descriptive analyses presented in this chapter is the systematic difference across raw average hourly wages between male and female workers. Average urban wages are consistently lower for female workers relative to male workers across all years or time periods in the various graphic analyses.

Chapter 7: Estimating Urban Wage Disparities in Mexico

The literature discussed in Chapter 2 agrees that the mechanisms behind industrial localization are one way to explain the observed unevenness in the spatial distribution of economic activity and income (Henderson et al. 2001). The theory of localization economies posits that it is the size of the externalities generated by the mechanisms behind industrial spatial concentration that determines the magnitude of spatial economic disparities. New Economic Geography theory further points to demand-market accessibility along with the presence of economies of scale in transportation and trade costs as elements that reinforce spatial patterns in the distribution of economic activity and spatial economic disparities. In line with this literature, this dissertation aims to investigate whether wage disparities across Mexico's urban areas might be explained by the location and concentration of manufacturing employment. This dissertation, furthermore, also aims to investigate if and to what extent Mexico's integration to global markets through trade liberalization and other globalization processes has contributed to the expansion or contraction of potential wage disparities across urban areas in the country that are associated with the location and concentration of manufacturing employment.

Existing literature, as discussed in Chapter 2, not only points to a potential direct relationship between globalization and urban wages but also an indirect relationship that is associated with the influence that globalization and the localization and location of industries have on each other. On the direct relationship, the literature observes the possibility that mechanisms by which a geographical area is exposed and integrated to global processes generate space-based externalities associated with this process of globalization that conceivably influence directly the productivity of firms and, therefore also, the wages of workers in an urban area.[83] This literature points to four direct ways by

[83] Globalization mechanisms may be economic, social, or cultural, and examples of these mechanisms include: international trade, capital flows, transnational corporations, multilateral institutions, international media, and foreign travel, among others (Stallings 2002: pp. 9-12).

which the local presence of globalization mechanisms may affect urban productivity and wages: *competition*, *inter-firm linkages*, *labor pooling*, and *demonstration effects* (e.g., Jordaan 2009, pp. 14-19; Mullen and Williams 2007).

On the indirect relationship, several studies have shown that globalization mechanisms, such as FDI firms, seem to be attracted to regions that contain competitive concentrations of economic activity (e.g., Hilber and Voicu 2009; He 2008; Crozet et al. 2004; Head et al. 1999, 1995). Spatial concentration forces, therefore, appear to be important elements of the environment in which globalization mechanisms operate, suggesting that the relationship between localization economies and globalization externalities might be important (Jordaan 2009, p. 5; He 2008). The literature, moreover, seems to indicate that both globalization externalities and localization economies are derived from similar sources (i.e., input sharing, labor pooling, knowledge spillovers, and competition). It follows from this similarity then that the spatial proximity and sources that facilitate localization economies may also facilitate and enhance the generation and transmission of globalization externalities. In this context, localization economies may in fact facilitate and enhance globalization externalities (Jordaan 2009, p.31), thereby influencing further the productivity of firms and the wages of workers in an urban area. Lastly, the theoretical discussion of demand-market access further poses that, by expanding the set of consumer markets firms serve, globalization influences the location and concentration of production—and, therefore, of employment, effecting in this manner changes to the wage determination process of urban areas with close proximity or accessibility to newly acquired consumer-demand markets.

Given that a primary motivation behind addressing my research objectives is to provide researchers and policymakers a better understanding of the spatial factors that may contribute to narrow or to exacerbate economic disparities across geographic space in developing economies like Mexico's in which profound processes of economic liberalization and globalization have taken place over the last few decades, I address in this chapter my research questions using an inferential framework for wage-determination. This framework allows me to ascertain the determinants of urban wages and, therefore, the determinants of wage disparities across urban areas in Mexico. Prior literature and methodology have been previously discussed in Chapters 2 and 3.

DETERMINANTS OF URBAN WAGES IN MEXICO BY GENDER

What determines the wages of male and female workers across Mexico's urban areas? Are the characteristics of local firms relevant for determining urban wages, and are these characteristics equally as important as the characteristics of local workers? What about other characteristics that may be unique to each urban area such as its location or the concentration of manufacturing industries? Are spatial characteristics relevant for determining the wages of male and female workers across Mexico's urban areas?

This section presents estimation results from augmented-Mincerian wage models where workers' hourly wages—specifically, the natural logarithm of hourly wages—are set to be a function of the key elements of analysis in this study (i.e., the spatial concentration of subsectors of manufacturing employment, an urban area's proximity to demand markets, and these elements' interaction) along with the individual characteristics of workers, the characteristics of their firm of employment, and the characteristics of the urban areas where the workers reside. The wage models are estimated using Ordinary Least Squares (OLS) regression, accounting for the plausible correlation of unobservable characteristics (i.e., robust clustered standard errors) by metropolitan area and year. As mentioned earlier in the dissertation, I conduct this empirical exercise separately for males and females for several reasons: first, to follow the labor economics literature which argues that the structure of the wage determination process for male and female workers is essentially different; second, because little is still known about the differential effects by gender of industrial and urban agglomerations on urban wages, although the literature points to significant differential effects (Fingleton and Longhi 2013, Echeverri-Carroll and Ayala 2010, Fernandez and Su 2004); and third, to advance the current body of knowledge on a yet unsettled issue of whether within-gender wage differentials expand or contract due to trade liberalization and globalization processes (Aguayo Tellez 2011).

In addition, as described in Chapter 3, the investigation of the role played by globalization mechanisms in moderating the described linear relationship enters not only through the analysis of market access in the empirical model but also through a before-and-after analytic approach in the style of a non-experimental difference-in-difference methodology, where the linear relationship is contrasted between a period of moderate export expansion (i.e., the years 1992 and 1993) to a period of accelerated export expansion and globalization processes (i.e., from 1994 to 2010). Accordingly, the estimation results represent historic means, that is, means over multiple years of data.

For this inferential analysis, I use the data from both of my analytic samples (i.e., the *short-run* and the *short/long-run analytic samples*)—also described at length in Chapter 3—to estimate the wage models. As an additional note on the interpretation of the estimation results, we must recall from Chapter 3 of the theoretical and methodological necessity of limiting the analytic samples to only manufacturing workers to appropriately estimate localized externalities from the spatial concentration of manufacturing employment.[84] Accordingly, while the data may reflect only manufacturing employment and wages, conclusions may be drawn and extrapolated to the urban scale. The full estimation results are presented in Table 7.1 for male workers and Table 7.2 for female workers. Following, I describe the characteristics of the six wage models estimated for each gender:

- *Model 1* estimates the wage model using the short-run analytic sample and <u>excludes</u> interaction terms across the key variables in my analysis that denote localization (i.e., spatial concentration indices) and demand-market accessibility (i.e., geographic distances to demand markets). This model, therefore, only analyzes the potential

[84] As Lee and Zang (1998) explains, citing Henderson (1986), it is critical to estimate scale economies on an industry basis rather than as an aggregate production function for the city since this aggregate production function can only have urbanization economies.

differential effects on wages of my key analytic variables before and after Mexico's rapidly expanding globalization process.

- *Model 1-Int* estimates the wage model using the short-run analytic sample and includes the key interaction terms excluded in *Model 1*. These interaction terms capture the potential effect on urban wages of the relationship between localization economies and access to demand markets as well as the effect on urban wages of their relationship with globalization.
- *Model 2* estimates the same wage model as *Model 1* but uses instead the short/long-run analytic sample for data on the period between 1992 and 2002. *Model 1* and *Model 2* are comparable except for the metropolitan areas included in each sample. Comparing the results from both samples allows me to examine the sensitivity of my results to sample changes and adjust my conclusions accordingly when using data for a longer period between 1992 and 2010, whose results are shown in *Model 3*.
- *Model 2-Int* estimates the same wage model as *Model 1-Int* but uses instead the short/long-run analytic sample for data on the period between 1992 and 2002. *Model 1-Int* and *Model 2-Int* are comparable except for the metropolitan areas included in each sample. As previously stated, comparing the results from both samples allows me to examine the sensitivity of my results to sample changes and adjust my conclusions accordingly when using data for a longer period between 1992 and 2010, whose results are shown in *Model 3-Int*.
- *Model 3* estimates the same wage model as *Model 1* and *Model 2* but uses instead the short/long-run analytic sample for data on the period between 1992 and 2010. While the results from *Model 3* are not comparable to the results from either *Model 1* or *Model 2* by virtue of using a different analytic sample and/or a time-extended sample, it does allow me to analyze the behavior of the estimation results, particularly those from *Model 2*, under a longer time frame.
- *Model 3-Int* estimates the same wage model as *Model 1-Int* and *Model 2-Int* but uses instead the short/long-run analytic sample for data on the period between 1992 and 2010. As previously stated, while the results from *Model 3-Int* are not comparable to

the results from either *Model 1-Int* or *Model 2-Int* by virtue of using a different analytic sample and/or a time-extended sample, it does allow me to analyze the behavior of the estimation results, particularly those from *Model 2-Int*, under a longer time frame.

Urban Areas, Wages, and Male Workers

The following section discusses the estimation results for male workers which are presented in Table 7.1.

Table 7.1: Analytic Model Results for Male Workers

Independent Variable: Ln of Real Hourly Wages	Short-Run Analytic Sample		Short/Long-Run Analytic Sample			
	Short-Run (Pre: 1992-1993 / Post: 1994-2002)		*Short-Run* (Pre: 1992-1993 / Post: 1994-2002)		*Long-Run* (Pre: 1992-1993 / Post: 1994-2010)	
	Model 1	**Model 1 -Int**	**Model 2**	**Model 2-Int**	**Model 3**	**Model 3-Int**
Individual Characteristics						
High School Degree	0.2587***	0.2570***	0.2687***	0.2674***	0.2306***	0.2299***
	(0.015)	(0.015)	(0.017)	(0.017)	(0.012)	(0.012)
Some College or Technical Education	0.3720***	0.3714***	0.3756***	0.3755***	0.3741***	0.3730***
	(0.022)	(0.022)	(0.025)	(0.025)	(0.019)	(0.019)
Technical or Vocational Education	0.2728***	0.2743***	0.2824***	0.2836***	0.2600***	0.2609***
	(0.012)	(0.012)	(0.014)	(0.014)	(0.012)	(0.012)
College Degree	1.0059***	1.0051***	1.0229***	1.0225***	0.9697***	0.9691***
	(0.022)	(0.022)	(0.024)	(0.024)	(0.020)	(0.020)
Potential Experience	0.0203***	0.0202***	0.0203***	0.0203***	0.0199***	0.0199***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Potential Experience Squared	-0.0003***	-0.0003***	-0.0003***	-0.0003***	-0.0003***	-0.0003***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Marital Status (Married or In Civil Union)	0.0385***	0.0395***	0.0343***	0.0350***	0.0323***	0.0330***
	(0.009)	(0.009)	(0.010)	(0.010)	(0.007)	(0.007)
Head of Household	0.1115***	0.1111***	0.1116***	0.1113***	0.1062***	0.1060***
	(0.008)	(0.008)	(0.009)	(0.009)	(0.006)	(0.006)
Migration Status (Recent Inmigrant)	-0.0021	-0.0077	0.0089	0.0104	0.0397	0.0379
	(0.040)	(0.039)	(0.056)	(0.056)	(0.035)	(0.035)
Occupation: Professional/Technical	0.2793***	0.2804***	0.2701***	0.2704***	0.2643***	0.2651***
	(0.016)	(0.016)	(0.018)	(0.018)	(0.015)	(0.015)
Occupation: Service/Sales	-0.014	-0.0134	-0.0116	-0.0111	-0.0088	-0.0082
	(0.014)	(0.014)	(0.015)	(0.015)	(0.011)	(0.011)
Occupation: Managerial/Administrative	0.2729***	0.2736***	0.2674***	0.2680***	0.2546***	0.2554***
	(0.012)	(0.012)	(0.014)	(0.014)	(0.010)	(0.010)
Firm-of-Employment Characteristics						
Size of Firm of Work: Micro and Small	-0.1393***	-0.1403***	-0.1425***	-0.1428***	-0.1233***	-0.1228***
	(0.012)	(0.012)	(0.013)	(0.013)	(0.010)	(0.010)
Size of Firm of Work: Medium	-0.1056***	-0.1071***	-0.1065***	-0.1077***	-0.0962***	-0.0955***
	(0.010)	(0.010)	(0.011)	(0.011)	(0.009)	(0.009)
Industry: Food & Beverages Mfg	-0.0185*	-0.0145	-0.0218**	-0.0208**	-0.0146*	-0.0133
	(0.010)	(0.010)	(0.010)	(0.010)	(0.009)	(0.009)
Industry: Electronics & Communication Mfg	0.0275**	0.0298**	0.0163	0.018	0.0002	0.001
	(0.013)	(0.013)	(0.014)	(0.014)	(0.013)	(0.013)
Industry: Transportation Mfg	0.0737***	0.0794***	0.0879***	0.0912***	0.0757***	0.0777***
	(0.013)	(0.013)	(0.014)	(0.014)	(0.011)	(0.011)
Industry: Machinery & Metallic Products Mfg	0.0536***	0.0578***	0.0422***	0.0437***	0.0451***	0.0458***
	(0.010)	(0.010)	(0.010)	(0.010)	(0.009)	(0.009)
Industry: Chemicals & Minerals Mfg	0.0444***	0.0471***	0.0369***	0.0389***	0.0399***	0.0403***
	(0.012)	(0.012)	(0.012)	(0.012)	(0.011)	(0.011)
% of College-Educated (Industry/Gender)	0.1633**	0.1331*	0.1897***	0.1533**	0.1147**	0.1095**
	(0.078)	(0.078)	(0.060)	(0.060)	(0.045)	(0.045)

Continued

Table 7.1 (Continued): Analytic Model Results for Male Workers

Independent Variable: Ln of Real Hourly Wages	Short-Run Analytic Sample: *Short-Run* (Pre: 1992-1993 / Post: 1994-2002)		Short/Long-Run Analytic Sample: *Short-Run* (Pre: 1992-1993 / Post: 1994-2002)		Short/Long-Run Analytic Sample: *Long-Run* (Pre: 1992-1993 / Post: 1994-2010)	
	Model 1	**Model 1 -Int**	**Model 2**	**Model 2-Int**	**Model 3**	**Model 3-Int**
Urban -Area Characteristics						
Unemployment Rate (Gender)	0.3548	0.2742	0.5927	0.1855	-0.3251	-0.4063
	(0.337)	(0.318)	(0.404)	(0.410)	(0.267)	(0.249)
Average Years of Education	0.0215	0.0407**	0.0329	0.0342*	0.0270*	0.0298*
	(0.019)	(0.017)	(0.020)	(0.020)	(0.016)	(0.017)
% of Manufacturing Employment in 1970	0.5184***	1.4509***	1.5494***	1.5519***	1.2623***	1.6238***
	(0.169)	(0.189)	(0.228)	(0.273)	(0.198)	(0.198)
Pairwise Coagglomeration Index 1/2	4.8324	7.9621**	-13.8697***	0.1331	-10.5727***	0.5869
	(3.935)	(3.714)	(4.883)	(5.616)	(3.696)	(4.162)
Pairwise Coagglomeration Index 1/3	6.8673	7.2246	0.0659	13.144	3.5433	-13.2133*
	(5.290)	(7.503)	(6.652)	(14.930)	(4.810)	(7.524)
Pairwise Coagglomeration Index 1/4	-0.1035	-0.1809	-8.5750*	-4.5149	-1.6659	2.2847
	(4.808)	(4.015)	(4.703)	(5.471)	(3.363)	(4.240)
Pairwise Coagglomeration Index 1/5	-3.0111	-11.6940*	11.1432	-10.0396	-6.7172	-4.9943
	(5.881)	(6.701)	(9.399)	(12.967)	(5.863)	(6.669)
Pairwise Coagglomeration Index 1/6	-2.4032	1.3086	21.0421***	10.8152	15.9359***	8.8309*
	(4.686)	(5.323)	(5.817)	(7.823)	(4.154)	(4.700)
Pairwise Coagglomeration Index 2/3	-14.0653***	-6.3499**	-0.9127	-13.4235**	-2.6807	-11.3776***
	(2.804)	(2.992)	(5.267)	(5.994)	(3.575)	(4.080)
Pairwise Coagglomeration Index 2/4	10.8591***	-2.2024	14.1197***	2.7154	11.2958***	5.6953***
	(1.916)	(2.595)	(1.922)	(3.313)	(1.625)	(2.020)
Pairwise Coagglomeration Index 2/5	-7.4866**	-12.0577***	0.3926	3.8745	1.7927	2.2433
	(3.431)	(3.005)	(7.398)	(8.572)	(3.913)	(3.935)
Pairwise Coagglomeration Index 2/6	-3.5055	2.2836	-14.2909***	-5.0187	-3.8517	0.0416
	(4.044)	(3.864)	(4.009)	(4.530)	(2.916)	(2.846)
Pairwise Coagglomeration Index 3/4	3.4619***	11.0700***	2.1691	11.2762***	-0.3855	7.4646**
	(0.881)	(1.273)	(2.533)	(4.185)	(2.097)	(3.080)
Pairwise Coagglomeration Index 3/5	7.2796**	13.8805***	8.4747**	10.1933	7.0664***	15.0948***
	(2.946)	(4.487)	(4.133)	(9.224)	(2.718)	(4.419)
Pairwise Coagglomeration Index 3/6	6.4448	-6.7672	7.9639	0.6393	2.983	7.3495
	(3.915)	(5.843)	(5.286)	(10.233)	(3.703)	(5.390)
Pairwise Coagglomeration Index 4/5	-1.0638	-0.3227	-5.3188*	-5.798	-0.1157	-1.9649
	(2.426)	(2.404)	(2.906)	(4.830)	(2.044)	(2.431)
Pairwise Coagglomeration Index 4/6	-4.9895	-1.1676	7.5539	1.7283	-3.3654	-3.4901
	(5.462)	(4.419)	(5.322)	(5.995)	(3.119)	(3.485)
Pairwise Coagglomeration Index 5/6	-4.0881	-3.2199	-30.4968***	-15.8324	-13.4289**	-15.0501**
	(6.978)	(6.584)	(7.862)	(12.000)	(5.769)	(6.414)
Ln of Population	-0.0699***	-0.0554***	-0.0949***	-0.0616**	-0.0516***	-0.0401**
	(0.017)	(0.016)	(0.020)	(0.028)	(0.015)	(0.018)
Key Analytic Variables						
Distance to Large Markets	0.0000	-0.0001	0.0001	0.0001	0.0001	-0.0002
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Dist. to US-Mexico Border Crossing	-0.0001**	0.0000	-0.0002***	0.0001	-0.0001***	0.0000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Diff. in Dist. to Gulf and Pacific Ports	0.0002***	0.0002***	0.0002***	0.0001	0.0002***	0.0001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Large Markets X POST	0.0001*	0.0001**	0.0000	-0.0001	0.0000	0.0003
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Border X POST	-0.0001**	-0.0001***	0.0000	-0.0003**	0.0000	-0.0002*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Ports X POST	-0.0001**	-0.0001**	-0.0001***	-0.0001	-0.0001***	0.0000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

Continued

Table 7.1 (Continued): Analytic Model Results for Male Workers

Independent Variable: Ln of Real Hourly Wages	Short-Run Analytic Sample		Short/Long-Run Analytic Sample			
	Short-Run (Pre: 1992-1993 / Post: 1994-2002)		*Short-Run* (Pre: 1992-1993 / Post: 1994-2002)		*Long-Run* (Pre: 1992-1993 / Post: 1994-2010)	
	Model 1	**Model 1 -Int**	**Model 2**	**Model 2-Int**	**Model 3**	**Model 3-Int**
Ln Spatial Concentration Index (LnSCI) 1	-0.0414***	0.1155***	-0.0347**	-0.0004	-0.0480***	-0.0336
	(0.015)	(0.032)	(0.017)	(0.091)	(0.016)	(0.074)
LnSCI 2	0.006	-0.0252	0.0269***	-0.0641*	0.0144**	0.0001
	(0.006)	(0.016)	(0.008)	(0.037)	(0.007)	(0.028)
LnSCI 3	-0.0075	0.0187	-0.0220***	-0.0127	-0.0159**	0.0511
	(0.007)	(0.013)	(0.008)	(0.039)	(0.008)	(0.035)
LnSCI 4	-0.0055	0.0009	-0.0022	-0.0405	0.003	0.0086
	(0.005)	(0.012)	(0.006)	(0.045)	(0.005)	(0.035)
LnSCI 5	-0.0047	-0.0267	0.0123	0.0603	0.0179	-0.0824
	(0.015)	(0.017)	(0.013)	(0.093)	(0.012)	(0.075)
LnSCI 6	0.0530***	-0.0364*	0.0048	0.0696	0.0055	-0.0075
	(0.010)	(0.019)	(0.010)	(0.086)	(0.009)	(0.066)
LnSCI 1 X POST	0.0183	-0.0319	0.0043	0.0043	0.0265	0.0166
	(0.018)	(0.034)	(0.018)	(0.087)	(0.017)	(0.074)
LnSCI 2 X POST	-0.0139**	0.0016	-0.0244***	0.0432	-0.0259***	-0.0213
	(0.006)	(0.018)	(0.006)	(0.036)	(0.006)	(0.028)
LnSCI 3 X POST	0.0048	-0.0037	0.0199**	0.0054	0.0215***	-0.0425
	(0.007)	(0.012)	(0.008)	(0.038)	(0.008)	(0.034)
LnSCI 4 X POST	-0.0023	-0.007	-0.0103*	0.0243	-0.0100**	-0.0217
	(0.005)	(0.011)	(0.005)	(0.045)	(0.004)	(0.035)
LnSCI 5 X POST	0.0111	0.0201	-0.0105	-0.0468	-0.0233*	0.0841
	(0.016)	(0.019)	(0.013)	(0.094)	(0.012)	(0.075)
LnSCI 6 X POST	-0.0093	0.0128	0.0215**	-0.0586	0.0146	0.0039
	(0.010)	(0.021)	(0.009)	(0.090)	(0.009)	(0.067)
LnSCI 1 X Large Markets		0.0001*		0.0001		0.0001
		(0.000)		(0.000)		(0.000)
LnSCI 2 X Large Markets		0.0000		0.0001		0.0000
		(0.000)		(0.000)		(0.000)
LnSCI 3 X Large Markets		0.0000		0.0000		0.0000
		(0.000)		(0.000)		(0.000)
LnSCI 4 X Large Markets		0.0000		0.0000		-0.0001***
		(0.000)		(0.000)		(0.000)
LnSCI 5 X Large Markets		0.0000		-0.0001		-0.0001
		(0.000)		(0.000)		(0.000)
LnSCI 6 X Large Markets		0.0001**		0.0000		0.0000
		(0.000)		(0.000)		(0.000)
LnSCI 1 X Border		-0.0002***		-0.0001		-0.0001
		(0.000)		(0.000)		(0.000)
LnSCI 2 X Border		0.0000		0.0000		0.0000
		(0.000)		(0.000)		(0.000)
LnSCI 3 X Border		-0.0000**		0.0000		-0.0001
		(0.000)		(0.000)		(0.000)
LnSCI 4 X Border		0.0000		0.0001		0.0000
		(0.000)		(0.000)		(0.000)
LnSCI 5 X Border		0.0001***		0.0000		0.0002***
		(0.000)		(0.000)		(0.000)
LnSCI 6 X Border		0.0000		-0.0001		0.0000
		(0.000)		(0.000)		(0.000)

Continued

Table 7.1 (Continued): Analytic Model Results for Male Workers

Independent Variable: Ln of Real Hourly Wages	Short-Run Analytic Sample: Short-Run (Pre: 1992-1993 / Post: 1994-2002) Model 1	Model 1 -Int	Short/Long-Run Analytic Sample: Short-Run (Pre: 1992-1993 / Post: 1994-2002) Model 2	Model 2-Int	Long-Run (Pre: 1992-1993 / Post: 1994-2010) Model 3	Model 3-Int
LnSCI 1 X Ports		0.0001***		0.0001		0.0001
		(0.000)		(0.000)		(0.000)
LnSCI 2 X Ports		0.0000		0.0000		0.0000
		(0.000)		(0.000)		(0.000)
LnSCI 3 X Ports		0.0000***		0.0000		0.0001**
		(0.000)		(0.000)		(0.000)
LnSCI 4 X Ports		-0.0000***		-0.0001***		-0.0001***
		(0.000)		(0.000)		(0.000)
LnSCI 5 X Ports		0.0000		0.0001		0.0000
		(0.000)		(0.000)		(0.000)
LnSCI 6 X Ports		-0.0001***		-0.0001*		-0.0001***
		(0.000)		(0.000)		(0.000)
LnSCI 1 X Large Markets X POST		-0.0001**		-0.0001		-0.0001
		(0.000)		(0.000)		(0.000)
LnSCI 2 X Large Markets X POST		0.0001***		0.0000		0.0000
		(0.000)		(0.000)		(0.000)
LnSCI 3 X Large Markets X POST		0.0000		0.0000		0.0000
		(0.000)		(0.000)		(0.000)
LnSCI 4 X Large Markets X POST		-0.0000***		0.0000		0.0000**
		(0.000)		(0.000)		(0.000)
LnSCI 5 X Large Markets X POST		0.0000		0.0001		0.0000
		(0.000)		(0.000)		(0.000)
LnSCI 6 X Large Markets X POST		0.0000		0.0001		0.0000
		(0.000)		(0.000)		(0.000)
LnSCI 1 X Border X POST		0.0001***		0.0001		0.0001
		(0.000)		(0.000)		(0.000)
LnSCI 2 X Border X POST		-0.0000*		-0.0001		0.0000
		(0.000)		(0.000)		(0.000)
LnSCI 3 X Border X POST		0.0000**		0.0000		0.0001*
		(0.000)		(0.000)		(0.000)
LnSCI 4 X Border X POST		0.0000		0.0000		0.0000
		(0.000)		(0.000)		(0.000)
LnSCI 5 X Border X POST		-0.0000**		0.0000		-0.0002**
		(0.000)		(0.000)		(0.000)
LnSCI 6 X Border X POST		0.0000		0.0001		0.0000
		(0.000)		(0.000)		(0.000)
LnSCI 1 X Ports X POST		0.0000		0.0000		-0.0001
		(0.000)		(0.000)		(0.000)
LnSCI 2 X Ports X POST		-0.0000*		-0.0001*		0.0000
		(0.000)		(0.000)		(0.000)
LnSCI 3 X Ports X POST		0.0000		0.0000		0.0000
		(0.000)		(0.000)		(0.000)
LnSCI 4 X Ports X POST		0.0000		0.0001**		0.0001***
		(0.000)		(0.000)		(0.000)
LnSCI 5 X Ports X POST		0.0000		-0.0001		0.0000
		(0.000)		(0.000)		(0.000)
LnSCI 6 X Ports X POST		0.0000***		0.0001**		0.0001***
		(0.000)		(0.000)		(0.000)
Constant	2.8233***	2.7738***	2.9501***	3.0437***	2.7140***	2.7316***
	(0.273)	(0.267)	(0.415)	(0.460)	(0.265)	(0.288)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Metropolitan Areas	36	36	28	28	28	28
Adjusted R-squared	0.5	0.503	0.497	0.499	0.476	0.477
F-statistic	467.403	572.265	487.339	791.368	289.994	345.892
Observations	12,098,652	12,098,652	10,405,559	10,405,559	16,922,508	16,922,508
Space-Time Clusters	277	277	216	216	364	364

Continued

Table 7.1 (Continued): Analytic Model Results for Male Workers

For space purposes, manufacturing subsectors in the tables are referred numerically as follows: (1) Food, beverages and tobacco products; (2) Textiles (including garment) and leather products; (3) Electronic and electric components; communications and measurement equipment; (4) Transportation equipment, parts, and components; (5) Metallic products; machinery and equipment; and, (6) Oil and lead, chemical, and plastic products; mineral, non-metallic products. Heteroskedasticity-consistent standard errors adjusted for within year/metropolitan area correlation are reported in parenthesis; the number of corresponding space-time clusters adjusted for in each model are also reported. Results from the year effects included in each of the models are omitted from the tables. Levels of statistical significance are represented as follows: *** $p \leq 0.01$; ** $p \leq 0.05$; and * $p \leq 0.10$.

Worker Characteristics

Individual characteristics are seemingly important determinants of wages for men in manufacturing across urban areas in Mexico; this is not surprising given the longstanding literature on wage determination for Mexico and other countries. In general, estimates for most individual-level variables across all of the male wage models presented in Table 7.1—regardless of sample, time period, or model specification—are highly significant. The results consistently indicate across models that college-educated and experienced males in manufacturing across urban areas in Mexico who are married, head of household, and in professional, technical, managerial, or administrative occupations earn on average higher wages than their counterparts. Specifically, the models indicate that in urban labor markets in Mexico, and particularly within manufacturing industries, college education—even some college education—is valued the highest, with males with a high school degree earning on average between 23 and 27 percent more than men without a high school education, everything else considered, and men with a college degree earning about four times as much as those with a high school degree. In addition, the models indicate that urban manufacturing wages for males increase about 2 percent with every extra year of experience workers have, although at higher levels of experience wages increase at a decreasing rate. Results also point to no significant wage differences between male manufacturing workers who are long-term residents within their urban area and those who recently in-migrated to their urban area. Finally, estimates for occupation indicate comparable wages for men in services, sales, and manual occupations as well as comparable wages for men in professional, technical, managerial, and administrative occupations. These results also indicate that men in professional, technical, managerial, or administrative occupations earn on average between 25 and 28 percent more than men in services, sales, or manual occupations.

Firm-of-Employment Characteristics

Estimates from Table 7.1 show that firm-of-employment characteristics are equally as important determinants of the wages of men in manufacturing across Mexico's urban areas as their individual characteristics are. Indeed, several firm characteristics included in the analysis are statistically significant across the wage models regardless of model specification or data sample. All wage models in Table 7.1 indicate, for example, that men who work in large manufacturing firms across urban areas in Mexico earn on average the highest wages, everything else considered, followed first by men who work in medium-sized manufacturing firms, and then by male workers in micro- and small-sized firms. Specifically, compared to men who work in large manufacturing firms, men in medium-sized manufacturing firms earn on average between 10 and 11 percent less, while men in micro- and small-sized firms earn on average between 12 and 14 percent less.

In addition, estimates for the variable percentage of college-educated men in the worker's own industry of employment indicate large wage benefits for men whose reported industry of employment (i.e., manufacturing subsector) contains a large percentage of college-educated men. In this manner, results offer some evidence that supports the existence of positive human-capital externalities that are related to the skill-intensity of the men's own industry of employment and would seem to arise among and to benefit only men. However, while for the most part this result is observable across all of the wage models, regardless of sample, time period, or model specification, the statistical significance of the estimates does decrease with the inclusion in the models of the analytical interaction terms, particularly in the case of Model 1-Int and Model 2-Int. This change in the statistical significance of the estimates suggests that at least some of the knowledge spillovers observed in the non-interaction wage models may in fact be the result of spillovers that are generated from the interplay between the location and spatial concentration of manufacturing employment.

Regarding workers' industry of employment, the wage models consistently indicate that men who work in transportation manufacturing earn on average the highest wages, followed first by men in machinery and metallic equipment industries, and then by men in chemicals manufacturing. Men who are employed in electronics manufacturing earn on average less than workers who are employed in the three afore-mentioned manufacturing subsectors but still more than workers employed in textiles manufacturing; however, this result is observed only in the models using the data with the largest sample of urban areas—the short-run analytic sample. Estimates using the short/long-run analytic sample indicate instead that the wages for men in electronics manufacturing are no different than those for workers employed in textiles manufacturing.

This difference observed in the estimates across samples indicates that the inclusion of a few metropolitan areas in one sample (i.e., the short-run analytic sample), or alternatively their exclusion from the other sample (i.e., the short/long-run analytic sample) may be driving up some of the wage differentials observed between workers in the electronics and communication products industry and workers in other manufacturing subsectors. It might be, specifically, that the exclusion of metropolitan areas like Matamoros, Ciudad Juarez, and Nuevo Laredo—which have been historically important industrial centers of export-oriented manufacturing, and especially of electronics and communication products, as indicated in Chapter 5—may be driving this difference. Given the apparent sensitivity of my results to the sample employed, their generalizability may be limited.

Finally, there is also an indication that the estimates across wage models for the indicator variable of workers in the food and beverage manufacturing subsector may also be driven by the differences across analytic samples. In general, the estimates report that workers employed in the food and beverages industry earn either the lowest wages among all manufacturing workers or equally low wages relative to the reference category (i.e., workers in textiles and leather products manufacturing). Overall, all of the estimates are negative in sign, which indicates that wages are lower for men in the food and beverage industry relative to men in the textiles and leather products industry; differences arise, however, when looking at the statistical significance of the estimates. These are generally statistically insignificant or slightly significant (i.e., at the 10 percent level) in Model 1 and

Model 1-Int, statistically significant (i.e., at the 5 percent level) in Model 2 and Model 2-Int, and again statistically insignificant or slightly significant (i.e., at the 10 percent level) in Model 3 and Model 3-Int. Given that the only difference that exists between Model 1 and Model 2 as well as between Model 1-Int and Model 2-Int is the analytic sample used to estimate each, then the observed differences may be directly attributed to this sample difference. Accordingly, the exclusion in the short/long-run analytic sample of metropolitan areas that are key to the food and beverages manufacturing industry, like Orizaba and Torreon, may be the reason driving these observed wage differentials. The difference in the level of statistical significance between estimates from Models 2/2-Int and Models 3/3-Int instead may be related to the possibility that the wage differentials that exist between male workers in the food and beverages subsector and male workers in the textiles and leather products subsector may be decreasing with time. Let me explain how I come about this conclusion. Recall that Model 2 and Model 2-Int refer to the period 1992-2002, and Model 3 and Model 3-Int refer to the longer period 1992-2010. Also recall that all estimates from the wage models reflect net effects averaged over the corresponding sample years. Given these facts, and specifically given that the only difference between Models 2/2-Int and Models 3/3-Int is the addition of data points for the years 2003 to 2010, then estimates from Models 3/3-Int that are smaller or less significant than estimates from Models 2/2-Int can only be the result of the added data and, specifically, the result of the averaging out of smaller or less significant estimated net effects in the years 2003 to 2010.

Urban-Area Characteristics

The results in Table 7.1 indicate that the manufacturing maturity of an urban area as well as the coagglomeration of certain manufacturing subsectors in an urban area are both important determinants of urban wages for male workers in Mexico. Estimates across all wage models for the variable that captures urban area percentage of manufacturing employment in 1970 reflect the impact of the path-dependent industrial history of urban areas in Mexico in determining the current wages of male workers. The estimates indicate that the larger an urban area's manufacturing base was in 1970, the higher the current wages of men are who reside in that urban area relative to those who reside elsewhere; that is, male workers in urban areas with a stronger and earlier history of manufacturing employment earn between 52 and 162 percent more, depending on the sample and model specification, relative to their counterparts in urban areas with a weaker history in manufacturing. The strong value and statistical significance of the estimates offer supporting evidence for the presence and strength of dynamic externalities—with long-term wage effects—that are associated with the localization of manufacturing employment across urban Mexico. The results indicate for all analytic samples and model specifications that, everything else considered, there is a high wage premium associated with the manufacturing maturity of urban areas.

My analysis in Chapter 5 alludes to high levels of coagglomeration across certain manufacturing subsectors that might be indicative of economic benefits related to their co-location. Indeed, results in Table 7.1 provide some evidence of wage benefits to male workers located in urban areas that report high levels of coagglomeration among some manufacturing subsectors, particularly higher-skilled, export-oriented subsectors. Specifically, wage advantages are observed in the coagglomeration of electronics manufacturing firms with either machinery or transportation manufacturing firms or in the coagglomeration of textiles and transportation manufacturing firms. From Chapter 2, we know that localization economies arise because industry-specific firms that concentrate in geographic space are able to take advantage of any or a combination of four factors: *labor pooling, input sharing, knowledge* or *technological spillovers, and competition*. It would seem from the results in Table 7.1 that localization economies also arise from the coagglomeration of industries from different manufacturing sectors. These industries possibly share some characteristics like similar production technologies or inputs, similarly skilled labor, or are perhaps even each other's suppliers. Their coagglomeration, thus, allows them to take advantage of shared factors, which allows for productivity-enhancing or wage-enhancing economies of scale from their joint spatial concentration. Alternatively, wage disadvantages are observed in the coagglomeration of textiles manufacturing firms with either electronics or machinery manufacturing firms, pointing to negative externalities from their coagglomeration in urban areas. The literature tells us that whereas the co-location or concentration of economic agents in geographic space typically confers wage advantages, their congestion instead may confer wage disadvantages. The evidence of potentially large wage benefits or disadvantages related to the coagglomeration of certain manufacturing subsectors does suggest the need for further research in this area.

Results offer some evidence of localized human-capital externalities affecting the wage level of male workers across urban areas in Mexico. Estimates from the interaction models indicate that the wages of male workers are on average higher in urban areas with a higher concentration of skilled workers. Some evidence, therefore, exists for the existence of localized knowledge spillovers across Mexico as well as for knowledge spillovers at the industry level, as discussed in the earlier section.

Although the literature has found evidence elsewhere of its relevance for determining urban wages, the results across all wage models indicate that the male unemployment rate is insignificant in determining the wage level of urban male workers in Mexico. The unemployment rate, therefore, does not contribute to contract or to expand male wage differentials across urban areas in Mexico.

Finally, urban scale offers a result that is conditional on whether Mexico City is included or excluded from the analysis. As is, the predictor variable that accounts for urbanization economies in the wage models presented in Table 7.1, the natural logarithm of an urban area's population, indicates the existence of strong urbanization disadvantages (wage penalties from living/working in large urban areas) independent of model specification and sample. There is a caveat, however, with this finding which the reader must be made aware of, and it is that this result appears to be driven by the disproportionate size of Mexico City relative to other metropolitan and urban areas in my sample. When one excludes Mexico City from the data, the estimate on the natural logarithm of an urban area's population becomes statistically insignificant across models, so that there is no evidence of urbanization externalities at all for urban areas in Mexico other than the wage penalties observed for workers living in Mexico City. This is not the first time that research shows evidence of negative urbanization externalities in Mexico City. Let us recall from Chapter 4 that the spatial deconcentration of manufacturing, away from Mexico City and into secondary cities within the central region of the country that was observed from the mid-1960s to the mid-1980s is often explained in the literature as a result of the costs associated with the excessive agglomeration of industry in Mexico City. Several authors consider that the high level of industrial concentration in the capital area created, over time, significant urban disamenities (e.g., diseconomies of scale, pollution, higher transportation costs, elevated wages, and congestion) that raised the cost for firms of locating in the metropolitan area (Krugman and Livas 1996, Hanson 1998b, Mendoza Cota 2003).

Key Analytic Variables: Spatial Concentration of Manufacturing Employment, Demand-Market Proximity, and Globalization

To facilitate the understanding of the main results of my inferential analysis, I divide my discussion in the following manner. First, I discuss the results presented in Table 7.1 that address directly my primary research objectives, which are: (1) to investigate whether wage disparities across Mexico's urban areas might be explained by the localization and relative location patterns (with respect to foreign and domestic markets) of manufacturing employment, and (2) to investigate if and to what extent Mexico's rapid integration to global markets through trade liberalization and other globalization processes has contributed to expand or to contract the potential wage disparities associated with the location and localization of manufacturing employment across urban areas in the country. In this part, therefore, I look at the estimated coefficients in Table 7.1 that reflect the potential direct effects on the wages of male workers of (1) the spatial concentration of manufacturing employment disaggregated by subsector (as represented by the variables LnSCI1 through LnSCI6), and (2) the industrial concentration's—or, for that matter, the urban area's—proximity or accessibility to consumer demand markets, both foreign and domestic, (as represented by the variables Border, Ports, and Large Markets). In addition, I also look in this part at the estimated coefficients in Table 7.1 that reflect the differential effect of the afore-mentioned variables on the wages of male workers that is observed (3) between the periods before and after Mexico's rapid integration to global markets (as represented by the variables LnSCI1 through LnSCI6 interacted with the variable POST, and the variables Border, Ports, and Large Markets interacted also with the variable POST).

Second, I address the results presented in Table 7.1 that intend to analyze the potential effects on the wages of male workers that may be derived from relationships, if these exists, between the spatial concentration of employment in each of the different manufacturing subsectors in the analysis and each concentration's distance to possible demand markets (as represented in Table 7.1 by the estimated coefficients from the interactions of the variables LnSCI1 through LnSCI6 with the variables Border, Ports, and Large Markets). As mentioned earlier in Chapter 3, this is an empirical inquiry of the dissertation that the literature has not previously addressed. From the theory discussed in Chapter 2, however, we know that the location—or co-location—decision of firms is often in part based on the tangible benefits to the firms that may be derived from this decision, such as productivity advantages related to the colocation of firms in geographic space and cost advantages related to the proximity of the firms to their demand market, advantages which according to the available theoretical literature translate into wage benefits for workers. I argue in this study that a plausible interaction between both location-decision factors may exist if firms choose to co-locate in an urban area with not only substantial positive localization externalities but also geographical proximity to the demand market they serve. Wage effects from the interaction may, consequently, follow. In other words, distance to demand markets may serve as a moderating variable for localization externalities, and vice versa. For completeness, I also assess in this part the contribution of Mexico's rapid integration to global markets to the effect of the aforementioned relationships on the wages of male workers. Accordingly, I look at 3-way interactions between the variable POST, the variables LnSCI1 through LnSCI6, and the variables Border, Ports, and Large Markets.

<u>Direct Effects on the Wages of Male Workers</u>

Localization and Globalization

In general, the estimated results presented in Table 7.1 offer limited consistent evidence of localized wage effects for male workers from the concentration of manufacturing employment in an urban area when this employment is disaggregated by major manufacturing subsector. The estimated results instead appear to be highly sensitive to sample and model specification, so that evidence of the presence or absence of possible localized externalities associated with industrial concentrations is not consistently observed across analytic samples or across model specifications. As the literature indicates, these effects would suggest that the colocation in geographic space of firms and workers within the same manufacturing subsector generates externalities that affect worker productivity and wages. Similarly, the estimated results offer limited evidence that Mexico's rapid integration to global markets through trade liberalization and other globalization processes has had a consistent effect in contributing to generate any localization externalities (either positive or negative) from the spatial concentration of these employment groups; the results instead are also highly sensitive to sample and model specification.

Model 1 and Model 1-Int—the wage models that employ the short-run analytic sample—both report main-effect coefficients that are statistically insignificant for four out of the six manufacturing subsectors in the analysis—that is, for textiles, electronics, transportation equipment, and machinery manufacturing—which indicates that the concentration of workers from each of these industries within an urban area does not seem to generate neither positive nor negative net localization externalities that affect the wages of male workers, specifically manufacturing male workers in the urban area. The spatial concentration of workers in the food and chemicals manufacturing subsectors, on the other hand, do appear to generate externalities that affect directly the wages of male workers. Observe that each of the corresponding coefficients in Model 1 and Model 1-Int are statistically significant. Note that evidence of externalities generated by the spatial concentration of workers from the various manufacturing subsectors is determined by the statistical significance of the main-effect coefficients. In this manner, coefficients that are statistically insignificant suggest the absence of externalities from industrial localization, and coefficients that are statistically significant suggest instead the presence of externalities. The sign of the coefficients dictate whether the externalities are positive or negative and, therefore, whether the externalities from industrial concentration enhance or penalize the wages of workers, respectively.

Specifically, Model 1 reports possible negative localization externalities, or localization diseconomies, that suggest a wage-dampening effect of about 4 percent that is associated with a unit increase in an urban area's index of spatial concentration of food manufacturing employment (β=-0.0414, $p \leq 0.01$). The spatial concentration of chemical workers seems instead to generate, according to the corresponding coefficient in Model 1, possible positive localization externalities, or localization economies, that suggest a wage-enhancing effect of about 5 percent that is associated with a unit increase in an urban area's index of spatial concentration of chemical workers (β=-0.0530, $p \leq 0.01$). Note, however, that once I account in the wage model for the potential relationship between industrial concentration and market accessibility (i.e., Model 1-Int), the direction of each of the effects changes. The statistical significance of the main-effect coefficient related to the chemicals manufacturing subsector changes as well from the 1 percent to the 10 percent level of statistical significance. In the context of this interaction model, a unit increase in an urban area's index of spatial concentration of workers in food manufacturing seems to generate a wage-enhancing effect of about 11.6 percent for manufacturing male workers (β=0.1155, $p \leq 0.01$), and a unit increase in an urban area's index of spatial concentration of workers in chemicals manufacturing seems to generate a wage-dampening effect of about 3.6 percent for manufacturing male workers (β=-0.0364, $p \leq 0.10$).

Looking at the differential-effect coefficients in Model 1 and Model 1-Int, we observe that none of the coefficients, except that in Model 1 related to the spatial concentration of textile workers, is statistically significant. Let us remember that each of these differential-effect coefficients assesses whether the relationship between an industry's employment concentration in geographic space and the wages of male workers varies before and after the implementation of NAFTA, an event which in this study denotes the beginning of a period in Mexico's economic history of rapidly expanding trade liberalization and globalization processes that increase the presence of mechanisms of globalization across Mexico's urban areas. Hence, the results suggest, contrary to theoretical expectations, that Mexico's rapid integration to global markets through trade liberalization and other globalization processes has, in general, not influenced the capacity of industrial concentrations to generate positive externalities that may increase the productivity and wage level of urban male workers, especially those in manufacturing. By the same token, the results suggests that the wages of male workers have not been affected adversely by negative externalities generated by processes related to both industrial co-localization and globalization. The only exception observed, as mentioned, is that related to the spatial concentration of textile workers and its differential effect on male wages as Mexico's globalization process intensified. Indeed, the corresponding coefficient in Model 1 (β=-0.0139, $p \leq 0.05$) suggests wage-dampening externalities for male workers in the years following the implementation of NAFTA from the spatial concentration of textile workers. This result, however, is no longer observed once I account in Model 1-Int for the potential relationship between industrial concentration and market accessibility.

Among the main-effect results from the wage models that employ the short/long-run analytic sample, we observe evidence of localization externalities from the spatial concentration of workers in the food, textiles, and electronics manufacturing subsectors. Statistical significant main-effect coefficients are only observed, for the most part, in the models which do not account for the potential relationship between industrial concentration and market accessibility; that is, they are only observed in the results from Model 2 and Model 3. Model 2-Int, however, does show a statistically significant coefficient at the 10 percent level related to the spatial concentration of textile workers. According to the results in Model 2 and Model 3, the spatial concentration of either food or electronics manufacturing workers seems to generate localization diseconomies that appear to dampen the wage level of male workers. This is observed in the negative sign and statistically significance of the corresponding coefficients. Explicitly, the results indicate that a unit increase in an urban area's relative index of spatial concentration of food manufacturing workers has a negative effect on the hourly wages of male workers in the urban area that ranges between about 3.5 percent and 5 percent, depending on the sample (i.e., short-run in Model 2 or long-run in Model 3). The larger coefficient in Model 3 (β=-0.0480, $p \leq 0.01$) suggests a wage effect that increases with time as it refers to an average net effect over the long-run period 1992-2010 as opposed to an average net effect over the short-run period 1992-2002 in Model 2 (β=-0.0347, $p \leq 0.05$). Similarly, the results indicate that a unit increase in an urban area's relative index of spatial concentration of electronics manufacturing workers has a negative effect on the hourly wages of male workers in the urban area that ranges between about 1.6 percent and 2.2 percent, depending on the sample (i.e., short-run in Model 2 or long-run in Model 3). In this case, however, the smaller coefficient in Model 3 (β=-0.0159, $p \leq 0.05$) suggests a wage effect that decreases with time as it refers to an average net effect over the long-run period 1992-2010 as opposed to an average net effect over the short-run period 1992-2002 in Model 2 (β=-0.0220, $p \leq 0.01$). None of these wage effects is, as mentioned, observable in the interaction models (i.e., Model 2-Int and Model 3-Int).

The spatial concentration of textile manufacturing workers, on the contrary, seems to generate localization economies that enhance the wage level of male workers. Specifically, the main-effect results indicate that a unit increase in an urban area's relative index of spatial concentration of textile manufacturing workers has a negative effect on the hourly wages of male workers in the urban area that ranges between about 1.6 percent and 2.2 percent, depending on the sample (i.e., short-run in Model 2 or long-run in Model 3). In this case, however, the smaller coefficient in Model 3 (β=0.0144, $p \leq 0.05$) suggests a wage-enhancing effect that decreases with time as it refers to an average net effect over the long-run period 1992-2010 as opposed to an average net effect over the short-run period 1992-2002 in Model 2 (β=0.0269, $p \leq 0.01$). Interestingly, though, once I account for the potential relationship between industrial concentration and market accessibility, at least in Model 2-Int, the same coefficient indicates a shift in the direction of the effect on male wages, suggesting that an increase in an urban area's relative concentration of textile workers has instead a negative effect on the hourly wages of male workers in the urban area (β=-0.0641, $p \leq 0.10$). This effect is, however, only significant at the 10 percent level of statistical significance while the same coefficient in Model 3-Int is statistically insignificant.

The results in Model 2 and Model 3 further suggest wage effects related to the spatial concentration of textile and electronics workers—but not of food manufacturing workers—that varied as Mexico's globalization process intensified following the implementation of NAFTA. Indeed, the coefficients related to the spatial concentration of textile workers suggest that the wages of male workers have been affected unfavorably by negative externalities generated by processes related to both industrial co-localization of textile manufacturing firms and local globalization mechanisms, with this negative effect on wages increasing with time. Observe that the corresponding coefficient in Model 2 (β=-0.0244, $p \leq 0.01$) is negative and statistically significant at the 1 percent level of significance and the coefficient in Model 3 (β=-0.0259, $p \leq 0.01$) is not only similarly negative and statistically significant at the 1 percent level but somewhat larger to the coefficient in Model 2. As Mexico's globalization process intensified and the local presence of globalization mechanisms increased, therefore, the wage benefits from the co-localization of textile workers in geographic space that are observed in the corresponding main-effect coefficients appear to have diminished during the period 1994-2002 based on the results from Model 2 and nullified if we consider the larger sample period from which the results from Model 3 are based. In contrast, the wage penalty to local male workers associated with the increase in an urban area's relative concentration of employment in electronics manufacturing seems to have diminished during the period following the implementation of NAFTA, with wage benefits increasing with time. Observe that the corresponding coefficient in Model 2 (β=0.0199, $p \leq 0.05$) is positive and statistically significant at the 5 percent level of significance and the coefficient in Model 3 (β=0.0215, $p \leq 0.01$) is not only similarly positive and statistically significant at the 1 percent level but somewhat larger than the coefficient in Model 2. These results, consequently, show evidence of positive externalities associated with the byplay of processes related to both the localization of the electronics industry and globalization. Notably, none of the same coefficients in the interaction wage models using the short/long-run analytic sample are statistically significant.

Three more instances in the results from the wage models using the short/long-run analytic sample suggest evidence that trade liberalization and globalization processes in Mexico may have influenced the ability of industrial concentrations to generate localized externalities that affect the wages of male workers. Observe the differential-effect coefficients in Model 2 (β=-0.0103, $p \leq 0.10$) and Model 3 (β=-0.0100, $p \leq 0.05$) related to the spatial concentration of workers in transportation manufacturing; observe also the differential-effect coefficient in Model 2 (β=0.0215, $p \leq 0.05$) related to the spatial concentration of workers in chemical products manufacturing; finally, observe the coefficient in Model 3 (β=-0.0233, $p \leq 0.10$) related to the spatial concentration of workers in the machinery manufacturing subsector. These results suggest that the rapidly expanding presence of globalization mechanisms in the country after the year 1994 allowed for wage-dampening, negative externalities to develop from the spatial concentration of workers in the transportation and the machinery manufacturing subsectors, with the externalities related to the transportation manufacturing subsector being observed consistently throughout the 1990s and 2000s decades while those related to the machinery manufacturing subsector are observed only throughout the 2000s decade. Contrary to these, the rapidly expanding presence of globalization mechanisms in the country after 1994 allowed instead for wage-enhancing, positive externalities to develop from the spatial concentration of workers in the chemical products manufacturing subsector, with evidence of these externalities observed only during the period 1994-2002 but not when considering the period 1994-2010. As is often observed in the results, none of this evidence is observed in the interaction wage models but rather only in the results from Model 2 and Model 3, which suggests that these externalities might in fact be related to the potential relationship between market accessibility and industrial concentration.

Overall, the results suggest that the spatial concentration of manufacturing activity across Mexico's urban landscape, when one groups this activity by major manufacturing subsector and observes each industrial concentration separately, does not yield typically or consistently localization externalities, neither positive nor negative, that affect the wage-level of male workers as results are largely not consistent across model specifications and samples. Any observed localized externalities in my results appear to be related to the interrelation of the location and co-location decisions of manufacturing firms across geographic space rather than simply to their spatial concentration given that the observed externalities tend to dissipate or change once this seemingly complex relationship is accounted for. In this manner, results suggest that localized male-specific wage externalities from the spatial concentration of some manufacturing activity may exist but only in urban areas in Mexico where market accessibility plays a role in their industrial development.

The results further suggest that Mexico's rapid integration to global markets through trade liberalization and other globalization processes has not influenced *directly* the capacity of industrial concentrations to generate localized externalities that affect the wage level of male workers. Any observed effect of globalization on this capacity would appear to be related, as in my earlier observation, to the complex interrelation of the location and co-location decisions of manufacturing firms across geographic space rather than simply to their spatial concentration. In this manner, results suggest that globalization may have contributed to generate some localized male-specific wage externalities from the spatial concentration of some manufacturing activity but, as mentioned earlier, only in urban areas in Mexico where market accessibility plays a role in their industrial development. These possible interaction effects are discussed later on.

I find important to note that the absence or presence of wage effects from localization in this study do not necessarily speak to the absence or presence of productivity effects from localization given that my general wage equation does not account, because of data limitations, for some characteristics of a worker's firm of employment or for some local market conditions that also play a role in determining the productivity level of workers, such as a firm's level of capital input or the level of competiveness of the market where the firm operates. It is in light of this caveat that my conclusions speak, therefore, about wages not about productivity and relate only to the question of whether the spatial concentration of manufacturing activity yields localized externalities that affect directly the wage level of local workers and that thus contribute to wage disparities across geographic space. In general, we can observe, therefore, that the spatial concentration of manufacturing activity across Mexico's urban landscape, when one groups this activity by major manufacturing subsector and observes each industrial concentration separately, has not contributed *directly* to narrow or to widen male wage disparities across urban areas in the country in either the immediate years before NAFTA was implemented or as Mexico's globalization process accelerated in the subsequent decades.

Location and Globalization

I shift now my discussion to the analysis of the effects on male wages associated with an urban area's accessibility or proximity to foreign and domestic demand markets. The estimated main wage effect of proximity to large markets across all six models suggests that an urban area's geographic proximity to a significantly large domestic market—this being either Mexico City, Guadalajara, or Monterrey, whichever is nearest to the urban area—does not influence in general the wages of urban male workers in Mexico, particularly those in manufacturing, regardless of model specification or analytic sample. However, there is evidence to suggest that the wages of male workers in cities that are relatively closer to large domestic markets may have decreased as Mexico's globalization process intensified following the implementation of NAFTA. Observe in Model 1 and Model 1-Int the differential wage effect of proximity to large markets for the period following NAFTA; the coefficients are both positive and somewhat statistically significant, although small in magnitude, suggesting that the effect of an urban area's proximity to large markets on male wages differs quantitatively, ceteris paribus, between the 1992-1993 and the 1994-2002 periods, with male wages increasing by 0.01 percent per every extra kilometer away from the nearest large domestic market in the period following the implementation of NAFTA. In other words, as Mexico's globalization process intensified, male wages seem to have increased in urban areas relatively farther away from large domestic markets and decreased in urban areas relatively close to large domestic markets. This result is net of urbanization effects, such as congestion.

Notably, this result is not observed in the models using the short/long-run analytic sample. However, the result observed in Model 1 and Model 1-Int is consistent with my theoretical discussion in Chapter 2 and analytical discussion in Chapter 5. From Chapter 5, we know that the onset of Mexico's trade liberalization and globalization processes contributed to the transitioning of the manufacturing sector in general from a domestic-oriented to an export-oriented industry. This transitioning would have not only meant higher costs of production for firms located relatively closer to a domestic demand market but farther away from a new foreign demand market because of the naturally higher costs to transport its manufactured goods to the new market, but would accordingly have meant as well lower wages for these firms' workers. On this, the theory presented in Chapter 2 tells us that wages will be relatively low in regions with relatively high transport costs to markets and high in regions with relatively low transport costs to markets (Hanson 1998a), which is consistent with the afore-mentioned result. Let us not forget, however, that while Mexico City, Guadalajara, and their surrounding satellite urban areas might be located relatively far away from, say, the U.S. market, if we consider their geographic distance by land, the metropolitan area of Monterrey and nearby urban areas are not. Yet, it is possible for firms in urban areas around and in Monterrey—as well as those around or in Guadalajara or Mexico City—to have transitioned their domestic-oriented production to export-oriented production destined to foreign markets other than the United States or even to have transitioned its production to exports goods that necessitate transport other than by land, which would then explain higher transportation costs to market as Mexico's globalization process intensified.

The estimated impact of distance to the nearest U.S.-Mexico border crossing indicates a plausible wage-enhancing effect related to the proximity of an urban area to an access point to foreign markets—or, in other words, an urban area's proximity to the U.S. demand market. Based on these estimates, male wages decrease between about 0.01 and 0.02 percent, depending on the model and analytic sample, for every extra kilometer of distance away from a U.S.-Mexico border-crossing port. The results, however, are only statistically significant in the models that exclude key interaction terms—that is, only in Model 1, Model 2, and Model 3—suggesting that any potential wage-enhancing effect that is seemingly related to an urban area's proximity to the U.S. market may in fact be accounted for by the potential relationship between an urban area's level of concentration of manufacturing employment and its accessibility or proximity to the U.S. market. Nevertheless, the results observed in Model 1, Model 2, and Model 3 are consistent with theories of market accessibility and globalization externalities. Theory on market accessibility suggests wages to be higher in urban areas with close geographic proximity to the U.S. market because of lower transportation costs to market even before the implementation of NAFTA given that, as mentioned throughout this dissertation, Mexico's trade liberalization process started earlier with the signing of the GATT in the mid-1980s. This result would also be expected following the existing theory on globalization externalities, which observes that the mechanisms by which a geographical area is exposed and integrated to global processes may generate space-based externalities that could conceivably influence the productivity of firms and, therefore also, the wages of workers in a region.

If these theories are correct, one would also expect for wages to increase further after the implementation of NAFTA. And indeed, the results indicate, as expected, that the wages of male workers in cities that are relatively closer to a U.S.-Mexico border-crossing port may have increased as Mexico's globalization process intensified in the years following the implementation of NAFTA. Observe the corresponding coefficients in Model 1, Model 1-Int, Model 2-Int, and Model 3-Int. The results for the models using the short-run analytic sample, for instance, are not sensitive to model specification and indicate a highly statistical significant and negative effect on wages—at either the 5 percent level of statistical significance for the coefficient in Model 1 or at the 1 percent level for the coefficient in Model 1-Int. The coefficients suggest, as would be expected, that male wages in urban areas with close geographic proximity to a U.S.-Mexico border-crossing land port increased during the period 1994-2002 relative to the period 1992-1993. Specifically, this result suggests that male wages decreased by an additional 0.01 percent with every extra kilometer away from a U.S.-Mexico border-crossing port in the period following the implementation of NAFTA. Similar negative coefficients are observed in the models using the short/long-run analytic sample, but only in the interaction models (i.e., Model 2-Int and Model 3-Int). Notably, the coefficient in Model 3-Int is smaller and less statistically significant than that in Model 2-Int, which suggests that the benefit of proximity to the U.S. market may be decaying with time, at least within a specific sample of urban areas—a result which would be consistent with the idea that economies of transportation increase with the quality and quantity of transportation corridors, thereby, making proximity to market less relevant to firms.

Lastly, there is evidence in the results to suggest that an urban area's accessibility to foreign markets through maritime ports may be an important determinant of male wages. There is also, moreover, evidence in the results to suggest that the effect on male wages of an urban area's accessibility to foreign markets through maritime ports may have changed over time. Observe the main-effect coefficients in Model 1 and Model 1-Int for the variable urban area's differential distance between the nearest principal Gulf Coast port and the nearest principal Pacific Coast port; the high statistical significance of both coefficients suggests that an urban area's relative distance to a maritime port matters to the wage determination process of male workers in the urban area. Specifically and within the context of this complex variable, the result suggests that, everything else equal, every extra kilometer away from a principal maritime port on the Pacific Coast relative to one on the Gulf Coast decreases male wages on average by 0.02 percent. Notably, Model 2-Int (β=-0.0003, $p \leq 0.05$) and Model 3-Int (β=-0.0002, $p \leq 0.10$) offer similar results to Model 1-Int, while Model 2 and Model 3 report coefficients that are statistically insignificant.

As mentioned, the results observed also suggest that the effect on male wages of an urban area's accessibility to foreign markets through maritime ports may have changed over time. Indeed, the coefficients measuring the differential effect on wages between the 1992-1993 period and the 1994-2002 period in Model 1 and Model 1-Int indicate not only a statistically significant differential effect at the 5 percent level of significance but also one in the opposite direction of the main effect discussed in the previous paragraph. The estimated coefficients, therefore, suggest that, compared to the 1992-1993 period, male wages during the 1994-2002 period decreased by 0.01 percent for every extra kilometer away from a principal maritime port in the Gulf Coast relative to one in the Pacific Coast.

Taken together, the main and differential effects suggest not only that an urban area's relative distance to a principal maritime port is an important determinant of the wages of male workers, but also that the wages of male workers are higher the closer an urban area is to maritime ports in the Pacific Coast. However, the results additionally suggest that whereas proximity or accessibility to maritime ports in the Pacific Coast is an important determinant of higher male wages, this has changed somewhat with globalization. As Mexico's globalization process intensified in the years following the implementation of NAFTA, male wages in urban areas with close proximity to maritime ports in the Gulf Coast would appear to have increased, suggesting a rise in the relevance of maritime ports in the Gulf Coast to manufacturing activity in Mexico. Markedly, Model 2 and Model 3 offer the same results observed in Model 1, while Model 2-Int and Model 3-Int report coefficients that are statistically insignificant.

Overall, the results on market proximity or accessibility largely suggest that in Mexico an urban area's relative location to the foreign consumer markets its industries serve is an important determinant of the wage level of its male labor force and, therefore, needs to be considered a source of interurban wage disparities for male workers in the country. The results also seem to suggest that physical distance to land ports, but not maritime ports, is still relevant to the location decisions of manufacturing firms even in the presence of significant improvements in transportation infrastructure and logistic services—all known to have occurred in Mexico over the last few decades and which would be expected to decrease the time and economic costs of transporting goods to market over a larger distance. In light of this, male workers and manufacturing firms in Mexico in urban areas located farther away from land ports of international trade would appear to be at an economic disadvantage relative to those in urban areas located closer in distance.

Moderating (Interaction) Effects on the Wages of Male Workers

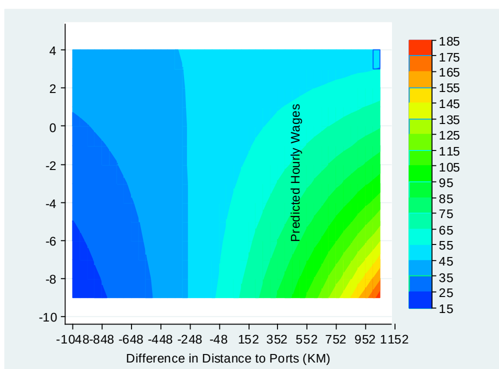
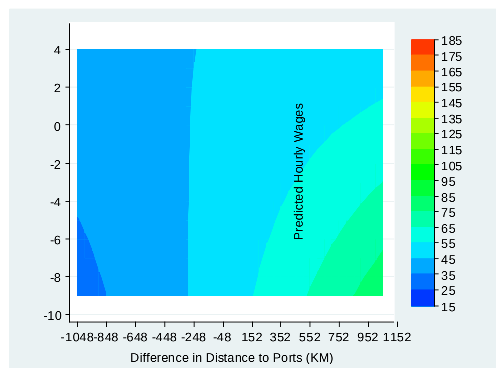
From my discussion in the previous section, it is evident that the results of my analysis for male workers are highly sensitive to model specification; that is, the results often vary when I compare those from the male wage models that do not account for the potential relationship between industrial concentration and market accessibility (i.e., Model 1, Model 2, and Model 3) to those that do (i.e., Model 1-Int, Model 2-Int, and Model 3-Int). The implications of this variation are threefold: first, that there may in fact exist a relationship between a firm's decision to co-locate in geographic space with similar firms and the proximity of the firm's chosen location to its demand markets; second, that externalities associated with the co-location decision of similar firms vary in relation to the relative location of firms to their demand markets; and third, that male workers' productivity and wage levels vary in relation not only to this complex decision process of firms but also to the resulting externality-generating process. Because of the nature of my study, another more complex implication emerges, that the increasing presence of globalization mechanisms in the country that may be directly attributed to Mexico's rapidly expanding trade liberalization and globalization policies influences also these processes.

Given the exploratory nature of this part of my analysis as well as the typical complexity that arises in interpreting coefficients that result from the interaction of two continuous variables or from three-way interactions, I focus the following discussion on results that I consider most noteworthy while I do make a mention briefly of other results. To facilitate the interpretation of some of the results, I calculate and graph marginal effects. Note that evidence that a relationship between an urban area's relative employment concentration in a specific manufacturing subsector and an urban area's accessibility to demand markets exists and that this relationship has in fact an effect on the wages of male workers is supported by the strength of the interaction coefficients. Substantively, the statistical significance of the coefficients indicates that the hourly wages of local male workers is conditional on an urban area's relative concentration of workers in a specific manufacturing subsector and the urban area's accessibility to demand markets.

There are three cases in Table 7.1 where the interaction coefficients are consistently significant across all of the male wage models: (1) the coefficients related to the interaction between an urban area's index of spatial concentration of employment in transportation equipment manufacturing and an urban area's differential distance to maritime ports (i.e., Model 1-Int: β=-0.0000, $p \leq 0.01$; Model 2-Int: β=-0.0001, $p \leq 0.01$; Model 3-Int: β=-0.0001, $p \leq 0.01$), (2) the coefficients related to the interaction between an urban area's index of spatial concentration of employment in chemicals manufacturing and an urban area's differential distance to maritime ports (Model 1-Int: β=-0.0001, $p \leq 0.01$; Model 2-Int: β=-0.0001, $p \leq 0.10$; Model 3-Int: β=-0.0001, $p \leq 0.01$), and (3) the coefficients related to the three-way interaction between an urban area's index of spatial concentration of employment in chemicals manufacturing, an urban area's differential distance to maritime ports, and the indicator variable that identifies the period following the implementation of NAFTA which is characterized by an increasing presence of mechanisms of globalization in the country (Model 1-Int: β=0.0000, $p \leq 0.01$; Model 2-Int: β=0.0001, $p \leq 0.05$; Model 3-Int: β=0.0001, $p \leq 0.01$).

The relative importance of the relationship between proximity to a major maritime port and the spatial concentration of employment in the chemical products manufacturing sector to the wage level of local male workers is evident in the afore-mentioned results as indicated by the statistical significance of the corresponding interaction coefficients. Likewise, a wage effect for male workers that changes with the intensification of Mexico's globalization process is also evident. A graph of marginal effects describing the direction of the estimated effect everything else considered, see Figure 7.1, shows that during Mexico's early globalization period (1992-1993) the wages of male workers were seemingly higher in urban areas with relative proximity to a major Pacific Coast maritime port—represented by positive distances in Figure 7.1—compared to a major Gulf Coast maritime port—represented by negative distances in Figure 7.1—at every level of spatial concentration of the industry. In other words, wages were higher in urban areas located closer to a major Pacific Coast maritime port than to a Gulf Coast maritime port regardless of the level of spatial concentration of employment in the chemical products manufacturing sector.

Figure 7.1: Interaction Effects on the Wages of Male Workers

<table>
<tr><th></th><th>Early Globalization Period</th><th>Accelerated Globalization Period</th></tr>
<tr><td>Chemical Products Mfg.</td><td>
</td><td>
</td></tr>
</table>

Note: Marginal effects and predicted hourly wages were calculated using the results from Model 1-Int. A similar pattern is observed in the results from Model 2-Int and Model 3-Int.

While the spatial concentration of employment in the chemicals subsector seems to play a role in how the relative proximity to maritime ports affects the wages of male workers across urban areas in Mexico, the type of role is not the one expected. One would expect for higher concentrations of employment in general to yield higher wages for male workers regardless of the coast the most proximal maritime port is located at, but that is not the case here. The results point instead to inverse localization externalities associated with the spatial concentration of the chemicals manufacturing industry between urban areas with geographic proximity to a major maritime port in the Pacific Coast and urban areas with geographic proximity to a major maritime port in the Gulf Coast. Specifically, negative localization externalities are observed for male workers in urban areas with the closest relative geographic proximity to a major maritime port in the Pacific Coast, and positive localization externalities are observed for male workers in urban areas with the closest relative geographic proximity to a major maritime port in the Gulf Coast. The effect of these conditional externalities converges with equidistance to major maritime ports in opposite sea coasts as well as with higher levels of spatial concentration.

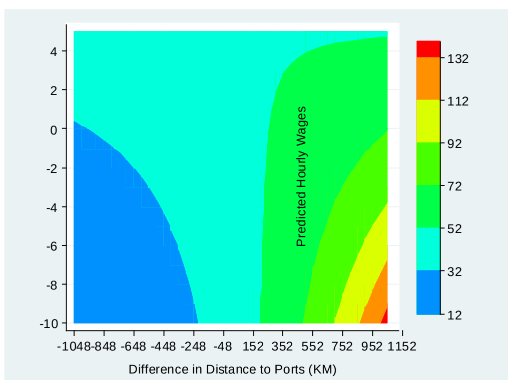
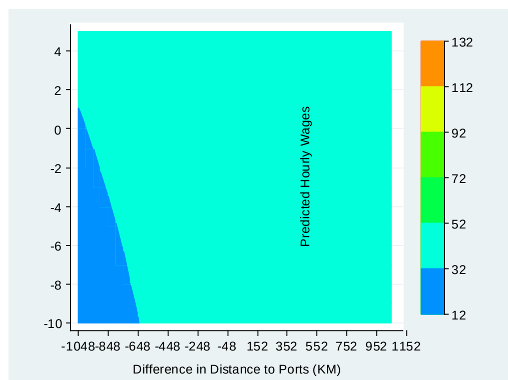
As globalization intensified, Figure 7.1 tells us that the interurban male wage disparity associated with the relationship between proximity to a major maritime port and the spatial concentration of employment in the chemical products manufacturing subsector narrowed, with some urban areas and their male workers gaining an economic advantage, others losing it, and still with others not being affected. Wages decreased in urban areas with relative proximity to maritime ports in the Pacific Coast; wages increased in urban areas with relative proximity to maritime ports in the Gulf Coast; and nothing largely changed in urban areas equidistant to maritime ports in either coast as well as with higher levels of spatial concentration of employment in the industry.

I conduct the same graphic exercise as the afore-presented one related to the spatial concentration of the chemicals manufacturing sector but for the transportation equipment manufacturing sector. The relative importance of the relationship between proximity to a major maritime port and the spatial concentration of employment in the transportation equipment manufacturing sector to the wage level of local male workers is evident in the results as indicated by the statistical significance of the corresponding interaction coefficients. What is not that evident, contrary to the results for the chemicals manufacturing sector, is the effect that globalization may have had on this relationship and its effect on male wages. The coefficient in Model 1-Int does not show an effect from globalization, yet the coefficients in Model 2-Int and Model 3-Int do. I present below a graphic analysis of marginal effects using the results from Model 2-Int for the case where an effect is observed, with the caveat that this effect is only observed for the sample of urban areas included in the short/long-run analytic sample.

Figure 7.2 shows that during Mexico's early globalization period (1992-1993), the wages of male workers were seemingly higher in urban areas with relative proximity to a major Pacific Coast maritime port—represented by positive distances in Figure 7.2—compared to a major Gulf Coast maritime port—represented by negative distances in Figure 7.2—at every level of spatial concentration of the industry, except for the urban areas with the highest level of spatial concentration where male wages were similar to others in close proximity to a major Gulf Coast maritime port or equidistant to major maritime ports in either sea coast. Similar to the earlier case of the chemicals manufacturing sector, while the spatial concentration of employment in the transportation subsector seems to play a role in how the relative proximity to maritime ports affects the wages of male workers across urban areas in Mexico, the type of role is not the one expected. As mentioned earlier, one would expect for higher concentrations of employment in general to yield higher wages for male workers regardless of the coast the most proximal maritime port is located at, but that is not the case here. The results point instead to inverse localization externalities associated with lower levels of industrial concentration between urban areas with geographic proximity to a major maritime port in the Pacific Coast and urban areas with geographic proximity to a major maritime port in the Gulf Coast. Specifically, negative localization externalities are observed for male workers in urban areas with the closest relative geographic proximity to a major maritime port in the Pacific Coast, and positive localization externalities are observed for male workers in urban areas with the closest relative geographic proximity to a major maritime port in the Gulf Coast. And the effect from each of these conditional externalities appears to converge with equidistance to major maritime ports in opposite sea coasts as well as with higher levels of spatial concentration of employment in the industry. Compared to the results observed from the spatial concentration of the chemicals manufacturing industry, the wage distribution observed in the results related to the transportation industry is narrower.

As globalization intensified (1994-2002), Figure 7.2 tells us that the interurban male wage disparity associated with the relationship between proximity to a major maritime port and the spatial concentration of employment in the transportation equipment manufacturing subsector may have narrowed significantly, almost to the point where male wages converged along the urban landscape except in urban areas with the closest proximity to a major maritime port in the Gulf Coast. While not represented in Figure 7.2., results from Model 3-Int indicate that this observed pattern still holds when the period of analysis extends to the year 2010.

Figure 7.2: Interaction Effects on the Wages of Male Workers

	Early Globalization Period	**Accelerated Globalization Period**
Transportation Equipment Mfg.		

Note: Marginal effects and predicted hourly wages were calculated using the results from Model 2-Int. A similar pattern is observed in the results from Model 3-Int.

Other evidence that a relationship between an urban area's relative employment concentration in a specific manufacturing subsector and an urban area's accessibility to demand markets exists and that this relationship has in fact an effect on the wages of male workers are observed for the following interaction relationships. It is my view that these statistically-significant relationships speak to the importance of market accessibility and the medium of accessibility (i.e., land ports versus maritime ports) to the colocation decision of firms in each manufacturing subsector. From Model 1-Int: the spatial concentration of employment in food manufacturing with distance to a U.S.-Mexico border crossing (β=-0.0002, $p \leq 0.01$) as well as with differential distance to maritime ports (β=0.0001, $p \leq 0.10$); the spatial concentration of employment in chemicals manufacturing with distance to the nearest large market (β=0.0001, $p \leq 0.05$); the spatial concentration of employment in electronics manufacturing with distance to a U.S.-Mexico border crossing (β=-0.0000, $p \leq 0.05$) as well as with differential distance to maritime ports (0.0000, $p \leq 0.01$); the spatial concentration of employment in transportation equipment manufacturing with differential distance to maritime ports (β=-0.0000, $p \leq 0.01$); and, the spatial concentration of employment in machinery manufacturing with distance to a U.S.-Mexico border crossing (β=0.0001, $p \leq 0.01$). From Model 3-Int: the spatial concentration of employment in transportation equipment manufacturing with distance to the nearest large market (β=-0.0001, $p \leq 0.01$); the spatial concentration of employment in machinery manufacturing with distance to a U.S.-Mexico border crossing (β=0.0002, $p \leq 0.01$); and, the spatial concentration of employment in electronics manufacturing with differential distance to maritime ports (β=0.0001, $p \leq 0.05$).

In addition, evidence that the nature and effects of the relationship between industrial concentration and market accessibility may have varied over time as Mexico's trade liberalization and globalization processes expanded are observed for several interaction relationships. In my view, these results suggest that there is indeed a three-way interaction affecting the wages of male workers between the colocation decision of firms in each manufacturing subsector, an urban area's accessibility to demand markets and the medium of accessibility (i.e., land ports versus maritime ports), and globalization processes or mechanisms. For simplicity, I do not explicitly write in each of the following relationships the indicator variable POST, which is the third element of the three-way interaction between industrial concentration, market accessibility, and Mexico's period of expanding globalization processes and mechanisms. From Model 1-Int: the spatial concentration of employment in food manufacturing with distance to the nearest large market (β=-0.0001, $p\leq0.05$) and with distance to a U.S.-Mexico border crossing (β=0.0001, $p\leq0.01$); the spatial concentration of employment in textiles manufacturing with distance to the nearest large market (β=0.0001, $p\leq0.01$); the spatial concentration of employment in electronics manufacturing with distance to a U.S.-Mexico border crossing (β=0.0000, $p\leq0.05$); the spatial concentration of employment in transportation equipment manufacturing with distance to the nearest large market (β=-0.0001, $p\leq0.01$); and, the spatial concentration of employment in machinery manufacturing with distance to a U.S.-Mexico border crossing (β=-0.0000, $p\leq0.05$). From Model 2-Int: the spatial concentration of employment in transportation equipment manufacturing with differential distance to maritime ports (β=0.0001, $p\leq0.05$). From Model 3-Int: the spatial concentration of employment in transportation equipment manufacturing with distance to the nearest large market (β=0.0000, $p\leq0.05$) as well as with differential distance to maritime ports (β=0.0001, $p\leq0.01$); and the spatial concentration of employment in machinery manufacturing with distance to a U.S.-Mexico border crossing (β=-0.0002, $p\leq0.05$).

Overall, the results offer evidence to suggest that the wage level of male workers across urban areas in Mexico is in some cases the result of joint processes related to the location and co-location (localization) decisions of manufacturing firms. In other words, the results point to a relationship between industrial concentration and market accessibility and a wage effect from this relationship. In a sense, the results also point to the importance of the medium of accessibility (i.e., land ports versus maritime ports) to the location and co-location decisions of manufacturing firms. Two important examples observed and that I have discussed here relate to the wage effects associated with the decision of chemicals products and transportation equipment manufacturing firms to locate and co-locate with close geographic proximity to maritime ports of international trade. For these cases and others, the results further offer some evidence that globalization may play a role in the wage determination process of male workers when the urban wage level is the result of both the location and co-location (localization) decisions of manufacturing firms. For the case of the transportation equipment and chemicals products manufacturing subsectors, globalization appears to have contributed to a narrowing of the wage distribution across urban areas in the country but with very few urban areas and male workers gaining an economic advantage beyond employment itself.

Urban Areas, Wages, and Female Workers

The following section discusses the estimation results for female workers which are presented in Table 7.2.

Table 7.2: Analytic Model Results for Female Workers

Independent Variable: Ln of Real Hourly Wages	Short-Run Analytic Sample		Short/Long-Run Analytic Sample			
	Short-Run (Pre: 1992-1993 / Post: 1994-2002)		Short-Run (Pre: 1992-1993 / Post: 1994-2002)		Long-Run (Pre: 1992-1993 / Post: 1994-2010)	
	Model 1	**Model 1 -Int**	**Model 2**	**Model 2-Int**	**Model 3**	**Model 3-Int**
Individual Characteristics						
High School Degree	0.2239***	0.2229***	0.2400***	0.2396***	0.1966***	0.1957***
	(0.031)	(0.031)	(0.035)	(0.035)	(0.021)	(0.021)
Some College or Technical Education	0.2374***	0.2381***	0.2413***	0.2421***	0.2555***	0.2544***
	(0.032)	(0.032)	(0.037)	(0.037)	(0.028)	(0.028)
Technical or Vocational Education	0.2041***	0.2039***	0.2058***	0.2052***	0.2094***	0.2087***
	(0.015)	(0.015)	(0.017)	(0.017)	(0.017)	(0.017)
College Degree	0.9174***	0.9168***	0.9326***	0.9316***	0.8940***	0.8931***
	(0.034)	(0.034)	(0.037)	(0.037)	(0.027)	(0.027)
Potential Experience	0.0121***	0.0122***	0.0124***	0.0124***	0.0127***	0.0126***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)
Potential Experience Squared	-0.0002***	-0.0002***	-0.0002***	-0.0002***	-0.0002***	-0.0002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Marital Status (Married or In Civil Union)	0.0594***	0.0599***	0.0675***	0.0671***	0.0577***	0.0571***
	(0.009)	(0.009)	(0.011)	(0.011)	(0.009)	(0.009)
Head of Household	0.0790***	0.0780***	0.0835***	0.0822***	0.0510***	0.0504***
	(0.012)	(0.012)	(0.015)	(0.015)	(0.012)	(0.012)
Migration Status (Recent Inmigrant)	-0.0862	-0.0901*	-0.0623	-0.0726	0.0498	0.0469
	(0.052)	(0.052)	(0.082)	(0.082)	(0.061)	(0.061)
Occupation: Professional/Technical	0.4099***	0.4103***	0.4053***	0.4064***	0.3838***	0.3848***
	(0.022)	(0.022)	(0.024)	(0.024)	(0.019)	(0.019)
Occupation: Service/Sales	-0.0039	-0.0045	-0.0039	-0.0044	0.0332*	0.0329*
	(0.016)	(0.016)	(0.017)	(0.017)	(0.019)	(0.019)
Occupation: Managerial/Administrative	0.3537***	0.3538***	0.3664***	0.3671***	0.3322***	0.3324***
	(0.013)	(0.013)	(0.015)	(0.015)	(0.012)	(0.012)
Firm-of-Employment Characteristics						
Size of Firm of Work: Micro and Small	-0.1687***	-0.1709***	-0.1739***	-0.1752***	-0.1355***	-0.1356***
	(0.010)	(0.009)	(0.009)	(0.009)	(0.010)	(0.010)
Size of Firm of Work: Medium	-0.0929***	-0.0954***	-0.0958***	-0.0968***	-0.0827***	-0.0826***
	(0.008)	(0.007)	(0.008)	(0.008)	(0.008)	(0.008)
Industry: Food & Beverages Mfg	-0.0305**	-0.0311**	-0.0337**	-0.0336**	-0.0139	-0.0139
	(0.015)	(0.015)	(0.016)	(0.016)	(0.014)	(0.014)
Industry: Electronics & Communication Mfg	0.0077	0.0065	-0.001	-0.003	-0.0164	-0.0173*
	(0.010)	(0.010)	(0.011)	(0.011)	(0.010)	(0.010)
Industry: Transportation Mfg	0.0229	0.0250*	0.0124	0.0137	0.0223*	0.0222*
	(0.014)	(0.014)	(0.018)	(0.018)	(0.013)	(0.013)
Industry: Machinery & Metallic Products Mfg	0.0203	0.0204	0.014	0.0141	-0.0002	0.0007
	(0.013)	(0.013)	(0.014)	(0.014)	(0.014)	(0.014)
Industry: Chemicals & Minerals Mfg	0.0393**	0.0393**	0.0327*	0.0323*	0.0115	0.0119
	(0.016)	(0.016)	(0.017)	(0.017)	(0.014)	(0.013)
% of College-Educated (Industry/Gender)	0.1166*	0.1082*	0.1171	0.1158	0.1766***	0.1626***
	(0.067)	(0.064)	(0.073)	(0.073)	(0.052)	(0.052)

Continued

Table 7.2 (Continued): Analytic Model Results for Female Workers

Independent Variable: Ln of Real Hourly Wages	Short-Run Analytic Sample: *Short-Run* (Pre: 1992-1993 / Post: 1994-2002)		Short/Long-Run Analytic Sample: *Short-Run* (Pre: 1992-1993 / Post: 1994-2002)		Short/Long-Run Analytic Sample: *Long-Run* (Pre: 1992-1993 / Post: 1994-2010)	
	Model 1	**Model 1 -Int**	**Model 2**	**Model 2-Int**	**Model 3**	**Model 3-Int**
Urban -Area Characteristics						
Unemployment Rate (Gender)	0.1808	0.3117	0.3088	0.4208	-0.0371	-0.1641
	(0.262)	(0.243)	(0.278)	(0.282)	(0.231)	(0.235)
Average Years of Education	0.0312**	0.0307*	0.02	-0.0053	0.0147	0.011
	(0.015)	(0.017)	(0.019)	(0.020)	(0.016)	(0.018)
% of Manufacturing Employment in 1970	0.5190***	1.0546***	1.1500***	1.6896***	0.8780***	1.3227***
	(0.172)	(0.217)	(0.243)	(0.286)	(0.218)	(0.248)
Pairwise Coagglomeration Index 1/2	11.1527***	7.8868	-4.0323	11.9947*	-2.8333	3.2852
	(4.232)	(4.916)	(6.159)	(7.092)	(4.027)	(4.905)
Pairwise Coagglomeration Index 1/3	-2.6092	1.7575	-2.2033	-21.354	1.0175	-26.3405***
	(4.637)	(7.798)	(5.872)	(15.906)	(4.554)	(8.646)
Pairwise Coagglomeration Index 1/4	5.3297	3.8126	-1.654	-1.9396	4.3411	10.1570*
	(5.418)	(5.067)	(6.415)	(6.539)	(4.244)	(5.457)
Pairwise Coagglomeration Index 1/5	-13.2136**	-16.6913**	-0.6667	-6.3201	-10.7754*	-0.981
	(6.550)	(8.341)	(9.480)	(12.163)	(6.177)	(7.950)
Pairwise Coagglomeration Index 1/6	3.4532	12.0231**	16.9584***	26.5882***	4.4179	6.4487
	(5.921)	(5.926)	(6.516)	(9.193)	(5.017)	(6.736)
Pairwise Coagglomeration Index 2/3	-11.2463***	-3.2736	-1.1068	1.5487	2.9078	2.2413
	(3.195)	(3.659)	(4.840)	(6.888)	(3.502)	(5.227)
Pairwise Coagglomeration Index 2/4	6.0811***	-4.0473	8.2102***	-3.2896	2.9969	-0.5679
	(2.222)	(2.777)	(2.527)	(3.593)	(1.973)	(2.399)
Pairwise Coagglomeration Index 2/5	-9.8644***	-9.2368**	-0.2451	-3.7205	0.7983	-0.5748
	(3.448)	(3.576)	(8.530)	(9.052)	(4.315)	(5.558)
Pairwise Coagglomeration Index 2/6	-3.2874	1.1807	-10.5684**	-6.4165	1.6599	3.6679
	(4.616)	(4.847)	(4.827)	(5.059)	(3.412)	(3.888)
Pairwise Coagglomeration Index 3/4	6.4461***	9.9970***	3.4551	17.8583***	-2.588	5.5616
	(0.857)	(1.472)	(2.569)	(4.113)	(2.293)	(3.551)
Pairwise Coagglomeration Index 3/5	1.2857	7.1659	-2.5264	8.8106	2.6039	10.4231*
	(4.208)	(5.466)	(4.986)	(10.052)	(3.182)	(5.305)
Pairwise Coagglomeration Index 3/6	13.5904***	-0.5802	11.3714**	-6.2174	5.2761	12.9250**
	(3.696)	(6.402)	(5.040)	(12.726)	(3.208)	(6.081)
Pairwise Coagglomeration Index 4/5	4.131	2.3497	-0.1446	-1.9957	0.1027	-5.7263*
	(2.957)	(3.442)	(3.343)	(6.280)	(2.483)	(3.438)
Pairwise Coagglomeration Index 4/6	-4.3774	-1.1587	9.3191	3.1035	1.6788	-1.4461
	(5.563)	(5.392)	(5.978)	(7.098)	(3.109)	(3.878)
Pairwise Coagglomeration Index 5/6	-6.8428	-10.0817	-26.1180***	-17.8614	-11.1436	-18.4524**
	(8.200)	(9.095)	(9.908)	(13.885)	(7.220)	(8.103)
Ln of Population	-0.0587***	-0.0281	-0.0533***	0.0742**	-0.0401***	-0.0008
	(0.017)	(0.020)	(0.019)	(0.032)	(0.014)	(0.019)
Key Analytic Variables						
Distance to Large Markets	-0.0001*	-0.0001*	0.0001	0.0009***	0.0001	0.0002
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Dist. to US-Mexico Border Crossing	-0.0001*	0.0000	-0.0001**	0.0007***	-0.0001**	0.0004**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Diff. in Dist. to Gulf and Pacific Ports	0.0001***	0.0002***	0.0002***	0.0006***	0.0002***	0.0003
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Large Markets X POST	0.0001***	0.0002***	-0.0000	-0.0008***	-0.0000	-0.0002
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Border X POST	-0.0000	-0.0001	0.0000	-0.0008***	0.0000	-0.0006***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Ports X POST	-0.0000	-0.0001**	-0.0001*	-0.0004**	-0.0001**	-0.0002
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

Continued

Table 7.2 (Continued): Analytic Model Results for Female Workers

Independent Variable: Ln of Real Hourly Wages	Short-Run Analytic Sample		Short/Long-Run Analytic Sample			
	Short-Run (Pre: 1992-1993 / Post: 1994-2002)		*Short-Run* (Pre: 1992-1993 / Post: 1994-2002)		*Long-Run* (Pre: 1992-1993 / Post: 1994-2010)	
	Model 1	**Model 1 -Int**	**Model 2**	**Model 2-Int**	**Model 3**	**Model 3-Int**
Ln Spatial Concentration Index (LnSCI) 1	-0.0265	0.1324***	-0.0113	0.3346**	-0.0243	0.1568
	(0.016)	(0.037)	(0.023)	(0.134)	(0.021)	(0.129)
LnSCI 2	-0.0089	-0.0599***	0.008	-0.0269	0.0003	-0.0479
	(0.006)	(0.020)	(0.010)	(0.047)	(0.009)	(0.040)
LnSCI 3	0.0092	0.0306*	-0.0185*	-0.1737***	-0.0168*	-0.0328
	(0.010)	(0.018)	(0.011)	(0.053)	(0.010)	(0.057)
LnSCI 4	-0.0160**	-0.0093	-0.0066	0.0399	-0.002	0.0657
	(0.006)	(0.017)	(0.007)	(0.067)	(0.006)	(0.056)
LnSCI 5	0.0081	0.0306	0.0223	0.2459*	0.0277**	0.0322
	(0.016)	(0.028)	(0.015)	(0.144)	(0.013)	(0.129)
LnSCI 6	0.0237**	-0.0792***	-0.0022	-0.1679	0.0106	-0.0576
	(0.011)	(0.030)	(0.014)	(0.125)	(0.013)	(0.110)
LnSCI 1 X POST	0.0115	-0.0658*	-0.0068	-0.3877***	0.0078	-0.2431*
	(0.018)	(0.040)	(0.024)	(0.130)	(0.021)	(0.128)
LnSCI 2 X POST	0.0076	0.0396*	-0.0035	0.02	-0.0026	0.0701*
	(0.007)	(0.023)	(0.008)	(0.048)	(0.008)	(0.042)
LnSCI 3 X POST	-0.0016	-0.0125	0.0236**	0.1627***	0.0277***	0.0321
	(0.009)	(0.017)	(0.011)	(0.053)	(0.010)	(0.056)
LnSCI 4 X POST	0.0095	0.0124	0.0011	-0.044	0.0053	-0.0605
	(0.007)	(0.018)	(0.007)	(0.065)	(0.006)	(0.056)
LnSCI 5 X POST	0.0013	-0.033	-0.0223	-0.197	-0.0361***	-0.0169
	(0.017)	(0.031)	(0.015)	(0.145)	(0.013)	(0.130)
LnSCI 6 X POST	-0.0002	0.0576*	0.0112	0.1154	0.0083	0.053
	(0.010)	(0.034)	(0.013)	(0.126)	(0.013)	(0.111)
LnSCI 1 X Large Markets		0.0001**		-0.0002		0.0000
		(0.000)		(0.000)		(0.000)
LnSCI 2 X Large Markets		0.0000		0.0002*		0.0000
		(0.000)		(0.000)		(0.000)
LnSCI 3 X Large Markets		0.0000*		0.0000		0.0000
		(0.000)		(0.000)		(0.000)
LnSCI 4 X Large Markets		0.0000		0.0000		0.0000
		(0.000)		(0.000)		(0.000)
LnSCI 5 X Large Markets		-0.0001		-0.0001		0.0000
		(0.000)		(0.000)		(0.000)
LnSCI 6 X Large Markets		0.0000		0.0001		0.0000
		(0.000)		(0.000)		(0.000)
LnSCI 1 X Border		-0.0002***		-0.0004***		-0.0002**
		(0.000)		(0.000)		(0.000)
LnSCI 2 X Border		0.0000**		-0.0001		0.0000
		(0.000)		(0.000)		(0.000)
LnSCI 3 X Border		-0.0001***		0.0001***		0.0000
		(0.000)		(0.000)		(0.000)
LnSCI 4 X Border		0.0000		0.0000		0.0000
		(0.000)		(0.000)		(0.000)
LnSCI 5 X Border		0.0000		-0.0002		0.0000
		(0.000)		(0.000)		(0.000)
LnSCI 6 X Border		0.0000		0.0002		0.0001
		(0.000)		(0.000)		(0.000)

Continued

Table 7.2 (Continued): Analytic Model Results for Female Workers

Independent Variable: Ln of Real Hourly Wages	Short-Run Analytic Sample: Short-Run (Pre: 1992-1993 / Post: 1994-2002)		Short/Long-Run Analytic Sample: Short-Run (Pre: 1992-1993 / Post: 1994-2002)		Short/Long-Run Analytic Sample: Long-Run (Pre: 1992-1993 / Post: 1994-2010)	
	Model 1	**Model 1 -Int**	**Model 2**	**Model 2-Int**	**Model 3**	**Model 3-Int**
LnSCI 1 X Ports		0.0001*		-0.0002*		0.0000
		(0.000)		(0.000)		(0.000)
LnSCI 2 X Ports		0.0000**		0.0001**		0.0001**
		(0.000)		(0.000)		(0.000)
LnSCI 3 X Ports		0.0000		0.0000		0.0001*
		(0.000)		(0.000)		(0.000)
LnSCI 4 X Ports		-0.0001***		-0.0001***		-0.0001***
		(0.000)		(0.000)		(0.000)
LnSCI 5 X Ports		0.0000		0.0001**		0.0000
		(0.000)		(0.000)		(0.000)
LnSCI 6 X Ports		-0.0001***		-0.0001*		-0.0002***
		(0.000)		(0.000)		(0.000)
LnSCI 1 X Large Markets X POST		-0.0002**		0.0003*		0.0001
		(0.000)		(0.000)		(0.000)
LnSCI 2 X Large Markets X POST		0.0000		-0.0001		0.0000
		(0.000)		(0.000)		(0.000)
LnSCI 3 X Large Markets X POST		-0.0000**		-0.0001		0.0000
		(0.000)		(0.000)		(0.000)
LnSCI 4 X Large Markets X POST		-0.0000*		-0.0001**		0.0000
		(0.000)		(0.000)		(0.000)
LnSCI 5 X Large Markets X POST		0.0001*		0.0001		0.0000
		(0.000)		(0.000)		(0.000)
LnSCI 6 X Large Markets X POST		0.0000		0.0000		0.0000
		(0.000)		(0.000)		(0.000)
LnSCI 1 X Border X POST		0.0001***		0.0004***		0.0003**
		(0.000)		(0.000)		(0.000)
LnSCI 2 X Border X POST		-0.0000**		0.0000		-0.0001
		(0.000)		(0.000)		(0.000)
LnSCI 3 X Border X POST		0.0001***		-0.0001*		0.0000
		(0.000)		(0.000)		(0.000)
LnSCI 4 X Border X POST		0.0000		0.0000		0.0001
		(0.000)		(0.000)		(0.000)
LnSCI 5 X Border X POST		0.0000		0.0001		-0.0001
		(0.000)		(0.000)		(0.000)
LnSCI 6 X Border X POST		0.0000		-0.0001		0.0000
		(0.000)		(0.000)		(0.000)
LnSCI 1 X Ports X POST		0.0000		0.0002**		0.0000
		(0.000)		(0.000)		(0.000)
LnSCI 2 X Ports X POST		-0.0001***		-0.0001***		-0.0001***
		(0.000)		(0.000)		(0.000)
LnSCI 3 X Ports X POST		0.0000		0.0000		0.0000
		(0.000)		(0.000)		(0.000)
LnSCI 4 X Ports X POST		0.0000**		0.0001***		0.0001***
		(0.000)		(0.000)		(0.000)
LnSCI 5 X Ports X POST		0.0000		-0.0001**		0.0000
		(0.000)		(0.000)		(0.000)
LnSCI 6 X Ports X POST		0.0000		0.0001**		0.0001***
		(0.000)		(0.000)		(0.000)
Constant	2.5624***	2.5040***	1.7539***	1.4999***	2.4488***	2.4376***
	(0.309)	(0.302)	(0.422)	(0.451)	(0.302)	(0.309)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Metropolitan Areas	36	36	28	28	28	28
Adjusted R-squared	0.513	0.515	0.511	0.513	0.498	0.5
F-statistic	347.364	400.401	546.682	1584.293	306.187	782.238
Observations	5,406,048	5,406,048	4,393,861	4,393,861	7,619,240	7,619,240
Space-Time Clusters	277	277	216	216	364	364

Continued

Table 7.2 (Continued): Analytic Model Results for Female Workers

For space purposes, manufacturing subsectors in the tables are referred numerically as follows: (1) Food, beverages and tobacco products; (2) Textiles (including garment) and leather products; (3) Electronic and electric components; communications and measurement equipment; (4) Transportation equipment, parts, and components; (5) Metallic products; machinery and equipment; and, (6) Oil and lead, chemical, and plastic products; mineral, non-metallic products. Heteroskedasticity-consistent standard errors adjusted for within year/metropolitan area correlation are reported in parenthesis; the number of corresponding space-time clusters adjusted for in each model are also reported. Results from the year effects included in each of the models are omitted from the tables. Levels of statistical significance are represented as follows: *** $p \leq 0.01$; ** $p \leq 0.05$; and * $p \leq 0.10$.

Worker Characteristics

Similar to the wages of men in manufacturing across urban Mexico, the individual characteristics of women in manufacturing are also primary determinants of their wages. In general, estimates for most individual-level variables across all of the female wage models presented in Table 7.2—regardless of sample, time period, or model specification—are highly significant. Specifically, the results consistently indicate that college-educated and experienced females in manufacturing across urban areas in Mexico who are married, head of household, and in professional and technical occupations earn on average higher wages than their counterparts. Specifically, the models indicate that in urban labor markets in Mexico, and particularly within manufacturing industries, college education—even some college education—is valued the highest, with women with a high school degree earning on average between 20 and 24 percent more than women without a high school education, everything else considered, and women with a college degree earning about four to four and half times as much as than those with a high school degree. In addition, the models indicate that urban manufacturing wages for women increase about 1 percent with every extra year of experience, although at higher levels of experience wages increase at a decreasing rate. Results also point to no significant wage differences between female workers who are long-term residents within their urban area and those who recently in-migrated to their urban area. Finally, estimates for occupation indicate three patterns: similar wages for women in service, sales, or manual occupations, with the latter being my reference category; wages that are on average 33 to 37 percent higher for women in managerial or administrative occupations relative to the wages of the reference category; and, wages that are between 38 to 41 percent higher for women in professional or technical occupations relative to the wages of the reference category. Comparing the results across gender, we notice that the estimates are typically higher for men than for women, except in two cases: marital status, where the estimates are higher for married women relative to married men, and occupational category, where estimates are higher for women in professional, technical, managerial, or administrative occupations relative to their male counterparts.

Firm-of-Employment Characteristics

All wage models in Table 7.2 indicate that, similar to men, women who work in large manufacturing firms across urban areas in Mexico earn on average the highest wages, everything else considered, followed first by women who work in medium-sized manufacturing firms, and then by female workers in micro- and small-sized firms. Estimates across wage models for the variable percentage of college-educated women in the worker's own industry of employment offer inconclusive evidence as to the potential existence and influence of gender- and industry-specific human-capital spillovers on female wages. Whereas the estimates for Model 1 and Model 1-Int are statistically significant at the 10 percent level, those for Model 2 and Model 2-Int are statistically insignificant; only the estimates for Model 3 and Model 3-Int seem to offer strong evidence of large knowledge spillovers that may be specific to certain manufacturing subsectors and specific to women. The fact that the only results that are statistically significant for this variable are those that refer to the short/long-run analytic sample for the period 1992-2010 indicates that these positive human-capital externalities related to the skill-intensity of the women's own industry of employment and that arise among and benefit only women are in fact a more recent occurrence, seeming to develop strongly over the decade of the 2000s. This result would seem in line with the information presented in Tables C.1 and C.4, which reveal not only increases in the educational attainment of women over time both in general as well as for most manufacturing subsectors. The results would seem to indicate that there is a threshold of human-capital accumulation that when surpassed starts to generate knowledge spillovers and that at some point during the decade of the 2000s this threshold was surpassed by female workers in manufacturing. Also, if we compare the estimated results across gender, we will notice more consistent evidence of these type of knowledge spillovers in the case of male workers which would also be consistent with the fact that there is a higher percentage of highly-skilled (i.e., college-educated) workers in manufacturing that are male.

Regarding worker's industry of employment, estimates across wage models generally indicate fewer wage differentials for women compared to men across manufacturing subsectors. With two exceptions, the results show that female wages across manufacturing subsectors are not significantly different than female wages in my reference category, textiles. These results are consistent across model specification, sample, and time period. The two exceptions are the case of female wages in food and beverage products manufacturing firms as well as in chemicals and mineral products manufacturing firms. Wages for females in food manufacturing seem to be 3 percent lower than for those in textiles manufacturing, although this result is not observed with data for the 2000s decade, which suggests that this wage differential has dissipated with time. Wages for females in chemicals manufacturing seem to be about 4 percent higher than wages in textiles and other manufacturing firms, although this result is only observed in wage models that employ the short-run analytic sample, which indicates as in other cases examined earlier that only few metropolitan areas drive this result and that otherwise wages in general are similar across subsectors. The fact that the same or similar wage differentials across subsectors, everything else considered, are not observed across gender offers evidence of differential treatment in the wage determination process of firms between men and women.

Urban-Area Characteristics

Similar to what is observed for male workers, the results in Table 7.2 indicate that the manufacturing maturity of an urban area as well as the coagglomeration of certain manufacturing subsectors in an urban area are both important determinants of urban wages for female workers in Mexico. Estimates across all wage models for the variable that captures urban area percentage of manufacturing employment in 1970 reflect the impact of the path-dependent industrial history of urban areas in Mexico in determining the current wages of female workers. This result is consistently observed across gender, regardless of model specification, sample, and time period. The estimates indicate that the larger an urban area's manufacturing base was in 1970, the higher the current wages of women are who reside in that urban area relative to those who reside elsewhere; that is, female workers in urban areas with a stronger and earlier history of manufacturing employment earn between 52 and 169 percent more, depending on the sample and model specification, relative to their counterparts in urban areas with a weaker history in manufacturing. These estimates are almost identical to those obtained from the male wage models. The strong value and statistical significance of the estimates offer supporting evidence for the presence and strength of dynamic externalities—with long-term wage effects—that are associated with the localization of manufacturing employment across urban Mexico. Looking at the strength of the results across gender does lead us to conclude that indeed, everything else considered, there is a high wage premium for both male and female workers that is associated with the manufacturing maturity of urban areas.

Table 7.2 presents some evidence of wage advantages to female workers from the coagglomeration of electronics manufacturing firms with transportation manufacturing firms, food manufacturing firms with chemicals manufacturing firms, and electronics manufacturing firms with chemicals manufacturing firms. Wage disadvantages to female workers are observed from the coagglomeration of food manufacturing firms with machinery manufacturing firms, and of textiles manufacturing firms with machinery manufacturing firms. Results point mostly to differential effects by gender in terms of the sectors whose coagglomeration confers wage advantages or disadvantages. There is, for instance, no evidence of wage advantages for female workers related to the co-localization of electronics manufacturing firms and machinery manufacturing firms; although, there is strong evidence of these wage advantages for male workers. There is also no evidence of wage advantages to male workers associated with the spatial coagglomeration of electronics and chemicals manufacturing firms; although, there is strong evidence of these wage advantages for female workers. On the contrary, we do observe in the results wage advantages to both genders from the coagglomeration of electronics and transportation manufacturing firms, and wage disadvantages to both genders from the coagglomeration of textiles and machinery manufacturing firms. Similarities or differences across gender do not appear to be related to the male-female employment ratio in manufacturing subsectors.

There is as well, compared to the results for males, some evidence of localized human-capital externalities affecting the wage level of female workers across urban areas in Mexico. However, the source of the externalities appears to be different across gender given that while for men it is the estimates from the interaction models that suggest the existence of urban knowledge spillovers, for women is the sample. Specifically, the only two wage models in Table 7.2 that offer evidence to suggest that the concentration of skills in an urban area contributes to increase the productivity of local female workers are those that use the short-run analytic sample. This sample is the one with the longest list of urban areas represented, suggesting that this analytic sample in particular contains some urban areas that indeed have the conditions necessary to generate some level of localized human-capital externalities that affect the productivity of female workers, and only female workers, in the urban area as similar results were not observed in the male wage models. Recall that the urban areas that are represented in the short-run analytic sample but not in the short/long-run analytic sample are: Ciudad Juarez, Coatzacoalcos, Manzanillo, Matamoros, Monclova, Nuevo Laredo, Orizaba, and Torreon.

Similar to the case of male workers, the results across all wage models indicate that the female unemployment rate is insignificant in determining the wage level of urban female workers in Mexico. The unemployment rate, therefore, does not contribute to contract or to expand wage differentials for either male or female workers across urban areas in Mexico.

Urban scale, as observed also for male workers, offers a result that is conditional on whether Mexico City is included or excluded from the analysis. The predictor variable that accounts for urbanization economies in my wage models, the natural logarithm of an urban area's population, indicates the existence of strong urbanization disadvantages (wage penalties from living/working in large urban areas). Let us recall, however, a caveat to this finding that I have previously addressed; the fact that this result appears to be driven by the disproportionate size of Mexico City relative to other metropolitan and urban areas in my sample. When one excludes Mexico City from the data, the estimate on the natural logarithm of an urban area's population becomes statistically insignificant across models, so that there is no evidence of urbanization externalities at all for urban areas in Mexico other than the wage penalties observed for workers living in Mexico City.

Key Analytic Variables: The Spatial Concentration of Manufacturing Employment, Demand-Market Proximity, and Globalization

As in my analysis of male wages, I divide my discussion in the following manner to facilitate the understanding of the main results of my inferential analysis. First, I discuss the results presented in Table 7.2 that address directly my primary research objectives, which are: (1) to investigate whether wage disparities across Mexico's urban areas might be explained by patterns of localization and relative location (with respect to demand markets) of manufacturing employment, and (2) to investigate if and to what extent

Mexico's rapid integration to global markets through trade liberalization and other globalization processes has contributed to expand or to contract the potential wage disparities associated with the localization and relative location to demand markets of manufacturing employment across urban areas in the country. In this part, therefore, I look at the estimated coefficients in Table 7.2 that reflect the potential direct effects on the wages of female workers of (1) the spatial concentration of manufacturing employment disaggregated by subsector (as represented by the variables LnSCI1 through LnSCI6), and (2) the industrial concentration's—or, for that matter, the urban area's—proximity or accessibility to consumer demand markets, both foreign and domestic, (as represented by the variables Border, Ports, and Large Markets). In addition, I also look in this part at the estimated coefficients in Table 7.2 that reflect the differential effect of the afore-mentioned variables on the wages of female workers that is observed (3) between the periods before and after Mexico's rapid integration to global markets (as represented by the variables LnSCI1 through LnSCI6 interacted with the variable POST, and the variables Border, Ports, and Large Markets interacted also with the variable POST).

Second, I address the results presented in Table 7.2 that intend to analyze the potential effects on the wages of female workers that may be derived from relationships, if these exists, between the spatial concentration of employment in each of the different manufacturing subsectors in the analysis and each concentration's distance to possible demand markets (as represented in Table 7.2 by the estimated coefficients from the interactions of the variables LnSCI1 through LnSCI6 with the variables Border, Ports, and Large Markets). As mentioned earlier in Chapter 3 and in the analysis of male wages, this is an empirical inquiry of the dissertation that the literature has not previously addressed. From the theory discussed in Chapter 2, however, we know that the location—or co-location—decision of firms is often in part based on the tangible benefits to the firms that may be derived from this decision, such as productivity advantages related to the colocation of firms in geographic space and cost advantages related to the proximity of the firms to their demand market, advantages which according to the available theoretical literature translate into wage benefits for workers. I argue in this study that a plausible interaction between both location-decision factors may exist if firms choose to co-locate in an urban area with not only substantial positive localization externalities but also geographical proximity to the demand market they serve. Wage effects from the interaction may, consequently, follow. In other words, distance to demand markets may serve as a moderating variable for localization externalities, and vice versa. For completeness, I also assess in this part the contribution of Mexico's rapid integration to global markets to the effect of the aforementioned relationships on the wages of male workers. Accordingly, I look at 3-way interactions between the variable POST, the variables LnSCI1 through LnSCI6, and the variables Border, Ports, and Large Markets.

Direct Effects on the Wages of Female Workers

Localization and Globalization

As was observed for male workers, the estimated results presented in Table 7.2 offer in general limited consistent evidence of localized wage effects for female workers from the concentration of manufacturing employment in an urban area when this employment is disaggregated by major manufacturing subsector. The estimated results instead appear to be highly sensitive to sample and model specification, so that evidence of the presence or absence of possible localized externalities associated with industrial concentrations is not consistently observed across analytic samples or across model specifications. As I have previously explained based on the available literature, these effects would suggest that the colocation in geographic space of firms and workers within the same manufacturing subsector generates externalities that affect worker productivity and wages. Similarly, the estimated results for female workers offer limited evidence that Mexico's rapid integration to global markets through trade liberalization and other globalization processes has had a consistent effect in contributing to generate any localization externalities (either positive or negative) from the spatial concentration of these employment groups that affect the wages of women workers in particular; the results instead are also highly sensitive to sample and model specification.

Model 1 and Model 1-Int—the wage models that employ the short-run analytic sample—report main-effect coefficients related to industrial concentration that are typically inconsistent across both models in terms of sign or statistical significance. The only consistent results observed across both wage models are those related to an urban area's relative concentration of workers in the machinery products manufacturing subsector. In this case, the results suggest that the spatial concentration of employment in this subsector does not generate any localization externalities that affect the wage level of female workers. Let us recall from an earlier discussion that evidence of externalities generated by the spatial concentration of workers from the various manufacturing subsectors is determined in this study by the statistical significance of the main-effect coefficients. In this manner, coefficients that are statistically insignificant suggest the absence of externalities from industrial localization, and coefficients that are statistically significant suggest instead the presence of externalities. The sign of the coefficients dictates whether the externalities are positive or negative and, therefore, whether the externalities from industrial concentration enhance or penalize the wages of workers, respectively.

When I compare the results in Model 1 and Model 1-Int across gender, I find that there is more evidence—albeit inconsistent—of externalities derived from industrial concentration in the case of female workers than in the case of male workers. I also find that the results related to the spatial concentration of employment in machinery and chemical products manufacturing are consistent across gender. Related to the spatial concentration of employment in chemical products manufacturing, the results suggest, similarly to the case of male workers, that an urban area's relative concentration of workers in the chemicals manufacturing subsector does generate externalities that affect directly the wages of female workers. On the latter case, Model 1 reports specifically possible positive localization externalities, or localization economies, that suggest a wage-enhancing effect of about 2.4 percent that is associated with a unit increase in an urban area's index of spatial concentration of workers in chemicals manufacturing ($\beta=0.0237$, $p\leq0.05$). Note, however, that once I account in the wage model (i.e., Model 1-Int) for the potential relationship between industrial concentration and market accessibility, the direction of this effect changes. The statistical significance of the main-effect coefficient related to the chemicals manufacturing subsector changes as well from the 5 percent to the 1 percent level of statistical significance. In the context of this interaction model, a unit increase in an urban area's index of spatial concentration of workers in chemicals manufacturing seems to generate a large wage-dampening effect of about 8 percent for local manufacturing female workers (β=-0.0792, $p \leq 0.01$). This change in the direction of the effect is consistent across gender.

Four instances in the results observed in either Model 1 or Model 1-Int provide some evidence of possible localized externalities associated with industrial concentrations; recall, however, that this evidence while is possibly indicative of localized externalities is conditional to specific circumstances given the inconsistency of the results across models. These externalities relate to the spatial concentration of employment in the food, textiles, electronic, and transportation equipment manufacturing subsectors. According to Model 1, a unit increase in an urban area's index of spatial concentration of workers in transportation equipment manufacturing seems to generate negative externalities that diminish the wage level of female workers by about 1.6 percent (β=-0.0160, $p \leq 0.05$). Similar evidence of localization diseconomies is observed from the coefficient associated with an urban area's relative concentration of textile workers, but the result in this case is observed instead in Model 1-Int, which accounts for the interaction of localization and market accessibility. Specifically, this result suggests that a unit increase in an urban area's index of spatial concentration of textile workers generates negative externalities that diminish the wage level of female workers by about 6 percent (β=-0.0599, $p \leq 0.01$). Alternatively, evidence of possible localization economies are observed from the concentration in geographic space of workers in the food and electronics manufacturing subsectors but only in the results of the interaction model (i.e., Model 1-Int). Accounting for the potential relationship between industrial concentration and market accessibility, everything else equal, an urban area's spatial concentration of food manufacturing workers and an urban area's spatial concentration of electronics manufacturing workers seem both to generate positive externalities that enhance the wage level of local female workers—about 13 percent (β=0.1324, $p \leq 0.01$) for every unit increase in an urban area's index of spatial concentration of food manufacturing workers and about 3 percent (β=0.0306, $p \leq 0.10$) for every unit increase in an urban area's index of spatial concentration of electronics manufacturing workers, with the former effect being statistically significant at the 1 percent level of significance and the latter only at the 10 percent level.

Looking at the differential-effect coefficients in Model 1 and Model 1-Int that are related to industrial concentration, I observe very limited evidence that would indicate that globalization mechanisms in Mexico have contributed to enhance or diminish externalities within industrial concentrations that affect the wage level of female workers, at least at the urban level. None of the coefficients are statistically significant in Model 1, and those that are significant in Model 1-Int are only significant at the 10 percent level of significance. Let us recall that each of these differential-effect coefficients assesses whether the relationship between an industry's employment concentration in geographic space and the wages of female workers varies before and after the implementation of NAFTA, an event which in this study denotes the beginning of a period in Mexico's economic history of rapidly expanding trade liberalization and globalization processes that increase the presence of mechanisms of globalization across Mexico's urban areas. Hence, the results suggest, contrary to theoretical expectations, that Mexico's rapid integration to global markets through trade liberalization and other globalization processes has, in general, not influenced the capacity of industrial concentrations to generate positive externalities that may increase the wage level of urban female workers, especially those in manufacturing. By the same token, the results suggests that the wages of female workers have, in general, not been affected adversely by negative externalities generated by processes related to both industrial co-localization and globalization. The exceptions observed—where the coefficients are only statistically significant at the 10 percent level—suggest weakly that during Mexico's period of rapid expansion of trade liberalization and globalization policies (i.e., 1994-2002) there might have been wage benefits for female workers in urban areas with relatively high concentration levels of employment in the textiles (β=0.0396, $p \leq 0.10$) and chemicals (β=0.0576, $p \leq 0.10$) manufacturing subsectors as well as wage penalties for female workers in urban areas with relatively high concentration levels of employment in the food manufacturing subsector (β=-0.0658, $p \leq 0.10$).

Among the main-effect results from the wage models of female workers that employ the short/long-run analytic sample, I observe some evidence of localized externalities or wage effects from the concentration in geographic space of workers in the food, electronics, and machinery manufacturing subsectors, with the most consistent evidence of externalities being that related to an urban area's spatial concentration of electronics manufacturing employment. In the case of male workers, if you may recall, externalities or wage effects from industrial concentration are observed from the concentration in geographic space of workers in the food, textiles, and electronics manufacturing subsectors. In general, the results indicate that for both urban male and female workers a high level of relative concentration of electronics employment in an urban area may decrease their wage level. For instance, a unit increase in an urban area's index of spatial concentration of electronics employment appears to decrease the wages of male workers by about 1.6 to 2.2 percent based on the results observed in Table 7.1 (i.e., Model 2: β=-0.0220, $p \leq 0.01$; Model 3: β=-0.0159, $p \leq 0.05$). Likewise, the results for female workers in Table 7.2 indicate that a unit increase in an urban area's index of spatial concentration of electronics employment decreases their wages by about 1.7 to 1.9 percent depending on the model specification (i.e., Model 2: β=-0.0185, $p \leq 0.10$; Model 2-Int: β=-0.1737, $p \leq 0.01$; Model 3: β=-0.0168, $p \leq 0.10$). In both instances, however, the effect seems to decay with time given that the coefficients are smaller in the long-run model specifications compared to the short-run model specifications.

Of significance in the case of the effect on wages associated with the spatial concentration of electronics employment is the fact that the results for both male and female workers that employ the short/long-run analytic sample indicate that the wage penalty associated with an increase in an urban area's relative concentration of employment in electronics manufacturing seems to have diminished during the period following the implementation of NAFTA. Remember that for male workers the corresponding coefficients in Model 2 (β=0.0199, $p \leq 0.05$) and Model 3 (β=0.0215, $p \leq 0.01$) are both positive and statistically significance. Likewise, the corresponding coefficients for female workers are all positive and statistically significant, except for the coefficient in Model 3-Int which is positive but statistically insignificant (i.e., Model 2: β=0.0236, $p \leq 0.05$; Model 2-Int: β=0.1627, $p \leq 0.01$; Model 3: β=0.0277, $p \leq 0.01$). In this manner, these results suggest that in some instances the presence of globalization mechanisms may influence the wage level of male and female workers that are located in urban areas with relatively high concentrations of electronics employment.

Evidence of localization economies that increase the wage level of female workers and that are associated with the spatial concentration of workers in food manufacturing is observed in Model 2-Int (β=0.3346, $p \leq 0.05$) along with evidence that these positive localization externalities may have in fact dissipated in the years following the implementation of NAFTA (i.e., Model 2-Int: β=-0.3877, $p \leq 0.01$; Model 3-Int: β=-0.2431, $p \leq 0.10$). Similarly, evidence of localization economies that increase the wage level of female workers and that are associated with the spatial concentration of workers in machinery manufacturing is observed in Model 2-Int (β=0.2459, $p \leq 0.10$) and Model 3 (β=0.0277, $p \leq 0.05$) along with conflicting evidence suggesting in one case that these positive localization externalities may have diminished in the years following the implementation of NAFTA (i.e., Model 3: β=-0.0361, $p \leq 0.01$) and in another case suggesting no variation across time (i.e., Model 2-Int: β=-0.197, $p > 0.10$). Notably, these same results for the case of male workers vary significantly to those observed for female workers.

Similar to the results observed for male workers, the results for female workers overall suggest that the spatial concentration of manufacturing activity across Mexico's urban landscape, when one groups this activity by major manufacturing subsector and observes each industrial concentration separately, does not yield typically or consistently localization externalities, neither positive nor negative, that affect the wage-level of female workers as results are largely not consistent across model specifications and samples. One important difference, however, across gender is that whereas for male workers any observed localized externalities appear to be related to the interrelation of the location and co-location decisions of manufacturing firms across geographic space rather than simply to their spatial concentration and therefore do not affect the wage level directly, for female workers there is some evidence of localization externalities associated with the concentration of some manufacturing activity that may affect their wage level directly. This evidence, nevertheless, is conditional on sample and model specifications, and would seem to dissipate during the decade of the 2000s. The results also suggest that whereas for male workers globalization processes in Mexico have not influenced *directly* the capacity of industrial concentrations to generate localized externalities that affect their wage level, for female workers this might not be the case. There is some evidence that would indicate that globalization mechanisms in Mexico have contributed to enhance or diminish externalities within industrial concentrations that affect the wage level of local female workers. Nevertheless, this evidence is highly conditional on sample and model specifications.

As mentioned earlier, I find important to note that the absence or presence of wage effects from localization in this study do not necessarily speak to the absence or presence of productivity effects from localization given that my general wage equation does not account, because of data limitations, for some characteristics of a worker's firm of employment or for some local market conditions that also play a role in determining the productivity level of workers, such as a firm's level of capital input or the level of competiveness of the market where the firm operates. It is in light of this caveat that my conclusions speak, therefore, primarily about wages not about productivity and relate only to the question of whether the spatial concentration of manufacturing activity yields localized externalities that affect directly the wage level of local workers and that thus contribute to wage disparities across geographic space.

Location and Globalization

I shift now my discussion to the analysis of the effects on female wages associated with an urban area's accessibility or proximity to foreign and domestic demand markets. Whereas for urban male workers in Mexico the estimated main wage effect of proximity to large markets consistently suggests that an urban area's geographic proximity to a significantly large domestic market (i.e., Mexico City, Guadalajara, or Monterrey) does not influence their wage level, for females, the results instead are somewhat more variable. Specifically, the results suggest a potentially negative effect, albeit only statistically significant at the 10 percent level of significance, when considering the results from the wage models employing the short-run analytic sample (i.e., Model 1 and Model 1-Int) and a potentially positive and highly statistical significant effect when considering the result of Model 2-Int (β=0.0009, $p \leq 0.01$), which employs the short/long-run analytic sample. Model 2, Model 3, and Model 3-Int report statistically insignificant results. So depending on the model specification or sample, female urban wages would appear to be higher the closer an urban area is to a large domestic market, lower, or with no significant difference, respectively.

A similar variability is observed in the differential-effect coefficients measuring the effect of globalization on the relative importance of proximity of an urban area to large domestic demand markets for determining the wage level of local female workers, except that the estimated effects here are opposite in direction. Observe for Model 1 and Model 1-Int how the related coefficients are both positive and highly statistically significant at the 1 percent level of significance, suggesting that the effect of an urban area's proximity to large markets on female wages differs quantitatively, ceteris paribus, between the 1992-1993 and the 1994-2002 periods, with female urban wages increasing between about 0.01 and 0.02 percent, depending on the model, per every extra kilometer away from the nearest large domestic market in the period following the implementation of NAFTA. In other words, as Mexico's globalization process intensified, female wages seem to have increased in urban areas relatively farther away from large domestic markets and decreased in urban areas relatively closer to large domestic markets. As with the case of male workers, this result is net of urbanization effects, such as congestion. Likewise, the result is consistent with theoretical expectations.

Markedly, the models employing the short/long-run analytic sample report, once again, either statistically insignificant coefficients in Model 2, Model 3, and Model 3-Int, or—instead—a negative and a highly statistical significant coefficient in Model 2-Int (β=-0.0008, $p \leq 0.01$). While this coefficient in Model 2-Int is considerably larger than that of Model 1-Int, the total effect on female wages of proximity to large markets for the period 1994-2002 based on the main and differential effects observed is similar in either Model 1-Int or Model 2-Int. Hence, from either of the results we would conclude, ceteris paribus, that the wages of female workers during the period 1994-2002 are seemingly higher in urban areas located farther away from large domestic markets, with wages increasing 0.01 percent per every extra kilometer of distance. This effect, however, seems to decay with time, as it is not observed under the same model specification but when comparing the 1992-1993 period to the 1994-2010 period.

Similar to the results observed for large markets in the case of male workers, the results in Model 1 and Model 1-Int for female workers are consistent with my theoretical discussion in Chapter 2 and analytical discussion in Chapter 5. Let me repeat my earlier discussion from the section on male workers. From Chapter 5, we know that the onset of Mexico's trade liberalization and globalization processes contributed to the transitioning of the manufacturing sector in general from a domestic-oriented to an export-oriented industry. This transitioning would have not only meant higher costs of production for firms located relatively closer to a domestic demand market but farther away from a new foreign demand market because of the naturally higher costs to transport its manufactured goods to the new market, but would accordingly have meant as well lower wages for these firms' workers. On this, the theory presented in Chapter 2 tells us that wages will be relatively low in regions with relatively high transport costs to markets and high in regions with relatively low transport costs to markets (Hanson 1998a), which is consistent with the afore-mentioned results. Let us not forget, however, that while Mexico City, Guadalajara, and their surrounding satellite urban areas might be located relatively far away from, say, the U.S. market, if we consider their geographic distance by land, the metropolitan area of Monterrey and nearby urban areas are not. Yet, it is possible for firms in urban areas around and in Monterrey—as well as those around or in Guadalajara or Mexico City—to have transitioned their domestic-oriented production to export-oriented production destined to foreign markets other than the United States or even to have transitioned its production to export goods that necessitate transport other than by land, which would then explain higher transportation costs to market as Mexico's globalization process intensified.

Clear gender differences exist on the effect on wages of an urban area's proximity to a U.S.-Mexico land border-crossing port, particularly when the results are compared across analytic samples. For female workers, the results of the models using the short-run analytic sample offer little evidence of a wage effect associated with an urban area's proximity to a land border-crossing port. Only the main-effect coefficient in Model 1 is statistically significant, but only at the 10 percent level of significance; the same coefficient in Model 1-Int is statistically insignificant. So while the main-effect coefficient in Model 1 is expectedly negative, thereby, suggesting a plausible wage-enhancing effect related to the proximity of an urban area to an access point to foreign markets—or, in other words, an urban area's proximity to the U.S. demand market—the fact remains that the significance of the effect disappears once I account for the potential relationship between industrial concentration and market accessibility. There is also no evidence in the results of the models using the short-run analytic sample, contrary to what is observed for male workers, to suggest that the effect on female wages of proximity to the U.S. market has changed over time as Mexico's globalization process intensified following the implementation of NAFTA, that is, between the 1992-1993 and the 1994-2002 periods. Both differential-effect coefficients in Model 1 and Model 1-Int are statistically insignificant for the case of female workers.

Interestingly, the results in the models using the short/long-run analytic sample offer a different picture on the potential effect on female wages associated with an urban area's proximity by land to foreign markets. The main-effect coefficients in Model 2 and Model 3 are both negative and statistically significant at the 5 percent level of significance, suggesting that for a specific sample of urban areas—those included in the short/long-run analytic sample—female wages may indeed be determined by whether or not the urban areas where these workers reside are relatively close to a U.S.-Mexico land border-crossing port. Specifically, the coefficients suggest that female wages in urban areas in the sample decrease on average, ceteris paribus, by 0.01 percent per every kilometer of distance away from a U.S.-Mexico land border-crossing port. According to the results in Model 2 and Model 3, this wage effect appears not to change as Mexico's globalization process intensified.

The sign of the coefficients observed in the interaction models (i.e., Model 2-Int and Model 3-Int), which account for the potential relationship between industrial concentration and market accessibility, is different to the sign observed in the same coefficients in Model 2 and Model 3. The main-effect coefficients in Model 2-Int and Model 3-Int indicate, instead, a positive and statistically significant effect, with the coefficient in Model 2-Int suggesting that female wages in urban areas in the sample increase on average, ceteris paribus, about 0.07 percent per every kilometer of distance away from a U.S.-Mexico border-crossing port ($p \leq 0.01$), and with the coefficient in Model 3-Int suggesting a smaller effect of about 0.04 percent ($p \leq 0.05$). Given that the sample in Model 2-Int refers to the period 1992-2002 and the sample in Model 3-Int refers to the period 1992-2010, the smaller coefficient in Model 3-Int suggests that the effect on female wages of an urban area's proximity to a U.S.-Mexico border-crossing may be decaying with time.

The differential-effect coefficients in Model 2-Int (β=-0.0008, $p \leq 0.01$) and Model 3-Int (β=-0.0006, $p \leq 0.01$) report, as expected, results that are similar in sign (i.e., negative) to those observed for male workers, although for female workers the coefficients are larger and more statistically significant. For female workers in the short/long-run analytic sample, these coefficients suggest that an urban area's proximity to a U.S.-Mexico land border-crossing port may have had and may continue to have a quantitatively different effect on the wages of female workers that is related to Mexico's expanding trade liberalization and globalization processes. Specifically, the coefficients suggest larger female wages in urban areas located closer to the U.S. market and smaller female wages in urban areas located farther away from the U.S. market for the sample periods 1994-2002 and 1994-2010 relative to the 1992-1993 period. The negative direction of the differential effect is consistent with what the theories of market accessibility and globalization externalities tell us. With Mexico's trade-liberalization and globalization processes intensifying and the U.S. market becoming one of the key target markets of export-oriented manufacturing production in Mexico following the implementation of NAFTA, one would expect according to the existing theory on market accessibility for wages to be higher in urban areas with relative close geographic proximity to the U.S. market because of lower transportation costs to market. This result would also be expected according to the existing theory on globalization externalities, which observes that the mechanisms by which a geographical area is exposed and integrated to global processes may generate space-based externalities that could conceivably influence the productivity of firms and, therefore also, the wages of workers in a region. The smaller coefficient in Model 3-Int relative to the coefficient in Model 2-Int suggests, in addition, that the estimated effect may be decaying with time.

While multicollinearity might be generating some instability in the main and differential-effect coefficients related to an urban area's proximity to the U.S. market—that is, given the difference in the sign and magnitude of the main-effect coefficients between Model 2 and Model 2-Int, and between Model 3 and Model 3-Int, as well as given the large magnitude of the differential-effect coefficients in Model 2-Int and Model 3-Int—the predictive validity of the results when considering their joint marginal effect, everything else equal, seems unaffected and consistent with theoretical expectations. The joint marginal effect on female wages of proximity to the U.S. market for the periods 1994-2002 and 1994-2010 based on the main and differential effects observed is similar across the wage models using the short/long-run analytic sample. Hence, from any of the results we would conclude, ceteris paribus, that the wages of female workers during the periods 1994-2002 and 1994-2010 are seemingly higher in urban areas located with relative close geographic proximity to the U.S. market, with wages decreasing somewhere between 0.01

and 0.02 percent, depending on the model, per every extra kilometer of distance. No evidence is observed that the joint marginal effect is dampening or decaying with time.

Lastly, there is evidence in the results to suggest that an urban area's accessibility to foreign markets through maritime ports may be, as with males, an important determinant of female wages. There is also, moreover, some evidence in the results to suggest that the effect on female wages of an urban area's accessibility to foreign markets through maritime ports may have changed over time as the country's globalization process intensified. Observe the main-effect coefficients in Model 1 and Model 1-Int for the variable urban area's differential distance between the nearest principal Gulf Coast port and the nearest principal Pacific Coast port; the high statistical significance of both coefficients suggests that an urban area's relative distance to a maritime port matters to the wage determination process of female workers. Specifically and within the context of this complex variable, the result suggests that, everything else equal, every extra kilometer away from a principal maritime port on the Pacific Coast relative to one on the Gulf Coast decreases female wages on average between about 0.01 and 0.02 percent, depending on the model. Notably, Model 2 (β=0.0002, $p \leq 0.01$), Model 2-Int (β=0.0006, $p \leq 0.01$), and Model 3 (β=0.0002, $p \leq 0.01$) offer similar results to those obtained using the short-run analytic sample. Model 3-Int, however, reports a coefficient that is statistically insignificant, suggesting that the effect may be decaying with time once the potential relationship between industrial concentration and market accessibility is accounted for.

As mentioned, the results observed in some of the wage models also suggest that the effect on female wages of an urban area's accessibility to foreign markets through maritime ports may have changed over time as processes of globalization intensified in the country, particularly for female workers in the short/long-run analytic sample. Of the coefficients measuring the differential effect on wages between the 1992-1993 period and the 1994-2002 period from the wage models using the short-run analytic sample, only the coefficient in Model 1-Int is statistically significant (at the 5 percent level of significance), indicating a sensitivity of the result to model specification; the coefficient, hence, becomes statistically significant once the potential relationship between industrial concentration and market accessibility is accounted for. Similar to males, the coefficient in Model 1-Int is negative, thereby, suggesting that, compared to the 1992-1993 period, female wages during the 1994-2002 period decreased by 0.01 percent for every extra kilometer away from a principal maritime port in the Gulf Coast relative to one in the Pacific Coast. Taken together, these main and differential effects from Model 1 and Model 1-Int suggest not only that an urban area's relative distance to a principal maritime port may be an important determinant of the wages of female workers, but also that the wages of female workers are in general higher the closer an urban area is to maritime ports in the Pacific Coast. However, the results additionally suggest that whereas proximity or accessibility to maritime ports in the Pacific Coast is an important determinant of higher female wages, this has changed somewhat with globalization. As Mexico's globalization process intensified in the years following the implementation of NAFTA, female wages in urban areas with close proximity to maritime ports in the Gulf Coast would appear to have increased, suggesting a rise in the relevance of maritime ports in the Gulf Coast to manufacturing activity in Mexico. Markedly, Model 2 (β=-0.0001, $p \leq 0.10$), Model 2-Int (β=-0.0004, $p \leq 0.05$), and Model 3 (β=-0.0001, $p \leq 0.05$) offer similar results as that observed in Model 1-Int (β=-0.0001, $p \leq 0.05$), while the results are statistically insignificant in Model 3-Int. A comparison of the results from Model 2-Int and Model 3-Int suggests a differential effect that decays with time.

Overall, the results on the effect of market proximity or accessibility on the wages of female workers across Mexico's urban areas largely suggest that in Mexico an urban area's relative location to the consumer demand markets its industries serve may be an important determinant of the wage level of its female labor force and, therefore, needs to be considered a source of interurban wage disparities for female workers in the country. The most prevalent results observed for the case of female workers are those pertaining to the indicator variable of differential distance to maritime ports of international trade as these results are the most consistent across model specifications and samples of all relevant results on the effect of market accessibility on urban wages for female workers. Relative physical proximity to maritime ports would appear to have been, based on the results, relevant up to around the early years of the decade of the 2000s to the location decision of manufacturing firms and, consequently, to the wage determination process of female workers across urban areas in Mexico. Sometime during the decade of the 2000s, however, this relevance diminished. In light of this, female workers and manufacturing firms in Mexico in urban areas located farther away from maritime ports of international trade would appear to have been at an economic disadvantage relative to those in urban areas located closer in distance, but that may no longer be the case. Consequently, urban areas located farther away from maritime ports of international trade would themselves also have been at an economic disadvantage than urban areas elsewhere, but that may also no longer be the case.

Results additionally suggest that not all maritime ports in Mexico convey the same economic advantage to urban areas located in close geographic proximity to the ports. Differences are observed according to whether the maritime port is located in the Gulf Coast or the Pacific Coast, but these differences have changed as Mexico's trade liberalization and globalization processes have intensified. Specifically, the results indicate that while female wages were seemingly higher in urban areas with relative proximity to major Pacific Coast maritime ports during Mexico's earlier globalization period, the wage level of female workers in urban areas with relative proximity to major Gulf Coast maritime ports improved as the country's globalization process intensified. Hence, similar to the results observed for male workers, the relative importance of proximity to major ports in one coast relative to major ports in the other coast seems to have shifted with the strengthening of Mexico's globalization process, favoring female wages in urban areas with relative proximity to major Gulf Coast maritime ports.

<u>Moderating (Interaction) Effects on the Wages of Female Workers</u>

From my discussion in the previous section, it is evident that the results of my analysis for female workers are highly sensitive to model specification; that is, the results often vary when I compare those from the female wage models that do not account for the potential relationship between industrial concentration and market accessibility (i.e., Model 1, Model 2, and Model 3) to those that do (i.e., Model 1-Int, Model 2-Int, and Model 3-Int). A similar model sensitivity is observed in the results from the male wage models. The implications of this variation are threefold: first, that there may in fact exist a relationship between a firm's decision to co-locate in geographic space with similar firms and the proximity of the firm's chosen location to its demand markets; second, that externalities associated with the co-location decision of similar firms vary in relation to the relative location of firms to their demand markets; and third, that female workers' productivity and wage levels vary in relation not only to this complex decision process of firms but also to the resulting externality-generating process. Because of the nature of my study, another more complex implication emerges, that the increasing presence of globalization mechanisms in the country that may be directly attributed to Mexico's rapidly expanding trade liberalization and globalization policies influences also these processes.

As I previously stated in my analysis for male workers, given the exploratory nature of this part of my analysis as well as the typical complexity that arises in interpreting coefficients that result from the interaction of two continuous variables or from three-way interactions, which is the case here, I focus the following discussion on results that I consider most noteworthy while I do make a mention briefly of other results. To facilitate the interpretation of some of the results, I calculate and graph marginal effects. Recall from my earlier discussion on male workers that evidence that a relationship between an urban area's relative employment concentration in a specific manufacturing subsector and an urban area's accessibility to demand markets exists and that this relationship has in fact an effect on the wages of female workers is supported by the strength of the interaction coefficients. Substantively, the statistical significance of the coefficients indicates that the hourly wages of local female workers is conditional on an urban area's relative concentration of workers in a specific manufacturing subsector and the urban area's accessibility to demand markets.

Whereas the results from the male wage models indicate only three cases where the interaction coefficients are consistent across all of the wage models, the results from the female wage models indicate seven such cases. This suggests that the relationship between market accessibility and industrial concentration is more relevant for the wage determination process of female workers than for male workers. The seven cases are: (1) the coefficients related to the interaction between an urban area's index of spatial concentration of employment in food manufacturing and urban area's distance to a U.S.-Mexico border crossing (i.e., Model 1-Int: β=-0.0002, $p \leq 0.01$; Model 2-Int: β=-0.0004, $p \leq 0.01$; Model 3-Int: β=-0.0002, $p \leq 0.05$); (2) the coefficients related to the interaction between an urban area's index of spatial concentration of employment in textiles manufacturing and an urban area's differential distance to maritime ports (i.e., Model 1-Int: β=0.0000, $p \leq 0.05$; Model 2-Int: β=0.0001, $p \leq 0.05$; Model 3-Int: β=0.0001, $p \leq 0.05$); (3) the coefficients related to the interaction between an urban area's index of spatial concentration of employment in transportation equipment manufacturing and an urban area's differential distance to maritime ports (i.e., Model 1-Int: β=-0.0000, $p \leq 0.01$; Model 2-Int: β=-0.0001, $p \leq 0.01$; Model 3-Int: β=-0.0001, $p \leq 0.01$), (4) the coefficients related to the interaction between an urban area's index of spatial concentration of employment in chemicals manufacturing and an urban area's differential distance to maritime ports (Model 1-Int: β=-0.0001, $p \leq 0.01$; Model 2-Int: β=-0.0001, $p \leq 0.10$; Model 3-Int: β=-0.0002, $p \leq 0.01$), (5) the coefficients related to the three-way interaction between an urban area's index of spatial concentration of employment in food manufacturing, an urban area's distance to a U.S.-Mexico border crossing, and the indicator variable that identifies the period following the implementation of NAFTA which is characterized by an increasing presence of mechanisms of globalization in the country (Model 1-Int: β=0.0001, $p \leq 0.01$; Model 2-Int: β=0.0004, $p \leq 0.01$; Model 3-Int: β=0.0003, $p \leq 0.05$); (6) the coefficients related to the three-way interaction between an urban area's index of spatial concentration of employment in textiles manufacturing, an urban area's differential distance to maritime ports, and the indicator variable that identifies the period following the implementation of NAFTA (Model 1-Int: β=-0.0001, $p \leq 0.01$; Model 2-Int: β=-0.0001, $p \leq 0.01$; Model 3-Int: β=-0.0001, $p \leq 0.01$); and, (7) the coefficients related to the three-way interaction between an urban area's index of spatial concentration of employment in transportation equipment manufacturing, an urban area's differential distance to maritime ports, and the indicator variable that identifies the period following the implementation of NAFTA (Model 1-Int: $\beta=0.0001$, $p\leq 0.05$; Model 2-Int: $\beta=0.0001$, $p\leq 0.01$; Model 3-Int: $\beta=0.0001$, $p\leq 0.01$).

For comparison purposes, Table 7.3 summarizes the cases for each gender where the interaction effects are statistically significant and consistent across model specifications and samples. The table highlights not only differences across gender but also the fact that the relationship between market accessibility and industrial concentration is seemingly more relevant for the wage determination process of female workers than for male workers. These differences could be related to the differential distribution of male and female workers across industries as well as to the potential distributional difference between male and female workers across industries and geographic space.

Following, let us look closer at two results for the case of female workers through a graphic analysis of marginal effects; specifically, let us look at the results related to the spatial concentration of employment in the textiles and transportation equipment manufacturing subsectors (refer to Figures 7.3 and 7.4, respectively). The relative importance of the relationship between proximity to a major maritime port and the spatial concentration of employment in both the textiles and the transportation equipment manufacturing subsectors to the wage level of local female workers is evident in the afore-mentioned results as indicated by the statistical significance of the corresponding interaction coefficients. Likewise, related wage effects for female workers that change with the intensification of Mexico's globalization process are also evident, although the effect is different depending on the industry of reference.

Table 7.3: Consistently Significant Moderating (Interaction) Effects by Gender

MALE WORKERS

Sector of Industrial Concentration	Market Access	Testing for Globalization Effects	Effect
Transportation	Ports	NO	-
Chemicals	Ports	NO	-
Chemicals	Ports	YES	+

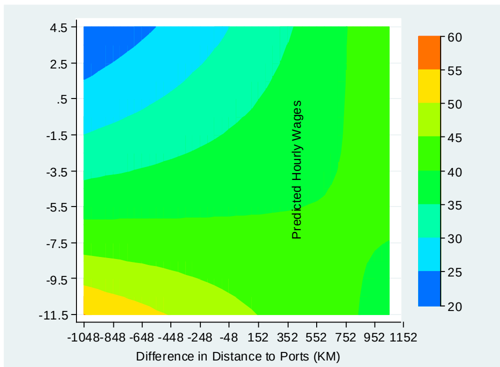
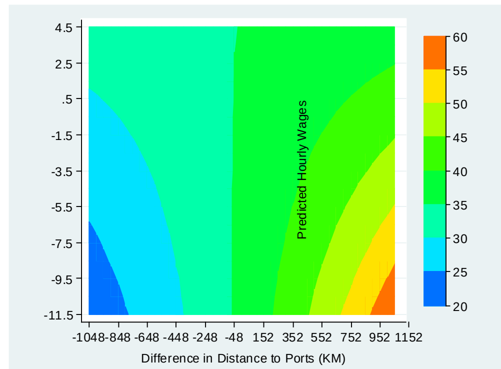
FEMALE WORKERS

Sector of Industrial Concentration	Market Access	Testing for Globalization Effects	Effect
Food	US Border	NO	-
Food	US Border	YES	+
Textiles	Ports	NO	+
Textiles	Ports	YES	-
Transportation	Ports	NO	-
Transportation	Ports	YES	+
Chemicals	Ports	NO	-

Figure 7.3 shows that, everything else considered, during Mexico's early globalization period (1992-1993) the female-wage gradient across urban areas with different levels of spatial concentration of textiles employment varied according to the sea coast where the most proximal major maritime port was located. In other words, the wage gradient observed for urban areas with different levels of spatial concentration of textiles employment was different between urban areas closer to a major maritime port in the Pacific Coast and urban areas closer to a major maritime port in the Gulf Coast. For urban areas with relative proximity to a major Gulf Coast maritime port—represented by negative distances in Figure 7.3—female wages were higher the lower the level of industrial

concentration of textiles employment, and wages decreased as the level of industrial concentration increased, denoting negative localization externalities. The female wage level in turn was overall similar in magnitude, regardless of the level of industrial concentration of textiles employment, in urban areas with closer relative geographic proximity to Pacific Coast maritime ports, although wages were not as high as those observed at low levels of spatial concentration in urban areas with relative proximity to a major Gulf Coast maritime port. Thus, while the spatial concentration of employment in the textiles subsector seems to have played a role in how the relative proximity to maritime ports affected the wages of female workers across urban areas in Mexico in the earlier years of the country's globalization period, the type of role observed is not the one expected. One would have expected for higher concentrations of employment in general to yield higher wages for female workers regardless of the coast the most proximal maritime port is located at, but that is seemingly not the case here. As mentioned, in urban areas with close proximity to a major maritime port in the Gulf Coast, results suggest instead the presence of negative localization externalities associated with the spatial concentration of employment in the textiles manufacturing subsector during the 1992-1993 period. Alternatively, in urban areas with close proximity to a major maritime port in the Pacific Coast, localization externalities associated with spatial concentration of the industry are not apparent.

Figure 7.3: Interaction Effects on the Wages of Female Workers

	Early Globalization Period	**Accelerated Globalization Period**
Textiles Mfg.		

Note: Marginal effects and predicted hourly wages were calculated using the results from Model 1-Int. A similar pattern is observed in the results from Model 2-Int and Model 3-Int.

As globalization intensified, Figure 7.3 tells us that, everything else considered, the relationship between proximity to a major maritime port and the spatial concentration of employment in the textiles manufacturing subsector changed, particularly in urban areas with relative proximity to a major maritime port in the Gulf Coast and lower levels of spatial concentration of the textiles industry. In this period, female wages are higher in urban areas located closer to a major Pacific Coast maritime port than to a Gulf Coast maritime port regardless of the level of spatial concentration of employment in the textiles manufacturing subsector. In addition, we can observe inverse localization externalities associated with the spatial concentration of the textiles manufacturing industry between urban areas with geographic proximity to a major maritime port in the Pacific Coast and urban areas with geographic proximity to a major maritime port in the Gulf Coast. Specifically, negative localization externalities are observed for female workers in urban areas with the closest relative geographic proximity to a major maritime port in the Pacific Coast, and positive localization externalities are observed for female workers in urban areas with the closest relative geographic proximity to a major maritime port in the Gulf Coast.

The effect of these conditional externalities converges with equidistance to major maritime ports in opposite sea coasts as well as with higher levels of spatial concentration.

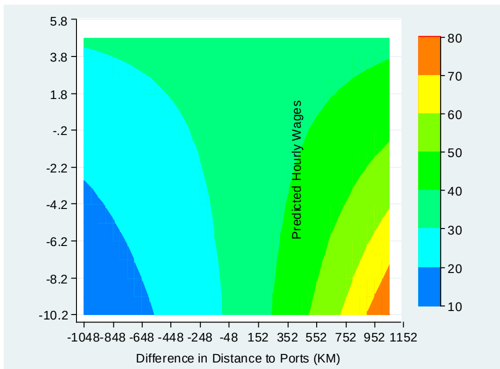
Figure 7.4 shows that, everything else considered, during Mexico's early globalization period (1992-1993) the wages of female workers were higher in urban areas located closer to a major Pacific Coast maritime port than to a Gulf Coast maritime port regardless of the level of spatial concentration of employment in the transportation equipment manufacturing subsector. Figure 7.4 further points to inverse localization externalities associated with the spatial concentration of the transportation equipment manufacturing industry between urban areas with geographic proximity to a major maritime port in the Pacific Coast and urban areas with geographic proximity to a major maritime port in the Gulf Coast. Specifically, negative localization externalities are observed for female workers in urban areas with the closest relative geographic proximity to a major maritime port in the Pacific Coast, and positive localization externalities are observed for female workers in urban areas with the closest relative geographic proximity to a major maritime port in the Gulf Coast. The effect of these conditional externalities converges with equidistance to major maritime ports in opposite sea coasts as well as with higher levels of spatial concentration.

As globalization intensified, Figure 7.4 tells us that the interurban female wage disparity associated with the relationship between proximity to a major maritime port and the spatial concentration of employment in the transportation equipment manufacturing subsector narrowed, with some urban areas and their female workers gaining an economic advantage, others losing it, and still with others not being affected. Wages decreased in urban areas with relative proximity to maritime ports in the Pacific Coast; wages increased in urban areas with relative proximity to maritime ports in the Gulf Coast; and nothing largely changed in urban areas equidistant to maritime ports in either coast as well as with higher levels of spatial concentration of employment in the industry.

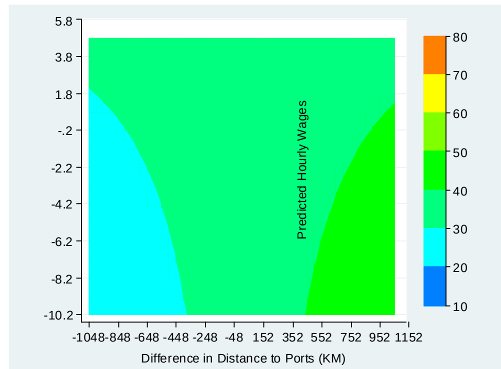
Figure 7.4: Interaction Effects on the Wages of Female Workers

Transportation Equipment Mfg.

Early Globalization Period



Accelerated Globalization Period



Note: Marginal effects and predicted hourly wages were calculated using the results from Model 1-Int.

Other evidence that a relationship between an urban area's relative employment concentration in a specific manufacturing subsector and an urban area's accessibility to demand markets exists and that this relationship has in fact an effect on the wages of female workers are observed for the following interaction relationships. As I have previously mentioned, it is my view that these statistically-significant relationships point to the importance of market accessibility and the medium of accessibility (i.e., land ports versus maritime ports) to the colocation decision of firms in each manufacturing subsector. From Model 1-Int: the spatial concentration of employment in food manufacturing with distance to the nearest large market (β=0.0001, $p \leq 0.05$); the spatial concentration of employment in chemicals manufacturing with distance to the nearest large market (β=0.0001, $p \leq 0.05$); the spatial concentration of employment in textiles manufacturing with distance to a U.S.-Mexico border crossing (β=0.0000, $p \leq 0.05$); and, the spatial concentration of employment in electronics manufacturing with distance to a U.S.-Mexico border crossing (β=-0.0001, $p \leq 0.01$). From Model 2-Int: the spatial concentration of employment in electronics manufacturing with distance to a U.S.-Mexico border crossing (β=0.0001, $p \leq 0.01$); and, the spatial concentration of employment in machinery manufacturing with differential distance to maritime ports (β=0.0001, $p \leq 0.05$).

In addition, evidence that the nature and effects of the relationship between industrial concentration and market accessibility may have varied over time as Mexico's trade liberalization and globalization processes expanded are observed for several interaction relationships. As I have previously noted, in my view, these results suggest that there is indeed a three-way interaction affecting the wages of female workers between the colocation decision of firms in each manufacturing subsector, an urban area's accessibility to demand markets and the medium of accessibility (i.e., land ports versus maritime ports), and globalization processes or mechanisms. For simplicity, I do not explicitly write in each of the following relationships the indicator variable POST, which is the third element of the three-way interaction between industrial concentration, market accessibility, and Mexico's period of expanding globalization processes and mechanisms. From Model 1-Int: the spatial concentration of employment in food manufacturing with distance to the nearest large market (β=-0.0002, $p \leq 0.05$); the spatial concentration of employment in textiles manufacturing with distance to a U.S.-Mexico border crossing (β=-0.0000, $p \leq 0.05$); and, the spatial concentration of employment in electronics manufacturing with distance to the nearest large market (β=-0.0000, $p \leq 0.05$) as well as with distance to a U.S.-Mexico border crossing (β=0.0001, $p \leq 0.01$). From Model 2-Int: the spatial concentration of employment in transportation equipment manufacturing with distance to the nearest large market (β=-0.0001, $p \leq 0.05$); the spatial concentration of employment in food manufacturing with differential distance to maritime ports (β=0.0002, $p \leq 0.05$); the spatial concentration of employment in machinery manufacturing with differential distance to maritime ports (β=-0.0001, $p \leq 0.05$); and, the spatial concentration of employment in chemicals manufacturing with differential distance to maritime ports (β=0.0001, $p \leq 0.05$). From Model 3-Int: the spatial concentration of employment in chemicals manufacturing with differential distance to maritime ports (β=0.0001, $p \leq 0.01$).

Overall, these results offer evidence to suggest that the wage level of female workers across urban areas in Mexico is in some cases the result of joint processes related to the location and co-location (localization) decisions of manufacturing firms. Although compared to the results observed for male workers, these results would appear to suggest that the relationship between market accessibility and industrial concentration is seemingly more relevant for the wage determination process of female workers than for male workers. The results also point, in a sense, to the importance of the medium of accessibility (i.e., land ports versus maritime ports) to the location and co-location decisions of manufacturing firms. Two important examples that I have discussed here relate to the wage effects associated with the decision of textiles and transportation equipment manufacturing firms to locate and co-locate with close geographic proximity to maritime ports of international trade. For these cases and others, the results further offer some evidence that globalization has affected the wage determination process of female workers when the urban wage level is the result of both the location and co-location (localization) decisions of manufacturing firms.

CONCLUSION

This chapter has presented estimation results from augmented-Mincerian wage models that linearize the relationship between worker wages and the key elements of analysis in this study (i.e., the location and localization of manufacturing activity) along with worker characteristics, firm of employment characteristics, and the spatial characteristics of the local labor market. The wage models estimated incorporate a before-and-after analytic approach in the style of a non-experimental difference-in-difference methodology to investigate the role that globalization has played in the contraction or expansion of urban wage disparities that are associated with the location and/or localization patterns of manufacturing activity. As the North American Free Trade Agreement NAFTA is arguably Mexico's most important policy instrument for trade liberalization and global-markets integration, this difference-in-difference approach placed the implementation of NAFTA as a source of variation in the importance that firms attribute to global markets and in the exposure of workers and firms to globalization mechanisms. Thus, consistent with my research objectives, I analyzed in this chapter four elements as sources of wage variation across space: the spatial concentration of manufacturing employment across subsectors, an urban area's access to demand markets, the strengthening of globalization processes in the country, and the elements' interactions.

Results suggest that localization externalities with the capacity to affect the wage level of workers, male or female, are not a typical outcome of industrial concentrations in Mexico when one defines these industrial concentrations by major manufacturing subsector. Some evidence of localization externalities is observed in the results, but this evidence is more often than not inconsistent across gender, industries, samples, and model specifications. In addition, results suggest that the increasing presence of globalization mechanisms in the country, following the implementation of the North American Free Trade Agreement, has not influenced systematically the capacity of any industrial concentration (defined by major manufacturing subsector) to generate localization externalities that affect the wage level of workers. Any evidence observed of effects from globalization is highly conditional on gender, industry, sample, and model specification.

It is important to consider that the absence or presence of wage effects from localization in this study does not necessarily speak to the absence or presence of productivity effects from localization given that my general wage equation does not account, because of data limitations, for some characteristics of a worker's firm of employment or for some local market conditions that also play a role in determining the productivity level of workers, such as a firm's level of capital input or the level of competiveness of the market where the firm operates. It is in light of this caveat that my conclusions speak, therefore, only about wage effects and not about productivity effects, and relate only to the question of whether the spatial concentration of manufacturing activity yields localized externalities that affect directly the wage level of local workers and that, in this manner, contribute to wage disparities across geographic space. Relatedly, we should also consider the case where productivity effects from localization might in fact exist, but these effects are not being translated into the wages of workers; an example are productivity bonuses or other work benefits attached to productivity which would not be accounted for in my measure of wages.

Compared to the results for localization, results for location are also variable by gender, sample, and model specification, but not in the same order of magnitude, offering a better idea of the importance of physical location and accessibility to consumer markets to the location decisions of firms, to the development of urban areas, and to the wages of urban workers in Mexico. Specifically, results point to proximity to foreign markets via land or maritime ports as being a significant source of wage disparities across urban areas in the country. Expectedly, results also point to globalization forces having had an effect on how proximity to markets affects the wages of workers. A slight variability by gender is observed in all of these results.

For male workers, for example, the results suggest that proximity to a major land port in the U.S.-Mexico Border yields a wage premium but only in the years following the implementation of NAFTA. Evidence of the same type of wage effect in the years prior would appear to be only the result of joint processes related to the location and co-location (localization) decisions of manufacturing firms. For female workers, on the other hand, the results seem to suggest the same wage premium from proximity to a major land port in the U.S.-Mexico Border, but this result is only observed in the smaller of my samples and not in both. If we consider only the results of this smaller sample, they also suggest that prior to the implementation of NAFTA, the wages of female workers were higher in urban areas away from the U.S.-Mexico Border, and that this changed as globalization processes strengthened in Mexico. Lastly, results indicate that proximity to a major land port in the U.S.-Mexico border continues to be important (based on data up to the year 2010) to the wage determination process of male and female workers, albeit generating a wage effect that is smaller, suggesting that physical distance to land ports is still relevant to the location decisions of manufacturing firms even in the presence of significant improvements in transportation infrastructure and logistic services—all known to have occurred in Mexico over the last few decades and which would be expected to decrease the time and economic costs of transporting goods to market over a larger distance. In light of this, workers and manufacturing firms in Mexico in urban areas located farther away from land ports of international trade would appear to be, still, at an economic disadvantage relative to those in urban areas located closer in distance.

One of the most salient results on wage effects from location relates to an urban area's differential distance to maritime ports. Here, the results largely suggest not only that proximity to maritime ports for international trade has been an important determinant of the wages of male and female workers across urban areas in Mexico, but also that not all proximity has been equally valued. Globalization forces, in fact, seem to have had an effect on how this proximity to maritime ports of international trade has been valued over time. Specifically, results point to a wage premium in the early years of Mexico's globalization process that is associated to an urban area's proximity to major maritime ports in the Pacific Coast, with wages decreasing with distance towards major maritime ports in the Gulf Coast. As Mexico's globalization process intensified in the years following the implementation of NAFTA, wages in urban areas with close proximity to maritime ports in the Gulf Coast appear to have increased, suggesting a rise in the relevance of maritime ports in the Gulf Coast to manufacturing activity in Mexico. The relevance of proximity to maritime ports to the wages of male and female workers across urban areas in Mexico, however, appears to have decreased with time and may no longer be relevant based on data up to the year 2010.

Finally, results offer significant evidence to suggest that the wage level of male and female workers across urban areas in Mexico is in some cases the result of joint processes related to the location and co-location (localization) decisions of manufacturing firms. In other words, the results point to a relationship between industrial concentration and market accessibility and a wage effect from this relationship. In a sense, these results also point to the importance of the medium of accessibility (i.e., land ports versus maritime ports) to the location and co-location decisions of manufacturing firms. Results appear, moreover, to suggest that the relationship between market accessibility and industrial concentration is seemingly more relevant for the wage determination process of female workers than for male workers. Results further suggest that globalization has influenced the level by which the location and co-location (localization) decisions of manufacturing firms jointly affect wages. In particular, we may observe from the results that globalization may have contributed to generate some localized gender-specific wage externalities from the spatial concentration of some manufacturing activity but, as mentioned earlier, only in urban areas in Mexico where market accessibility plays a role in their industrial development.

For males, for example, results indicate that if in an urban area the level of spatial concentration of employment in the transportation equipment or in the chemical products manufacturing subsectors interacts in any manner with the urban area's differential distance to maritime ports, the wage level of male workers in the urban area would be affected. How would these factors interact? In several ways, for example, if the location decision of firms depends on the local level of spatial concentration of the industry of interest, or also if the strength of the localization externalities associated to the spatial concentration of an industry are linked to the local level of accessibility to demand markets. For females, on the other hand, results indicate that if in an urban area the level of spatial concentration of employment in the textiles, the transportation equipment, or in the chemical products manufacturing subsectors interacts in any manner with the city's differential distance to maritime ports, the wage level of female workers in the urban area would be affected. Likewise, female wages would also be affected if the level of spatial concentration of employment in the food manufacturing subsector interacts in any manner with the proximity to a major land port of international trade. Finally, the results for both male and female workers suggest that the effect that globalization has typically, although not exclusively, had on the level by which the location and co-location (localization) decisions of manufacturing firms jointly affect wages is to decrease wage variability over space, contributing to narrow the wage distribution across urban areas in the country. Nevertheless, very few urban areas and workers have gained an economic advantage (aside from employment itself) from this effect from globalization as wages have often decreased instead of increased.

PART IV: CONCLUSIONS

Chapter 8: Findings and Conclusions

> *Spatial "development must then take the form either of mitigating the disadvantages of being outside existing centers or of [fostering] the creation of new centers of activity"* (Henderson et al. 2001).

This dissertation had five major research aims. First, to trace the historical patterns of location and localization of manufacturing activity across Mexico's urban landscape. Second, to examine the behavior of urban wages to patterns over time of location and localization of manufacturing activity in the country. Third, to determine the contribution of the patterns of location and localization of manufacturing activity to wage disparities across urban areas in Mexico. Fourth, to investigate the role that globalization plays in the contraction or expansion of urban wage disparities that are associated with the location and/or localization patterns of manufacturing activity. And, fifth, to differentiate the analysis by gender.

The dissertation began with an extensive overview of the relevant literature explaining the existence of wage disparities across urban areas. In line with the dissertation's research objectives, I presented the literatures that offer a framework for analyzing the potential contributions of industrial concentrations *within* geographic space to wage disparities *across* geographic space in an economic environment, like Mexico's, that is increasingly influenced by globalization processes, as well as identified major contributions that have been made to these areas of research and some of the gaps requiring further study. For this purpose, I discussed the established literatures of localization economies from Urban Economics (UE) and demand-market access and proximity from New Economic Geography (NEG), as well as the most recent literature on globalization externalities (GE). I continued by addressing other factors known in the literature to explain urban wage disparities. Placed-based characteristics were at the center of this discussion and include: an urban area's scale and diversity, the educational composition of its population, the local availability of amenities, the characteristics or condition of its labor market (i.e., the rate of unemployment), and the characteristics of its product market (i.e., firm characteristics). Next, I presented the conceptual model framing the dissertation's subsequent analysis, followed by a description of the data and methodology that I used to conduct my empirical research and a discussion of their respective contributions and limitations.

The analysis began with two contextual chapters to understand the historical patterns of spatial industrial development in Mexico and to inform the descriptive and quantitative analytic strategies of the dissertation research. The first chapter addressed the macro policies that have contributed to the formation of the spatial landscape of manufacturing in Mexico, including a discussion of policy instruments designed to redistribute industrial production in the country but that often failed to be effective. It relied on relevant available literature to trace primarily the historical development of urban manufacturing industrialization in Mexico under the import substitution model of development (or before the implementation of trade liberalization reforms and the country's resulting engagement in globalization), followed by a discussion of the geography of manufacturing industrialization in the country after trade liberalization. The second chapter described the spatial development of manufacturing employment across urban areas in Mexico during the decades of the 1990s and 2000s by presenting a comprehensive, descriptive analysis of the employment concentration patterns of major manufacturing sectors across Mexico's urban space, extending the available body of knowledge.

The analysis was followed by a descriptive chapter focusing on the relationship between urban wages and various known determinants of urban wage disparities relevant to my main research inquiry. Gender differences and the plausible moderating effects of globalization processes were investigated. The penultimate chapter presented the results of a multivariate analysis of urban wages for male and female workers in Mexico. Finally, this concluding chapter not only highlights key results in the study but offers policy implications of the results, along with a discussion of the limitations and contributions of the study, and the future research agenda.

In sum, this dissertation makes an important contribution to the literature by assessing urban wage disparities in Mexico related to the economic geography of manufacturing activity in the country; the moderating influence of globalization is also assessed. Gender differences are explored as well. The results highlight that the location of industrial activity is more relevant than its localization to the explanation of spatial wage disparities, at least when location refers to an urban area's accessibility to foreign demand markets and as it pertains to Mexico. The moderating influence of globalization is also observed to be more significant to the effects of location on urban wages than to the effects of localization on urban wages. In addition, results point to a relationship between industrial concentration and market accessibility and a wage effect from this relationship; globalization seems to influence this relationship as well. Results also speak to a gender component in the analysis of spatial wage disparities in Mexico that should not be ignored. The information obtained from the study has important policy implications for the economic development of a country's urban landscape and fills the gap in our knowledge of how globalization affects urban economies. Moreover, in the era when protectionism and anti-globalization sentiments have once again permeated mainstream politics (in countries other than Mexico), the findings from this research become more relevant.

MAIN EMPIRICAL FINDINGS

Observed Historical Trends on the Economic Geography of Manufacturing in Mexico

Few metropolitan and principal urban areas in Mexico have emerged as new centers of employment of any manufacturing sector since the implementation of the North

American Free Trade Agreement. Those few that have emerged, however, seem to have done so in direct response to economic opportunities arising from trade liberalization and globalization policies and are typically located in the northern and north-central regions of the country (e.g., Chihuahua, Torreon, Saltillo, San Luis Potosi). What is mostly observed in the data are patterns of persistent spatial concentration of employment of manufacturing subsectors in traditional urban centers (e.g., capital cities) with a solid and mature subsector-specific manufacturing base. These traditional manufacturing centers seem to consolidate further their relative ranking in the national hierarchy of subsector-specific manufacturing employment over the decades of the 1990s and 2000s as a direct result of economic opportunities arising from trade liberalization and globalization policies. Mexico's largest metropolitan areas as well as urban areas along the U.S.-Mexico border region, and urban areas in the periphery of Mexico City are among these traditional urban centers.

Still, a very narrow group of metropolitan or principal urban areas in Mexico persistently concentrate significant levels of employment of any manufacturing subsector, with the exception of food manufacturing employment which shows a tendency to be more spread across space relative to other manufacturing subsectors. Barring the city of Campeche, for example, the spatial concentration of employment of manufacturing subsectors in Mexico's southern region is negligible. In addition, patterns of coagglomeration of manufacturing subsectors are observed for Mexico as well as patterns of localization in urban areas with ease of access to demand markets. The importance of an urban area's access to the U.S. market via land ports, to other foreign markets via maritime ports, and to domestic markets is evident for Mexico.

Spatial Wage Disparities in Mexico from Location, Localization, and Globalization

Are wages in cities and across cities in Mexico influenced by the spatial concentration of manufacturing activity? Results in my analysis, in general, offer little evidence that spatial concentrations of manufacturing industries in Mexico have contributed or contribute in any significant and systematic manner to wage disparities across the country's urban areas when one defines these industrial concentrations by major manufacturing subsector. Under certain conditions, depending on the gender or urban areas considered in the analysis, do some industrial concentrations appear to generate localized externalities associated with their concentration in geographic space that generate wage disparities across space, but these externalities are highly case specific. Likewise, the increasing presence of globalization mechanisms in the country, following the implementation of the North American Free Trade Agreement, appears also to not have influenced systematically the capacity of any industrial concentration (defined by major manufacturing subsector) to generate localization externalities that affect the wage level of workers and, with that, that contribute to wage disparities across geographic space. Any evidence to the contrary would also be highly case specific.

What matters most, it seems, to explain spatial wage disparities in Mexico during the decades of the 1990s and 2000s (in addition to the characteristics of the local labor force, local firms, and some place-based characteristics) are the advantages conferred to local manufacturing firms and passed on to their workers of being located in urban areas with better access (or closer proximity) to the demand markets these firms serve. Results point specifically to proximity to foreign demand markets via land or maritime ports as a source of wage disparities across urban areas in Mexico. Expectedly, given earlier findings as well as theoretical expectations, results also point to strengthening globalization forces and mechanisms as having had an effect on how an urban area's proximity to markets affects the wages of local workers. A slight variability in these results is observed across gender.

For male workers, results suggest that proximity to a major land port in the U.S.-Mexico Border yields a wage premium but only in the years following the implementation of NAFTA. Evidence of the same type of wage effect in the years prior would appear to be only the result of joint processes related to the location and co-location (localization) decisions of manufacturing firms. For female workers, on the other hand, the results seem to suggest the same wage premium from proximity to a major land port in the U.S.-Mexico Border, but this result is only observed for one of my samples of urban areas, the smaller, and not in both. If we consider only the results of this smaller sample, they also suggest that prior to the implementation of NAFTA, the wages of female workers were higher in urban areas away from the U.S.-Mexico Border, and that this changed as globalization processes strengthened in Mexico. Overall, the wages of workers (male or female) in urban areas relatively closer to a U.S.-Mexico border-crossing port appeared to have increased with globalization, with wages decreasing between 0.5 and 1.5 percent for every 50 kilometers of distance away from a U.S.-Mexico border-crossing port.

Proximity to a major land port in the U.S.-Mexico Border seemingly continues to be important (based on data up to the year 2010) to the wage determination process of male and female workers, albeit generating a wage effect that is smaller than for earlier years, suggesting that physical distance to land ports is still relevant to the location decisions of manufacturing firms even in the presence of significant improvements in transportation infrastructure and logistic services—all known to have occurred in Mexico over the last few decades and which would be expected to decrease the time and economic costs of transporting goods to market over a larger distance, making urban areas further away from the U.S.-Mexico Border more attractive to firms. In light of this, workers and manufacturing firms in Mexico in urban areas located farther away from land ports of international trade would appear to be, still, at an economic disadvantage relative to those in urban areas located closer in distance. Consequently, urban areas located further away from land ports of international trade continue as well to be at an economic disadvantage relative to urban areas located closer in distance. Nevertheless, the decreasing wage effect observed by using recent data (2003-2010) would seem to be the result of increasing economies of transportation associated with public infrastructural investments in the country that did improved the quality and quantity of transportation corridors.

One of the most salient results in my analysis on the wage effects associated to market accessibility or proximity relates to an urban area's differential distance to maritime ports. Specifically, the results largely suggest not only that proximity to maritime ports for international trade has been an important determinant of the wages of male and female workers across urban areas in Mexico and, therefore, also a source of wage disparities across the countries urban landscape, but also that not all proximity to major maritime ports has been equally valued. Globalization forces, in fact, seem to have had an effect on how this proximity to maritime ports of international trade has been valued over time. Specifically, results point to a wage premium for both male and female workers in the early years of Mexico's globalization process that is associated to an urban area's proximity to major maritime ports in the Pacific Coast, with wages decreasing with distance towards major maritime ports in the Gulf Coast. As Mexico's globalization process intensified in the years following the implementation of NAFTA, wages in urban areas with close proximity to maritime ports in the Gulf Coast appear to have increased, suggesting a rise in the relevance of maritime ports in the Gulf Coast to manufacturing activity in Mexico. Three factors may explain the increased relevance of the maritime ports in the Gulf Coast (e.g., refer to Map 3.1): the location of the chemicals manufacturing industry and the increased trade in chemical products; the increased spatial concentration of transportation and machinery manufacturing industries in the central region of Mexico and the increased trade of related products (e.g., automobiles and heavy machinery); and, increased trade with the European Union (e.g., refer to Figure A.2). Noteworthy, however, is the fact that the relevance of proximity to maritime ports to the wages of male and female workers across urban areas in Mexico appears to have decreased with time and may no longer be relevant based on data up to the year 2010. Consequently, an urban area's differential distance to maritime ports may also no longer contribute to wage disparities across urban areas in Mexico.

Are wages in cities and across cities in Mexico influenced by joint processes related to the location and the spatial concentration of manufacturing activity? The answer to this question is of theoretical and empirical importance given that it has not been addressed before in the literature even when the answer is of significant policy relevance. Results offer significant evidence to suggest that the wage level of male and female workers across urban areas in Mexico is in some cases the result of joint processes related to the location and co-location (localization) decisions of manufacturing firms. In other words, the results point to a relationship between industrial concentration and market accessibility and a wage effect from this relationship. In a sense, these results also point to the importance of the medium of accessibility (i.e., land ports versus maritime ports) to the location and co-location decisions of manufacturing firms. Results appear, moreover, to suggest that the relationship between market accessibility and industrial concentration is seemingly more relevant for the wage determination process of female workers than for male workers. Results further suggest that globalization has influenced the level by which the location and co-location (localization) decisions of manufacturing firms jointly affect wages. In particular, we observe from the results that globalization may have contributed to generate some localized gender-specific wage externalities from the spatial concentration of some manufacturing activity but only in urban areas in Mexico where market accessibility plays a role in their industrial development.

For males, results indicate that if in an urban area the level of spatial concentration of employment in the transportation equipment or in the chemical products manufacturing subsectors interacts in any manner with the urban area's differential distance to maritime ports, the wage level of male workers in the urban area would be affected. How would these factors interact? In several ways, for example, if the location decision of firms depends on the local level of spatial concentration of the industry of interest, or also if the strength of the localization externalities associated to the spatial concentration of an industry are linked to the local level of accessibility to demand markets. For females, on the other hand, results indicate that if in an urban area the level of spatial concentration of employment in the textiles, the transportation equipment, or in the chemical products manufacturing subsectors interacts in any manner with the urban area's differential distance to maritime ports, the wage level of female workers in the urban area would be affected. Likewise, female wages would also be affected if the level of spatial concentration of employment in the food manufacturing subsector interacts in any manner with the proximity to a major land port of international trade. Finally, the results for both male and female workers suggest that the effect that globalization has typically, although not exclusively, had on the level by which the location and co-location (localization) decisions of manufacturing firms jointly affect wages is to decrease wage variability over space, contributing to narrow the wage distribution across urban areas in the country. Nevertheless, very few urban areas and workers have gained an economic advantage from this effect from globalization (aside from employment itself) as wages have often decreased instead of increased. These results, notwithstanding, speak to a gender component that should not be ignored in the analysis of spatial wage disparities related to the location and localization of manufacturing activity within Mexico's intensely globalizing context. Results point to the existence of some localization externalities that are (1) mediated by market access alone (i.e., results from two-way interaction terms) or in tandem with the influence of globalization mechanisms (i.e., results from three-way interaction terms), and (2) that are gender-specific in their effects and also industry-specific (the same industrial concentration may or may not generate across gender the same type of localization externalities).

Other Important Results

Results show a high wage premium for male and female workers associated with the manufacturing maturity of urban areas in Mexico. Workers in urban areas in Mexico with a stronger and earlier history of manufacturing employment earn on average somewhere between 52 and 169 percent more relative to their counterparts in urban areas with a weaker history in manufacturing. This result offers supporting evidence in general for the existence of dynamic externalities from industrial localization (e.g., Henderson 1997) as well as specifically for the presence and strength of dynamic externalities, with long-term wage effects, associated with the localization of manufacturing employment across urban Mexico. Spatial wage disparities in a country can, therefore, be explained by the path-dependent industrial history of its urban areas.

Evidence of localized externalities that affect the wage level of urban workers and that is derived from the coagglomeration of two manufacturing industries, as opposed to the spatial concentration of just one manufacturing industry (sector), is observed in the results. These localized externalities from coagglomeration seem to be gender-specific, which means that the same coagglomeration may generate externalities that affect differently the wage level of male and female workers, and appear not to be related to the male-female employment ratio in manufacturing subsectors. Coagglomeration externalities can also be positive and confer wage advantages, or negative and confer wage disadvantages to workers. While this study cannot show the reasons why these externalities might be positive or negative, the literature tells us that congestion or the saturation of the market from the co-location of firms may result in negative externalities. A wage advantage is observed for male and female workers in urban areas with a high coagglomeration of employment from the electronics and transportation manufacturing sectors. A wage disadvantage is observed for male and female workers in urban areas with a high coagglomeration of employment from the textiles and machinery manufacturing sectors. The evidence of wage benefits or disadvantages related to the coagglomeration of certain manufacturing subsectors does suggest the need for further research in this area.

Results indicate that there are no wage advantages to urban workers in Mexico from living or working in larger urban areas. There are, however, indications in the results that the unremitting industrial and urban primacy of Mexico City does confer wage disadvantages to workers in the metropolitan area. Results also indicate that there are no economic disadvantages to urban workers in Mexico from living or working in urban areas with relatively higher unemployment rates. Contrary to expectations, the results show that during the decades of the 1990s and 2000s neither the size of a city nor the struggling conditions of its labor market contributed to generate spatial wage disparities in Mexico.

Evidence of industry- and gender-specific knowledge spillovers that enhance labor productivity are observed for male workers during the decades of the 1990s and the 2000s. For female workers, however, the productivity benefits of working in a manufacturing sector with a relatively higher-skilled workforce do not seem to have developed until the decade of the 2000s. Positive human-capital externalities related to the skill-intensity of a women's own industry of employment and that arise among and benefit only women are, therefore, a more recent occurrence that seems to have developed over the decade of the 2000s. This result appears in line with trends that show increases in the educational attainment of women over time both in general and across manufacturing sectors. It is also consistent with the fact that there is a higher percentage of highly-skilled (i.e., college-educated) workers in manufacturing that are male. The result appears to indicate that there is a threshold of human-capital accumulation that when surpassed starts to generate knowledge spillovers and that at some point during the decade of the 2000s this threshold was surpassed by female workers in manufacturing. It is important to note, however, the persistent low levels of educational attainment of the manufacturing labor force across Mexico's urban areas, which is expectedly related to the manufacturing sector's persistent demand for low skill workers and the type of manufacturing performed in the country.

CONTRIBUTIONS OF THE STUDY

This study contributes to the theoretical literature on urban wage disparities in three significant ways. First, the study introduced a more comprehensive examination of the space-based sources of urban wage disparities in a country. It did this by incorporating to the analysis of urban wages in Mexico competing and complementing theories that are often not analyzed in tandem because of data unavailability or contextual limitations as well as novel data measures of location (i.e., proximity to foreign demand markets via maritime ports) and localization of economic activity (i.e., the spatial concentration index). This approach contributes to a greater theoretical and empirical understanding of the mechanisms behind the unevenness in the spatial distribution of economic activity and income, and offers researchers and policymakers a better understanding of the spatial factors that contribute to narrow or to exacerbate economic disparities across geographic space in developing economies, like Mexico's, in which profound processes of economic liberalization and globalization have taken place over the last few decades.

Second, the study introduced a new approach to model localization externalities. This approach allows for the study of localization externalities to become an examination of urban economies as opposed to the more conventional examination of individual industries. Undertaking this approach was possible because of the measure of localization (i.e., spatial concentration index) that I used to conduct the dissertation analysis. Finally, this dissertation contributed to further our understanding of the differential effects of manufacturing location and localization on urban wages by gender, and to advance the current body of knowledge on a yet unsettled issue of whether within-gender wage differentials expand or contract due to trade liberalization and globalization processes.

Other contributions of the study include: providing an analysis of spatial wage disparities for Mexico (or for a developing country) that is carried out at the urban level as opposed to the most common state or regional level, and presenting a comprehensive, two-decade analysis of the location and localization patterns of manufacturing employment across urban areas in Mexico disaggregated by sectors of manufacturing activity.

POLICY IMPLICATIONS

Results suggest that localization externalities with the capacity to affect the wage level of workers, male or female, are not a typical outcome of industrial concentrations in urban areas in Mexico when one defines these industrial concentrations by major manufacturing subsector. This is not the same as saying that no industrial concentration in Mexico (e.g. an industrial cluster) generates localization economies or diseconomies, only that spatial concentrations at the scale of major manufacturing subsectors do not. And this finding has not changed with the increasing presence of globalization mechanisms across urban areas in Mexico. Whether the industrial concentration is composed of purely-domestic manufacturing firms, multinational manufacturing firms, export-oriented manufacturing firms, maquiladoras, or a combination, the results are on average the same; their spatial concentration does not generate typically localization externalities that have an effect on the wage level of workers. The implication of these results is as follows. Workers in urban areas with low or without industrial concentrations of manufacturing activity, when one defines these industrial concentrations by major manufacturing subsector, would appear to be not at an economic disadvantage in terms of their wage level to workers in urban areas with high industrial concentrations, everything else equal. Likewise, urban areas with low or without industrial concentrations of manufacturing activity would appear to be also not at an economic disadvantage to urban areas with high industrial concentrations, everything else equal. National, state, or local government interventions are, therefore, not needed in Mexico to minimize the economic disadvantage to workers, to firms, and to urban areas from the local absence of high industrial concentrations of a manufacturing activity (by major subsector) as these disadvantages do not exist. Urban and labor market disadvantages and advantages could arise from other sources, such as from differences in manufacturing employment levels across the urban landscape, but they do not arise from externalities generated by the spatial concentration of manufacturing employment.

Whereas negative localization externalities that dampen the wage level of local workers and that point to the congestion of economic actors in space would not be a desirable outcome for urban areas from the local presence of industrial concentrations, positive localization externalities would as these take the form of higher productivity and wage levels for local economic actors from the local presence of industrial concentrations in urban areas, and would expectedly contribute to the economic development and growth of the urban areas where these industrial concentrations are located. The question here becomes why do industrial concentrations fail to generate localization economies and how can this outcome be changed by government or other economic actors? The answer lies in looking at the sources of localization economies (*labor pooling, input sharing, knowledge* or *technological spillovers, and healthy competition*) and identifying whether these elements are present and available to local industrial concentrations across urban areas in the country.

Conditions that may be limiting the ability or the capacity of manufacturing sectors in Mexico to generate localization economies from their spatial concentration include: very high levels of labor turnover, limited local availability of suppliers of quality inputs, ineffective trade associations that fail to engage firms in the industrial concentration to cooperate with each other, and low-skilled labor and manufacturing activities. Many of these conditions can only be addressed by the manufacturing firms themselves. But the success of industrial concentrations in other areas of the world offer lessons of where policies could help develop industrial concentrations in Mexico that generate localization economies and aid in the development of urban areas. For industrial concentrations to generate localized externalities, a level of cooperation and interaction is needed. This cooperation can be achieved through trade associations and government programs that foster the interaction of the economic agents that are part of the industrial concentration. In Mexico, these associations and programs exist, and have existed since the late 1910s, but their efforts have been mostly regulatory and their attempts to foster localization economies have focused on specific clusters of economic activity and not on industrial concentrations at the scale of major manufacturing subsectors. These programs and associations include for example: PROMEXICO, the Confederación Nacional de Cámaras Individuales de los Estados Unidos Mexicanos, the Consejo Nacional de la Industria Maquiladora y Manufacturera de Exportación, and the Cámara Nacional de la Industria de la Transformación.

Results point to the existence of a wage premium that is associated to an urban area's proximity to the U.S. consumer market and that is uniquely the result of the increasing presence of globalization mechanisms in the country following the implementation of the North American Free Trade Agreement. In other words, physical proximity to the U.S. market via a land port in the U.S.-Mexico Border matters for the wage level of urban workers, with wages being higher in urban areas with closer proximity to the U.S.-Mexico Border, and wages decreasing with distance away from the U.S.-Mexico Border. NEG theory tells us that higher wages from proximity or accessibility to demand markets arise because local firms are benefitting from lower costs of production (e.g., transportation) related to the proximity to consumer markets. Therefore, results suggest that there is an economic benefit to firms for locating in urban areas in close geographic proximity to the demand markets they serve, even in the presence of significant improvements in transportation infrastructure and logistic services, which are known to have occurred in Mexico over the last few decades and which would be expected to decrease the time and economic costs of transporting goods to market over a larger physical distance. The economic benefit of proximity to the U.S. market, nevertheless, appears to be decreasing with time. The most likely cause of this change is exactly these infrastructural improvements that have increased economies of scale in transportation, thereby, making proximity to the U.S. market slightly less relevant to firms as public investments in infrastructure increase.

The implication of this wage premium is that urban areas located farther away from land ports of international trade to the U.S. market are at an economic disadvantage relative to urban areas located in close geographic proximity to attract and to retain firms (and employment) whose consumer market is the United States, given that locating in urban areas farther away from their consumer market would represent to them higher costs of production and lower relative wages to their workers. To address this economic disadvantage, policies that improve the attractiveness of urban areas and that attract and retain firms and workers to these urban areas need to be put in place. Tax incentives as well as public investment to improve the offering of local amenities, including the quality of local infrastructure, are good examples of the types of policies necessary to counteract the cost and wage disadvantages that would be faced by firms and workers in urban areas that are not located in close proximity to the U.S. market, contributing in this manner to make urban areas farther away more attractive to firms and to workers. Improvements through public infrastructural investments to Mexico's transportation corridors, connecting urban areas located farther away from the U.S.-Mexico Border to the U.S. market, are also good examples of important government actions to counteract the afore-mentioned cost and wage disadvantages. We have already observed a lowering of the value of the wage premium in the analysis that includes later data (2003-2010), which might indicate as mentioned that improvements in infrastructure during this period have in fact diminished the economic relevance of physical proximity to the U.S. market. Consequently, it is conceivable that these investments in infrastructure could stimulate industrial and urban development in urban areas located further away from the U.S.-Mexico Border but whose firms still service consumer markets in the United States.

Maritime transportation of exports has gained importance in Mexico over time. Indeed, from 1996 to 2011, maritime transportation increased its share of the total value of transported exports by about 6.3 percentage points (from 21.8 percent in 1996 to 28.1 percent in 2011), with the highest increase observable during the 2000s decade. The reasons behind this increase may be attributed to several factors, for example: increasing trade with the rest of world, which as Figures A.7 and A.8 in Appendix A show increased significantly during the 2000s decade, and increasing manufacturing and exports of heavy merchandise, such as automobiles and machinery, which as Figures A.3, A.5, and A.6 in Appendix A illustrate are industries which have shown remarkable growth since NAFTA was implemented. The implication of these increases in manufacturing exports using maritime ports is that proximity to maritime ports may be an important factor behind the location decisions of export manufacturing firms and key to the development of urban areas in close geographic proximity to maritime ports. Results in this analysis validate this implication as they largely suggest that proximity to maritime ports for international trade has been an important determinant of the wages of male and female workers across urban areas in Mexico. Nevertheless, the relevance of proximity to maritime ports to the wages of male and female workers across urban areas in Mexico appears to have decreased with time and may no longer be relevant based on data up to the year 2010. This latter result would only make sense, in the context of increases in manufacturing exports using maritime ports, if significant improvements in transportation and maritime port infrastructures as well as cargo-transport logistic services that decrease the time and economic costs of transporting goods to market over a larger physical distance have occurred in Mexico, and they have. From a policy perspective, the irrelevance in recent years of proximity to maritime ports to the location decisions of manufacturing firms minimizes the policy interventions that would otherwise be necessary to compensate the related locational disadvantage of urban areas located farther away from maritime ports.

Findings indicate that interurban, gender-specific wage disparities within a country are in part the result of joint processes related to the location and the spatial concentration of some manufacturing activity as well as to gender. This manufacturing activity is that which is most engaged in international trade and for which access to foreign consumer markets would be essential. The implication of this result is that access to consumer markets, the local availability of a gender-specific labor force, and the local availability of a network of similar firms all seemingly influence the location decisions of firms within this type of manufacturing activity. In this context, for urban development efforts by governments to be successful, these must take into consideration the relative location of the targeted urban area, the type of manufacturing activity targeted by these efforts, the gender most likely to be employed, and the level of spatial concentration of the manufacturing activity in the targeted urban area.

Results point to a wage premium for living in urban areas with a history of manufacturing. The implication here is that workers are penalized for living in urban areas whose manufacturing history is more recent. Given that the current wage level of workers in a city is dependent on the city's industrial maturity, national and local policies to attract and to retain qualified workers to urban areas that are industrially young are essential for the development of the manufacturing industry in the urban area as well as for the development of the urban area itself. Investments to improve the offering of local amenities, including the quality of local infrastructure, which would make an urban area more attractive to workers are a good example of the type of policy that is necessary to counteract the wage disadvantage that would be faced by workers in industrial centers that are young.

Finally, externalities derived from the coagglomeration of multiple industrial sectors seem, according to the results of this analysis, to be more important than externalities derived from the spatial concentration of a single major industrial sector for explaining wages in urban areas and wage disparities across urban areas. The finding highlights the interconnectedness of manufacturing industries across subsectors, and implies that attracting interconnected industries from different subsectors to an urban area might be a good policy strategy for its development. Understanding that both coagglomeration and spatial concentration can be sources of spatial development or spatial underdevelopment allows for the design of targeted policy instruments of economic development and growth that are specific to the industrial circumstances of each city.

LIMITATIONS OF THE STUDY

This study has five major limitations. First, results from the inferential analyses only speak to the observed effects on wages of externalities generated by the location and localization of manufacturing activity, and by the increasing exposure of urban areas to globalization mechanisms. Results do not speak, however, to the mechanisms that generate or hinder the development of these externalities (e.g., labor pooling, input sharing, knowledge or technological spillovers, competition, FDI). Second, the non-experimental difference-in-difference approach that I use to examine the potential effects of globalization on urban wages may not be capturing *solely* the effects from globalization. It may also be capturing, for example, technological development that would have otherwise happened in the absence of globalization. Third, the inability to account for potential sources of endogeneity in the estimation of urban wages due primarily to data limitations but also to intense computational requirements has likely led to the underestimation or overestimation of some estimation results (refer to Chapter 3 for the relevant discussion). Fourth, the unbalanced geographical coverage across time of the data sample required of me to carry out the study's descriptive and inferential analyses on two samples (i.e., the short-run and short/long-run analytic samples). This approach limited my ability to conduct clean, straight-forward analyses on a single sample, muddling the interpretation of results and limiting their generalizability. Finally, the time invariance of the data on distances to demand-markets limited my ability to capture, along with proximity, market accessibility. Without time-variant data, capturing the evolution of transportation networks and infrastructural improvements in the access to markets is impossible.

FUTURE RESEARCH AGENDA

Several issues raised throughout the study remain unaddressed and should be the starting points for developing extensions to this research. This study has focused on the effects on urban wages of externalities generated by the location and localization of manufacturing activity, and by the increasing exposure of urban areas to globalization mechanisms. However, as expressed earlier in the limitations section, this study is not suitable for uncovering and studying the mechanisms that generate or hinder the development of these externalities (e.g., labor pooling, input sharing, knowledge or technological spillovers, competition, FDI). As a result, quantitative and/or qualitative research targeting the nature of these externalities is needed and would inform the results from this study.

In addition, empirical results from this dissertation point to some gender differences in the effects that location, localization, and globalization have on urban wages. In most cases, my ability to explain the nature of these differences was limited because of lack of relevant data or literature that could inform the results. This speaks to the importance of further research on the culture of gender and the dynamics of gender interactions within the manufacturing industry in Mexico.

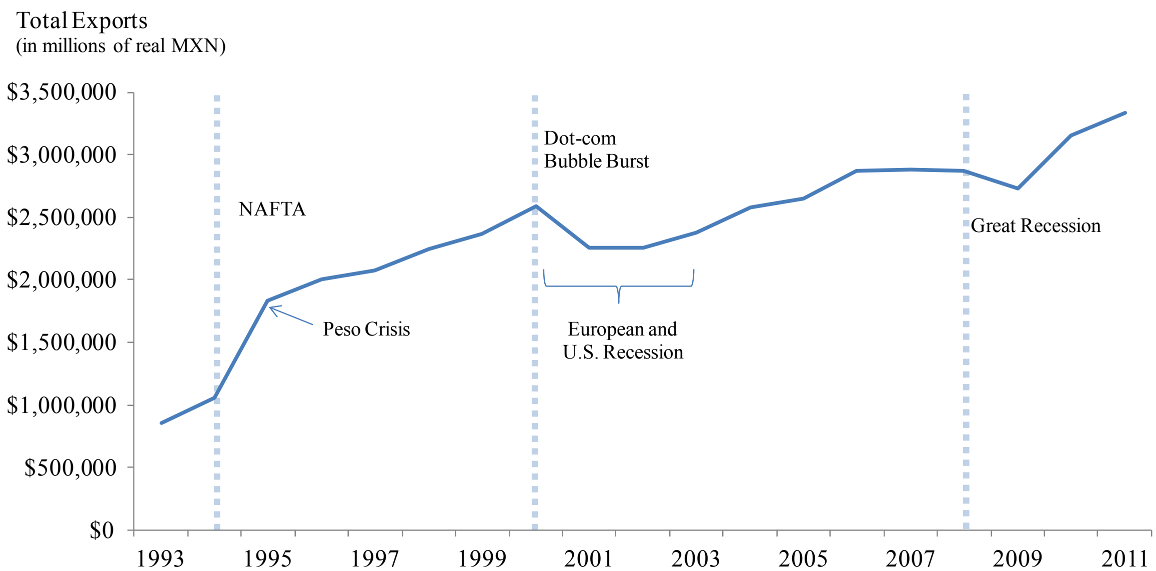
The dissertation analysis also revealed that localized externalities derived from the coagglomeration of multiple manufacturing sectors may be at least as important but perhaps more important than localized externalities derived from the spatial concentration of a single industrial sector for explaining wages in cities and wage disparities across cities. We also learned from the results that not all industries have the ability to generate externalities from their coagglomeration and that there is a gender component in the manner in which coagglomeration externalities are developed and impact urban wages. The significant theoretical and policy implications of these results in the context of the still young and developing body of literature on industrial coagglomerations speak to the importance of carrying out research focused on the coagglomeration of manufacturing industries.

Finally, carrying out a similar analysis as this dissertation that employs the same methodological approach on data from other countries (e.g., China, Turkey, and Brazil) would contribute to assess its validity and evaluate its applicability to other contexts.

Appendices

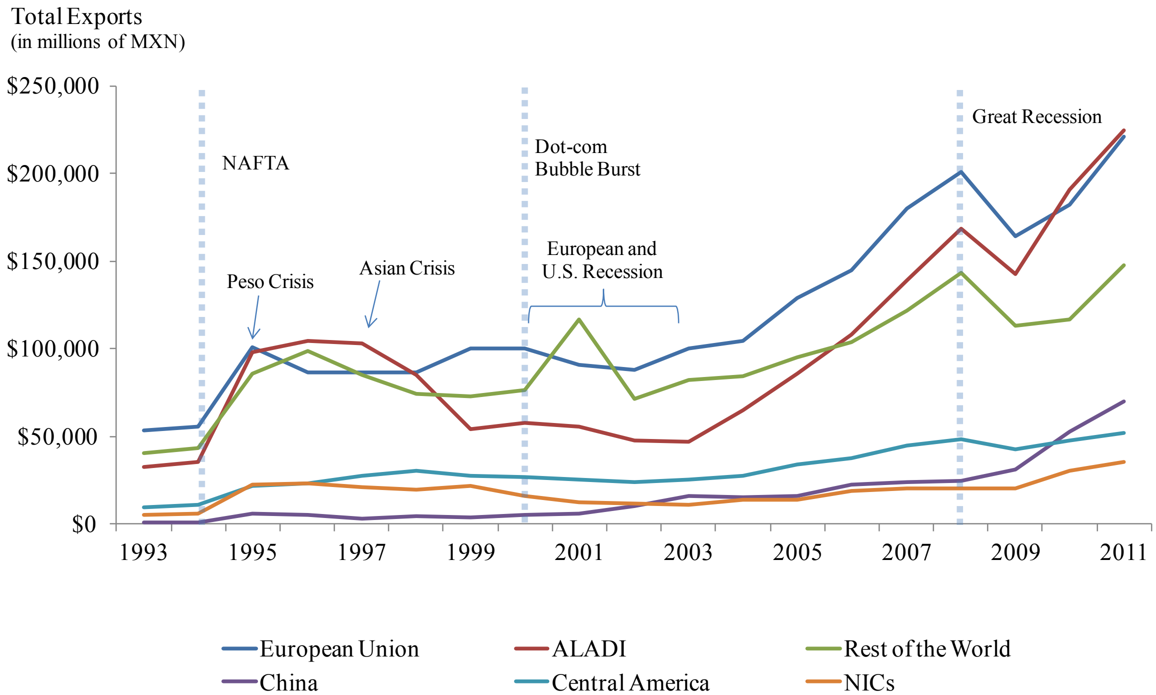
APPENDIX A

Figure A.1: Total NAFTA Exports from Mexico, 1993-2011



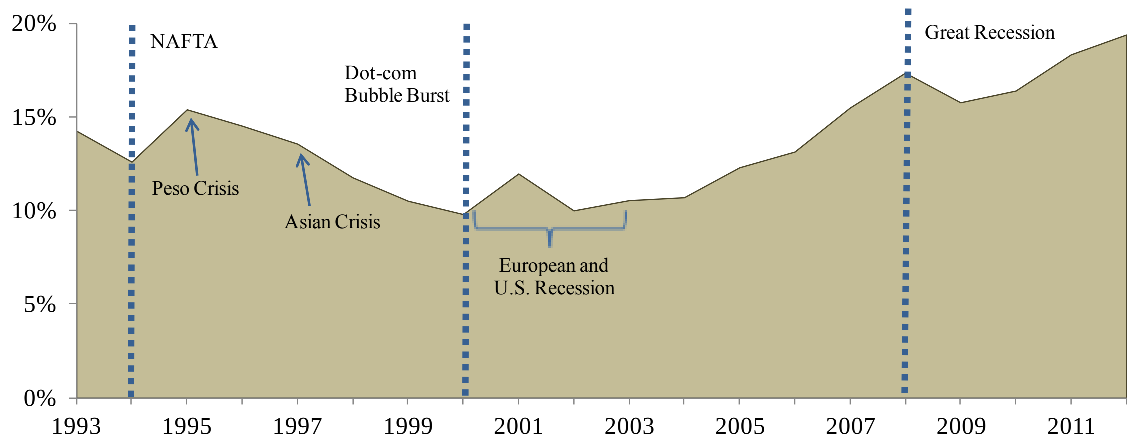
Source: Own elaboration using data provided by Mexico's Ministry of Economy (2013) with data from the Bank of Mexico. Values were converted from U.S. dollars to Mexican pesos using the exchange rate to settle liabilities denominated in foreign currency as reported by the Bank of Mexico and deflated using Mexico's Implicit Price Deflator for GDP as reported by INEGI.

Figure A.2: Total Exports from Mexico by Region excluding NAFTA, 1993-2011



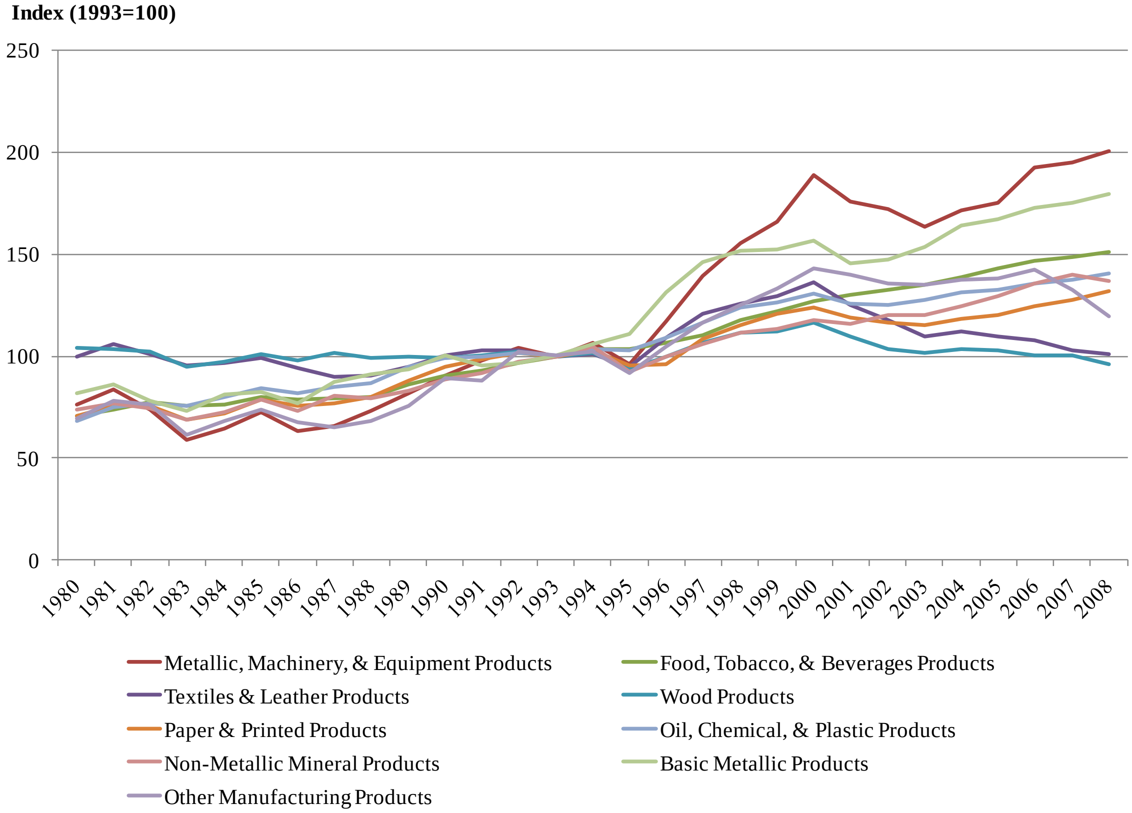
Source: Own elaboration using data provided by Mexico's Ministry of Economy (2013) with data from the Bank of Mexico. Values were converted from U.S. dollars to Mexican pesos using the exchange rate to settle liabilities denominated in foreign currency as reported by the Bank of Mexico and deflated using Mexico's Implicit Price Deflator for GDP as reported by INEGI.

Figure A.3: Percent Share of Mexico's Total Non-NAFTA Exports



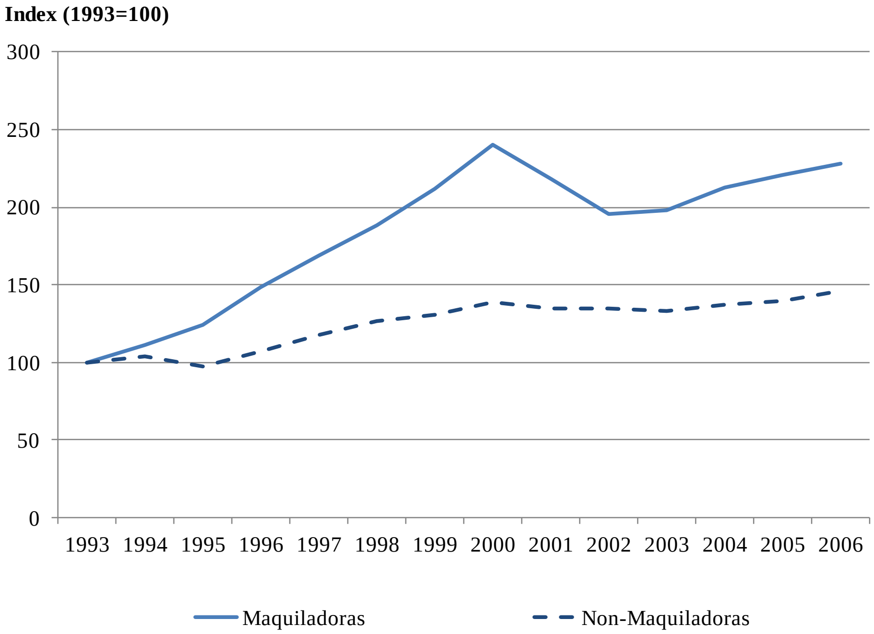
Source: Own elaboration using data provided by Mexico's Ministry of Economy (2013) with data from the Bank of Mexico.

Figure A.4: Index of Manufacturing Activity by Subsector, 1980-2008



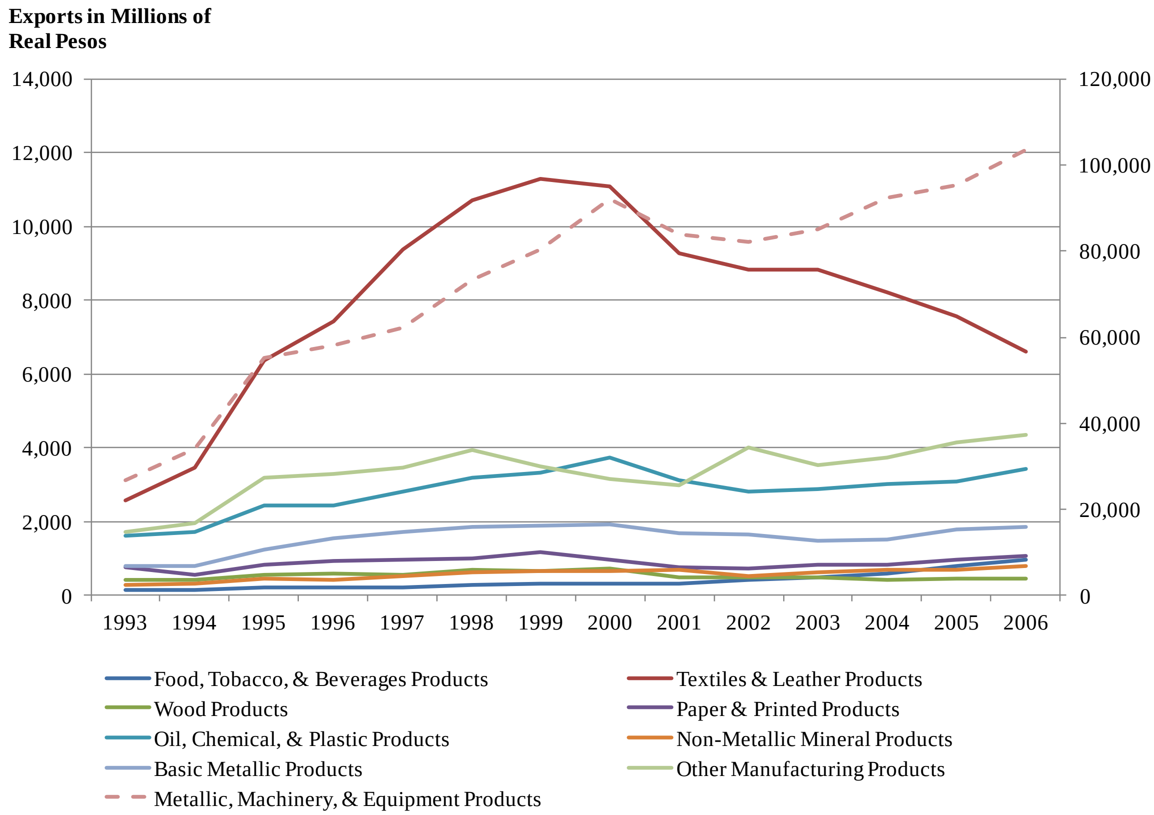
Source: Own elaboration using INEGI's Economic Information Bank with data from the *Dirección General de Contabilidad Nacional y Estadísticas Económicas*. Indices reported are annual averages of seasonally-adjusted monthly indices.

Figure A.5: Index of Manufacturing Activity for Maquiladoras and Non-Maquiladoras, 1993-2006



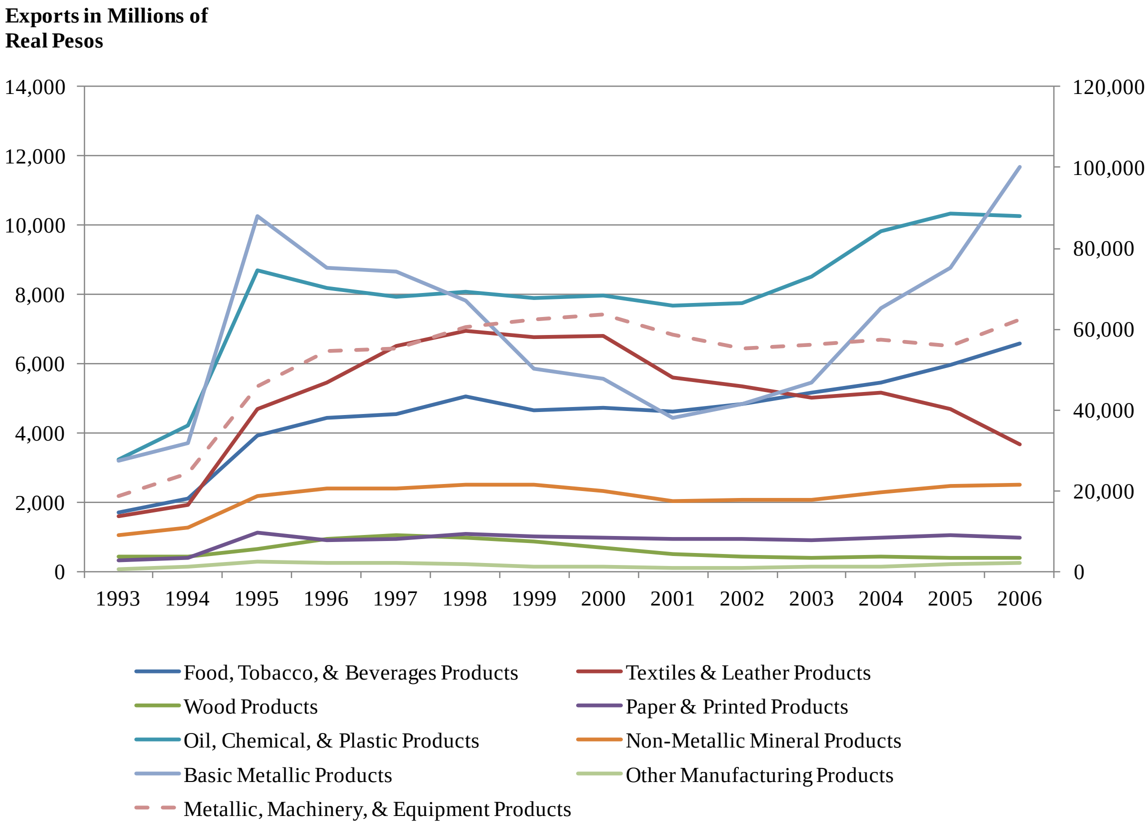
Source: Own elaboration using INEGI's Economic Information Bank with data from the *Dirección General de Contabilidad Nacional y Estadísticas Económicas*. Indices reported are annual averages of seasonally-adjusted monthly indices.

Figure A.6: Maquila Manufacturing Exports by Subsector, 1993-2006



Source: Own elaboration using INEGI's Economic Information Bank with data from the Working Group on International Trade Statistics, formed by Bank of Mexico, INEGI, Tax Administration Service (SAT), and the Ministry of Economy. Values are annual averages and were converted from U.S. dollars to Mexican pesos using the exchange rate to settle liabilities denominated in foreign currency as reported by the Bank of Mexico and deflated using Mexico's Implicit Price Deflator for GDP as reported by INEGI. Dashed line refers to data on the secondary axis.

Figure A.7: Non-Maquila Manufacturing Exports by Subsector, 1993-2006



Source: Own elaboration using INEGI's Economic Information Bank with data from the Working Group on International Trade Statistics, formed by Bank of Mexico, INEGI, Tax Administration Service (SAT), and the Ministry of Economy. Values are annual averages and were converted from U.S. dollars to Mexican pesos using the exchange rate to settle liabilities denominated in foreign currency as reported by the Bank of Mexico and deflated using Mexico's Implicit Price Deflator for GDP as reported by INEGI. Dashed line refers to data on the secondary axis.

Table A.1: Percentage of Gross Manufacturing Sales by Market and Subsectors for Selected Years

	1994		1995		2000		2007*	
	National	Foreign	National	Foreign	National	Foreign	National	Foreign
Manufacturing Total	84%	16%	72%	28%	71%	29%	42%	58%
Food, Beverages and Tobacco	96%	4%	94%	6%	94%	6%	78%	22%
Textiles and Leather	94%	6%	85%	15%	83%	17%	40%	60%
Electronic, Transportation, and Machinery and Equipment	69%	31%	48%	52%	48%	52%	32%	68%
Oil and Lead, Chemical, and Plastic; Mineral, Non-Metallic	88%	12%	79%	21%	85%	15%	59%	41%

Note (*): Data for the year 2007 refer to gross sales from both maquiladora and non-maquiladora firms. For the years prior to 2007, the data only refer to gross sales from non-maquiladora manufacturing firms. The earliest available data are for the year 1994.
Source: Own elaboration using data from INEGI's Annual Industrial Survey for the years 1994, 1995, and 2000 and INEGI's Statistic of the Manufacturing, Maquila, and Export Service Industry Program for the year 2007.

Table A.2: Percentage of Exports by Type of Manufacturing (with or without Maquila) and Subsectors for Selected Years

	1993		1994		1995		2000		2006	
	Maquila	w/o Maquila	Maquila	w/o Maquila	Maquila	w/o Maquila	Maquila	w/o Maquila	Maquila	w/o Maquila
Food, Beverages and Tobacco	7%	93%	7%	93%	5%	95%	6%	94%	13%	87%
Textiles and Leather	62%	38%	64%	36%	57%	43%	62%	38%	64%	36%
Electronic, Transportation, and Machinery and Equipment	56%	44%	55%	45%	50%	50%	58%	42%	59%	41%
Oil and Lead, Chemical, and Plastic; Mineral, Non-Metallic	31%	69%	27%	73%	21%	79%	30%	70%	25%	75%

Note: The earliest available data are for the year 1993. The latest available data are for the year 2006.
Source: Own elaboration using data provided by INEGI's Economic Information Bank with data from the Working Group on International Trade Statistics, formed by Bank of Mexico, INEGI, Tax Administration Service (SAT), and the Ministry of Economy.

APPENDIX B

Map B.1: Official Federal Entities in Mexico and Author's Regional Divisions

Source: Own elaboration

Map B.2: Metropolitan Areas in the Study

Source: Own elaboration

Table B.1: Geographical Coverage by Region and Metropolitan Area of the Original ENEU and ENOE Samples (Third-Quarter Rotation Group), 1987-2010

	ENEU																		ENOE					
Metropolitan Area	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
North Central Region																								
Guadalajara, Jal.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
León, Gto.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
San Luis Potosí, S.L.P.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Aguascalientes, Ags.						X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Colima, Col.						X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Morelia, Mich.						X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Manzanillo, Col.						X	X	X	X	X	X	X	X	X	X									
Querétaro, Qro.							X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Celaya, Gto.*								X	X	X	X	X	X	X	X	X	X	X						
Irapuato, Gto.*								X	X	X	X	X	X	X	X	X	X	X						
South Central Region																								
Orizaba, Ver.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X								
Puebla, Pue.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Veracruz, Ver.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Acapulco, Gro.						X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Cuernavaca, Mor.						X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Toluca, Edo. Mex.						X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Coatzacoalcos, Ver.						X	X	X	X	X	X	X	X	X	X	X								
Tlaxcala, Tlax.*									X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Pachuca, Hgo.*											X	X	X	X	X	X	X	X	X	X	X	X	X	X
Mexico City																								
Mexico City	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Continued

Table B.1: Geographical Coverage by Region and Metropolitan Area of the Original ENEU and ENOE Samples (Third-Quarter Rotation Group), 1987-2010 (Continued)

	ENEU																		ENOE					
Metropolitan Area	**1987**	**1988**	**1989**	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Northern Border																								
Cd. Juárez, Chih.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X								
Matamoros, Tamps.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X								
Nuevo Laredo, Tamps.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X								
Tijuana, B.C.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
La Paz, B.C.S.*										X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Mexicali, B.C.*												X	X	X	X	X								
Northeastern Region																								
Chihuahua, Chih.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Monterrey, N.L.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Tampico, Tamps.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Torreón, Coah.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X								
Durango, Dgo.						X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Saltillo, Coah.						X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Zacatecas, Zac.						X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Monclova, Coah.							X	X	X	X	X	X	X	X	X	X								
Northwestern Region																								
Culiacán, Sin.						X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Hermosillo, Son.						X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Tepic, Nay.						X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Southern Region																								
Mérida, Yuc.	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Campeche, Camp.						X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Oaxaca, Oax.						X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Tuxtla Gutiérrez , Chis.						X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Villahermosa, Tab.						X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Cancún, Q. Roo*										X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Cd. del Carmen, Camp.*											X	X	X	X	X	X	X							

* Cancun, Cd. del Carmen, Celaya, Irapuato, La Paz, Mexicali, Pachuca, and Tlaxcala are represented in the ENEU but are excluded from this study because of insufficient years of data to conduct the analysis.

Table B.2: Weighted Analytic Sample of Full-time Formal-Sector Male Workers in Formal Employment in Manufacturing Subsectors by Region, Metropolitan Area, and Year

	ENEU													ENOE					
Metropolitan Area	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
North Central Region																			
Guadalajara, Jal.	74,976	77,321	65,026	64,342	69,518	89,162	88,135	92,300	122,903	118,082	113,429	97,187	94,236	63,332	68,500	83,210	76,172	64,611	69,460
León, Gto.	22,488	22,352	22,969	19,372	18,823	23,885	37,466	41,946	40,355	41,418	43,524	47,425	45,094	41,780	41,168	41,390	37,354	33,367	37,161
San Luis Potosí, S.L.P.	20,253	25,218	22,455	20,751	25,369	24,265	32,791	32,137	35,790	34,779	34,980	29,187	32,600	28,556	32,201	29,787	30,758	23,188	31,504
Aguascalientes, Ags.	15,250	13,863	15,036	13,315	15,244	16,954	20,239	20,679	25,791	22,459	22,113	20,510	19,942	16,304	15,562	14,372	13,435	11,835	12,865
Colima, Col.	958	1,459	1,040	1,215	1,557	1,037	1,221	1,737	1,630	1,080	2,012	1,965	1,937	2,250	1,778	1,849	1,812	1,961	1,004
Morelia, Mich.	4,009	3,392	2,716	3,377	4,296	4,418	7,425	6,187	6,740	8,688	4,291	5,342	4,858	4,222	4,564	4,298	5,366	5,587	3,633
Manzanillo, Col.	398	254	237	279	354	343	416	322	415	591	------	------	------	------	------	------	------	------	------
Querétaro, Qro.	------	15,017	13,628	13,713	13,988	18,084	25,822	24,793	28,303	23,083	19,694	19,709	20,749	20,276	16,593	20,075	15,839	11,788	13,921
Total	138,332	158,876	143,107	136,364	149,149	178,148	213,515	220,101	261,927	250,180	240,043	221,325	219,416	176,720	180,366	194,981	180,736	152,337	169,548
South Central Region																			
Orizaba, Ver.	10,670	11,738	10,065	8,652	9,106	9,316	10,125	11,413	11,351	13,651	9,893	------	------	------	------	------	------	------	------
Puebla, Pue.	32,873	52,533	47,026	43,610	46,017	58,505	66,641	59,790	70,657	54,648	61,253	47,469	53,493	52,456	40,832	41,995	42,673	35,048	34,933
Veracruz, Ver.	6,959	6,101	6,089	6,545	5,214	6,456	7,567	8,069	6,633	7,280	7,024	5,671	6,132	2,522	2,897	3,144	2,907	2,990	2,949
Acapulco, Gro.	2,128	2,815	1,462	2,042	2,603	3,310	3,102	2,795	2,206	3,104	4,009	4,874	3,148	2,514	2,638	1,812	1,453	1,714	767
Cuernavaca, Mor.	11,248	9,492	8,167	5,450	5,698	6,349	10,369	10,857	12,739	9,324	3,902	4,836	4,274	4,702	5,249	5,228	4,390	2,878	3,242
Toluca, Edo. Mex.	25,416	18,404	15,372	16,262	23,408	22,145	31,089	34,728	45,195	41,390	39,195	36,597	30,950	33,991	26,490	29,178	24,620	21,935	25,246
Coatzacoalcos, Ver.	6,504	5,010	16,518	16,031	16,166	17,497	20,381	17,712	17,293	17,703	16,531	------	------	------	------	------	------	------	------
Total	95,798	106,093	104,699	98,592	108,212	123,578	149,274	145,364	166,074	147,100	141,807	99,447	97,997	96,185	78,106	81,357	76,043	64,565	67,137
Mexico City																			
Mexico City	429,909	374,936	415,635	296,283	302,247	302,546	416,807	402,600	415,294	387,646	378,380	371,780	393,165	246,244	265,736	271,241	259,294	227,598	253,717
Northern Border																			
Cd. Juárez, Chih.	50,863	47,028	59,520	61,514	70,692	72,616	96,209	97,340	95,963	96,377	94,586	------	------	------	------	------	------	------	------
Matamoros, Tamps.	9,995	9,761	11,277	14,403	13,938	14,159	19,209	24,430	24,647	22,281	21,143	------	------	------	------	------	------	------	------
Nuevo Laredo, Tamps.	6,004	6,287	6,791	6,698	7,231	7,224	12,924	12,542	13,078	10,744	13,922	------	------	------	------	------	------	------	------
Tijuana, B.C.	20,406	27,081	32,649	36,646	39,963	48,221	49,180	54,322	50,405	50,520	45,979	46,886	50,607	37,599	47,981	43,939	42,040	36,689	28,692
Total	87,268	90,157	110,237	119,261	131,824	142,220	177,522	188,634	184,093	179,922	175,630	46,886	50,607	37,599	47,981	43,939	42,040	36,689	28,692

Continued

Table B.2: Weighted Analytic Sample of Full-time Formal-Sector Male Workers in Formal Employment in Manufacturing Subsectors by Region, Metropolitan Area, and Year (Continued)

	ENEU													ENOE					
Metropolitan Area	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Northeastern Region																			
Chihuahua, Chih.	14,454	16,101	16,548	18,846	17,297	20,515	25,036	29,213	29,258	28,225	29,082	24,998	28,037	27,648	25,954	25,726	25,347	21,106	22,768
Monterrey, N.L.	129,861	136,080	141,563	120,236	142,810	142,349	171,936	186,486	194,718	195,591	165,285	171,427	165,954	159,059	138,555	127,238	124,929	102,914	102,577
Tampico, Tamps.	10,507	8,537	11,591	10,569	10,988	13,421	13,106	16,029	18,383	14,731	15,536	13,823	10,218	9,667	6,484	4,623	4,444	5,469	5,823
Torreón, Coah.	17,040	18,968	20,756	19,098	23,337	27,915	36,912	37,780	38,551	40,319	39,229	------	------	------	------	------	------	------	------
Durango, Dgo.	3,090	2,692	2,442	1,782	2,922	4,360	4,351	4,485	5,149	5,302	5,659	5,123	6,699	5,241	4,842	2,865	3,800	2,948	4,378
Saltillo, Coah.	22,430	21,913	21,280	23,743	26,188	29,990	42,489	44,734	56,789	50,948	51,965	39,403	41,233	37,506	38,331	41,920	38,135	35,755	40,998
Zacatecas, Zac.	1,575	1,969	1,293	1,776	1,143	1,576	1,578	1,802	1,772	2,368	2,967	2,416	1,996	1,327	1,633	1,530	1,613	1,527	1,231
Monclova, Coah.	------	14,421	16,562	13,709	14,673	18,060	18,145	18,680	18,627	17,640	16,877	------	------	------	------	------	------	------	------
Total	198,957	220,681	232,035	209,759	239,358	258,186	313,553	339,209	363,247	355,124	326,600	257,190	254,137	240,448	215,799	203,902	198,268	169,719	177,775
Northwestern Region																			
Culiacán, Sin.	5,493	5,416	5,058	3,176	3,405	4,250	5,514	6,326	5,496	4,563	4,533	6,505	7,829	3,959	6,260	4,160	3,548	4,943	4,585
Hermosillo, Son.	9,377	8,106	7,328	7,428	9,142	12,153	13,259	13,873	14,117	11,623	11,234	10,637	12,730	14,401	17,230	15,953	14,511	14,277	12,303
Tepic, Nay.	1,877	2,586	2,429	1,954	2,451	1,881	2,705	2,936	2,825	2,613	2,613	2,107	2,009	759	1,945	2,036	1,661	1,732	1,000
Total	16,747	16,108	14,815	12,558	14,998	18,284	21,478	23,135	22,438	18,799	18,380	19,249	22,568	19,119	25,435	22,149	19,720	20,952	17,888
Southern Region																			
Mérida, Yuc.	13,460	12,924	15,089	10,326	11,635	14,033	17,800	20,193	19,859	18,936	19,091	16,908	18,424	17,056	16,009	17,748	11,131	9,994	11,119
Campeche, Camp.	1,688	1,684	1,593	2,073	1,019	1,723	1,358	1,662	2,399	3,223	2,775	2,840	2,863	2,648	2,279	1,829	1,884	1,720	1,942
Oaxaca, Oax.	1,141	758	1,003	1,122	1,256	1,537	1,645	1,791	2,552	2,206	2,340	1,767	1,445	1,104	1,602	662	1,058	941	1,115
Tuxtla Gutiérrez, Chis.	1,347	1,316	1,133	1,281	976	1,633	1,491	1,527	1,558	2,171	2,374	2,552	1,403	1,277	1,102	1,277	723	1,590	2,172
Villahermosa, Tab.	2,825	1,963	2,397	3,282	3,386	3,241	3,482	2,618	3,301	3,238	3,573	2,180	1,617	2,093	1,940	1,539	1,348	1,093	865
Total	20,461	18,645	21,215	18,084	18,272	22,167	25,776	27,791	29,669	29,774	30,153	26,247	25,752	24,178	22,932	23,055	16,144	15,338	17,213
TOTAL	987,472	985,496	1,041,743	890,901	964,060	1,045,129	1,317,925	1,346,834	1,442,742	1,368,545	1,310,993	1,042,124	1,063,642	840,493	836,355	840,624	792,245	687,198	731,970

Source: Own elaboration based on the general analytic sample.

Table B.3: Weighted Analytic Sample of Full-time Formal-Sector Female Workers in Formal Employment in Manufacturing Subsectors by Region, Metropolitan Area, and Year

	ENEU													ENOE					
Metropolitan Area	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
North Central Region																			
Guadalajara, Jal.	29,952	31,040	29,261	33,394	39,912	41,137	39,434	51,719	67,825	66,041	69,485	52,787	50,234	48,612	49,108	46,865	49,304	41,679	47,715
León, Gto.	9,457	8,305	6,869	6,611	7,287	10,262	15,537	18,271	15,396	21,212	18,915	17,450	17,021	18,827	20,767	19,145	19,179	12,659	17,795
San Luis Potosí, S.L.P.	7,585	9,430	8,366	7,058	7,728	8,187	12,493	13,021	13,918	13,615	14,634	12,986	15,671	13,955	16,435	15,256	15,569	10,352	11,875
Aguascalientes, Ags.	4,443	4,874	6,357	5,566	4,867	6,104	9,927	9,203	11,942	9,562	10,600	11,276	9,942	7,854	8,486	8,188	8,159	5,513	5,904
Colima, Col.	189	118	167	144	289	224	262	306	437	426	334	734	1,685	1,303	1,447	652	1,094	848	1,190
Morelia, Mich.	612	1,566	321	1,644	1,169	1,036	1,429	1,121	2,340	2,376	2,175	2,226	1,954	1,753	2,210	1,708	2,809	2,557	2,149
Manzanillo, Col.	141	102	236	154	102	319	289	448	504	322	------	------	------	------	------	------	------	------	------
Querétaro, Qro.	------	4,533	4,646	4,942	5,276	6,434	8,003	9,271	11,051	10,201	8,094	10,181	10,131	9,547	9,181	13,266	11,230	7,005	9,941
Total	52,379	59,968	56,223	59,513	66,630	73,703	87,374	103,360	123,413	123,755	124,237	107,640	106,638	101,851	107,634	105,080	107,344	80,613	96,569
South Central Region																			
Orizaba, Ver.	1,382	1,860	2,057	1,484	1,661	2,167	2,299	2,230	3,177	3,209	3,685	------	------	------	------	------	------	------	------
Puebla, Pue.	7,881	11,224	11,005	11,894	12,050	13,876	22,398	21,605	23,233	17,183	15,979	18,871	17,176	15,779	17,553	15,732	15,659	10,925	13,006
Veracruz, Ver.	1,803	1,125	1,461	1,609	995	726	1,218	2,137	2,167	1,669	832	1,427	1,183	1,094	418	394	830	776	895
Acapulco, Gro.	402	628	223	526	758	719	1,171	1,318	437	408	711	1,608	1,635	602	705	281	182	581	459
Cuernavaca, Mor.	3,639	3,856	2,092	1,890	2,035	3,103	4,914	3,939	6,181	5,422	3,205	3,251	1,759	2,374	2,003	2,622	2,027	2,606	2,002
Toluca, Edo. Mex.	5,275	4,732	4,302	5,479	4,574	5,626	10,814	11,852	16,497	12,889	12,128	11,082	13,026	11,536	11,746	12,397	11,132	10,490	8,558
Coatzacoalcos, Ver.	639	939	2,241	2,131	1,572	2,490	2,967	2,747	2,627	2,289	3,242	------	------	------	------	------	------	------	------
Total	21,021	24,364	23,381	25,013	23,645	28,707	45,781	45,828	54,319	43,069	39,782	36,239	34,779	31,385	32,425	31,426	29,830	25,378	24,920
Mexico City																			
Mexico City	152,468	143,088	178,591	116,907	116,881	136,046	170,836	165,471	201,097	203,159	180,449	177,744	139,124	135,407	161,734	145,738	128,713	99,093	112,086
Northern Border																			
Cd. Juárez, Chih.	29,728	27,620	45,121	40,379	44,457	45,597	65,174	62,383	67,298	69,546	62,185	------	------	------	------	------	------	------	------
Matamoros, Tamps.	12,603	11,888	11,091	12,737	13,977	16,401	21,613	24,564	26,579	20,656	22,738	------	------	------	------	------	------	------	------
Nuevo Laredo, Tamps.	3,279	3,757	4,611	3,756	4,192	4,062	7,140	6,191	7,354	5,580	6,112	------	------	------	------	------	------	------	------
Tijuana, B.C.	15,816	20,751	22,186	26,819	32,500	34,845	40,957	39,936	42,918	41,706	37,292	34,694	39,360	33,202	38,015	40,082	32,891	34,429	25,882
Total	61,426	64,016	83,009	83,691	95,126	100,905	134,884	133,074	144,149	137,488	128,327	34,694	39,360	33,202	38,015	40,082	32,891	34,429	25,882

Continued

Table B.3: Weighted Analytic Sample of Full-time Formal-Sector Female Workers in Formal Employment in Manufacturing Subsectors by Region, Metropolitan Area, and Year (Continued)

	ENEU													ENOE					
Metropolitan Area	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
Northeastern Region																			
Chihuahua, Chih.	12,771	13,685	14,746	17,545	18,132	19,960	24,586	25,833	23,239	26,347	22,977	21,206	22,214	18,621	22,846	25,765	22,951	19,415	20,133
Monterrey, N.L.	34,510	34,495	40,582	32,855	44,676	44,175	66,823	62,464	73,531	60,867	57,529	56,782	67,806	59,998	59,576	65,239	57,648	40,120	37,123
Tampico, Tamps.	2,697	2,642	2,279	3,327	2,007	3,095	3,086	4,060	4,440	4,056	3,947	4,550	3,041	2,485	1,383	1,219	1,730	958	1,839
Torreón, Coah.	8,036	9,842	10,093	8,929	12,538	16,071	19,409	17,927	20,418	17,670	18,045	------	------	------	------	------	------	------	------
Durango, Dgo.	780	609	629	636	1,030	1,827	2,261	2,834	3,420	3,423	3,104	2,226	2,318	3,618	3,590	3,046	3,566	2,841	3,003
Saltillo, Coah.	4,262	4,231	5,859	5,977	7,396	9,234	13,793	15,128	15,476	14,337	10,140	10,726	14,512	10,491	9,410	12,096	12,768	9,134	14,496
Zacatecas, Zac.	288	132	238	523	679	729	745	557	1,094	1,117	1,282	932	668	958	584	713	734	670	594
Monclova, Coah.	------	1,230	1,802	1,996	2,904	3,318	3,191	3,769	4,169	3,715	3,772	------	------	------	------	------	------	------	------
Total	63,344	66,866	76,228	71,788	89,362	98,409	133,894	132,572	145,787	131,532	120,796	96,422	110,559	96,171	97,389	108,078	99,397	73,138	77,188
Northwestern Region																			
Culiacán, Sin.	2,148	1,454	1,680	1,644	1,705	1,668	1,976	2,175	2,431	2,310	1,680	2,412	2,455	2,178	1,982	2,142	1,304	1,631	1,690
Hermosillo, Son.	4,098	2,517	5,139	4,591	6,787	7,900	9,247	9,740	9,395	6,767	5,840	4,686	6,116	9,384	10,380	8,487	8,572	6,910	6,682
Tepic, Nay.	442	1,008	1,061	1,114	921	794	1,146	1,254	1,369	1,619	1,100	714	718	477	319	570	235	566	559
Total	6,688	4,979	7,880	7,349	9,413	10,362	12,369	13,169	13,195	10,696	8,620	7,812	9,289	12,039	12,681	11,199	10,111	9,107	8,931
Southern Region																			
Mérida, Yuc.	4,090	3,670	4,119	4,330	7,031	5,827	8,125	6,363	11,265	9,330	7,764	8,991	10,880	9,963	7,244	8,815	3,776	3,490	4,049
Campeche, Camp.	728	470	449	237	286	398	370	557	1,491	1,641	2,214	1,534	2,364	2,683	1,898	1,975	1,512	1,096	1,473
Oaxaca, Oax.	339	316	704	394	530	347	969	543	1,001	989	881	966	1,067	639	293	398	512	519	293
Tuxtla Gutiérrez, Chis.	431	36	145	241	254	235	347	231	427	1,524	1,330	1,399	1,438	900	952	1,869	1,108	1,213	510
Villahermosa, Tab.	412	137	468	675	506	489	633	505	558	515	625	620	341	219	89	522	539	384	539
Total	6,000	4,629	5,885	5,877	8,607	7,296	10,444	8,199	14,742	13,999	12,814	13,510	16,090	14,404	10,476	13,579	7,447	6,702	6,864
TOTAL	363,326	367,910	431,197	370,138	409,664	455,428	595,582	601,673	696,702	663,698	615,025	474,061	455,839	424,459	460,354	455,182	415,733	328,460	352,440

Source: Own elaboration based on the general analytic sample.

Table B.4: Correlation Coefficients among Distance Variables

Distance to	Largest Market	US-Mexico Border Crossing	Pacific Coast Port	Gulf of Mexico Port	Diff. to Gulf and Pacific Ports
Nearest largest market (MXC, GDL, MTY)	1.000				
Nearest major US-Mexico border crossing	-0.037	1.000			
	(0.830)				
Nearest major port in the Pacific Coast	0.803	-0.258	1.000		
	(0.000)	(0.128)			
Nearest major port in the Gulf of Mexico	0.731	-0.335	0.475	1.000	
	(0.000)	(0.046)	(0.004)		
Diff. in dist. to Gulf and Pacific ports	-0.060	-0.079	-0.503	0.523	1.000
	(0.728)	(0.648)	(0.002)	(0.001)	

Notes: P-values are reported below the correlation coefficients.
Source: Own elaboration based on data obtained from the SCT.

APPENDIX C

General Descriptive Examination of the Data Measures

Appendix Tables C.1 through C.8 present a descriptive profile of the characteristics of the sample with respect to the variables included in the empirical analysis. For tractability purposes and where applicable, only selected years are reported (i.e., 1992, 1997, 2002, 2007, and 2010). The years included in this examination exercise do not constitute directly years of domestic or global economic instability; although, the data may reflect trends related to economic disturbances in earlier periods.

Variables on Individual Characteristics

Table C.1 presents the sample means of individual characteristics, separately, for male and female workers. Table C.1 shows that average real hourly wages for female workers are consistently lower than those of male workers. On average, across the selected years, women in manufacturing earn $8 pesos per hour less than males in manufacturing do. Additionally, Table C.1 shows that the real hourly wages of male and female workers in manufacturing have decreased over time. Indeed, from 1992 to 2010, real hourly wages decreased about 11 percent for males and 10 percent for females. Across years, however, fluctuations in real wages may be observed; a particular wage contraction period is evident after the peso crisis of 1995.

Table C.1 further shows that a large percentage of male and female workers in manufacturing perform manual occupations (i.e., about 58 percent on average across the selected years for both genders equally), followed by managerial or administrative occupations (i.e., about 24 percent for males and 27 percent for females on average across the selected years). In line with these characteristics, Table C.1 shows that the educational attainment of a large percentage of workers is below a high-school diploma (i.e., about 65 percent of males and 67 of females on average across the selected years have not earned a high school diploma). Other trends are evident with respect to educational attainment. Both male and female workers in manufacturing show increases in educational attainment over time: more men and women are completing a high school education; and, more men but particularly more women are earning college degrees. Higher rates of college attainment for women, however, have translated to fewer women earning a technical degree. Average potential years of experience, as a construct based on years of education, naturally reports increases as a result of the higher levels of educational attainment. In addition, I observe that a substantially larger percentage of males in the sample relative to females are married (i.e., about 71 percent compared to 37 percent on average, respectively) or are heads of households (i.e., about 65 percent compared to 17 percent, on average, respectively). Finally, Table C.1 shows that a very small percentage of individuals reported to be a recent immigrant to the metropolitan or principal urban area (i.e., 0.4 percent of males and 0.6 percent of females on average across the selected years). It would appear that migration across urban areas in Mexico of workers with a tendency to work full-time in the manufacturing subsector is either low or occurred prior to 1992. The small percentage values of recent immigrants does not permit me to analyze the endogenous quality-of-labor argument found in the empirical literature (e.g., Glaeser and Maré 2001), which states that observed wage gains that result from spatial industrial concentrations or urban agglomerations come from innate characteristics associated with the local quality of labor not particularly from agglomeration mechanisms. This remains, therefore, a limitation posed by my data.

Variables on Firm Characteristics

Tables C.2 through C.4 present a descriptive profile of the characteristics of the firms represented in the general analytic sample. Table C.2 presents the distribution of firms in the sample by manufacturing subsector as well as the average firm size, separately for men and women. In terms of firm size, Table C.2 shows that a large number of male and female workers in the sample are employed by large-sized firms (i.e., 58 percent of males and 53 percent of females); medium-sized firms employ an important share of the remaining workers (i.e., 25 percent of males and 28 percent of females in the sample). And the rest are employed by micro- or small-sized firms. Additionally, a clear trend emerges across the reported years. Over time, fewer male and female workers are employed by micro-, small-, and, especially, large-sized firms, while significant employment gains may be observed in medium-sized firms.

Table C.3 presents the share of male and female full-time formal-sector workers in each manufacturing subsector across selected years. The table shows that the ratio of male to female employment in the food, transportation, machinery, and chemicals subsectors ranges roughly between 3 and 6, whereas in the textile and electronic subsectors the ratio is substantially closer to being even. Additionally, Table C.3 offers evidence of the feminization of the manufacturing labor force as, over time, the proportion of women relative to men in all subsectors is seen to increase.

Table C.4 reports the percentage of college-educated, full-time formal-sector workers by gender and manufacturing subsector for selected years. It is evident from the table that the skill composition of the labor force varies not only across time and subsector but also across gender. In general, on average—across subsectors and time—a higher percentage of highly-skilled (i.e., college-educated) workers are male; that is, 12.1 percent of male workers on average, across time and all subsectors, are college-educated, while 9.9 percent of female workers on average are college-educated. The subsector with the highest average percentage of college-educated male workers is, as expected, the electronics manufacturing subsector and the second highest is the chemicals manufacturing subsector (i.e., 17.8 percent and 14.1 percent on average across time, respectively). The subsector with the lowest average percentage of college-educated male workers is the textiles manufacturing subsector (i.e., 6.7 percent on average across time) followed by the food manufacturing subsector (i.e., 9.7 percent on average across time). Overall, a higher share of college-educated male workers are found in the more typically technology-oriented manufacturing subsectors such as the electronics, chemicals, transportation, and machinery manufacturing subsectors. For the sample of females, Table C.4 shows that the subsector with the highest average percentage of college-educated female workers is the machinery manufacturing subsector and the second highest, similar to male workers, is the chemicals manufacturing subsector (i.e., 14.6 percent and 13.3 percent on average across time, respectively). The subsector with lowest average percentage of college-educated female workers is the textiles manufacturing subsector (i.e., 4.6 percent on average across time) followed by the electronics manufacturing subsector (i.e., 6.8 percent on average across time). As I have previously noted, textiles and electronics are also two subsectors where a large percentage of women have historically being employed, in fact, almost as many women work in these subsectors as men do, especially since NAFTA was implemented (refer to Appendix Table C.3).

Table C.4 additionally reveals that while fewer women than men in manufacturing are college-educated, the percentage of women with college-education has increased significantly over time for most manufacturing subsectors. Looking at the percentage change from 1992 to 2010, the percentage of college-educated women in the chemicals and electronics manufacturing subsectors has more than doubled (i.e., increased by 118 percent) or double (i.e., increased by 101 percent), respectively. Additionally, the percentage of college-educated women in Textiles and in Transportation also increased, though moderately (i.e., 76 percent and 50 percent, respectively). This is in line with what Table C.1 indicates in terms of the increases in the higher educational attainment of women. On the contrary, the percentage of men with college education has decreased in some subsectors (i.e., food, textiles, and chemicals) or increase moderately in the rest (i.e., 5 percent in transportation, 33 percent in electronics, and, the highest, 72 percent in machinery manufacturing).

Variables on Local Characteristics

Tables C.5 and C.6 present a descriptive profile of the characteristics of the metropolitan and principal urban areas in the general analytic sample for selected years in terms of the male and female unemployment rates, urban population, aggregate level of education, and distances to key consumer markets. Table C.5 depicts slightly higher average unemployment rates for women relative to men during the 1990s decade and a pattern of converging unemployment rates across the sexes over the course of the 2000s decade. In addition, both sexes experience increasing unemployment rates over time. Moreover, Table C.5 shows that average years of education of the urban areas has increased with time, from 10.0 years in 1992 to 11.6 years in 2010. And also that average population, 12 years of age and over, in the sample of urban areas almost doubled from 430,403 in 1992 to 763,447 in 2010. I exclude Mexico City from the computation of average population in the urban areas in the general analytic sample given the metropolitan area's exceedingly large population relative to the other urban areas in the sample—I estimate Mexico City's population, 12 years of age and over, in 1992 at 11,203,044 and in 2010 at 15,187,637. The exclusion of Mexico City provides a better representation of average urban size in the general analytic sample.

Table C.6 presents the average values in kilometers, across the 36 metropolitan and principal urban areas in the general analytic sample, for the distance variables employ in the empirical study. In sum, urban areas in the general analytic sample are on average 481 kilometers away from the nearest largest market, 854 kilometers away from the nearest major U.S.-Mexico border land port, 994 kilometers away from the nearest major maritime port in the Pacific Coast, and 778 kilometers away from the nearest major maritime port in the Gulf of Mexico. On average, the urban areas in the sample are 215 kilometers closer to a major Gulf of Mexico maritime port than to a Pacific Coast maritime Port, as denoted by the negative average value for the measure difference in distance to major Gulf and Pacific maritime ports.

Tables C.7 and C.8 present correlation matrices of the urban-level variables included in the empirical analysis.[85] The matrices are estimated for the short-run and short/long-run analytic samples of metropolitan and principal urban areas, respectively. The correlation matrices indicate that none of the variables poses a risk of introducing multicollinearity to the empirical models. However, differences in the magnitudes of the coefficients across analytic samples do forewarn about potential differences across the results of the short-run and short/long-run estimated models due to the slight variation in the samples' urban coverage.

Additionally, several relationships across the variables are revealed by the estimated correlation coefficients. The coefficients across the spatial concentration indices in both instances (i.e., the short-run and short/long-run cases) reveal potential coagglomeration patterns across manufacturing subsectors, particularly among the highly export-oriented subsectors. We may observe in Table C.7, for instance, that the correlation coefficient between the spatial concentration indices for the transportation and electronics subsectors is 0.713 and that for the textiles and machinery subsectors is 0.729. In the same manner, we gather from Table C.8 that the correlation coefficient between the spatial concentration indices for two highly export-oriented subsectors, namely the electronics and machinery subsectors, is relatively high at 0.774 and that for the machinery and chemicals subsectors is equally as high at 0.782. What the correlation coefficients may be indicating is not only the potential coagglomeration patterns across sets of subsectors but in fact also joint preferences to locate close to consumer markets, as is the case, for example, of the concentration of *maquiladora* firms from all subsectors in the U.S.-Mexico border region. Looking at the correlation coefficients between the spatial concentration indices and the measure for nearest distance to a major U.S.-Mexico border crossing point, we may observe that for the electronics, transportation, and machinery subsectors the coefficients are negative and range from 0.528 to 0.609 for the short-run sample and from 0.482 to 0.519 for the short/long-run sample. While the coefficients are not very high, they do,

[85] The 15 pairwise coagglomeration indices are excluded for space purposes from Tables C.7 and C.8. The corresponding correlation coefficients among the indices themselves are, as expected, very high ($\rho \geq 0.900$), whereas the coefficients across the rest of the urban-level variables are low.

however, denote a strong negative relationship between distance to the U.S.-Mexico border land ports and the spatial concentration of the subsectors. In addition, the correlation coefficients indicate the tendency of some manufacturing subsectors to concentrate in large urban areas. Indeed, the coefficients between the natural logarithm of population and the spatial concentration indices range from 0.412 for the transportation subsector to 0.762 for the chemicals subsector in the short-run analytic sample, and from 0.387 for the transportation subsector to 0.739 for the food subsector in the short/long-run analytic sample.

Table C.1: Sample Means across Variables on Individual Characteristics by Gender for Selected Years using the General Analytic Sample

Year	Real Hourly Wage ($)	Less than High School (%)	High School Diploma (%)	Some College or Tech Education (%)	Technical Degree (%)	College Degree (%)	Potential Years of Experience (#)	Married or In Civil Union (%)	Head of Household (%)	Recent Inmigrant (%)	Occupation: Professional or Technical (%)	Occupation: Service or Sales (%)	Occupation: Managerial or Administrative (%)	Occupation: Manual (%)
Male														
1992	$36.74	69.6	4.9	5.9	8.7	10.9	17.3	69.3	65.0	0.2	8.3	10.9	23.6	57.2
1997	$29.42	67.8	6.1	4.8	10.0	11.3	16.5	69.9	64.9	0.3	8.1	9.7	24.7	57.5
2002	$36.39	66.4	7.7	4.4	8.2	13.2	17.8	72.7	67.4	0.2	7.8	10.2	22.7	59.3
2007	$35.88	62.6	13.5	4.4	6.7	12.8	18.5	72.5	65.4	0.5	7.6	10.2	23.8	58.3
2010	$32.62	60.2	16.7	3.9	7.7	11.5	18.5	69.0	62.8	0.8	7.8	10.0	23.0	59.2
Female														
1992	$29.68	63.9	2.9	5.3	20.8	7.0	13.2	29.2	12.6	0.4	7.3	7.3	29.3	56.2
1997	$20.57	67.2	4.0	3.5	18.1	7.2	13.8	35.3	13.0	0.1	6.7	7.6	28.1	57.6
2002	$25.54	70.3	6.7	2.7	11.7	8.6	15.8	41.2	15.4	0.1	6.0	7.6	25.7	60.7
2007	$26.91	66.9	10.6	1.8	8.8	11.9	17.4	41.2	18.1	0.9	7.1	11.0	25.8	56.2
2010	$26.84	64.6	12.2	3.1	8.7	11.4	18.2	39.1	24.4	1.2	6.2	8.3	25.2	60.2

Notes: The sum, by year, of the percentage of individuals in the sample with educational credentials in each of the 5 educational groups adds to 100 percent. The sum, by year, of the percentage of individuals in the sample working in each of the 4 occupational groups adds to 100 percent.
Source: Own elaboration using the general analytic sample.

Table C.2: Sample Means across Variables on Firm Characteristics by Gender for Selected Years using the General Analytic Sample

Year	Food Mfg (%)	Textiles Mfg (%)	Electronics Mfg (%)	Transportation Mfg (%)	Machinery Mfg (%)	Chemicals Mfg (%)	Micro & Small Firms (%)	Medium Firms (%)	Large Firms (%)
Male									
1992	22.3	13.0	10.2	13.1	19.0	22.5	19.8	21.0	59.1
1997	18.7	15.1	11.7	14.6	18.5	21.4	16.0	21.5	62.4
2002	19.0	13.0	12.2	16.8	16.7	22.1	15.3	16.1	68.5
2007	19.6	13.5	11.2	16.1	16.6	23.1	16.2	35.9	47.9
2010	21.3	11.3	10.6	16.9	14.4	25.6	17.4	31.7	51.0
Female									
1992	15.5	27.2	17.1	11.7	9.0	19.5	24.2	24.7	51.1
1997	15.1	24.9	23.6	12.0	7.4	16.9	17.3	22.8	60.0
2002	14.0	25.3	18.8	14.5	8.1	19.4	15.8	18.7	65.5
2007	15.5	18.8	20.8	14.9	7.5	22.4	18.6	33.1	48.3
2010	14.9	19.7	18.5	15.5	7.4	24.1	19.2	39.6	41.2

Notes: Industry short titles presented refer to the following manufacturing subsectors: (1) food, beverages and tobacco products; (2) textiles and leather products; (3) electronic and electric components, communications and measurement equipment; (4) transportation equipment, parts, and components; (5) metallic products, machinery and equipment; (6) oil and lead, chemical, and plastic products, mineral, non-metallic products. The sum, by year, of the percentage of individuals in the sample employed in each of the manufacturing subsectors adds to 100 percent. The sum, by year, of the percentage of individuals in the sample employed in micro and small, medium, and large firms adds to 100 percent.
Source: Own elaboration using the general analytic sample.

Table C.3: Share of Male and Female Full-time Formal-Sector Workers Employed in each Manufacturing Subsector across Selected Years using Data from the General Analytic Sample

	1992		1997		2002		2007		2010	
Subsector	**Male (%)**	**Female (%)**	**Male (%)**	**Female (%)**	**Male (%)**	**Female (%)**	**Male (%)**	**Female (%)**	**Male (%)**	**Female (%)**
Food	79.6	20.4	73.9	26.1	74.5	25.5	70.0	30.0	74.8	25.2
Textiles	56.5	43.5	58.3	41.7	52.6	47.4	57.7	42.3	54.2	45.8
Electronics	61.9	38.1	53.1	46.9	58.2	41.8	49.9	50.1	54.3	45.7
Transportation	75.3	24.7	73.7	26.3	71.6	28.4	66.4	33.6	69.4	30.6
Machinery	85.1	14.9	85.1	14.9	81.4	18.6	80.4	19.6	80.2	19.8
Chemicals	75.8	24.2	74.4	25.6	71.0	29.0	65.7	34.3	68.9	31.1

Notes: Industry short titles presented refer to the following manufacturing subsectors: (1) food, beverages and tobacco products; (2) textiles and leather products; (3) electronic and electric components, communications and measurement equipment; (4) transportation equipment, parts, and components; (5) metallic products, machinery and equipment; (6) oil and lead, chemical, and plastic products, mineral, non-metallic products.
Source: Own elaboration using the general analytic sample.

Table C.4: Percentage of College-Educated, Full-time, Formal-Sector Workers by Gender and Manufacturing Subsector

Year	Food Mfg (%)	Textiles Mfg (%)	Electronics Mfg (%)	Transportation Mfg (%)	Machinery Mfg (%)	Chemicals Mfg (%)
Male						
1992	8.3	5.4	19.0	14.1	8.2	13.4
1997	9.6	8.7	13.8	9.2	10.8	15.3
2002	12.3	8.2	14.4	12.0	15.4	15.5
2007	11.9	6.6	16.7	13.7	10.1	16.8
2010	6.3	4.6	25.1	14.8	14.1	9.6
Average	9.7	6.7	17.8	12.8	11.7	14.1
Female						
1992	11.3	4.2	4.3	6.1	13.0	7.8
1997	7.3	2.4	4.8	9.5	16.7	12.0
2002	10.2	4.8	5.5	8.1	12.8	14.0
2007	14.9	4.1	10.9	10.4	18.4	15.9
2010	13.1	7.4	8.7	9.2	12.2	16.9
Average	11.4	4.6	6.8	8.7	14.6	13.3

Notes: Industry short titles presented refer to the following manufacturing subsectors: (1) food, beverages and tobacco products; (2) textiles and leather products; (3) electronic and electric components, communications and measurement equipment; (4) transportation equipment, parts, and components; (5) metallic products, machinery and equipment; (6) oil and lead, chemical, and plastic products, mineral, non-metallic products.
Source: Own elaboration using data from the general analytic sample.

Table C.5: Sample Means across Variables on Local Characteristics for Selected Years using the General Analytic Sample

Year	Unemployment Rate (Male, %)	Unemployment Rate (Female, %)	Average Years of Education	Population (excluding Mexico City)
1992	3.0	3.5	10.0	430,403
1997	4.1	5.2	10.5	485,528
2002	4.0	5.2	10.9	621,403
2007	5.5	5.6	11.4	739,742
2010	8.1	7.9	11.6	763,447

Note: Given the exceedingly large population of Mexico City, relative to other metropolitan and principal urban areas in the general analytic sample, I present in the table the average population across the urban areas excluding the population of Mexico City. This provides a better representation of urban size in the sample of 36 metropolitan and principal urban areas.
Source: Own elaboration using data from the general analytic sample.

Table C.6: Average Distance Values for Variables Representing Market Access

Distance to	Average Distance (Km)
Nearest largest market (MXC, GDL, MTY)	481
Nearest major US-Mexico border crossing	854
Nearest major port in the Pacific Coast	994
Nearest major port in the Gulf of Mexico	778
Diff. in dist. to Gulf and Pacific ports	-215

Source: Own elaboration based on data obtained from the SCT.

Table C.7: Correlation Coefficients among Variables Representing the Local Characteristics of Metropolitan and Principal Urban Areas, including the Spatial Concentration Index by Manufacturing Subsector and the Distance Variables, for the Short-Run Analytic Sample of 36 urban areas.

	LnSCInd Food	LnSCInd Textiles	LnSCInd Electronics	LnSCInd Transportion	LnSCInd Machinery	LnSCInd Chemicals	Unemp. Rate Male	Unemp. Rate Female	Average Yrs of Education	Ln of Population	Share of Mfg in 1970	Dist. to Largest Market	Dist. to U.S.-Mexico Border	Diff. in Dist. to Ports
LnSCInd-Food	1.000													
LnSCInd-Textiles	0.545	1.000												
	0.000													
LnSCInd-Electronics	0.346	0.561	1.000											
	0.000	0.000												
LnSCInd-Transportion	0.249	0.523	0.713	1.000										
	0.000	0.000	0.000											
LnSCInd-Machinery	0.587	0.729	0.653	0.636	1.000									
	0.000	0.000	0.000	0.000										
LnSCInd-Chemicals	0.541	0.606	0.507	0.480	0.636	1.000								
	0.000	0.000	0.000	0.000	0.000									
Unemp. Rate - Male	0.018	0.016	-0.083	-0.010	0.084	0.091	1.000							
	0.730	0.765	0.135	0.861	0.097	0.072								
Unemp. Rate - Female	0.014	-0.035	-0.143	-0.018	0.142	0.124	0.741	1.000						
	0.785	0.502	0.010	0.748	0.005	0.014	0.000							
Average Yrs of Education	0.020	-0.444	-0.491	-0.352	-0.335	-0.248	0.052	0.159	1.000					
	0.694	0.000	0.000	0.000	0.000	0.000	0.306	0.002						
Ln of Population	0.739	0.627	0.485	0.387	0.645	0.712	-0.015	-0.019	-0.124	1.000				
	0.000	0.000	0.000	0.000	0.000	0.000	0.762	0.707	0.014					
Share of Mfg in 1970	0.409	0.665	0.207	0.244	0.682	0.522	0.060	0.130	-0.287	0.528	1.000			
	0.000	0.000	0.000	0.000	0.000	0.000	0.244	0.011	0.000	0.000				
Dist. to Largest Market	-0.169	-0.140	0.141	-0.187	-0.180	-0.106	-0.212	-0.254	-0.146	-0.128	-0.352	1.000		
	0.001	0.007	0.011	0.001	0.000	0.036	0.000	0.000	0.004	0.011	0.000			
Dist. to U.S.-Mexico Border	0.004	-0.327	-0.606	-0.609	-0.528	-0.303	-0.009	-0.031	0.477	-0.138	-0.239	-0.038	1.000	
	0.932	0.000	0.000	0.000	0.000	0.000	0.860	0.540	0.000	0.006	0.000	0.449		
Diff. in Dist. to Ports	0.065	0.020	0.124	-0.035	-0.078	-0.261	-0.066	-0.207	-0.118	-0.065	-0.120	-0.058	-0.086	1.000
	0.199	0.705	0.026	0.527	0.124	0.000	0.195	0.000	0.019	0.202	0.019	0.249	0.088	

Notes: P-values are reported below the correlation coefficients. Industry short titles presented refer to the following manufacturing subsectors: (1) food, beverages and tobacco products; (2) textiles and leather products; (3) electronic and electric components, communications and measurement equipment; (4) transportation equipment, parts, and components; (5) metallic products, machinery and equipment; (6) oil and lead, chemical, and plastic products, mineral, non-metallic products. Source: Own elaboration using data from the short-run analytic sample.

Table C.8: Correlation Coefficients among Variables Representing the Local Characteristics of Metropolitan and Principal Urban Areas, including the Spatial Concentration Index by Manufacturing Subsector and the Distance Variables, for the Short/Long-Run Analytic Sample of 28 urban areas.

	LnSCInd Food	LnSCInd Textiles	LnSCInd Electronics	LnSCInd Transportion	LnSCInd Machinery	LnSCInd Chemicals	Unemp. Rate Male	Unemp. Rate Female	Average Yrs of Education	Ln of Population	Share of Mfg in 1970	Dist. to Largest Market	Dist. to U.S.-Mexico Border	Diff. in Dist. to Ports
LnSCInd-Food	1.000													
LnSCInd-Textiles	0.570	1.000												
	0.000													
LnSCInd-Electronics	0.582	0.554	1.000											
	0.000	0.000												
LnSCInd-Transportion	0.415	0.472	0.623	1.000										
	0.000	0.000	0.000											
LnSCInd-Machinery	0.728	0.651	0.774	0.660	1.000									
	0.000	0.000	0.000	0.000										
LnSCInd-Chemicals	0.691	0.670	0.675	0.505	0.782	1.000								
	0.000	0.000	0.000	0.000	0.000									
Unemp. Rate - Male	0.106	0.103	0.093	0.226	0.191	0.137	1.000							
	0.015	0.021	0.056	0.000	0.000	0.002								
Unemp. Rate - Female	0.182	0.054	0.091	0.254	0.239	0.181	0.741	1.000						
	0.000	0.225	0.063	0.000	0.000	0.000	0.000							
Average Yrs of Education	-0.315	-0.499	-0.436	-0.167	-0.436	-0.450	0.193	0.192	1.000					
	0.000	0.000	0.000	0.001	0.000	0.000	0.000	0.000						
Ln of Population	0.751	0.645	0.598	0.412	0.735	0.762	0.159	0.137	-0.111	1.000				
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003					
Share of Mfg in 1970	0.509	0.750	0.438	0.333	0.670	0.700	0.122	0.163	-0.348	0.587	1.000			
	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.000	0.000	0.000				
Dist. to Largest Market	-0.258	-0.140	0.120	-0.238	-0.227	-0.172	-0.205	-0.220	-0.039	-0.223	-0.381	1.000		
	0.000	0.002	0.014	0.000	0.000	0.000	0.000	0.000	0.298	0.000	0.000			
Dist. to U.S.-Mexico Border	-0.218	-0.213	-0.519	-0.485	-0.482	-0.410	-0.086	-0.096	0.363	-0.191	-0.271	0.155	1.000	
	0.000	0.000	0.000	0.000	0.000	0.000	0.021	0.010	0.000	0.000	0.000	0.000		
Diff. in Dist. to Ports	0.102	0.019	0.146	0.077	0.036	-0.054	0.000	-0.116	-0.073	-0.040	-0.099	-0.004	-0.211	1.000
	0.018	0.671	0.003	0.111	0.418	0.218	1.000	0.002	0.052	0.287	0.010	0.922	0.000	

Notes: P-values are reported below the correlation coefficients. Industry short titles presented refer to the following manufacturing subsectors: (1) food, beverages and tobacco products; (2) textiles and leather products; (3) electronic and electric components, communications and measurement equipment; (4) transportation equipment, parts, and components; (5) metallic products, machinery and equipment; (6) oil and lead, chemical, and plastic products, mineral, non-metallic products. Source: Own elaboration using data from the short/long-run analytic sample.

APPENDIX D

Table D.1: Spatial Concentration of Manufacturing Employment in Food, Beverage, and Tobacco Products Industries for Selected Years—Short-Run Analytic Sample

1992			1997			2002		
Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index
Mexico City	1	3.73	Mexico City	1	3.44	Guadalajara, Jal.	1	3.46
Guadalajara, Jal.	2	2.66	Guadalajara, Jal.	2	3.00	Mexico City	2	3.33
Monterrey, N.L.	3	2.20	Monterrey, N.L.	3	2.52	Monterrey, N.L.	3	2.42
Orizaba, Ver.	4	1.96	San Luis Potosi, S.L.P.	4	1.76	Toluca, Edo. Mex.	4	2.01
Toluca, Edo. Mex.	5	1.66	Merida, Yuc.	5	1.54	San Luis Potosi, S.L.P.	5	1.56
Merida, Yuc.	6	1.52	Orizaba, Ver.	6	1.34	Torreon, Coah.	6	1.45
Torreon, Coah.	7	1.37	Toluca, Edo. Mex.	7	1.27	Orizaba, Ver.	7	1.42
San Luis Potosi, S.L.P.	8	1.20	Puebla, Pue.	8	0.94	Merida, Yuc.	8	1.27
Puebla, Pue.	9	1.16	Hermosillo, Son.	9	0.85	Puebla, Pue.	9	0.70
Culiacan, Sin.	10	0.86	Torreon, Coah.	10	0.78	Tampico, Tamps.	10	0.42
Aguascalientes, Ags.	11	0.77	Culiacan, Sin.	11	0.68	Hermosillo, Son.	11	0.36
Hermosillo, Son.	12	0.69	Aguascalientes, Ags.	12	0.38	Tepic, Nay.	12	0.33
Saltillo, Coah.	13	0.15	Saltillo, Coah.	13	0.37	Chihuahua, Chih.	13	0.26
Tijuana, B.C.	14	0.10	Durango, Dgo.	14	0.13	Culiacan, Sin.	14	0.10
Veracruz, Ver.	15	-0.13	Tepic, Nay.	15	0.12	Aguascalientes, Ags.	15	0.09
Cd. Juarez, Chih.	16	-0.15	Acapulco, Gro.	16	0.09	Saltillo, Coah.	16	0.01
Tampico, Tamps.	17	-0.15	Chihuahua, Chih.	17	-0.07	Acapulco, Gro.	17	-0.02
Tepic, Nay.	18	-0.24	Tampico, Tamps.	18	-0.21	Tijuana, B.C.	18	-0.09
Campeche, Camp.	19	-0.30	Leon, Gto.	19	-0.34	Durango, Dgo.	19	-0.32
Chihuahua, Chih.	20	-0.38	Tijuana, B.C.	20	-0.39	Cd. Juarez, Chih.	20	-0.34
Zacatecas, Zac.	21	-0.46	Cd. Juarez, Chih.	21	-0.46	Zacatecas, Zac.	21	-0.38
Morelia, Mich.	22	-0.59	Morelia, Mich.	22	-0.48	Leon, Gto.	22	-0.51
Villahermosa, Tab.	23	-0.64	Campeche, Camp.	23	-0.65	Villahermosa, Tab.	23	-0.51
Cuernavaca, Mor.	24	-0.83	Veracruz, Ver.	24	-0.65	Oaxaca, Oax.	24	-0.53
Tuxtla Gutierrez, Chis.	25	-0.95	Villahermosa, Tab.	25	-0.74	Morelia, Mich.	25	-0.70
Acapulco, Gro.	26	-1.06	Oaxaca, Oax.	26	-1.05	Veracruz, Ver.	26	-0.73
Durango, Dgo.	27	-1.06	Zacatecas, Zac.	27	-1.33	Colima, Col.	27	-0.78
Leon, Gto.	28	-1.29	Matamoros, Tamps.	28	-1.35	Campeche, Camp.	28	-0.94
Oaxaca, Oax.	29	-1.48	Tuxtla Gutierrez, Chis.	29	-1.50	Coatzacoalcos, Ver.	29	-1.99
Colima, Col.	30	-1.79	Colima, Col.	30	-1.65	Matamoros, Tamps.	30	-2.05
Matamoros, Tamps.	31	-1.81	Coatzacoalcos, Ver.	31	-1.83	Nuevo Laredo, Tamps.	31	-2.28
Nuevo Laredo, Tamps.	32	-2.03	Cuernavaca, Mor.	32	-1.96	Tuxtla Gutierrez, Chis.	32	-2.40
Coatzacoalcos, Ver.	33	-2.45	Nuevo Laredo, Tamps.	33	-2.28	Cuernavaca, Mor.	33	-2.74

Source: Own elaboration using the short-run analytic sample of 36 metropolitan and principal urban areas. Indices are in natural logarithmic form. A line across each column separates urban areas in those with below- and above-average spatial concentration values. To make the indices fully comparable across the selected years, three metropolitan areas (i.e., Queretaro, Monclova, and Manzanillo) in the sample were not considered in the estimation of the spatial concentration indices presented in this table as data for these metropolitan areas were not available for some of the years presented. If included, however, the urban areas would occupy the following rankings: Queretaro would be ranked 12 in 1997 and 11 in 2002; Manzanillo would be ranked 33 in 1992 and 35 in 1997; and, Monclova would be ranked 34 in 1997 and 32 in 2002.

Table D.2: Spatial Concentration of Manufacturing Employment in Textiles and Leather Products Industries for Selected Years—Short-Run Analytic Sample

1992			1997			2002		
Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index
Leon, Gto.	1	4.20	Leon, Gto.	1	3.70	Leon, Gto.	1	4.25
Mexico City	2	3.74	Mexico City	2	3.52	Mexico City	2	3.40
Puebla, Pue.	3	2.58	Puebla, Pue.	3	3.24	Puebla, Pue.	3	3.12
Guadalajara, Jal.	4	2.54	Torreon, Coah.	4	2.87	Torreon, Coah.	4	2.80
Monterrey, N.L.	5	2.18	Guadalajara, Jal.	5	2.16	Guadalajara, Jal.	5	2.20
Cd. Juarez, Chih.	6	1.85	Aguascalientes, Ags.	6	2.07	Aguascalientes, Ags.	6	1.98
Aguascalientes, Ags.	7	1.78	Monterrey, N.L.	7	1.46	Toluca, Edo. Mex.	7	1.49
Torreon, Coah.	8	0.98	Toluca, Edo. Mex.	8	0.98	Merida, Yuc.	8	1.15
Toluca, Edo. Mex.	9	0.61	Merida, Yuc.	9	0.93	Campeche, Camp.	9	0.72
Merida, Yuc.	10	0.50	Tijuana, B.C.	10	0.62	Monterrey, N.L.	10	0.72
Cuernavaca, Mor.	11	0.41	Cd. Juarez, Chih.	11	0.09	Matamoros, Tamps.	11	0.45
San Luis Potosi, S.L.P.	12	0.11	Hermosillo, Son.	12	0.05	Tijuana, B.C.	12	-0.18
Orizaba, Ver.	13	-0.17	Chihuahua, Chih.	13	0.04	San Luis Potosi, S.L.P.	13	-0.55
Chihuahua, Chih.	14	-0.70	Matamoros, Tamps.	14	-0.38	Cuernavaca, Mor.	14	-0.64
Saltillo, Coah.	15	-1.06	Orizaba, Ver.	15	-0.40	Saltillo, Coah.	15	-0.69
Tijuana, B.C.	16	-1.14	San Luis Potosi, S.L.P.	16	-0.46	Cd. Juarez, Chih.	16	-0.78
Nuevo Laredo, Tamps.	17	-1.36	Cuernavaca, Mor.	17	-0.80	Orizaba, Ver.	17	-0.88
Tampico, Tamps.	18	-1.38	Saltillo, Coah.	18	-1.45	Durango, Dgo.	18	-0.90
Hermosillo, Son.	19	-1.40	Nuevo Laredo, Tamps.	19	-1.94	Chihuahua, Chih.	19	-1.95
Matamoros, Tamps.	20	-2.89	Durango, Dgo.	20	-2.54	Hermosillo, Son.	20	-1.99
Morelia, Mich.	21	-3.02	Acapulco, Gro.	21	-3.01	Zacatecas, Zac.	21	-2.18
Coatzacoalcos, Ver.	22	-5.41	Zacatecas, Zac.	22	-3.68	Tampico, Tamps.	22	-2.68
Veracruz, Ver.	23	-5.43	Morelia, Mich.	23	-4.10	Acapulco, Gro.	23	-3.02
Durango, Dgo.	24	-5.52	Tampico, Tamps.	24	-4.23	Morelia, Mich.	24	-3.17
Campeche, Camp.	25	-5.53	Tepic, Nay.	25	-4.43	Nuevo Laredo, Tamps.	25	-3.56
Culiacan, Sin.	26	-5.66	Veracruz, Ver.	26	-5.85	Culiacan, Sin.	26	-3.74
Tepic, Nay.	27	-6.10	Tuxtla Gutierrez, Chis.	27	-5.96	Oaxaca, Oax.	27	-3.99
Acapulco, Gro.	28	-6.61	Campeche, Camp.	28	-6.65	Veracruz, Ver.	28	-5.76
Oaxaca, Oax.	29	-6.66	Coatzacoalcos, Ver.	29	-6.94	Tuxtla Gutierrez, Chis.	29	-5.82
Villahermosa, Tab.	30	-6.69	Culiacan, Sin.	30	-7.08	Villahermosa, Tab.	30	-6.25
Tuxtla Gutierrez, Chis.	31	-7.90	Colima, Col.	31	-7.21	Tepic, Nay.	31	-6.68
Zacatecas, Zac.	32	-7.96	Villahermosa, Tab.	32	-8.04	Colima, Col.	32	-8.30
Colima, Col.	33	-8.53	Oaxaca, Oax.	33	-8.50	Coatzacoalcos, Ver.	33	-10.14

Source: Own elaboration using the short-run analytic sample of 36 metropolitan and principal urban areas. Indices are in natural logarithmic form. A line across each column separates urban areas in those with below- and above-average spatial concentration values. To make the indices fully comparable across the selected years, three metropolitan areas (i.e., Queretaro, Monclova, and Manzanillo) in the sample were not considered in the estimation of the spatial concentration indices presented in this table as data for these metropolitan areas were not available for some of the years presented. If included, however, the urban areas would occupy the following rankings: Queretaro would be ranked 18 in 1997 and 23 in 2002; Manzanillo would be ranked last in 1992 and 1997 as none of the manufacturing subsector was located within the urban area; and, Monclova would be ranked 14 in 1997 and 8 in 2002.

Table D.3: Spatial Concentration of Manufacturing Employment in Electric and Electronic Products Industries for Selected Years—Short-Run Analytic Sample

1992			1997			2002		
Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index
Cd. Juarez, Chih.	1	4.66	Tijuana, B.C.	1	4.89	Tijuana, B.C.	1	4.50
Matamoros, Tamps.	2	3.71	Cd. Juarez, Chih.	2	4.59	Cd. Juarez, Chih.	2	4.36
Tijuana, B.C.	3	3.49	Matamoros, Tamps.	3	3.69	Matamoros, Tamps.	3	3.39
Mexico City	4	3.34	Monterrey, N.L.	4	2.80	Monterrey, N.L.	4	3.11
Monterrey, N.L.	5	2.50	Guadalajara, Jal.	5	2.65	Guadalajara, Jal.	5	2.36
Chihuahua, Chih.	6	1.98	Chihuahua, Chih.	6	2.04	Chihuahua, Chih.	6	2.08
Guadalajara, Jal.	7	1.57	Mexico City	7	1.47	Mexico City	7	1.30
Nuevo Laredo, Tamps.	8	1.39	Nuevo Laredo, Tamps.	8	1.37	Nuevo Laredo, Tamps.	8	1.26
San Luis Potosi, S.L.P.	9	1.15	Hermosillo, Son.	9	1.10	San Luis Potosi, S.L.P.	9	0.83
Hermosillo, Son.	10	0.01	San Luis Potosi, S.L.P.	10	0.18	Hermosillo, Son.	10	0.56
Torreon, Coah.	11	-0.09	Torreon, Coah.	11	0.05	Torreon, Coah.	11	0.14
Aguascalientes, Ags.	12	-0.88	Saltillo, Coah.	12	-0.87	Saltillo, Coah.	12	0.09
Puebla, Pue.	13	-1.35	Toluca, Edo. Mex.	13	-0.92	Aguascalientes, Ags.	13	0.09
Toluca, Edo. Mex.	14	-1.60	Aguascalientes, Ags.	14	-1.15	Puebla, Pue.	14	-0.74
Cuernavaca, Mor.	15	-1.68	Puebla, Pue.	15	-1.59	Merida, Yuc.	15	-1.29
Saltillo, Coah.	16	-2.21	Durango, Dgo.	16	-1.83	Toluca, Edo. Mex.	16	-2.02
Morelia, Mich.	17	-3.14	Merida, Yuc.	17	-2.05	Durango, Dgo.	17	-3.07
Durango, Dgo.	18	-3.53	Cuernavaca, Mor.	18	-2.17	Cuernavaca, Mor.	18	-3.33
Merida, Yuc.	19	-4.12	Morelia, Mich.	19	-3.44	Morelia, Mich.	19	-3.80
Leon, Gto.	20	-4.22	Leon, Gto.	20	-6.20	Veracruz, Ver.	20	-5.82
Coatzacoalcos, Ver.	21	-4.84	Colima, Col.	21	-6.28	Colima, Col.	21	-6.23
Tampico, Tamps.	22	-4.96	Zacatecas, Zac.	22	-6.77	Orizaba, Ver.	22	-6.48
Tuxtla Gutierrez, Chis.	23	-6.95	Culiacan, Sin.	23	-7.77	Zacatecas, Zac.	23	-7.04
Zacatecas, Zac.	24	-7.02	Tampico, Tamps.	24	-------	Oaxaca, Oax.	24	-7.33
Oaxaca, Oax.	25	-7.20	Orizaba, Ver.	25	-------	Acapulco, Gro.	25	-7.66
Culiacan, Sin.	26	-7.29	Veracruz, Ver.	26	-------	Tepic, Nay.	26	-7.68
Orizaba, Ver.	27	-7.37	Acapulco, Gro.	27	-------	Tuxtla Gutierrez, Chis.	27	-8.09
Villahermosa, Tab.	28	-7.78	Villahermosa, Tab.	28	-------	Coatzacoalcos, Ver.	28	-8.59
Campeche, Camp.	29	-10.00	Tuxtla Gutierrez, Chis.	29	-------	Tampico, Tamps.	29	-8.60
Veracruz, Ver.	30	-------	Tepic, Nay.	30	-------	Culiacan, Sin.	30	-9.20
Acapulco, Gro.	31	-------	Campeche, Camp.	31	-------	Leon, Gto.	31	-------
Tepic, Nay.	32	-------	Coatzacoalcos, Ver.	32	-------	Villahermosa, Tab.	32	-------
Colima, Col.	33	-------	Oaxaca, Oax.	33	-------	Campeche, Camp.	33	-------

Source: Own elaboration using the short-run analytic sample of 36 metropolitan and principal urban areas. Indices are in natural logarithmic form. A line across each column separates urban areas in those with below- and above-average spatial concentration values. Missing data, indicated by (------), correspond to indices in antilogarithmic form with values of zero, meaning that none of the manufacturing subsector is located within the urban area. To make the indices fully comparable across the selected years, three metropolitan areas (i.e., Queretaro, Monclova, and Manzanillo) in the sample were not considered in the estimation of the spatial concentration indices presented in this table as data for these metropolitan areas were not available for some of the years presented. If included, however, the urban areas would occupy the following rankings: Queretaro would be ranked 10 in 1997 and 9 in 2002; Manzanillo would be ranked last in 1992 and 1997 as none of the manufacturing subsector was located within the urban area; and, Monclova would be ranked 21 in 1997 and 21 in 2002.

Table D.4: Spatial Concentration of Manufacturing Employment in Transportation Equipment, Parts, and Components Industries for Selected Years—Short-Run Analytic Sample

1992			1997			2002		
Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index
Cd. Juarez, Chih.	1	4.38	Cd. Juarez, Chih.	1	5.07	Cd. Juarez, Chih.	1	5.12
Saltillo, Coah.	2	3.18	Saltillo, Coah.	2	3.79	Saltillo, Coah.	2	3.78
Matamoros, Tamps.	3	3.10	Chihuahua, Chih.	3	3.77	Chihuahua, Chih.	3	3.62
Chihuahua, Chih.	4	3.06	Puebla, Pue.	4	3.31	Puebla, Pue.	4	2.59
Mexico City	5	2.97	Matamoros, Tamps.	5	2.56	Matamoros, Tamps.	5	2.52
Monterrey, N.L.	6	2.97	Monterrey, N.L.	6	2.26	Toluca, Edo. Mex.	6	2.27
Toluca, Edo. Mex.	7	2.96	Nuevo Laredo, Tamps.	7	2.15	Monterrey, N.L.	7	2.19
Puebla, Pue.	8	2.66	Toluca, Edo. Mex.	8	1.89	Nuevo Laredo, Tamps.	8	2.16
Nuevo Laredo, Tamps.	9	1.99	Mexico City	9	1.65	San Luis Potosi, S.L.P.	9	1.46
Cuernavaca, Mor.	10	1.53	Aguascalientes, Ags.	10	1.13	Mexico City	10	1.39
Aguascalientes, Ags.	11	1.30	San Luis Potosi, S.L.P.	11	0.56	Aguascalientes, Ags.	11	0.85
Hermosillo, Son.	12	0.22	Torreon, Coah.	12	0.14	Guadalajara, Jal.	12	0.27
San Luis Potosi, S.L.P.	13	0.04	Hermosillo, Son.	13	0.01	Torreon, Coah.	13	0.04
Torreon, Coah.	14	-0.91	Guadalajara, Jal.	14	-0.36	Durango, Dgo.	14	-0.82
Veracruz, Ver.	15	-1.05	Tijuana, B.C.	15	-1.04	Hermosillo, Son.	15	-1.04
Tampico, Tamps.	16	-2.01	Cuernavaca, Mor.	16	-1.44	Tuxtla Gutierrez, Chis.	16	-1.54
Guadalajara, Jal.	17	-2.66	Veracruz, Ver.	17	-1.94	Zacatecas, Zac.	17	-1.55
Durango, Dgo.	18	-2.72	Durango, Dgo.	18	-3.30	Tijuana, B.C.	18	-1.74
Zacatecas, Zac.	19	-4.15	Zacatecas, Zac.	19	-3.30	Veracruz, Ver.	19	-1.94
Tijuana, B.C.	20	-4.98	Tampico, Tamps.	20	-3.48	Tampico, Tamps.	20	-2.67
Morelia, Mich.	21	-5.09	Campeche, Camp.	21	-4.20	Cuernavaca, Mor.	21	-2.79
Leon, Gto.	22	-5.36	Leon, Gto.	22	-4.65	Leon, Gto.	22	-3.02
Acapulco, Gro.	23	-5.76	Orizaba, Ver.	23	-6.94	Merida, Yuc.	23	-4.34
Coatzacoalcos, Ver.	24	-5.97	Morelia, Mich.	24	-7.24	Morelia, Mich.	24	-6.98
Campeche, Camp.	25	-6.25	Merida, Yuc.	25	-------	Colima, Col.	25	-7.63
Culiacan, Sin.	26	-6.77	Acapulco, Gro.	26	-------	Tepic, Nay.	26	-7.66
Orizaba, Ver.	27	-7.13	Villahermosa, Tab.	27	-------	Campeche, Camp.	27	-8.49
Oaxaca, Oax.	28	-10.13	Tuxtla Gutierrez, Chis.	28	-------	Orizaba, Ver.	28	-------
Merida, Yuc.	29	-------	Culiacan, Sin.	29	-------	Acapulco, Gro.	29	-------
Villahermosa, Tab.	30	-------	Tepic, Nay.	30	-------	Villahermosa, Tab.	30	-------
Tuxtla Gutierrez, Chis.	31	-------	Coatzacoalcos, Ver.	31	-------	Culiacan, Sin.	31	-------
Tepic, Nay.	32	-------	Oaxaca, Oax.	32	-------	Coatzacoalcos, Ver.	32	-------
Colima, Col.	33	-------	Colima, Col.	33	-------	Oaxaca, Oax.	33	-------

Source: Own elaboration using the short-run analytic sample of 36 metropolitan and principal urban areas. Indices are in natural logarithmic form. A line across each column separates urban areas in those with below- and above-average spatial concentration values. Missing data, indicated by (------), correspond to indices in antilogarithmic form with values of zero, meaning that none of the manufacturing subsector is located within the urban area. To make the indices fully comparable across the selected years, three metropolitan areas (i.e., Queretaro, Monclova, and Manzanillo) in the sample were not considered in the estimation of the spatial concentration indices presented in this table as data for these metropolitan areas were not available for some of the years presented. If included, however, the urban areas would occupy the following rankings: Queretaro would be ranked 8 in 1997 and 11 in 2002; Manzanillo would be ranked last in 1992 and 1997 as none of the manufacturing subsector was located within the urban area; and, Monclova would be ranked 17 in 1997 and 13 in 2002.

Table D.5: Spatial Concentration of Manufacturing Employment in Machinery and Metallic Products Industries for Selected Years—Short-Run Analytic Sample

1992			1997			2002		
Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index
Mexico City	1	3.92	Monterrey, N.L.	1	3.59	Monterrey, N.L.	1	3.78
Monterrey, N.L.	2	3.55	Mexico City	2	3.30	Mexico City	2	3.13
Guadalajara, Jal.	3	2.44	Guadalajara, Jal.	3	2.32	Guadalajara, Jal.	3	2.81
Saltillo, Coah.	4	1.67	Saltillo, Coah.	4	1.93	San Luis Potosi, S.L.P.	4	2.07
San Luis Potosi, S.L.P.	5	1.56	San Luis Potosi, S.L.P.	5	1.75	Saltillo, Coah.	5	1.72
Tijuana, B.C.	6	1.02	Torreon, Coah.	6	1.61	Torreon, Coah.	6	1.68
Torreon, Coah.	7	0.77	Puebla, Pue.	7	1.05	Puebla, Pue.	7	1.46
Veracruz, Ver.	8	0.72	Cd. Juarez, Chih.	8	0.88	Matamoros, Tamps.	8	0.77
Aguascalientes, Ags.	9	0.42	Tijuana, B.C.	9	0.78	Cd. Juarez, Chih.	9	0.67
Puebla, Pue.	10	0.31	Matamoros, Tamps.	10	0.63	Aguascalientes, Ags.	10	0.58
Chihuahua, Chih.	11	-0.33	Veracruz, Ver.	11	0.36	Toluca, Edo. Mex.	11	0.30
Cd. Juarez, Chih.	12	-0.38	Aguascalientes, Ags.	12	0.06	Tijuana, B.C.	12	0.13
Toluca, Edo. Mex.	13	-0.43	Chihuahua, Chih.	13	-0.11	Veracruz, Ver.	13	-0.18
Matamoros, Tamps.	14	-0.46	Toluca, Edo. Mex.	14	-0.23	Chihuahua, Chih.	14	-0.42
Cuernavaca, Mor.	15	-1.00	Hermosillo, Son.	15	-0.29	Merida, Yuc.	15	-0.45
Orizaba, Ver.	16	-1.03	Orizaba, Ver.	16	-0.59	Nuevo Laredo, Tamps.	16	-0.55
Culiacan, Sin.	17	-1.20	Merida, Yuc.	17	-0.66	Leon, Gto.	17	-0.97
Leon, Gto.	18	-1.42	Tampico, Tamps.	18	-0.93	Orizaba, Ver.	18	-0.98
Merida, Yuc.	19	-1.43	Cuernavaca, Mor.	19	-1.14	Tampico, Tamps.	19	-1.57
Hermosillo, Son.	20	-1.55	Leon, Gto.	20	-1.28	Hermosillo, Son.	20	-1.66
Tampico, Tamps.	21	-1.93	Nuevo Laredo, Tamps.	21	-1.85	Morelia, Mich.	21	-2.36
Coatzacoalcos, Ver.	22	-2.70	Morelia, Mich.	22	-1.93	Zacatecas, Zac.	22	-3.09
Nuevo Laredo, Tamps.	23	-2.80	Culiacan, Sin.	23	-2.72	Tuxtla Gutierrez, Chis.	23	-3.51
Durango, Dgo.	24	-3.09	Tuxtla Gutierrez, Chis.	24	-2.90	Culiacan, Sin.	24	-3.52
Morelia, Mich.	25	-3.47	Durango, Dgo.	25	-2.92	Colima, Col.	25	-3.72
Tuxtla Gutierrez, Chis.	26	-3.78	Zacatecas, Zac.	26	-2.95	Durango, Dgo.	26	-3.77
Campeche, Camp.	27	-4.02	Coatzacoalcos, Ver.	27	-4.02	Cuernavaca, Mor.	27	-4.01
Colima, Col.	28	-4.36	Colima, Col.	28	-4.08	Tepic, Nay.	28	-4.69
Villahermosa, Tab.	29	-4.57	Campeche, Camp.	29	-4.47	Coatzacoalcos, Ver.	29	-5.46
Acapulco, Gro.	30	-4.96	Villahermosa, Tab.	30	-4.82	Campeche, Camp.	30	-5.94
Oaxaca, Oax.	31	-4.96	Oaxaca, Oax.	31	-5.86	Oaxaca, Oax.	31	-6.74
Tepic, Nay.	32	-5.71	Tepic, Nay.	32	-6.00	Villahermosa, Tab.	32	-7.18
Zacatecas, Zac.	33	-5.84	Acapulco, Gro.	33	-6.36	Acapulco, Gro.	33	-8.05

Source: Own elaboration using the short-run analytic sample of 36 metropolitan and principal urban areas. Indices are in natural logarithmic form. A line across each column separates urban areas in those with below- and above-average spatial concentration values. To make the indices fully comparable across the selected years, three metropolitan areas (i.e., Queretaro, Monclova, and Manzanillo) in the sample were not considered in the estimation of the spatial concentration indices presented in this table as data for these metropolitan areas were not available for some of the years presented. If included, however, the urban areas would occupy the following rankings: Queretaro would be ranked 8 in 1997 and 10 in 2002; Manzanillo would be ranked 34 in 1992 and 33 in 1997; and, Monclova would be ranked 1 in 1997 with an index value of 3.80 and 3 in 2002 with an index value of 2.94.

Table D.6: Spatial Concentration of Manufacturing Employment in Chemical and Mineral Products Industries for Selected Years—Short-Run Analytic Sample

1992			1997			2002		
Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index
Mexico City	1	4.15	Mexico City	1	3.70	Mexico City	1	3.92
Monterrey, N.L.	2	2.81	Coatzacoalcos, Ver.	2	3.50	Coatzacoalcos, Ver.	2	3.01
Guadalajara, Jal.	3	2.22	Monterrey, N.L.	3	3.06	Guadalajara, Jal.	3	2.73
Tampico, Tamps.	4	1.69	Guadalajara, Jal.	4	2.77	Monterrey, N.L.	4	2.72
Coatzacoalcos, Ver.	5	1.42	Tampico, Tamps.	5	2.25	Toluca, Edo. Mex.	5	1.69
Cuernavaca, Mor.	6	1.20	Tijuana, B.C.	6	1.17	Tampico, Tamps.	6	1.50
Tijuana, B.C.	7	1.18	Saltillo, Coah.	7	0.82	Tijuana, B.C.	7	1.16
Saltillo, Coah.	8	0.90	Cuernavaca, Mor.	8	0.80	Saltillo, Coah.	8	1.06
Toluca, Edo. Mex.	9	0.71	Toluca, Edo. Mex.	9	0.76	San Luis Potosi, S.L.P.	9	0.76
Puebla, Pue.	10	0.18	Leon, Gto.	10	0.45	Leon, Gto.	10	0.71
San Luis Potosi, S.L.P.	11	-0.09	Orizaba, Ver.	11	0.32	Matamoros, Tamps.	11	0.01
Leon, Gto.	12	-0.12	Puebla, Pue.	12	0.27	Orizaba, Ver.	12	0.00
Orizaba, Ver.	13	-0.34	San Luis Potosi, S.L.P.	13	0.24	Puebla, Pue.	13	-0.03
Torreon, Coah.	14	-0.37	Cd. Juarez, Chih.	14	0.13	Cuernavaca, Mor.	14	-0.05
Cd. Juarez, Chih.	15	-0.49	Torreon, Coah.	15	-0.31	Chihuahua, Chih.	15	-0.44
Matamoros, Tamps.	16	-0.67	Chihuahua, Chih.	16	-0.39	Torreon, Coah.	16	-0.47
Merida, Yuc.	17	-0.74	Matamoros, Tamps.	17	-0.83	Nuevo Laredo, Tamps.	17	-0.86
Chihuahua, Chih.	18	-1.20	Villahermosa, Tab.	18	-0.86	Merida, Yuc.	18	-0.96
Hermosillo, Son.	19	-1.22	Merida, Yuc.	19	-0.97	Cd. Juarez, Chih.	19	-1.08
Morelia, Mich.	20	-1.63	Hermosillo, Son.	20	-1.14	Hermosillo, Son.	20	-1.58
Villahermosa, Tab.	21	-2.29	Morelia, Mich.	21	-1.32	Aguascalientes, Ags.	21	-1.63
Nuevo Laredo, Tamps.	22	-2.32	Nuevo Laredo, Tamps.	22	-2.19	Villahermosa, Tab.	22	-1.65
Culiacan, Sin.	23	-2.52	Aguascalientes, Ags.	23	-2.28	Morelia, Mich.	23	-1.76
Durango, Dgo.	24	-2.68	Culiacan, Sin.	24	-2.46	Tuxtla Gutierrez, Chis.	24	-3.07
Aguascalientes, Ags.	25	-2.80	Veracruz, Ver.	25	-3.04	Culiacan, Sin.	25	-3.13
Veracruz, Ver.	26	-2.94	Campeche, Camp.	26	-3.63	Colima, Col.	26	-3.92
Tepic, Nay.	27	-3.81	Durango, Dgo.	27	-3.84	Durango, Dgo.	27	-4.14
Campeche, Camp.	28	-3.89	Oaxaca, Oax.	28	-4.14	Tepic, Nay.	28	-4.36
Colima, Col.	29	-3.90	Zacatecas, Zac.	29	-4.41	Oaxaca, Oax.	29	-4.63
Zacatecas, Zac.	30	-3.92	Colima, Col.	30	-4.58	Acapulco, Gro.	30	-5.28
Oaxaca, Oax.	31	-4.16	Tuxtla Gutierrez, Chis.	31	-4.68	Veracruz, Ver.	31	-5.30
Acapulco, Gro.	32	-4.24	Acapulco, Gro.	32	-4.84	Campeche, Camp.	32	-5.84
Tuxtla Gutierrez, Chis.	33	-4.63	Tepic, Nay.	33	-5.85	Zacatecas, Zac.	33	-5.91

Source: Own elaboration using the short-run analytic sample of 36 metropolitan and principal urban areas. Indices are in natural logarithmic form. A line across each column separates urban areas in those with below- and above-average spatial concentration values. To make the indices fully comparable across the selected years, three metropolitan areas (i.e., Queretaro, Monclova, and Manzanillo) in the sample were not considered in the estimation of the spatial concentration indices presented in this table as data for these metropolitan areas were not available for some of the years presented. If included, however, the urban areas would occupy the following rankings: Queretaro would be ranked 15 in 1997 and 11 in 2002; Manzanillo would be ranked 34 in 1992 and 35 in 1997; and, Monclova would be ranked 23 in 1997 and 25 in 2002.

Table D.7: Spatial Concentration of Manufacturing Employment in Food, Beverage, and Tobacco Products Industries for Selected Years—Short/Long-Run Analytic Sample

1992			1997			2002			2007			2010		
Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index
Mexico City	1	3.81	Mexico City	1	3.54	Guadalajara, Jal.	1	3.56	Mexico City	1	3.45	Mexico City	1	3.84
Guadalajara, Jal.	2	2.74	Guadalajara, Jal.	2	3.11	Mexico City	2	3.43	Guadalajara, Jal.	2	3.32	Guadalajara, Jal.	2	2.97
Monterrey, N.L.	3	2.28	Monterrey, N.L.	3	2.62	Monterrey, N.L.	3	2.52	Monterrey, N.L.	3	2.61	Toluca, Edo. Mex.	3	2.23
Toluca, Edo. Mex.	4	1.74	San Luis Potosi, S.L.P.	4	1.87	Toluca, Edo. Mex.	4	2.11	Toluca, Edo. Mex.	4	2.36	San Luis Potosi, S.L.P.	4	1.81
Merida, Yuc.	5	1.60	Merida, Yuc.	5	1.64	San Luis Potosi, S.L.P.	5	1.67	Merida, Yuc.	5	2.10	Monterrey, N.L.	5	1.74
San Luis Potosi, S.L.P.	6	1.27	Toluca, Edo. Mex.	6	1.37	Merida, Yuc.	6	1.38	San Luis Potosi, S.L.P.	6	1.19	Merida, Yuc.	6	1.40
Puebla, Pue.	7	1.24	Puebla, Pue.	7	1.05	Puebla, Pue.	7	0.81	Puebla, Pue.	7	1.05	Chihuahua, Chih.	7	1.12
Culiacan, Sin.	8	0.94	Hermosillo, Son.	8	0.95	Tampico, Tamps.	8	0.52	Hermosillo, Son.	8	0.81	Tampico, Tamps.	8	1.05
Aguascalientes, Ags.	9	0.84	Culiacan, Sin.	9	0.78	Hermosillo, Son.	9	0.46	Chihuahua, Chih.	9	0.81	Culiacan, Sin.	9	1.02
Hermosillo, Son.	10	0.77	Aguascalientes, Ags.	10	0.48	Tepic, Nay.	10	0.43	Culiacan, Sin.	10	0.75	Puebla, Pue.	10	0.71
Saltillo, Coah.	11	0.22	Saltillo, Coah.	11	0.47	Chihuahua, Chih.	11	0.37	Aguascalientes, Ags.	11	0.72	Aguascalientes, Ags.	11	0.61
Tijuana, B.C.	12	0.17	Durango, Dgo.	12	0.24	Culiacan, Sin.	12	0.20	Tepic, Nay.	12	0.45	Hermosillo, Son.	12	0.54
Veracruz, Ver.	13	-0.05	Tepic, Nay.	13	0.22	Aguascalientes, Ags.	13	0.20	Saltillo, Coah.	13	0.25	Morelia, Mich.	13	0.06
Tampico, Tamps.	14	-0.08	Acapulco, Gro.	14	0.19	Saltillo, Coah.	14	0.12	Tijuana, B.C.	14	0.16	Saltillo, Coah.	14	-0.18
Tepic, Nay.	15	-0.16	Chihuahua, Chih.	15	0.03	Acapulco, Gro.	15	0.08	Leon, Gto.	15	0.03	Veracruz, Ver.	15	-0.19
Campeche, Camp.	16	-0.23	Tampico, Tamps.	16	-0.10	Tijuana, B.C.	16	0.01	Tampico, Tamps.	16	-0.10	Tijuana, B.C.	16	-0.20
Chihuahua, Chih.	17	-0.30	Leon, Gto.	17	-0.24	Durango, Dgo.	17	-0.22	Morelia, Mich.	17	-0.20	Tepic, Nay.	17	-0.45
Zacatecas, Zac.	18	-0.38	Tijuana, B.C.	18	-0.29	Zacatecas, Zac.	18	-0.28	Villahermosa, Tab.	18	-0.62	Durango, Dgo.	18	-0.45
Morelia, Mich.	19	-0.52	Morelia, Mich.	19	-0.38	Leon, Gto.	19	-0.40	Zacatecas, Zac.	19	-0.81	Cuernavaca, Mor.	19	-0.96
Villahermosa, Tab.	20	-0.57	Campeche, Camp.	20	-0.54	Villahermosa, Tab.	20	-0.41	Veracruz, Ver.	20	-1.06	Leon, Gto.	20	-1.19
Cuernavaca, Mor.	21	-0.75	Veracruz, Ver.	21	-0.54	Oaxaca, Oax.	21	-0.42	Acapulco, Gro.	21	-1.37	Tuxtla Gutierrez, Chis.	21	-1.34
Tuxtla Gutierrez, Chis.	22	-0.88	Villahermosa, Tab.	22	-0.64	Morelia, Mich.	22	-0.60	Colima, Col.	22	-1.42	Villahermosa, Tab.	22	-1.67
Acapulco, Gro.	23	-0.98	Oaxaca, Oax.	23	-0.94	Veracruz, Ver.	23	-0.63	Durango, Dgo.	23	-1.45	Oaxaca, Oax.	23	-1.72
Durango, Dgo.	24	-0.98	Zacatecas, Zac.	24	-1.22	Colima, Col.	24	-0.67	Oaxaca, Oax.	24	-2.06	Zacatecas, Zac.	24	-2.00
Leon, Gto.	25	-1.21	Tuxtla Gutierrez, Chis.	25	-1.39	Campeche, Camp.	25	-0.83	Campeche, Camp.	25	-2.18	Colima, Col.	25	-2.06
Oaxaca, Oax.	26	-1.41	Colima, Col.	26	-1.55	Tuxtla Gutierrez, Chis.	26	-2.29	Cuernavaca, Mor.	26	-2.33	Campeche, Camp.	26	-2.13
Colima, Col.	27	-1.71	Cuernavaca, Mor.	27	-1.86	Cuernavaca, Mor.	27	-2.63	Tuxtla Gutierrez, Chis.	27	-2.83	Acapulco, Gro.	27	-2.44

Source: Own elaboration using the short/long-run analytic sample of 28 metropolitan and principal urban areas. Indices are in natural logarithmic form. A line across each column separates urban areas in those with below- and above-average spatial concentration values. To make the indices fully comparable across the selected years, the metropolitan area of Queretaro was not considered in the estimation of the spatial concentration indices presented in this table as data for this metropolitan area were not available for 1992. If included, however, Queretaro would occupy the following rankings: 10 in 1997, 9 in 2002, 18 in 2007, and 14 in 2010.

Table D.8: Spatial Concentration of Manufacturing Employment in Textiles and Leather Products Industries for Selected Years—Short/Long-Run Analytic Sample

1992			1997			2002			2007			2010		
Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index
Leon, Gto.	1	4.28	Leon, Gto.	1	3.90	Leon, Gto.	1	4.47	Leon, Gto.	1	5.21	Leon, Gto.	1	5.52
Mexico City	2	3.82	Mexico City	2	3.72	Mexico City	2	3.62	Mexico City	2	3.64	Mexico City	2	3.51
Puebla, Pue.	3	2.66	Puebla, Pue.	3	3.44	Puebla, Pue.	3	3.33	Puebla, Pue.	3	2.66	Puebla, Pue.	3	2.95
Guadalajara, Jal.	4	2.63	Guadalajara, Jal.	4	2.36	Guadalajara, Jal.	4	2.41	Guadalajara, Jal.	4	2.20	Toluca, Edo. Mex.	4	2.61
Monterrey, N.L.	5	2.26	Aguascalientes, Ags.	5	2.27	Aguascalientes, Ags.	5	2.20	Toluca, Edo. Mex.	5	1.70	Guadalajara, Jal.	5	1.93
Aguascalientes, Ags.	6	1.86	Monterrey, N.L.	6	1.67	Toluca, Edo. Mex.	6	1.70	Aguascalientes, Ags.	6	1.39	Aguascalientes, Ags.	6	1.64
Toluca, Edo. Mex.	7	0.69	Toluca, Edo. Mex.	7	1.18	Merida, Yuc.	7	1.36	Merida, Yuc.	7	1.30	Campeche, Camp.	7	1.30
Merida, Yuc.	8	0.59	Merida, Yuc.	8	1.13	Campeche, Camp.	8	0.94	Campeche, Camp.	8	1.23	Merida, Yuc.	8	0.18
Cuernavaca, Mor.	9	0.49	Tijuana, B.C.	9	0.82	Monterrey, N.L.	9	0.93	Saltillo, Coah.	9	0.37	Tijuana, B.C.	9	0.06
San Luis Potosi, S.L.P.	10	0.19	Hermosillo, Son.	10	0.25	Tijuana, B.C.	10	0.03	Monterrey, N.L.	10	0.36	San Luis Potosi, S.L.P.	10	-0.27
Chihuahua, Chih.	11	-0.62	Chihuahua, Chih.	11	0.25	San Luis Potosi, S.L.P.	11	-0.33	Tijuana, B.C.	11	0.34	Monterrey, N.L.	11	-0.84
Saltillo, Coah.	12	-0.98	San Luis Potosi, S.L.P.	12	-0.26	Cuernavaca, Mor.	12	-0.43	Durango, Dgo.	12	-0.32	Durango, Dgo.	12	-0.87
Tijuana, B.C.	13	-1.05	Cuernavaca, Mor.	13	-0.60	Saltillo, Coah.	13	-0.48	Cuernavaca, Mor.	13	-0.49	Cuernavaca, Mor.	13	-1.20
Tampico, Tamps.	14	-1.30	Saltillo, Coah.	14	-1.25	Durango, Dgo.	14	-0.69	Hermosillo, Son.	14	-1.52	Morelia, Mich.	14	-1.56
Hermosillo, Son.	15	-1.32	Durango, Dgo.	15	-2.34	Chihuahua, Chih.	15	-1.74	San Luis Potosi, S.L.P.	15	-2.30	Hermosillo, Son.	15	-1.66
Morelia, Mich.	16	-2.93	Acapulco, Gro.	16	-2.81	Hermosillo, Son.	16	-1.78	Tampico, Tamps.	16	-2.89	Saltillo, Coah.	16	-2.55
Veracruz, Ver.	17	-5.34	Zacatecas, Zac.	17	-3.48	Zacatecas, Zac.	17	-1.97	Morelia, Mich.	17	-3.77	Chihuahua, Chih.	17	-2.96
Durango, Dgo.	18	-5.44	Morelia, Mich.	18	-3.89	Tampico, Tamps.	18	-2.47	Chihuahua, Chih.	18	-3.97	Tampico, Tamps.	18	-4.28
Campeche, Camp.	19	-5.45	Tampico, Tamps.	19	-4.03	Acapulco, Gro.	19	-2.80	Culiacan, Sin.	19	-4.02	Veracruz, Ver.	19	-5.56
Culiacan, Sin.	20	-5.57	Tepic, Nay.	20	-4.23	Morelia, Mich.	20	-2.95	Acapulco, Gro.	20	-4.58	Oaxaca, Oax.	20	-5.75
Tepic, Nay.	21	-6.01	Veracruz, Ver.	21	-5.65	Culiacan, Sin.	21	-3.53	Tepic, Nay.	21	-5.51	Villahermosa, Tab.	21	-5.82
Acapulco, Gro.	22	-6.52	Tuxtla Gutierrez, Chis.	22	-5.76	Oaxaca, Oax.	22	-3.78	Colima, Col.	22	-5.77	Culiacan, Sin.	22	-6.21
Oaxaca, Oax.	23	-6.58	Campeche, Camp.	23	-6.45	Veracruz, Ver.	23	-5.55	Zacatecas, Zac.	23	-7.85	Zacatecas, Zac.	23	-6.33
Villahermosa, Tab.	24	-6.61	Culiacan, Sin.	24	-6.88	Tuxtla Gutierrez, Chis.	24	-5.61	Oaxaca, Oax.	24	-------	Acapulco, Gro.	24	-------
Tuxtla Gutierrez, Chis.	25	-7.81	Colima, Col.	25	-7.01	Villahermosa, Tab.	25	-6.03	Tuxtla Gutierrez, Chis.	25	-------	Colima, Col.	25	-------
Zacatecas, Zac.	26	-7.88	Villahermosa, Tab.	26	-7.84	Tepic, Nay.	26	-6.46	Veracruz, Ver.	26	-------	Tepic, Nay.	26	-------
Colima, Col.	27	-8.45	Oaxaca, Oax.	27	-8.30	Colima, Col.	27	-8.09	Villahermosa, Tab.	27	-------	Tuxtla Gutierrez, Chis.	27	-------

Source: Own elaboration using the short/long-run analytic sample of 28 metropolitan and principal urban areas. Indices are in natural logarithmic form. A line across each column separates urban areas in those with below- and above-average spatial concentration values. Missing data, indicated by (------), correspond to indices in antilogarithmic form with values of zero, meaning that none of the manufacturing subsector is located within the urban area. To make the indices fully comparable across the selected years, the metropolitan area of Queretaro was not considered in the estimation of the spatial concentration indices presented in this table as data for this metropolitan area were not available for 1992. If included, however, Queretaro would occupy the following rankings: 13 in 1997, 18 in 2002, 14 in 2007, and 16 in 2010.

Table D.9: Spatial Concentration of Manufacturing Employment in Electric and Electronic Products Industries for Selected Years—Short/Long-Run Analytic Sample

1992			1997			2002			2007			2010		
Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index
Tijuana, B.C.	1	4.04	Tijuana, B.C.	1	5.44	Tijuana, B.C.	1	5.16	Tijuana, B.C.	1	4.96	Tijuana, B.C.	1	4.28
Mexico City	2	3.89	Monterrey, N.L.	2	3.34	Monterrey, N.L.	2	3.77	Monterrey, N.L.	2	3.56	Guadalajara, Jal.	2	3.76
Monterrey, N.L.	3	3.06	Guadalajara, Jal.	3	3.19	Guadalajara, Jal.	3	3.03	Guadalajara, Jal.	3	3.54	Monterrey, N.L.	3	3.76
Chihuahua, Chih.	4	2.53	Chihuahua, Chih.	4	2.58	Chihuahua, Chih.	4	2.75	Chihuahua, Chih.	4	2.92	Chihuahua, Chih.	4	3.38
Guadalajara, Jal.	5	2.12	Mexico City	5	2.01	Mexico City	5	1.96	Mexico City	5	2.18	Mexico City	5	2.15
San Luis Potosi, S.L.P.	6	1.70	Hermosillo, Son.	6	1.64	San Luis Potosi, S.L.P.	6	1.49	Aguascalientes, Ags.	6	1.21	San Luis Potosi, S.L.P.	6	2.14
Hermosillo, Son.	7	0.57	San Luis Potosi, S.L.P.	7	0.72	Hermosillo, Son.	7	1.23	San Luis Potosi, S.L.P.	7	0.92	Saltillo, Coah.	7	1.66
Aguascalientes, Ags.	8	-0.32	Saltillo, Coah.	8	-0.33	Saltillo, Coah.	8	0.76	Hermosillo, Son.	8	0.38	Aguascalientes, Ags.	8	1.43
Puebla, Pue.	9	-0.79	Toluca, Edo. Mex.	9	-0.38	Aguascalientes, Ags.	9	0.76	Saltillo, Coah.	9	0.12	Hermosillo, Son.	9	0.24
Toluca, Edo. Mex.	10	-1.05	Aguascalientes, Ags.	10	-0.61	Puebla, Pue.	10	-0.07	Toluca, Edo. Mex.	10	-2.56	Cuernavaca, Mor.	10	-2.05
Cuernavaca, Mor.	11	-1.12	Puebla, Pue.	11	-1.05	Merida, Yuc.	11	-0.62	Puebla, Pue.	11	-2.72	Merida, Yuc.	11	-2.17
Saltillo, Coah.	12	-1.66	Durango, Dgo.	12	-1.28	Toluca, Edo. Mex.	12	-1.35	Leon, Gto.	12	-3.40	Toluca, Edo. Mex.	12	-2.18
Morelia, Mich.	13	-2.58	Merida, Yuc.	13	-1.50	Durango, Dgo.	13	-2.40	Merida, Yuc.	13	-4.44	Morelia, Mich.	13	-4.31
Durango, Dgo.	14	-2.98	Cuernavaca, Mor.	14	-1.63	Cuernavaca, Mor.	14	-2.66	Tuxtla Gutierrez, Chis.	14	-5.02	Tampico, Tamps.	14	-5.87
Merida, Yuc.	15	-3.56	Morelia, Mich.	15	-2.90	Morelia, Mich.	15	-3.14	Veracruz, Ver.	15	-5.44	Colima, Col.	15	-6.53
Leon, Gto.	16	-3.66	Leon, Gto.	16	-5.65	Veracruz, Ver.	16	-5.15	Durango, Dgo.	16	-5.60	Acapulco, Gro.	16	-------
Tampico, Tamps.	17	-4.40	Colima, Col.	17	-5.74	Colima, Col.	17	-5.57	Cuernavaca, Mor.	17	-5.71	Campeche, Camp.	17	-------
Tuxtla Gutierrez, Chis.	18	-6.39	Zacatecas, Zac.	18	-6.23	Zacatecas, Zac.	18	-6.37	Acapulco, Gro.	18	-6.21	Culiacan, Sin.	18	-------
Zacatecas, Zac.	19	-6.46	Culiacan, Sin.	19	-7.23	Oaxaca, Oax.	19	-6.66	Zacatecas, Zac.	19	-7.21	Durango, Dgo.	19	-------
Oaxaca, Oax.	20	-6.64	Acapulco, Gro.	20	-------	Acapulco, Gro.	20	-7.00	Colima, Col.	20	-7.34	Leon, Gto.	20	-------
Culiacan, Sin.	21	-6.73	Campeche, Camp.	21	-------	Tepic, Nay.	21	-7.02	Campeche, Camp.	21	-------	Oaxaca, Oax.	21	-------
Villahermosa, Tab.	22	-7.22	Oaxaca, Oax.	22	-------	Tuxtla Gutierrez, Chis.	22	-7.43	Culiacan, Sin.	22	-------	Puebla, Pue.	22	-------
Campeche, Camp.	23	-9.45	Tampico, Tamps.	23	-------	Tampico, Tamps.	23	-7.94	Morelia, Mich.	23	-------	Tepic, Nay.	23	-------
Acapulco, Gro.	24	-------	Tepic, Nay.	24	-------	Culiacan, Sin.	24	-8.53	Oaxaca, Oax.	24	-------	Tuxtla Gutierrez, Chis.	24	-------
Colima, Col.	25	-------	Tuxtla Gutierrez, Chis.	25	-------	Campeche, Camp.	25	-------	Tampico, Tamps.	25	-------	Veracruz, Ver.	25	-------
Tepic, Nay.	26	-------	Veracruz, Ver.	26	-------	Leon, Gto.	26	-------	Tepic, Nay.	26	-------	Villahermosa, Tab.	26	-------
Veracruz, Ver.	27	-------	Villahermosa, Tab.	27	-------	Villahermosa, Tab.	27	-------	Villahermosa, Tab.	27	-------	Zacatecas, Zac.	27	-------

Source: Own elaboration using the short/long-run analytic sample of 28 metropolitan and principal urban areas. Indices are in natural logarithmic form. A line across each column separates urban areas in those with below- and above-average spatial concentration values. Missing data, indicated by (------), correspond to indices in antilogarithmic form with values of zero, meaning that none of the manufacturing subsector is located within the urban area. To make the indices fully comparable across the selected years, the metropolitan area of Queretaro was not considered in the estimation of the spatial concentration indices presented in this table as data for this metropolitan area were not available for 1992. If included, however, Queretaro would occupy the following rankings: 7 in 1997, 6 in 2002, 8 in 2007, and 8 in 2010.

Table D.10: Spatial Concentration of Manufacturing Employment in Transportation Equipment, Parts, and Components Industries for Selected Years—Short/Long-Run Analytic Sample

1992			1997			2002			2007			2010		
Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index
Saltillo, Coah.	1	3.63	Saltillo, Coah.	1	4.46	Saltillo, Coah.	1	4.56	Saltillo, Coah.	1	4.39	Saltillo, Coah.	1	4.88
Chihuahua, Chih.	2	3.51	Chihuahua, Chih.	2	4.43	Chihuahua, Chih.	2	4.39	Chihuahua, Chih.	2	3.70	Chihuahua, Chih.	2	3.59
Mexico City	3	3.43	Puebla, Pue.	3	3.98	Puebla, Pue.	3	3.36	Puebla, Pue.	3	3.54	Puebla, Pue.	3	3.53
Monterrey, N.L.	4	3.42	Monterrey, N.L.	4	2.93	Toluca, Edo. Mex.	4	3.05	Monterrey, N.L.	4	3.01	Monterrey, N.L.	4	3.06
Toluca, Edo. Mex.	5	3.42	Toluca, Edo. Mex.	5	2.56	Monterrey, N.L.	5	2.96	Hermosillo, Son.	5	2.59	Tijuana, B.C.	5	2.53
Puebla, Pue.	6	3.11	Mexico City	6	2.31	San Luis Potosi, S.L.P.	6	2.24	San Luis Potosi, S.L.P.	6	2.58	Hermosillo, Son.	6	2.29
Cuernavaca, Mor.	7	1.98	Aguascalientes, Ags.	7	1.79	Mexico City	7	2.16	Toluca, Edo. Mex.	7	2.26	San Luis Potosi, S.L.P.	7	2.25
Aguascalientes, Ags.	8	1.75	San Luis Potosi, S.L.P.	8	1.23	Aguascalientes, Ags.	8	1.62	Aguascalientes, Ags.	8	1.86	Aguascalientes, Ags.	8	2.06
Hermosillo, Son.	9	0.68	Hermosillo, Son.	9	0.68	Guadalajara, Jal.	9	1.04	Mexico City	9	1.57	Toluca, Edo. Mex.	9	1.78
San Luis Potosi, S.L.P.	10	0.50	Guadalajara, Jal.	10	0.30	Durango, Dgo.	10	-0.05	Tijuana, B.C.	10	0.38	Guadalajara, Jal.	10	0.95
Veracruz, Ver.	11	-0.59	Tijuana, B.C.	11	-0.37	Hermosillo, Son.	11	-0.26	Guadalajara, Jal.	11	0.37	Durango, Dgo.	11	0.95
Tampico, Tamps.	12	-1.55	Cuernavaca, Mor.	12	-0.77	Tuxtla Gutierrez, Chis.	12	-0.76	Cuernavaca, Mor.	12	-0.11	Mexico City	12	0.67
Guadalajara, Jal.	13	-2.21	Veracruz, Ver.	13	-1.28	Zacatecas, Zac.	13	-0.78	Tuxtla Gutierrez, Chis.	13	-0.26	Colima, Col.	13	-0.10
Durango, Dgo.	14	-2.27	Durango, Dgo.	14	-2.64	Tijuana, B.C.	14	-0.97	Durango, Dgo.	14	-0.29	Zacatecas, Zac.	14	-1.00
Zacatecas, Zac.	15	-3.70	Zacatecas, Zac.	15	-2.64	Veracruz, Ver.	15	-1.17	Colima, Col.	15	-0.47	Tuxtla Gutierrez, Chis.	15	-1.78
Tijuana, B.C.	16	-4.53	Tampico, Tamps.	16	-2.81	Tampico, Tamps.	16	-1.89	Zacatecas, Zac.	16	-1.24	Tampico, Tamps.	16	-2.09
Morelia, Mich.	17	-4.64	Campeche, Camp.	17	-3.54	Cuernavaca, Mor.	17	-2.01	Leon, Gto.	17	-3.39	Cuernavaca, Mor.	17	-2.54
Leon, Gto.	18	-4.91	Leon, Gto.	18	-3.98	Leon, Gto.	18	-2.24	Merida, Yuc.	18	-3.61	Merida, Yuc.	18	-2.56
Acapulco, Gro.	19	-5.31	Morelia, Mich.	19	-6.57	Merida, Yuc.	19	-3.57	Morelia, Mich.	19	-4.35	Leon, Gto.	19	-2.74
Campeche, Camp.	20	-5.80	Acapulco, Gro.	20	-------	Morelia, Mich.	20	-6.21	Veracruz, Ver.	20	-4.74	Veracruz, Ver.	20	-3.85
Culiacan, Sin.	21	-6.32	Colima, Col.	21	-------	Colima, Col.	21	-6.85	Tampico, Tamps.	21	-6.94	Tepic, Nay.	21	-7.11
Oaxaca, Oax.	22	-9.68	Culiacan, Sin.	22	-------	Tepic, Nay.	22	-6.88	Acapulco, Gro.	22	-------	Acapulco, Gro.	22	-------
Colima, Col.	23	-------	Merida, Yuc.	23	-------	Campeche, Camp.	23	-7.71	Campeche, Camp.	23	-------	Campeche, Camp.	23	-------
Merida, Yuc.	24	-------	Oaxaca, Oax.	24	-------	Acapulco, Gro.	24	-------	Culiacan, Sin.	24	-------	Culiacan, Sin.	24	-------
Tepic, Nay.	25	-------	Tepic, Nay.	25	-------	Culiacan, Sin.	25	-------	Oaxaca, Oax.	25	-------	Morelia, Mich.	25	-------
Tuxtla Gutierrez, Chis.	26	-------	Tuxtla Gutierrez, Chis.	26	-------	Oaxaca, Oax.	26	-------	Tepic, Nay.	26	-------	Oaxaca, Oax.	26	-------
Villahermosa, Tab.	27	-------	Villahermosa, Tab.	27	-------	Villahermosa, Tab.	27	-------	Villahermosa, Tab.	27	-------	Villahermosa, Tab.	27	-------

Source: Own elaboration using the short/long-run analytic sample of 28 metropolitan and principal urban areas. Indices are in natural logarithmic form. A line across each column separates urban areas in those with below- and above-average spatial concentration values. Missing data, indicated by (------), correspond to indices in antilogarithmic form with values of zero, meaning that none of the manufacturing subsector is located within the urban area. To make the indices fully comparable across the selected years, the metropolitan area of Queretaro was not considered in the estimation of the spatial concentration indices presented in this table as data for this metropolitan area were not available for 1992. If included, however, Queretaro would occupy the following rankings: 5 in 1997, 8 in 2002, 4 in 2007, and 8 in 2010.

Table D.11: Spatial Concentration of Manufacturing Employment in Machinery and Metallic Products Industries for Selected Years—Short/Long-Run Analytic Sample

1992			1997			2002			2007			2010		
Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index
Mexico City	1	3.94	Monterrey, N.L.	1	3.80	Monterrey, N.L.	1	3.99	Monterrey, N.L.	1	4.06	Monterrey, N.L.	1	4.14
Monterrey, N.L.	2	3.57	Mexico City	2	3.51	Mexico City	2	3.35	Mexico City	2	3.32	Mexico City	2	3.34
Guadalajara, Jal.	3	2.46	Guadalajara, Jal.	3	2.53	Guadalajara, Jal.	3	3.03	San Luis Potosi, S.L.P.	3	3.00	San Luis Potosi, S.L.P.	3	3.27
Saltillo, Coah.	4	1.69	Saltillo, Coah.	4	2.14	San Luis Potosi, S.L.P.	4	2.28	Guadalajara, Jal.	4	2.52	Guadalajara, Jal.	4	2.47
San Luis Potosi, S.L.P.	5	1.58	San Luis Potosi, S.L.P.	5	1.96	Saltillo, Coah.	5	1.93	Saltillo, Coah.	5	1.91	Saltillo, Coah.	5	1.87
Tijuana, B.C.	6	1.04	Puebla, Pue.	6	1.27	Puebla, Pue.	6	1.68	Tijuana, B.C.	6	1.36	Tijuana, B.C.	6	1.15
Veracruz, Ver.	7	0.74	Tijuana, B.C.	7	1.00	Aguascalientes, Ags.	7	0.80	Puebla, Pue.	7	1.27	Puebla, Pue.	7	1.13
Aguascalientes, Ags.	8	0.44	Veracruz, Ver.	8	0.57	Toluca, Edo. Mex.	8	0.52	Aguascalientes, Ags.	8	0.33	Toluca, Edo. Mex.	8	0.65
Puebla, Pue.	9	0.33	Aguascalientes, Ags.	9	0.27	Tijuana, B.C.	9	0.34	Merida, Yuc.	9	-0.05	Aguascalientes, Ags.	9	0.21
Chihuahua, Chih.	10	-0.31	Chihuahua, Chih.	10	0.10	Veracruz, Ver.	10	0.03	Chihuahua, Chih.	10	-0.09	Chihuahua, Chih.	10	0.16
Toluca, Edo. Mex.	11	-0.41	Toluca, Edo. Mex.	11	-0.01	Chihuahua, Chih.	11	-0.21	Toluca, Edo. Mex.	11	-0.11	Veracruz, Ver.	11	-0.03
Cuernavaca, Mor.	12	-0.98	Hermosillo, Son.	12	-0.08	Merida, Yuc.	12	-0.23	Veracruz, Ver.	12	-0.29	Cuernavaca, Mor.	12	-0.12
Culiacan, Sin.	13	-1.18	Merida, Yuc.	13	-0.45	Leon, Gto.	13	-0.75	Leon, Gto.	13	-0.29	Leon, Gto.	13	-0.85
Leon, Gto.	14	-1.40	Tampico, Tamps.	14	-0.72	Tampico, Tamps.	14	-1.35	Cuernavaca, Mor.	14	-1.65	Morelia, Mich.	14	-0.98
Merida, Yuc.	15	-1.41	Cuernavaca, Mor.	15	-0.93	Hermosillo, Son.	15	-1.44	Durango, Dgo.	15	-1.65	Merida, Yuc.	15	-1.58
Hermosillo, Son.	16	-1.54	Leon, Gto.	16	-1.07	Morelia, Mich.	16	-2.14	Culiacan, Sin.	16	-1.79	Hermosillo, Son.	16	-1.85
Tampico, Tamps.	17	-1.91	Morelia, Mich.	17	-1.72	Zacatecas, Zac.	17	-2.87	Morelia, Mich.	17	-2.14	Durango, Dgo.	17	-1.85
Durango, Dgo.	18	-3.07	Culiacan, Sin.	18	-2.51	Tuxtla Gutierrez, Chis.	18	-3.29	Hermosillo, Son.	18	-2.40	Culiacan, Sin.	18	-2.18
Morelia, Mich.	19	-3.46	Tuxtla Gutierrez, Chis.	19	-2.68	Culiacan, Sin.	19	-3.30	Colima, Col.	19	-3.75	Zacatecas, Zac.	19	-3.78
Tuxtla Gutierrez, Chis.	20	-3.76	Durango, Dgo.	20	-2.71	Colima, Col.	20	-3.50	Tampico, Tamps.	20	-4.68	Campeche, Camp.	20	-5.05
Campeche, Camp.	21	-4.00	Zacatecas, Zac.	21	-2.73	Durango, Dgo.	21	-3.56	Zacatecas, Zac.	21	-4.87	Colima, Col.	21	-5.06
Colima, Col.	22	-4.35	Colima, Col.	22	-3.87	Cuernavaca, Mor.	22	-3.79	Campeche, Camp.	22	-4.93	Tampico, Tamps.	22	-5.13
Villahermosa, Tab.	23	-4.56	Campeche, Camp.	23	-4.26	Tepic, Nay.	23	-4.47	Tepic, Nay.	23	-6.83	Acapulco, Gro.	23	-------
Acapulco, Gro.	24	-4.94	Villahermosa, Tab.	24	-4.61	Campeche, Camp.	24	-5.72	Villahermosa, Tab.	24	-6.94	Oaxaca, Oax.	24	-------
Oaxaca, Oax.	25	-4.94	Oaxaca, Oax.	25	-5.64	Oaxaca, Oax.	25	-6.52	Acapulco, Gro.	25	-------	Tepic, Nay.	25	-------
Tepic, Nay.	26	-5.69	Tepic, Nay.	26	-5.79	Villahermosa, Tab.	26	-6.96	Oaxaca, Oax.	26	-------	Tuxtla Gutierrez, Chis.	26	-------
Zacatecas, Zac.	27	-5.82	Acapulco, Gro.	27	-6.15	Acapulco, Gro.	27	-7.83	Tuxtla Gutierrez, Chis.	27	-------	Villahermosa, Tab.	27	-------

Source: Own elaboration using the short/long-run analytic sample of 28 metropolitan and principal urban areas. Indices are in natural logarithmic form. A line across each column separates urban areas in those with below- and above-average spatial concentration values. Missing data, indicated by (------), correspond to indices in antilogarithmic form with values of zero, meaning that none of the manufacturing subsector is located within the urban area. To make the indices fully comparable across the selected years, the metropolitan area of Queretaro was not considered in the estimation of the spatial concentration indices presented in this table as data for this metropolitan area were not available for 1992. If included, however, Queretaro would occupy the following rankings: 6 in 1997, 7 in 2002, 8 in 2007, and 8 in 2010.

Table D.12: Spatial Concentration of Manufacturing Employment in Chemical and Mineral Products Industries for Selected Years—Short/Long-Run Analytic Sample

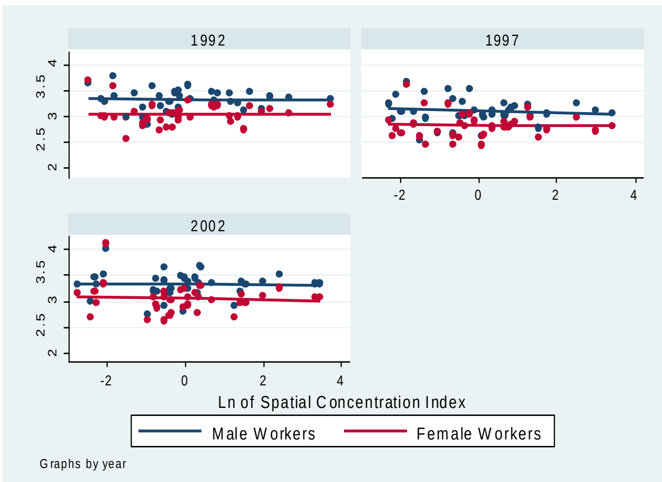
1992			1997			2002			2007			2010		
Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index	Metropolitan Area	Rank	Ln Index
Mexico City	1	4.19	Mexico City	1	3.83	Mexico City	1	4.01	Mexico City	1	4.09	Mexico City	1	4.17
Monterrey, N.L.	2	2.85	Monterrey, N.L.	2	3.19	Guadalajara, Jal.	2	2.83	Monterrey, N.L.	2	3.06	Monterrey, N.L.	2	2.83
Guadalajara, Jal.	3	2.26	Guadalajara, Jal.	3	2.90	Monterrey, N.L.	3	2.81	Guadalajara, Jal.	3	2.11	Guadalajara, Jal.	3	2.80
Tampico, Tamps.	4	1.73	Tampico, Tamps.	4	2.39	Toluca, Edo. Mex.	4	1.78	Toluca, Edo. Mex.	4	1.71	Toluca, Edo. Mex.	4	1.61
Cuernavaca, Mor.	5	1.24	Tijuana, B.C.	5	1.30	Tampico, Tamps.	5	1.59	Saltillo, Coah.	5	1.22	Leon, Gto.	5	1.33
Tijuana, B.C.	6	1.22	Saltillo, Coah.	6	0.95	Tijuana, B.C.	6	1.25	Tijuana, B.C.	6	1.09	San Luis Potosi, S.L.P.	6	1.03
Saltillo, Coah.	7	0.94	Cuernavaca, Mor.	7	0.93	Saltillo, Coah.	7	1.15	San Luis Potosi, S.L.P.	7	1.06	Saltillo, Coah.	7	0.98
Toluca, Edo. Mex.	8	0.75	Toluca, Edo. Mex.	8	0.89	San Luis Potosi, S.L.P.	8	0.85	Leon, Gto.	8	0.77	Tijuana, B.C.	8	0.42
Puebla, Pue.	9	0.22	Leon, Gto.	9	0.58	Leon, Gto.	9	0.80	Chihuahua, Chih.	9	0.44	Puebla, Pue.	9	0.04
San Luis Potosi, S.L.P.	10	-0.05	Puebla, Pue.	10	0.41	Puebla, Pue.	10	0.07	Merida, Yuc.	10	0.39	Merida, Yuc.	10	-0.32
Leon, Gto.	11	-0.08	San Luis Potosi, S.L.P.	11	0.37	Cuernavaca, Mor.	11	0.04	Cuernavaca, Mor.	11	0.24	Tampico, Tamps.	11	-0.62
Merida, Yuc.	12	-0.70	Chihuahua, Chih.	12	-0.25	Chihuahua, Chih.	12	-0.34	Puebla, Pue.	12	0.07	Cuernavaca, Mor.	12	-0.75
Chihuahua, Chih.	13	-1.16	Villahermosa, Tab.	13	-0.73	Merida, Yuc.	13	-0.87	Tampico, Tamps.	13	-1.02	Chihuahua, Chih.	13	-0.84
Hermosillo, Son.	14	-1.19	Merida, Yuc.	14	-0.84	Hermosillo, Son.	14	-1.48	Morelia, Mich.	14	-1.20	Hermosillo, Son.	14	-2.15
Morelia, Mich.	15	-1.60	Hermosillo, Son.	15	-1.01	Aguascalientes, Ags.	15	-1.54	Hermosillo, Son.	15	-1.31	Morelia, Mich.	15	-2.29
Villahermosa, Tab.	16	-2.25	Morelia, Mich.	16	-1.19	Villahermosa, Tab.	16	-1.56	Culiacan, Sin.	16	-2.70	Oaxaca, Oax.	16	-2.83
Culiacan, Sin.	17	-2.48	Aguascalientes, Ags.	17	-2.15	Morelia, Mich.	17	-1.67	Acapulco, Gro.	17	-3.00	Tuxtla Gutierrez, Chis.	17	-3.22
Durango, Dgo.	18	-2.65	Culiacan, Sin.	18	-2.32	Tuxtla Gutierrez, Chis.	18	-2.98	Tuxtla Gutierrez, Chis.	18	-3.42	Culiacan, Sin.	18	-3.29
Aguascalientes, Ags.	19	-2.76	Veracruz, Ver.	19	-2.90	Culiacan, Sin.	19	-3.04	Aguascalientes, Ags.	19	-3.48	Acapulco, Gro.	19	-3.32
Veracruz, Ver.	20	-2.90	Campeche, Camp.	20	-3.50	Colima, Col.	20	-3.83	Veracruz, Ver.	20	-3.99	Aguascalientes, Ags.	20	-3.53
Tepic, Nay.	21	-3.77	Durango, Dgo.	21	-3.71	Durango, Dgo.	21	-4.05	Oaxaca, Oax.	21	-4.22	Villahermosa, Tab.	21	-3.59
Campeche, Camp.	22	-3.86	Oaxaca, Oax.	22	-4.01	Tepic, Nay.	22	-4.27	Colima, Col.	22	-4.96	Veracruz, Ver.	22	-4.31
Colima, Col.	23	-3.86	Zacatecas, Zac.	23	-4.27	Oaxaca, Oax.	23	-4.53	Villahermosa, Tab.	23	-5.25	Durango, Dgo.	23	-4.42
Zacatecas, Zac.	24	-3.89	Colima, Col.	24	-4.45	Acapulco, Gro.	24	-5.19	Campeche, Camp.	24	-5.25	Zacatecas, Zac.	24	-4.96
Oaxaca, Oax.	25	-4.12	Tuxtla Gutierrez, Chis.	25	-4.54	Veracruz, Ver.	25	-5.20	Durango, Dgo.	25	-5.60	Campeche, Camp.	25	-5.07
Acapulco, Gro.	26	-4.20	Acapulco, Gro.	26	-4.71	Campeche, Camp.	26	-5.74	Tepic, Nay.	26	-5.68	Colima, Col.	26	-5.54
Tuxtla Gutierrez, Chis.	27	-4.59	Tepic, Nay.	27	-5.72	Zacatecas, Zac.	27	-5.82	Zacatecas, Zac.	27	-8.78	Tepic, Nay.	27	-8.05

Source: Own elaboration using the short/long-run analytic sample of 28 metropolitan and principal urban areas. Indices are in natural logarithmic form. A line across each column separates urban areas in those with below- and above-average spatial concentration values. To make the indices fully comparable across the selected years, the metropolitan area of Queretaro was not considered in the estimation of the spatial concentration indices presented in this table as data for this metropolitan area were not available for 1992. If included, however, Queretaro would occupy the following rankings: 12 in 1997, 10 in 2002, 5 in 2007, and 5 in 2010.

APPENDIX E

Figure E.1: Spatial Concentration of Manufacturing Employment by Subsector and Average Urban Wages across Metropolitan and Principal Urban Areas for Selected Years—Short-Run Analytic Sample

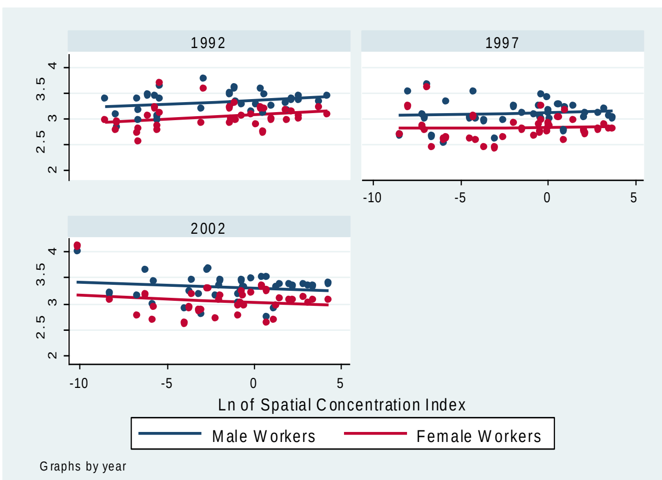
Food Manufacturing:



Slope Coefficients of Fitted Lines

	Year	β
Male	1992	-0.003
	1997	-0.016
	2002	-0.002
Female	1992	0.002
	1997	-0.005
	2002	-0.012

Textiles Manufacturing:



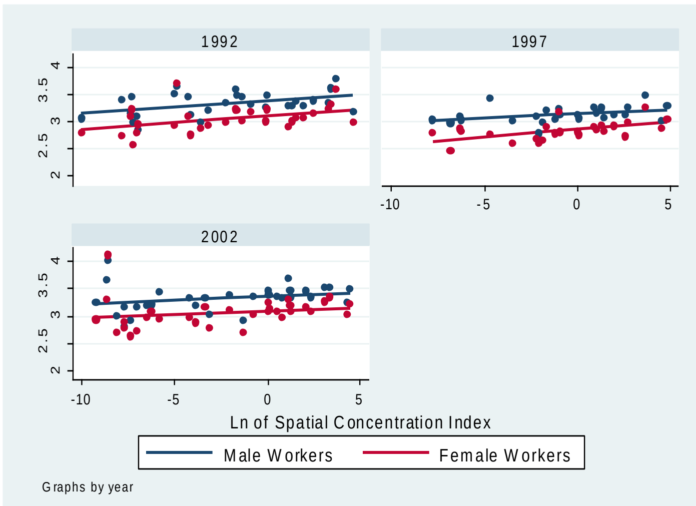
Slope Coefficients of Fitted Lines

	Year	β
Male	1992	0.015
	1997	0.006
	2002	-0.011
Female	1992	0.015
	1997	0.003
	2002	-0.013

Continued

Figure E.1 (Continued): Spatial Concentration of Manufacturing Employment by Subsector and Average Urban Wages across Metropolitan and Principal Urban Areas for Selected Years—Short-Run Analytic Sample

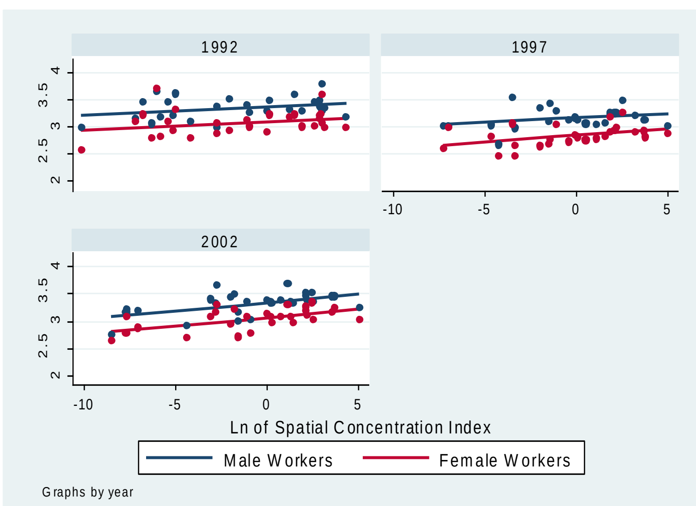
Electronics Manufacturing:



Slope Coefficients of Fitted Lines

	Year	β
Male	1992	0.022 **
	1997	0.016 *
	2002	0.015
Female	1992	0.025 **
	1997	0.026 ***
	2002	0.014

Transportation Manufacturing:



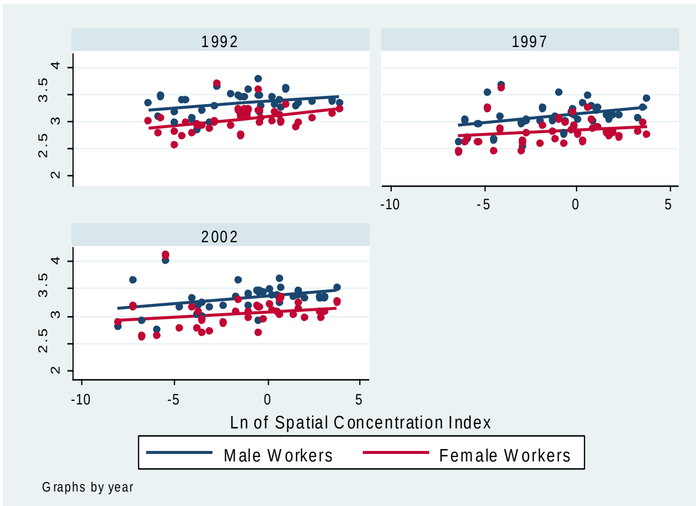
Slope Coefficients of Fitted Lines

	Year	β
Male	1992	0.016 *
	1997	0.015
	2002	0.031 ***
Female	1992	0.015
	1997	0.025 **
	2002	0.029 ***

Continued

Figure E.1 (Continued): Spatial Concentration of Manufacturing Employment by Subsector and Average Urban Wages across Metropolitan and Principal Urban Areas for Selected Years—Short-Run Analytic Sample

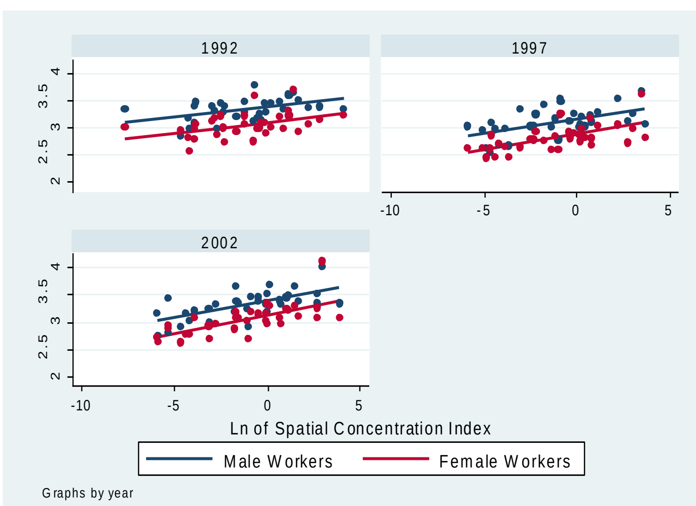
Machinery Manufacturing:



Slope Coefficients of Fitted Lines

	Year	β
Male	1992	0.024 *
	1997	0.033 **
	2002	0.028 **
Female	1992	0.033 **
	1997	0.017
	2002	0.018

Chemicals Manufacturing:



Slope Coefficients of Fitted Lines

	Year	β
Male	1992	0.037 ***
	1997	0.053 ***
	2002	0.062 ***
Female	1992	0.039 ***
	1997	0.056 ***
	2002	0.069 ***

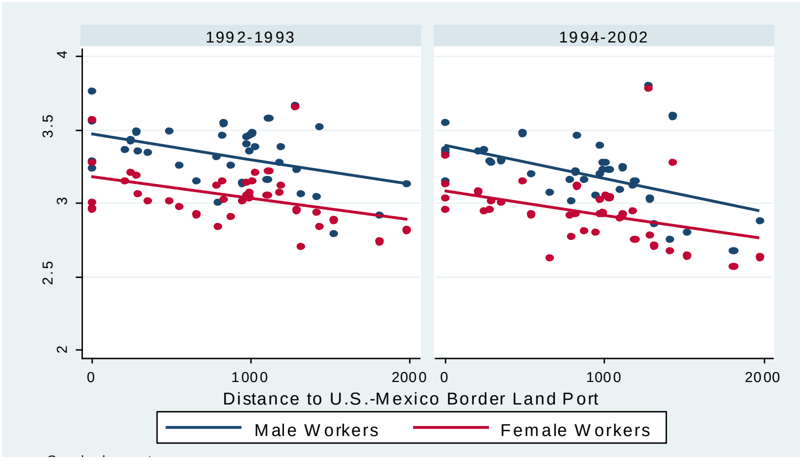
Source: Own elaboration using the short-run analytic sample of 36 metropolitan and principal urban areas. Spatial concentration indices and average hourly wages are presented in natural logarithmic form. Levels of statistical significance of the slope coefficients are represented as: *** p ≤ 0.01; ** p ≤ 0.05; and * p ≤ 0.10.

Table E.1: Statistical Significance of the Slope Coefficients Derived from the Descriptive Analysis in Figure C.1.

	Male Workers			Female Workers		
	1992	1997	2002	1992	1997	2002
Food						
Textiles						
Electronics	**	*		**	***	
Transportation	*		***		**	***
Machinery	*	**	**	**		
Chemicals	***	***	***	***	***	***

Source: Own elaboration using the short -run analytic sample of 36 metropolitan and principal urban areas. The levels of statistical significance of the slope coefficients are represented as follows: *** $p \leq 0.01$; ** $p \leq 0.05$; and * $p \leq 0.10$.

Figure E.2: Distance to Nearest Major U.S.-Mexico Border Land Port and Average Urban Wages across Metropolitan and Principal Urban Areas—Short-Run Analytic Sample

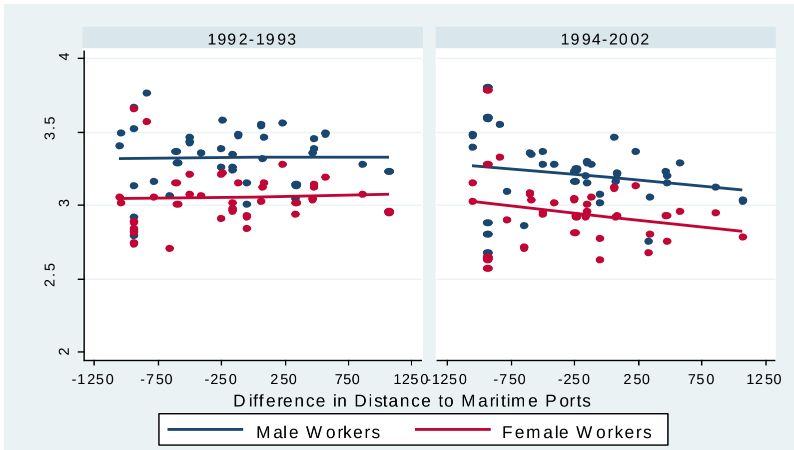


Slope Coefficients of the Fitted Lines

	1992-1993	1994-2002
Male	-0.000173 ***	-0.000223 ***
Female	-0.000146 **	-0.000161 **

Source: Own elaboration using the short-run analytic sample of 36 metropolitan and principal urban areas. Average hourly wages are presented in natural logarithmic form. The period 1992-1993 depicts the years before Mexico's accelerated export expansion and globalization exposure, and the period 1994-2002 depicts the years after. The implementation of NAFTA marks the dividing threshold. The levels of statistical significance of the slope coefficients are represented as follows: *** p ≤ 0.01; ** p ≤ 0.05; and * p ≤ 0.10.

Figure E.3: Difference in Distance to Major Gulf Coast and Pacific Coast Maritime Ports and Average Urban Wages across Metropolitan and Principal Urban Areas—Short-Run Analytic Sample

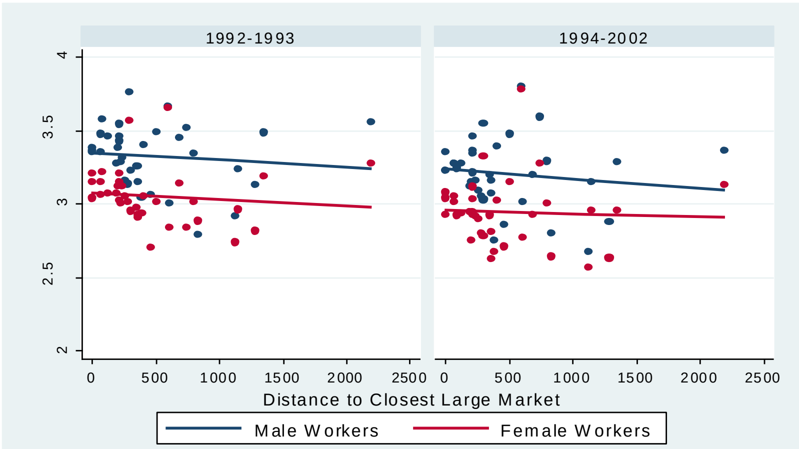


Slope Coefficients of the Fitted Lines:

	1992-1993	1994-2002
Male	0.000005	-0.000080
Female	0.000011	-0.000098

Source: Own elaboration using the short-run analytic sample of 36 metropolitan and principal urban areas. Average hourly wages are presented in natural logarithmic form. The period 1992-1993 depicts the years before Mexico's accelerated export expansion and globalization exposure, and the period 1994-2002 depicts the years after. The implementation of NAFTA marks the dividing threshold. The levels of statistical significance of the slope coefficients are represented as follows: *** p ≤ 0.01; ** p ≤ 0.05; and * p ≤ 0.10.

Figure E.4: Distance to Nearest Large Market and Average Urban Wages across Metropolitan and Principal Urban Areas—Short-Run Analytic Sample



Slope Coefficients of the Fitted Lines

	1992-1993	1994-2002
Male	-0.000050	-0.000062
Female	-0.000046	-0.000023

Source: Own elaboration using the short-run analytic sample of 36 metropolitan and principal urban areas. Average hourly wages are presented in natural logarithmic form. The period 1992-1993 depicts the years before Mexico's accelerated export expansion and globalization exposure, and the period 1994-2002 depicts the years after. The implementation of NAFTA marks the dividing threshold. The levels of statistical significance of the slope coefficients are represented as follows: *** $p \leq 0.01$; ** $p \leq 0.05$; and * $p \leq 0.10$.

APPENDIX F

Robustness Test—Globalization and Firm Size

Previous literature observes that firms in Mexico that are most engaged in international transactions share several common characteristics that differentiate them from purely domestic firms (Ottaviano 2011). These firms are bigger, more skilled-intensive, more innovative, have better access to capital markets, and find it easier to withstand the transaction costs associated with international transactions relative to purely domestic firms. This robustness test, therefore, exploits the empirical fact that large-sized firms in Mexico should be the most exposed to globalization and its effects, and hence, tests the hypothesis that urban wage variation from localization economies and market-access advantages should be more pronounced in an analysis of, for example, large-sized firms relative to an analysis of all firms. This hypothesis conforms to the theoretical perspective discussed in Chapter 2 where localized wage effects from both localization externalities and market-access advantages are in part related to an urban area's exposure to globalization processes. This test is, however, conducted simply as an empirical exercise given that the results may be biased by scale effects since large firms tend to be on average more productive and their workers tend to earn on average higher wages than their counterparts—refer to Chapter 2 for further discussion.

Tables F.1 and F.2, hence, present OLS wage estimation results for male and female workers across firm size using both analytic samples. For space purposes, manufacturing subsectors in the tables are referred numerically as follows: (1) Food, beverages and tobacco products; (2) Textiles (including garment) and leather products; (3) Electronic and electric components; communications and measurement equipment; (4) Transportation equipment, parts, and components; (5) Metallic products; machinery and equipment; and, (6) Oil and lead, chemical, and plastic products; mineral, non-metallic products. Heteroskedasticity-consistent standard errors adjusted for within year/metropolitan area correlation are reported in parenthesis; the number of corresponding space-time clusters adjusted for in each model are also reported. Results from the year effects included in each of the models are omitted from the tables. Levels of statistical significance are represented as follows: *** $p \leq 0.01$; ** $p \leq 0.05$; and * $p \leq 0.10$.

Table F.1: Analytic Model Results for Male Workers by Firm Size

	Short-Run Analytic Sample		Short/Long-Run Analytic Sample			
	Short-Run (Pre: 1992-1993 / Post: 1994-2002)		*Short-Run* (Pre: 1992-1993 / Post: 1994-2002)		*Long-Run* (Pre: 1992-1993 / Post: 1994-2010)	
Independent Variable: Ln of Real Hourly Wages	**Model 1 - Int** Micro+SME	**Model 1 -Int** Large Enterprises	**Model 2-Int** Micro+SME	**Model 2-Int** Large Enterprises	**Model 3-Int** Micro+SME	**Model 3-Int** Large Enterprises
Individual Characteristics						
High School Degree	0.2489***	0.2582***	0.2515***	0.2748***	0.2126***	0.2415***
	(0.026)	(0.017)	(0.028)	(0.020)	(0.017)	(0.016)
Some College or Technical Education	0.3603***	0.3755***	0.3621***	0.3831***	0.3818***	0.3711***
	(0.030)	(0.025)	(0.031)	(0.030)	(0.027)	(0.022)
Technical or Vocational Education	0.2443***	0.2879***	0.2474***	0.3045***	0.2220***	0.2867***
	(0.012)	(0.015)	(0.013)	(0.017)	(0.015)	(0.014)
College Degree	0.9543***	1.0233***	0.9640***	1.0487***	0.8881***	1.0099***
	(0.028)	(0.029)	(0.029)	(0.033)	(0.029)	(0.025)
Potential Experience	0.0171***	0.0210***	0.0168***	0.0212***	0.0176***	0.0204***
	(0.002)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)
Potential Experience Squared	-0.0003***	-0.0003***	-0.0003***	-0.0003***	-0.0003***	-0.0003***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Marital Status (Married or In Civil Union)	0.0623***	0.0262**	0.0633***	0.017	0.0587***	0.0146
	(0.012)	(0.013)	(0.013)	(0.016)	(0.011)	(0.011)
Head of Household	0.0848***	0.1269***	0.0835***	0.1315***	0.0830***	0.1240***
	(0.013)	(0.011)	(0.014)	(0.013)	(0.009)	(0.010)
Migration Status (Recent Inmigrant)	-0.1059	0.0494	-0.1241	0.1115	-0.0253	0.0840*
	(0.073)	(0.044)	(0.082)	(0.068)	(0.045)	(0.046)
Occupation: Professional/Technical	0.2274***	0.3036***	0.2373***	0.2883***	0.2425***	0.2782***
	(0.025)	(0.021)	(0.025)	(0.025)	(0.025)	(0.019)
Occupation: Service/Sales	-0.0463***	0.0033	-0.0405**	0.006	-0.0102	-0.0053
	(0.015)	(0.016)	(0.016)	(0.018)	(0.012)	(0.014)
Occupation: Managerial/Administrative	0.2998***	0.2663***	0.3001***	0.2566***	0.2683***	0.2497***
	(0.015)	(0.016)	(0.015)	(0.019)	(0.017)	(0.013)
Firm-of-Employment Characteristics						
Industry: Food & Beverages Mfg	-0.0555***	0.0091	-0.0636***	0.0072	-0.0471***	0.0158
	(0.015)	(0.012)	(0.015)	(0.014)	(0.010)	(0.013)
Industry: Electronics & Communication Mfg	0.0335	0.0544***	0.0168	0.0443**	0.0168	0.0229
	(0.021)	(0.017)	(0.016)	(0.021)	(0.015)	(0.017)
Industry: Transportation Mfg	0.0496**	0.1047***	0.0349*	0.1223***	0.0366***	0.1084***
	(0.020)	(0.016)	(0.018)	(0.019)	(0.014)	(0.015)
Industry: Machinery & Metallic Products Mfg	0.0450***	0.0565***	0.0365***	0.0406**	0.0415***	0.0468***
	(0.014)	(0.017)	(0.013)	(0.019)	(0.012)	(0.015)
Industry: Chemicals & Minerals Mfg	0.0270*	0.0643***	0.0194	0.0584***	0.0193*	0.0625***
	(0.015)	(0.016)	(0.014)	(0.018)	(0.012)	(0.015)
% of College-Educated (Industry/Gender)	-0.0888	0.1894**	0.0206	0.1723**	-0.0549	0.1826***
	(0.139)	(0.075)	(0.068)	(0.085)	(0.050)	(0.070)

Continued

Table F.1 (Continued): Analytic Model Results for Male Workers by Firm Size

	Short-Run Analytic Sample		Short/Long-Run Analytic Sample			
	Short-Run (Pre: 1992-1993 / Post: 1994-2002)		*Short-Run* (Pre: 1992-1993 / Post: 1994-2002)		*Long-Run* (Pre: 1992-1993 / Post: 1994-2010)	
Independent Variable: Ln of Real Hourly Wages	**Model 1 - Int** Micro+SME	**Model 1 -Int** Large Enterprises	**Model 2-Int** Micro+SME	**Model 2-Int** Large Enterprises	**Model 3-Int** Micro+SME	**Model 3-Int** Large Enterprises
Urban -Area Characteristics						
Unemployment Rate (Gender)	-0.4919	0.7528*	-0.7143	0.8627*	-0.8584***	-0.087
	(0.410)	(0.413)	(0.433)	(0.478)	(0.311)	(0.372)
Average Years of Education	0.0048	0.0593***	0.0009	0.0596**	0.0042	0.0532**
	(0.019)	(0.019)	(0.019)	(0.025)	(0.019)	(0.021)
% of Manufacturing Employment in 1970	1.0059***	1.3929***	1.1167***	1.7432***	1.2192***	1.7713***
	(0.227)	(0.213)	(0.289)	(0.313)	(0.217)	(0.265)
Pairwise Coagglomeration Index 1/2	15.7390***	2.054	14.4734**	-5.2476	4.2513	-0.1727
	(4.494)	(4.391)	(6.977)	(6.476)	(4.506)	(5.137)
Pairwise Coagglomeration Index 1/3	8.4109	7.8411	17.6681	8.5667	-6.5995	-24.7636**
	(11.533)	(7.759)	(17.666)	(15.324)	(8.404)	(9.686)
Pairwise Coagglomeration Index 1/4	1.1645	-2.6242	-1.8664	-11.6326*	11.8975**	-3.1393
	(5.836)	(4.203)	(7.074)	(6.294)	(5.187)	(4.950)
Pairwise Coagglomeration Index 1/5	-33.2708***	-3.0986	-20.9927	1.0725	-14.7069**	7.1485
	(10.237)	(7.038)	(13.083)	(14.215)	(7.042)	(8.555)
Pairwise Coagglomeration Index 1/6	13.4421*	0.0065	3.8944	15.7301*	-9.1949	16.9349***
	(7.796)	(5.961)	(9.058)	(9.353)	(5.937)	(5.424)
Pairwise Coagglomeration Index 2/3	-6.7602	-6.3576**	-16.4196**	-14.7548**	-13.9876***	-9.6116*
	(4.511)	(3.192)	(7.868)	(6.341)	(5.298)	(5.198)
Pairwise Coagglomeration Index 2/4	-1.2708	-2.4185	-1.9597	5.6143	4.5875*	5.9407**
	(3.374)	(2.545)	(3.260)	(3.872)	(2.770)	(2.576)
Pairwise Coagglomeration Index 2/5	-13.2838***	-10.4419***	2.8227	5.1501	5.1803	-1.123
	(4.206)	(3.387)	(8.905)	(9.179)	(4.611)	(5.452)
Pairwise Coagglomeration Index 2/6	0.0253	4.7299	-4.1846	-7.2026	2.7214	-2.0434
	(4.097)	(4.698)	(5.213)	(5.512)	(2.692)	(4.151)
Pairwise Coagglomeration Index 3/4	12.0718***	10.3431***	18.8343***	7.6300*	6.0768	6.9439*
	(3.092)	(1.248)	(5.614)	(4.601)	(3.985)	(3.562)
Pairwise Coagglomeration Index 3/5	14.4407*	14.1450***	5.6729	15.3411*	7.2295	21.8073***
	(7.965)	(4.473)	(10.876)	(9.032)	(4.775)	(5.431)
Pairwise Coagglomeration Index 3/6	-13.3786	-7.2543	3.0092	1.0933	18.3708***	5.6815
	(8.811)	(5.975)	(14.241)	(10.821)	(7.003)	(6.537)
Pairwise Coagglomeration Index 4/5	1.4251	-0.5762	-15.3602***	-1.9757	-7.6455**	-0.3871
	(3.458)	(2.812)	(5.889)	(5.135)	(3.254)	(2.972)
Pairwise Coagglomeration Index 4/6	-6.1823	0.8435	-5.0188	12.8504*	-2.108	-2.4631
	(6.829)	(4.997)	(6.974)	(7.290)	(4.199)	(4.438)
Pairwise Coagglomeration Index 5/6	7.672	-7.2816	0.2635	-32.9505**	-6.7129	-20.7524**
	(8.212)	(6.840)	(12.932)	(14.234)	(6.543)	(8.110)
Ln of Population	-0.0439**	-0.0514***	-0.0954***	-0.0501	-0.0829***	-0.0085
	(0.022)	(0.019)	(0.032)	(0.031)	(0.020)	(0.022)
Key Analytic Variables						
Distance to Large Markets	0.0000	-0.0001*	-0.0001	0.0001	-0.0005***	-0.0002
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Dist. to US-Mexico Border Crossing	0.0001	0.0000	0.0002	-0.0001	0.0000	0.0000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Diff. in Dist. to Gulf and Pacific Ports	0.0003***	0.0001	0.0002	0.0000	-0.0001	0.0001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Large Markets X POST	0.0001	0.0002**	0.0001	-0.0001	0.0005***	0.0002
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Border X POST	-0.0001**	-0.0001**	-0.0005***	-0.0001	-0.0002*	-0.0001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Ports X POST	-0.0001	-0.0001	-0.0001	0.0001	0.0001	0.0000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

Continued

Table F.1 (Continued): Analytic Model Results for Male Workers by Firm Size

	Short-Run Analytic Sample		Short/Long-Run Analytic Sample			
	Short-Run (Pre: 1992-1993 / Post: 1994-2002)		*Short-Run* (Pre: 1992-1993 / Post: 1994-2002)		*Long-Run* (Pre: 1992-1993 / Post: 1994-2010)	
Independent Variable: Ln of Real Hourly Wages	**Model 1 - Int** Micro+SME	**Model 1 -Int** Large Enterprises	**Model 2-Int** Micro+SME	**Model 2-Int** Large Enterprises	**Model 3-Int** Micro+SME	**Model 3-Int** Large Enterprises
Ln Spatial Concentration Index (LnSCI) 1	-0.0156	0.1560***	-0.0764	0.004	-0.1676***	-0.0101
	(0.030)	(0.039)	(0.083)	(0.120)	(0.054)	(0.110)
LnSCI 2	-0.0056	-0.029	-0.1383***	-0.017	-0.0294	0.0227
	(0.018)	(0.019)	(0.034)	(0.050)	(0.020)	(0.040)
LnSCI 3	0.0253*	0.0213	0.0154	-0.0115	0.1175***	0.0503
	(0.015)	(0.014)	(0.040)	(0.053)	(0.025)	(0.052)
LnSCI 4	-0.007	-0.0004	0.018	-0.0903	0.0171	-0.0074
	(0.015)	(0.013)	(0.041)	(0.055)	(0.026)	(0.043)
LnSCI 5	0.0122	-0.0319	-0.0476	0.1637	-0.1731***	-0.0305
	(0.027)	(0.021)	(0.086)	(0.118)	(0.056)	(0.093)
LnSCI 6	-0.0082	-0.0445*	0.2534***	-0.079	0.1165**	-0.1029
	(0.036)	(0.026)	(0.084)	(0.114)	(0.050)	(0.091)
LnSCI 1 X POST	0.0397	-0.0481	-0.0065	0.0554	0.1303**	-0.0062
	(0.045)	(0.039)	(0.086)	(0.115)	(0.055)	(0.109)
LnSCI 2 X POST	-0.0004	-0.0092	0.1106***	-0.009	0.0203	-0.0477
	(0.019)	(0.023)	(0.033)	(0.051)	(0.022)	(0.041)
LnSCI 3 X POST	-0.0131	0.0007	-0.0139	0.0047	-0.1034***	-0.0382
	(0.014)	(0.014)	(0.040)	(0.051)	(0.026)	(0.051)
LnSCI 4 X POST	0.0038	-0.0067	-0.031	0.0764	-0.0289	-0.0016
	(0.014)	(0.012)	(0.040)	(0.055)	(0.027)	(0.042)
LnSCI 5 X POST	0.007	0.0162	0.1428	-0.1764	0.1821***	0.0329
	(0.025)	(0.022)	(0.088)	(0.117)	(0.059)	(0.093)
LnSCI 6 X POST	-0.0203	0.0282	-0.2949***	0.1023	-0.1149**	0.0888
	(0.034)	(0.027)	(0.093)	(0.115)	(0.053)	(0.091)
LnSCI 1 X Large Markets	0.0001*	0.0001	0.0001	0.0001	0.0002***	0.0002
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 2 X Large Markets	0.0000	0.0000	0.0001	0.0001	0.0000	0.0000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 3 X Large Markets	0.0000	0.0000	0.0001*	0.0000	0.0000	0.0000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 4 X Large Markets	0.0000	0.0000	-0.0000**	0.0000	-0.0001***	-0.0000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 5 X Large Markets	0.0000	0.0000	-0.0001	-0.0002	0.0000	-0.0001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 6 X Large Markets	0.0000	0.0001**	-0.0002***	0.0000	-0.0001***	0.0000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 1 X Border	-0.0001***	-0.0002***	0.0000	0.0000	0.0000	-0.0001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 2 X Border	0.0000	0.0000	0.0001**	0.0000	0.0000	-0.0001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 3 X Border	0.0000	-0.0001***	0.0000	0.0000	-0.0001***	-0.0001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 4 X Border	0.0000	0.0000**	0.0000	0.0001**	0.0000	0.0000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 5 X Border	0.0000**	0.0001***	0.0001*	-0.0001	0.0002***	0.0001*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 6 X Border	0.0000	0.0000	-0.0002***	0.0000	-0.0001*	0.0001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

Continued

Table F.1 (Continued): Analytic Model Results for Male Workers by Firm Size

	Short-Run Analytic Sample		Short/Long-Run Analytic Sample			
	Short-Run (Pre: 1992-1993 / Post: 1994-2002)		*Short-Run* (Pre: 1992-1993 / Post: 1994-2002)		*Long-Run* (Pre: 1992-1993 / Post: 1994-2010)	
Independent Variable: Ln of Real Hourly Wages	**Model 1 - Int** Micro+SME	**Model 1 -Int** Large Enterprises	**Model 2-Int** Micro+SME	**Model 2-Int** Large Enterprises	**Model 3-Int** Micro+SME	**Model 3-Int** Large Enterprises
LnSCI 1 X Ports	0.0000	0.0002***	0.0001	0.0001	0.0002***	0.0001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 2 X Ports	-0.0000***	0.0000	0.0000	0.0000	0.0000	0.0000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 3 X Ports	0.0001***	0.0000***	0.0000	0.0000	0.0001***	0.0001*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 4 X Ports	-0.0000***	0.0000	-0.0001***	-0.0001*	-0.0000***	-0.0001**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 5 X Ports	0.0000*	0.0000	0.0000	0.0001	-0.0001*	0.0000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 6 X Ports	0.0000	-0.0001***	-0.0001***	0.0000	-0.0001***	-0.0001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 1 X Large Markets X POST	-0.0001**	-0.0001***	-0.0002*	-0.0002	-0.0002***	-0.0002
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 2 X Large Markets X POST	0.0000	0.0001***	0.0000	0.0000	0.0000	0.0000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 3 X Large Markets X POST	0.0000	0.0000	-0.0001**	0.0000	-0.0000*	0.0000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 4 X Large Markets X POST	-0.0000**	-0.0000***	0.0000	0.0000	0.0000***	0.0000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 5 X Large Markets X POST	0.0000	0.0000	0.0000	0.0002	0.0000	0.0001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 6 X Large Markets X POST	0.0000	0.0000	0.0002***	0.0000	0.0001***	0.0000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 1 X Border X POST	0.0000	0.0001***	0.0001	0.0000	0.0000	0.0001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 2 X Border X POST	0.0000	0.0000	-0.0001***	0.0000	-0.0001	0.0001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 3 X Border X POST	0.0000	0.0001***	0.0000	0.0000	0.0001***	0.0001*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 4 X Border X POST	0.0000	0.0000	0.0000	-0.0001*	0.0000	0.0000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 5 X Border X POST	0.0000	-0.0001***	-0.0002***	0.0001	-0.0002***	-0.0001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 6 X Border X POST	0.0000	0.0000	0.0003***	-0.0001	0.0001**	-0.0001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 1 X Ports X POST	-0.0001**	0.0000	-0.0001	0.0000	-0.0002**	-0.0001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 2 X Ports X POST	0.0000	-0.0000**	0.0000	-0.0001	0.0000	-0.0001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 3 X Ports X POST	-0.0000*	0.0000	0.0000	0.0001	-0.0000**	0.0000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 4 X Ports X POST	0.0000	0.0000	0.0000*	0.0001**	0.0000**	0.0001**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 5 X Ports X POST	0.0000	0.0000	0.0000	-0.0001	0.0000	0.0000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 6 X Ports X POST	0.0001***	0.0001***	0.0001***	0.0000	0.0001***	0.0001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	3.1691***	2.4700***	4.0401***	2.4122***	3.7445***	1.9033***
	(0.346)	(0.303)	(0.485)	(0.521)	(0.319)	(0.372)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Metropolitan Areas	36	36	28	28	28	28
Adjusted R-squared	0.465	0.509	0.471	0.497	0.445	0.487
F-statistic	725.38	358.703	1222.629	375.896	1375.535	347.904
Observations	4,273,460	7,825,192	4,013,088	6,392,471	7,153,129	9,769,379
Space-Time Clusters	277	277	216	216	364	364

Table F.2: Analytic Model Results for Female Workers by Firm Size

	Short-Run Analytic Sample		Short/Long-Run Analytic Sample			
	Short-Run		*Short-Run*		*Long-Run*	
Independent Variable:	**Model 1 - Int**	**Model 1 -Int**	**Model 2-Int**	**Model 2-Int**	**Model 3-Int**	**Model 3-Int**
Ln of Real Hourly Wages	Micro+SME	Large Enterprises	Micro+SME	Large Enterprises	Micro+SME	Large Enterprises
Individual Characteristics						
High School Degree	0.2254***	0.2195***	0.2319***	0.2467***	0.1853***	0.1978***
	(0.038)	(0.039)	(0.040)	(0.048)	(0.025)	(0.027)
Some College or Technical Education	0.1964***	0.2532***	0.1953***	0.2651***	0.2147***	0.2798***
	(0.059)	(0.028)	(0.062)	(0.035)	(0.043)	(0.027)
Technical or Vocational Education	0.1732***	0.2214***	0.1742***	0.2295***	0.1861***	0.2248***
	(0.020)	(0.019)	(0.021)	(0.022)	(0.020)	(0.020)
College Degree	0.7656***	0.9669***	0.7711***	0.9948***	0.7353***	0.9813***
	(0.038)	(0.044)	(0.040)	(0.052)	(0.030)	(0.037)
Potential Experience	0.0119***	0.0127***	0.0121***	0.0132***	0.0127***	0.0132***
	(0.003)	(0.002)	(0.003)	(0.003)	(0.002)	(0.002)
Potential Experience Squared	-0.0002***	-0.0002***	-0.0002***	-0.0002***	-0.0002***	-0.0003***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Marital Status (Married or In Civil Union)	0.0685***	0.0581***	0.0708***	0.0678***	0.0505***	0.0618***
	(0.018)	(0.008)	(0.019)	(0.010)	(0.014)	(0.009)
Head of Household	0.0565***	0.0842***	0.0550***	0.0923***	0.0352**	0.0586***
	(0.016)	(0.016)	(0.017)	(0.022)	(0.014)	(0.016)
Migration Status (Recent Inmigrant)	0.0407	-0.1160***	0.0922	-0.1154*	0.17	-0.0323
	(0.159)	(0.037)	(0.174)	(0.064)	(0.126)	(0.039)
Occupation: Professional/Technical	0.4374***	0.3963***	0.4331***	0.3934***	0.4273***	0.3517***
	(0.026)	(0.033)	(0.027)	(0.039)	(0.025)	(0.028)
Occupation: Service/Sales	0.0006	-0.0155	-0.0032	-0.0133	0.0613**	-0.0055
	(0.022)	(0.022)	(0.023)	(0.024)	(0.024)	(0.023)
Occupation: Managerial/Administrative	0.3586***	0.3489***	0.3604***	0.3684***	0.3316***	0.3302***
	(0.017)	(0.015)	(0.018)	(0.019)	(0.014)	(0.015)
Firm-of-Employment Characteristics						
Industry: Food & Beverages Mfg	-0.1007***	0.0461**	-0.1023***	0.0518**	-0.0742***	0.0575***
	(0.020)	(0.023)	(0.021)	(0.025)	(0.016)	(0.022)
Industry: Electronics & Communication Mfg	0.0001	0.0565***	-0.0037	0.0567***	-0.0167	0.0331*
	(0.024)	(0.017)	(0.025)	(0.020)	(0.018)	(0.017)
Industry: Transportation Mfg	0.0232	0.0717***	0.0183	0.0669***	0.0057	0.0725***
	(0.022)	(0.018)	(0.022)	(0.022)	(0.025)	(0.018)
Industry: Machinery & Metallic Products Mfg	0.0309	0.0519**	0.0287	0.0511*	-0.0049	0.0446**
	(0.027)	(0.023)	(0.028)	(0.026)	(0.023)	(0.021)
Industry: Chemicals & Minerals Mfg	0.0032	0.1055***	-0.0003	0.1069***	-0.0179	0.0724***
	(0.020)	(0.024)	(0.020)	(0.027)	(0.016)	(0.022)
% of College-Educated (Industry/Gender)	-0.0348	0.1669**	-0.019	0.1587*	0.1124	0.1673**
	(0.081)	(0.081)	(0.092)	(0.091)	(0.075)	(0.066)

Continued

Table F.2 (Continued): Analytic Model Results for Female Workers by Firm Size

	Short-Run Analytic Sample		Short/Long-Run Analytic Sample			
	Short-Run (Pre: 1992-1993 / Post: 1994-2002)		*Short-Run* (Pre: 1992-1993 / Post: 1994-2002)		*Long-Run* (Pre: 1992-1993 / Post: 1994-2010)	
Independent Variable: Ln of Real Hourly Wages	**Model 1 - Int** Micro+SME	**Model 1 -Int** Large Enterprises	**Model 2-Int** Micro+SME	**Model 2-Int** Large Enterprises	**Model 3-Int** Micro+SME	**Model 3-Int** Large Enterprises
Urban -Area Characteristics						
Unemployment Rate (Gender)	-0.008	0.3897	0.4721	0.3213	-0.7527***	0.0294
	(0.332)	(0.268)	(0.362)	(0.313)	(0.275)	(0.271)
Average Years of Education	0.0076	0.0504***	0.0114	-0.0043	-0.0092	0.0202
	(0.024)	(0.018)	(0.025)	(0.022)	(0.021)	(0.021)
% of Manufacturing Employment in 1970	1.1200***	0.8578***	1.6271***	1.7910***	1.0833***	1.6940***
	(0.264)	(0.267)	(0.372)	(0.399)	(0.253)	(0.353)
Pairwise Coagglomeration Index 1/2	16.8205***	0.5977	21.9360***	-1.7379	11.8781**	-5.7159
	(5.699)	(5.790)	(7.878)	(8.802)	(5.031)	(6.616)
Pairwise Coagglomeration Index 1/3	-3.3715	6.4945	-38.1987**	-10.7421	-27.5167***	-19.8755*
	(11.257)	(8.379)	(18.406)	(15.563)	(9.094)	(11.076)
Pairwise Coagglomeration Index 1/4	1.6334	5.4182	9.6583	-3.9786	14.1903**	9.3556
	(5.968)	(5.452)	(7.550)	(7.781)	(5.833)	(6.451)
Pairwise Coagglomeration Index 1/5	-13.1594	-14.3994*	13.1478	-16.5134	0.8776	-8.8729
	(10.784)	(8.508)	(14.735)	(14.497)	(8.759)	(10.609)
Pairwise Coagglomeration Index 1/6	0.0053	19.5527***	-11.5007	51.2924***	-12.7330*	20.8547**
	(8.271)	(6.879)	(11.810)	(11.851)	(7.617)	(8.932)
Pairwise Coagglomeration Index 2/3	-3.6177	-4.4294	6.1468	-4.1876	2.4693	2.92
	(4.240)	(3.917)	(8.544)	(7.150)	(6.022)	(6.042)
Pairwise Coagglomeration Index 2/4	-4.5014	-4.4417	-7.2953*	-2.1979	-1.345	-2.7588
	(3.563)	(3.029)	(3.826)	(4.281)	(2.921)	(3.321)
Pairwise Coagglomeration Index 2/5	-5.0761	-9.4304**	-12.1182	13.5027	-8.4753	14.3998*
	(5.182)	(3.981)	(9.138)	(11.594)	(5.176)	(8.513)
Pairwise Coagglomeration Index 2/6	-6.5212	5.8085	-9.8819*	-6.197	2.0266	2.484
	(4.415)	(6.111)	(5.715)	(7.526)	(3.601)	(5.455)
Pairwise Coagglomeration Index 3/4	7.2298***	9.5134***	21.1684***	15.8365***	4.798	4.4976
	(2.220)	(1.541)	(5.605)	(4.564)	(3.582)	(4.287)
Pairwise Coagglomeration Index 3/5	10.9384	5.2621	11.3134	11.6388	12.7683**	6.6834
	(8.429)	(5.112)	(12.236)	(10.221)	(6.196)	(5.945)
Pairwise Coagglomeration Index 3/6	-2.7134	-2.3949	7.4165	-16.4137	15.3818*	8.4739
	(10.009)	(6.773)	(14.582)	(13.565)	(8.157)	(7.293)
Pairwise Coagglomeration Index 4/5	-8.2521*	5.0732	-27.2563***	3.8812	-10.9878**	-4.9231
	(4.922)	(3.708)	(8.306)	(6.000)	(4.773)	(3.854)
Pairwise Coagglomeration Index 4/6	8.512	-4.658	8.073	6.19	5.9055	-2.2867
	(7.117)	(5.825)	(8.473)	(8.924)	(5.120)	(4.675)
Pairwise Coagglomeration Index 5/6	3.7833	-16.2744*	9.2941	-40.1169***	-9.8837	-23.5167**
	(10.924)	(9.620)	(17.026)	(14.775)	(9.001)	(10.546)
Ln of Population	0.0265	-0.0506**	0.0297	0.0897**	0.0222	-0.0049
	(0.025)	(0.023)	(0.038)	(0.036)	(0.021)	(0.025)
Key Analytic Variables						
Distance to Large Markets	-0.0001	-0.0001*	0.0001	0.0014***	0.0001	0.0004
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Dist. to US-Mexico Border Crossing	-0.0002**	0.0000	0.0002	0.0011***	0.0002	0.0008**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Diff. in Dist. to Gulf and Pacific Ports	0.0004***	0.0002*	0.0003	0.0007**	0.0001	0.0005*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Large Markets X POST	0.0002**	0.0002***	0.0000	-0.0013***	-0.0001	-0.0004
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Border X POST	0.0000	-0.0001	-0.0006***	-0.0011***	-0.0005*	-0.0009***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Ports X POST	-0.0002***	-0.0002*	-0.0002	-0.0005*	-0.0001	-0.0005
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

Continued

Table F.2 (Continued): Analytic Model Results for Female Workers by Firm Size

	Short-Run Analytic Sample		Short/Long-Run Analytic Sample			
	Short-Run (Pre: 1992-1993 / Post: 1994-2002)		*Short-Run* (Pre: 1992-1993 / Post: 1994-2002)		*Long-Run* (Pre: 1992-1993 / Post: 1994-2010)	
Independent Variable: Ln of Real Hourly Wages	**Model 1 - Int** Micro+SME	**Model 1 -Int** Large Enterprises	**Model 2-Int** Micro+SME	**Model 2-Int** Large Enterprises	**Model 3-Int** Micro+SME	**Model 3-Int** Large Enterprises
Ln Spatial Concentration Index (LnSCI) 1	0.0334	0.1439***	0.0748	0.4568*	0.0546	0.2711
	(0.044)	(0.041)	(0.117)	(0.232)	(0.146)	(0.232)
LnSCI 2	-0.0445**	-0.0688**	-0.0628	-0.035	-0.0324	-0.0766
	(0.022)	(0.027)	(0.038)	(0.071)	(0.044)	(0.067)
LnSCI 3	0.0504***	0.0459**	-0.0147	-0.2587***	0.0082	-0.0682
	(0.019)	(0.019)	(0.053)	(0.093)	(0.054)	(0.113)
LnSCI 4	0.0197	-0.0561***	0.0303	0.018	0.0383	0.0846
	(0.021)	(0.019)	(0.059)	(0.093)	(0.078)	(0.072)
LnSCI 5	-0.0346	0.0746**	0.0913	0.3795**	0.0336	0.0049
	(0.038)	(0.033)	(0.125)	(0.182)	(0.179)	(0.161)
LnSCI 6	-0.0105	-0.1096***	-0.0472	-0.2113	-0.0752	0.0021
	(0.043)	(0.035)	(0.099)	(0.179)	(0.148)	(0.156)
LnSCI 1 X POST	0.0119	-0.0685	-0.1831	-0.4985**	-0.1128	-0.3753
	(0.052)	(0.047)	(0.116)	(0.227)	(0.144)	(0.230)
LnSCI 2 X POST	0.01	0.0556*	0.0611	0.0256	0.039	0.1059
	(0.024)	(0.031)	(0.038)	(0.072)	(0.047)	(0.069)
LnSCI 3 X POST	-0.0310*	-0.024	0.0127	0.2448**	0.0035	0.0604
	(0.019)	(0.020)	(0.051)	(0.094)	(0.054)	(0.113)
LnSCI 4 X POST	-0.0094	0.0559***	-0.0497	-0.0171	-0.0357	-0.0776
	(0.022)	(0.019)	(0.058)	(0.092)	(0.078)	(0.072)
LnSCI 5 X POST	0.012	-0.0778**	-0.0443	-0.3234*	-0.0331	0.0182
	(0.042)	(0.036)	(0.129)	(0.184)	(0.180)	(0.161)
LnSCI 6 X POST	0.014	0.0815**	0.0424	0.1374	0.0734	-0.025
	(0.046)	(0.036)	(0.103)	(0.180)	(0.148)	(0.156)
LnSCI 1 X Large Markets	0.0002*	0.0001	0.0001	-0.0004	0.0000	-0.0001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 2 X Large Markets	-0.0001	0.0000	-0.0001	0.0004***	0.0000	0.0000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 3 X Large Markets	0.0000	0.0000*	0.0001	0.0001	0.0000	0.0001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 4 X Large Markets	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 5 X Large Markets	0.0001	-0.0001***	0.0001	-0.0002	0.0000	0.0001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 6 X Large Markets	0.0001	0.0000	0.0000	0.0000	0.0000	-0.0001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 1 X Border	-0.0001**	-0.0002***	-0.0001	-0.0005**	-0.0001	-0.0004*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 2 X Border	0.0000	0.0001*	0.0001	-0.0001	0.0000	0.0000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 3 X Border	-0.0001***	-0.0001***	0.0000	0.0002***	0.0000	0.0000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 4 X Border	0.0000	0.0001***	0.0000	0.0000	0.0000	-0.0001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 5 X Border	0.0000	0.0001	-0.0001	-0.0002	0.0000	0.0001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 6 X Border	0.0000	0.0000	0.0001	0.0002	0.0001	0.0000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)

Continued

Table F.2 (Continued): Analytic Model Results for Female Workers by Firm Size

	Short-Run Analytic Sample		Short/Long-Run Analytic Sample			
	Short-Run (Pre: 1992-1993 / Post: 1994-2002)		*Short-Run* (Pre: 1992-1993 / Post: 1994-2002)		*Long-Run* (Pre: 1992-1993 / Post: 1994-2010)	
Independent Variable: Ln of Real Hourly Wages	**Model 1 - Int** Micro+SME	**Model 1 -Int** Large Enterprises	**Model 2-Int** Micro+SME	**Model 2-Int** Large Enterprises	**Model 3-Int** Micro+SME	**Model 3-Int** Large Enterprises
LnSCI 1 X Ports	0.0001	0.0000	0.0002*	-0.0004**	0.0002	-0.0001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 2 X Ports	0.0000	0.0001**	0.0000	0.0001***	0.0001	0.0001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 3 X Ports	0.0000**	0.0000	0.0000	0.0001	0.0000	0.0001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 4 X Ports	0.0000	-0.0001***	0.0000	-0.0002***	0.0000	-0.0002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 5 X Ports	0.0000	0.0001***	0.0000	0.0003**	-0.0001	0.0001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 6 X Ports	0.0000	-0.0001***	-0.0001**	-0.0001**	-0.0001***	-0.0002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 1 X Large Markets X POST	-0.0002*	-0.0001*	0.0000	0.0004**	0.0001	0.0002
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 2 X Large Markets X POST	0.0001**	0.0000	0.0001	-0.0003**	0.0000	0.0000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 3 X Large Markets X POST	0.0000	-0.0000**	-0.0001**	-0.0001	0.0000	-0.0001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 4 X Large Markets X POST	-0.0001***	0.0000	-0.0001***	0.0000	0.0000	0.0000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 5 X Large Markets X POST	-0.0001	0.0001***	0.0000	0.0002	0.0000	-0.0001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 6 X Large Markets X POST	0.0000	0.0000	0.0000	0.0000	0.0000	0.0001*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 1 X Border X POST	0.0000	0.0001***	0.0002*	0.0005**	0.0001	0.0004**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 2 X Border X POST	0.0000	0.0000	-0.0001	0.0001	-0.0001	-0.0001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 3 X Border X POST	0.0001**	0.0001***	0.0001*	-0.0001**	0.0000	0.0000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 4 X Border X POST	0.0000	-0.0001***	0.0001	0.0000	0.0000	0.0001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 5 X Border X POST	0.0000	0.0000	0.0000	0.0001	0.0000	-0.0002
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 6 X Border X POST	0.0000	-0.0001	0.0000	-0.0002	-0.0001	0.0001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 1 X Ports X POST	0.0000	0.0001	0.0000	0.0004**	-0.0001	0.0001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 2 X Ports X POST	0.0000	-0.0001***	-0.0001**	-0.0002***	-0.0001**	-0.0001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 3 X Ports X POST	0.0000	0.0000	0.0000	0.0000	0.0000	-0.0001**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 4 X Ports X POST	0.0000	0.0001***	0.0000	0.0002***	0.0000	0.0002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 5 X Ports X POST	0.0000	-0.0001**	0.0000	-0.0003**	0.0001	-0.0001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LnSCI 6 X Ports X POST	0.0001*	0.0000*	0.0002***	0.0001**	0.0002***	0.0002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Constant	2.0342***	2.5831***	2.0152***	1.0978**	2.4625***	2.1679***
	(0.416)	(0.332)	(0.556)	(0.500)	(0.354)	(0.394)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Metropolitan Areas	36	36	28	28	28	28
Adjusted R-squared	0.448	0.544	0.447	0.543	0.452	0.532
F-statistic	486.158	301.432	3630.324	2705.988	686.898	425.383
Observations	2,018,266	3,387,782	1,927,187	2,466,674	3,562,218	4,057,022
Space-Time Clusters	277	277	216	216	364	364

APPENDIX G

Did trade reform contribute to a geographic redistribution of manufacturing activity in Mexico?

The literature acknowledges that the relationship between the geographical redistribution of manufacturing activity in Mexico and trade reform is non-spurious. The relocation patterns of the manufacturing industry in Mexico following trade reform are explained in fact by two factors: the costs associated with the excessive agglomeration of industry in Mexico City, and as a consequence of trade openness. Various authors have documented variations in the localization patterns of the manufacturing industry following trade reform. Whether using Gini coefficients or location quotients on output and employment measures, a relative spatial deconcentration and decentralization of manufacturing production from the industrial core (i.e., Mexico City) to secondary cities and the periphery were observed, particularly after the opening of the economy. Through multiple frameworks of analysis, the econometric evidence directly links the spatial distribution of the manufacturing industry to the trade liberalization process (Castro Lugo and Félix Verduzco 2010, Pérez Cruz and Vela Peón 2008, Mendoza Cota and Pérez Cruz 2007, Dávila Flores 2004, Mendoza Cota 2003, Hanson 1998b).[86]

From a linear model of state employment growth by industry for two periods, before (1980-1985) and after trade reform (1985-93), Hanson (1998b) estimates that employment growth (a proxy for industry relocation) is higher in states that are relatively close to foreign markets (in this case the U.S. market), but that this outcome is only significant after trade reform. Before that, and as expected, access to foreign markets

[86] All of the empirical studies presented here, except two, use industry-level data on the manufacturing sector, either by state or region, from a combined database of the Mexican Industrial Census and Economic Census (Pérez Cruz and Vela Peón 2008, Mendoza Cota and Pérez Cruz 2007, Dávila Flores 2004, and Hanson 1998b). Castro Lugo and Félix Verduzco (2010), and Mendoza Cota (2003), on the other hand, use industry-level data by city from the National Survey of Urban Employment (ENEU by its acronym in Spanish) and the Industrial Census, respectively. The period of analysis is often divided in the years before and after trade liberalization, with either 1985 or 1993 taken as year-proxies for the implementation of trade reform.

(which is measured by road distance from the state capital to the nearest major U.S. border crossing and is a proxy of transportation costs) did not influence firms' decision to relocate, which implies that at least some of the industries that relocated closer to the U.S. after trade reform may have done so specifically as a result of the lower barriers for trade, and not as a result of, for example, federal, state, or local government incentives to relocate. Results from Mendoza Cota and Pérez Cruz (2007)—using a different regionalization scheme and an instrumental variables approach—and Castro Lugo and Félix Verduzco (2010)—using a linear model at the city level and the 1992-1993 period as the period before trade reform—are consistent with Hanson's (1998b). Mendoza Cota and Pérez Cruz (2007), in addition, finds that diseconomies of scale (the negative costs generated from the excessive concentration of industry in Mexico City) played also an important role in the industrial relocation to alternate areas of the country after trade reform.

Additionally, Hanson (1998b), Pérez Cruz and Vela Peón (2008), Mendoza Cota (2003), and Castro Lugo and Félix Verduzco (2010) test the hypothesis that trade reform contributed to shape Mexico's economic space by using alternatively the concepts from the urban economic theory of agglomeration economies. Specifically, the authors posit the aforesaid hypothesis that if the relocation of industries is indeed correlated to trade openness, then one should observe after trade reform indications of a higher magnitude of agglomeration economies in the new industrial centers that otherwise were not present before the policy change. Through different levels of analysis and different measures of industrial agglomeration, all of the authors find some evidence to support the presence of developing agglomeration economies after trade reform.[87] Hanson (1998b), for instance, finds evidence that trade reform led to a spatial decentralization of employment and a

[87] Pérez Cruz and Vela Peón (2008) measure industrial concentration by using Gini coefficients. Hanson (1998b)—for a state-level analysis—and Mendoza Cota (2003)—for a city-level analysis—both measure within-industry agglomeration economies by the use of an employment location quotient, which equals to the share of state employment in the industry relative to the share of national employment in the industry. Hanson (1998b) further measures diversity as the sum of squared state employment shares for all other industries in the state relative to the sum of squared national employment shares for all other industries in the nation. Castro Lugo and Félix Verduzco (2010) measures a city's specialization using a Balassa index of revealed comparative advantage and the city's diversity using a Herfindal index.

reduction of regional specialization, as multiple manufacturing activities expanded into the new industrial centers. Contrary to Hanson (1998b), Castro Lugo and Félix Verduzco (2010) does find evidence of both localization and urbanization economies, particularly after trade reform. From the period of analysis before trade reform (1992-1993) to the period after (2002-2003), the strength of the estimated coefficients increased. It is noteworthy that evidence of localization economies is only found when the unit of analysis is the city instead of the state. This is consistent with theory in that localization economies decrease with distance.

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