The Dissertation Committee for Kaveh Majlesi
certifies that this is the approved version of the following dissertation:

THREE ESSAYS ON TRADE AND INVESTMENT IN CHILDREN IN DEVELOPING COUNTRIES

Committee:

Sandra E. Black, Supervisor

Jason Abrevaya

Leigh Linden

Stephen J. Trejo

Shannon Cavanagh

THREE ESSAYS ON TRADE AND INVESTMENT IN CHILDREN IN DEVELOPING COUNTRIES

by

Kaveh Majlesi, B.S.; MBA; MPA/ID; M.S.Econ.

DISSERTATION

Presented to the Faculty of the Graduate School of

The University of Texas at Austin

in Partial Fulfillment

of the Requirements

for the Degree of

DOCTOR OF PHILOSOPHY

THE UNIVERSITY OF TEXAS AT AUSTIN

May 2012

To the love of my life Setareh whose presence makes everything possible

Acknowledgments

I am very grateful to my advisor Sandra Black for guidance and encouragement. I am also thankful to Jason Abrevaya, Leigh Linden, Stephen Trejo, and Shannon Cavanagh for their comments and suggestions.

THREE ESSAYS ON TRADE AND INVESTMENT IN CHILDREN IN DEVELOPING COUNTRIES

Kaveh Majlesi, Ph.D.
The University of Texas at Austin, 2012

Supervisor: Sandra E. Black

This dissertation contains three chapters on international trade and investment in children's human capital in developing countries.

The first chapter examines the effects of changes in labor market opportunities for women on the bargaining power of women within households and, ultimately, on investment in children's human capital. I show that a positive demand shock for female labor in a woman's age category increases her bargaining power, and this raises investment in the health of girls relative to that of boys within the household. To identify this effect, I exploit the geographic heterogeneity in demand for younger versus older female labor within the Mexican export manufacturing sector and its differential changes across municipalities between 2002 and 2005. I find that a 1 percent increase in labor demand for older (mostly married) women, caused by a demand shock to the export manufacturing sector, raises the share of decisions made by the wife in a household by 1.3 percent and the chance of a daughter being in good health by 1.1 percent.

Previous research has shown that school enrollment in developing countries responds to a change in the return to education generated by a change in demand in the export sector, that pays higher wages for a given skill level. In the second chapter of my dissertation, using data from Mexico, I show that the negative effects of a lower return to education are not limited to lower rates of school enrollment. Parents also respond to a decrease in the return to education for children, as a result of an increase in labor market opportunities for very young, unskilled labor in the export sector, by reducing spending on children's education even while they are enrolled at school. This suggests that parents respond along the intensive margin as well as on the extensive margin.

Firm level studies offer mixed results on the effect of ex-ante liquidity constraints on firms' export status. The third chapter of my dissertation explores the same matter using a new methodology. I predict that, controlling for the firms' productivity level and given that firms were not exporters in the previous period, a larger appreciation of the real exchange rate should have a larger positive effect on the probability of less-liquidity-constrained firms becoming exporters. I test this prediction using a panel of Mexican manufacturing firms and find robust evidence in its support.

Table of Contents

List of Tables

List of Figures

Chapter 1

Labor Market Opportunities and Sex-Specific Investment in Children's Human Capital: Evidence from Mexico

1.1 Introduction

Household investment in children's human capital is of central importance to policy makers in developing countries; governments across the globe have designed and implemented policies to encourage parents to invest more in the health and education of their children.[1] However, there is little hope for designing the most effective policies without an understanding of what underlies the decisions made by parents.

There is a large literature on how parental characteristics and household environment affect investment in children's human capital in developing countries.[2] However, there is much less known about the role of the state

[1] Numerous conditional cash transfer programs across countries (e.g., PROGRESA in Mexico, Bolsa Familia in Brazil, and Familias in Colombia) are some examples.

[2] A number of studies have focused on the relationship between parents' education and children's health or education (Behrman and Wolfe 1987; Thomas, Strauss, and Henriques 1991; Desai and Alva 1998), while other papers have looked into the role of parents' financial resources (Duflo 2000; De Carvalho Filho 2010). Household composition, including sibling composition and birth order, has also been studied as a determinant of investment in children (Parish and Willis 1993; Morduch 2000; Sawada and Lokshin 2009; Vogl 2011).

of the labor market on parental investment decisions.[3] Using the geographic heterogeneity in labor demand for different genders and cohorts within the export manufacturing sector in Mexico and its differential changes across municipalities between 2002-2005, this chapter identifies a mechanism through which changes in labor market opportunities could induce differential changes in parental investment in the health of boys and girls: changing women's bargaining power within households.

A theory of household bargaining predicts that an increase in women's bargaining power within households shifts household spending towards items that women value more. These items could be individual private goods or household public and collective goods, such as food, health services, and children.[4] Existing evidence suggests that women value family's health more than men do and that, across developing countries, mothers value daughters relatively more than fathers do.[5] As a result, increased bargaining power for women could lead to greater investment in girls' health relative to boys'.

I argue that an increase in demand for older women, who are mostly married, generated by an increase in labor market opportunities for them, raises women's bargaining power within households, and expenditure share of

[3] An exception is the relationship between higher return to investment on girls, as labor market opportunities for women expand, and survival rate of girls that has been mostly studied in the context of India and China (Rosenzweig and Shultz 1982; Agnihotri, Palmer-Jones and Parikh 2002; Qian 2008).

[4] As first suggested by Weiss and Willis (1985), we can think of children as collective consumption goods from the parents' point of view.

[5] Thomas(1990), Strauss and Thomas (1995), and Behrman (1997) provide surveys.

health services and investment in girls' health go up as a result. Investment in boys' health does not change significantly with changes in mothers' bargaining power.[6]

There are a number of challenges to identifying changes in mothers' bargaining power, as labor market opportunities for them expand and the link to investment in girls' health. One of the contributions of this chapter is to show directly that an increase in demand for older female labor, and therefore mothers' employability and wage rate, is a determinant of women's bargaining power within households. To do this, first, following Bartik (1991), Blanchard and Katz (1992), Bound and Holzer (2000), and Autor and Duggan (2003), and using data from the Social Security Institute of Mexico (IMSS), I construct demand indices that capture exogenous shifts in local labor demand for different gender-age categories: women in the age category of 15-24 years (who are mostly single), women who are 25 years of age or older (who are mostly married), and men. The demand index for each gender-age-municipality cell is constructed based on the nationwide changes in employment of that gender-age category in different industries, weighted by the local labor market-specific shares of employment in each industry. I am able to identify differential demand shocks for younger versus older women since, as I will show later in this

[6]Atkin (2009) looks at the provision of manufacturing jobs in Mexico and finds that relative to all other women, including those who never work, child height improves for women who end up working in manufacturing due to the new factory openings. That paper does not address the question of whether shifting the bargaining power between parents has had any effect on children's height. Also, given that about 70 percent of women did not work during the period of study, Atkin (2009) does not offer any insight into the potential effect of the new manufacturing jobs on investment in children in the majority of households.

chapter, the labor market for women in the Mexican manufacturing sector is segregated for older and younger women.

Next, using two panel waves of the Mexican Family Life Survey, I identify the effect of an increase in demand for younger versus older female labor on women's bargaining power, as proxied by the share of decisions made by wife in the household as well as the expenditure share of goods which are assumed to be favored more/(less) by women. The share of decisions made by each spouse is constructed using the data on who makes different decisions within the household in 12 different categories. The results show that it is demand for older women in the labor market that affects women's bargaining power within households; there is no effect of demand for younger women. The magnitudes I find suggest that a 10 percent growth in demand for older women in the export sector translates into a 13 percent increase in the share of decisions made by the wife in the household. Importantly, the effect is not limited to working women, confirming the idea that married women's bargaining power is a function of their wage rate and employability in the market and not their earnings while married.

This chapter also shows that an increase in demand for older female labor, thus women's bargaining power within households, results in more investment in girls' health without any significant effect on boy's health. One challenge with attempting to isolate the effect of mothers' bargaining power, as generated by increased labor demand for older women, on investment in daughters is that the increase in labor demand for older women may influence

investment in girls through another avenue as well. Families may invest more in girls because the returns to that investment, in terms of longer-run labor market success, have increased. I address this by looking separately at the changes in demand for younger women and older women. I show that while the latter changes mothers' bargaining power within households, the former does not. If households invested in daughters' health as the result of better employment prospect for them, one would expect a positive demand shock for younger women to result in a positive and significant effect on investment in girls' health as well; this does not play out in the data. Instead, it is an increase in demand for older women that has a positive and significant effect on investment in girls' health. I find that a 1 percent increase in labor demand for older (mostly married) women, caused by a demand shock to the export manufacturing sector, increases the chance of a daughter being characterized as "in good health" by 1.1 percent, and a daughter completing the vaccination course by 1.4 percent.

As it is not obvious how to best measure labor market demand shocks, I test the robustness of my results to the use of another methodology. Increases in Chinese exports to the U.S. following China's entry into the WTO in 2001 had a differential effect across industries in Mexican export manufacturing sector. I use this differential effect to estimate a change in demand for different gender-age cells in each municipality. I then estimate the effect of changes in demand for labor, brought about by China joining the WTO, on measures of women's bargaining power and children's health. These findings are consistent

with the earlier results.

The Mexican export manufacturing sector provides an ideal setting to empirically identify the household bargaining mechanism. In Mexico, like many other developing countries, the export manufacturing sector is a major source of employment for women, and shocks to this sector generate large variations in demand for women in the labor market.[7] [8]

By focusing on the export sector, this chapter contributes to the very recent literature on how the provision of export jobs changes the incentives to invest in human capital.[9] In recent decades many developing countries have relied on exports for growth and, since human capital is considered a major determinant of long run growth, it is important to understand how investment in human capital responds to the growth in exports.

Finally, this chapter also contributes to our understanding of the gender gap in human capital that has been of considerable concern in developing countries.[10] Depending on whether a country's export specialization patterns are male or female-intensive, export manufacturing could have different effects on

[7]According to the World Bank (2007) estimates, in 2003, 60 percent of the total labor force in export processing zones in Mexico were female.

[8]Juhn et al, (2010) examines the changes in the women's labor market in Mexico during the 1990's and concludes that between-industry shifts, consistent with trade-based explanations, account for 40 percent of the growth in women's wage bill share between 1990 and 2000. According to that study, women benefited because some of the fastest growing industries in this period were female-intensive industries.

[9]Atkin 2010 (Mexico); Jensen 2010 (India); Oster and Millet 2010 (India); and Shastry 2010 (India) study the provision of low-skill and high-skill export jobs and changes in incentives to stay (enroll) at school.

[10]Sen and Sengupta 1983; Das Gupta 1987; Behrman et al. 1988; Baird, Friedman, Schady 2011 provide evidence.

the decisions made within households, including investment in children's human capital. More specifically, export specialization towards female-intensive industries could result in disproportional investment in girls' health, if mothers face more and better options to participate in the labor market.

The remainder of this chapter proceeds as follows. Section 1.2 provides the theoretical framework. Section 1.3 discusses the data, empirical strategy, and empirical specification. Section 1.4 shows the results, and Section 1.5 concludes.

1.2 Theoretical framework

Appendix A.2 presents a household decision model in which parents make decisions about their private expenditures as well as public consumption (such as spending on children). The model is based on collective models of the household proposed by Blundell, Chiappori, and Meghir (2005) and Bourguignon, Browning, and Chiappori (2009). These models allow for each parent to care differently about the private and public goods and cover all cooperative bargaining models that take Pareto efficiency as an axiom. Because of that, their empirical predictions are consistent with all possible consumption externalities between household members, and all types of individual preferences.

The solution to the household decision making problem implies that households will have demand functions for private and public goods as functions of total resources (i.e., expenditures), individual and household characteristics, and women's relative bargaining power within the household.

In the literature, different factors have been proposed as determinants of women's bargaining power. Examples of these include, but are not limited to, women's non-earned income and their wage rate in the labor market. There are other factors in the household's environment that may influence women's bargaining power as well. Some examples are employability (number of jobs available), sex ratios in the marriage market, parental wealth, and the legal structure.[11] Because of data availability on non-labor income (as an exogenous source of variation in women's bargaining power) in household surveys, many studies have looked at the effect of an increase in women's non-labor income on the allocation of resources, despite its small effect on total household budget.

As discussed by Pollak (2005, 2011), the well-being of a household member at the threat point, and therefore her bargaining power within the household that affects her utility in marriage, is (partially) determined by her "wage rate" and not "earnings".[12] Thinking of earnings as an indicator of bargaining power is a mistake, since the observed earnings at the cooperative equilibrium (marriage) is not necessarily a good proxy for earnings at the threat point. An example, relevant to the context of this study, is the case of wives who do not work and have no earned income. If a wife does not partic-

[11] In the wording of McElroy (1990) these are called extrahousehold environmental parameters and include every variable that affects how well each family member could do in the next best alternative outside of the family. These are variables that change the distribution of power within marriage without affecting the preferences or the budget constraint.

[12] Chiappori and Donni (2006) shows that any efficient outcome of the collective approach to modeling decision making in households can be constructed as a bargaining solution and if some distribution factors are known to be positively correlated with a member's threat point, then her power in the collective model should be increasing in that distribution factor.

ipate in the labor market when married, but she would work if that marriage dissolves, the fact that she has zero earnings at the cooperative equilibrium cannot predict her earnings if the equilibrium dissolves. In other words, the wage rate is exogenous and is a parameter of the model, while earnings are endogenous; they are equal to the product of the exogenous wage rate and the endogenous, optimal choice of, hours worked. As a result, a wife's earnings while married are not a good indicator of her bargaining power, because her hours worked could change at the threat point. However, the wage rate is an indicator of the bargaining power. For women who do work when married, the wage rate is a determinant of their bargaining power, not because their earnings at the cooperative equilibrium (marriage) go up, but because it positively affects their well being at the threat point.

In this chapter I focus on demand for older female labor, which affects both their employability and wage rate, as a determinant of married women's bargaining power. In the section on empirical analysis, I show that the labor market for women in the Mexican manufacturing sector is segregated for older (mostly married) and younger (mostly single) women in the sense that a demand shock for older (younger) women raises the wage rate and employment only for that group of women and not the other.

As demand for older women (who are mostly married) in the labor market goes up, women's well being at the threat point and, as a result, their bargaining power within the household improves. For working women, as the employability of women goes up, their chance of staying employed (with a

possibly higher wage rate) at the threat point increases and it positively affects their bargaining power. Non-working women will also have more opportunities to participate in the labor market with a higher wage rate at their threat point. This raises their bargaining power within households as well.

The theoretical model predicts that spending on a public consumption good (e.g. daughters' health) is increasing in women's (men's) bargaining power if and only if women's (men's) marginal willingness to pay for that public good is larger than that of men (women). Evidence from across developing countries suggests that mothers value daughters relatively more than fathers do, and I will show some evidence that it holds in my sample of households. In this case, an increase in labor demand for older women will increase their bargaining power within households and could lead to more investment in daughters' health.

1.3 Empirical Implementation

1.3.1 Data

This chapter combines two different datasets to examine how changes in demand for different gender-age categories within the Mexican export manufacturing sector affect households' investment in children's health. The household level data come from the Mexican Family Life Survey (MxFLS). MxFLS is a multi-thematic and longitudinal database that collects a wide range of information on socioeconomic, demographic and health indicators of the Mexican population. I use two waves of the data collected in 2002 and 2005. The

dataset is nationally representative, covers more than 100 municipalities in Mexico, and gathers information from more than 8000 households.

A unique feature of MxFLS is that it asks the household respondents who makes the decision regarding 12 different categories of decisions made in the households. Examples are the food that is eaten in the house, children's clothing, health services and medicine of children, children's education, strong expenditures, etc. A decision could be made by one of the spouses, jointly, or someone else (like children). Using these answers, I am able to construct a direct measure of decision making power for each spouse within households. The dataset also reports some of the health variables like number of vaccinations received, and overall health condition individually for each child, making it easy to separately analyze investment on girls and boys.

Table 1.1 shows some of the household characteristics in MxFLS. The data used in this study (and presented in Table 1.1) does not include the extended households. Also, children are limited to the children of the parents in the household who are 18 years old or younger.

Labor market (municipality-level) data come from the Mexican Social Security Institute (IMSS). It includes monthly employment data from all formal private-sector establishments and reports data on each employee's age, gender, and salary. It also reports the employer's id, the 2-digit, 3-digit, and 4-digit industry of activity, as well as the state and municipality of the firm.[13]

[13]The aggregations from the firm to industry-municipality level were carried out at the central office of IMSS in Mexico city where the data is held securely.

The universal coverage of this dataset originates from the fact that IMSS provides health insurance and pension coverage and all employees must enroll.

Since this chapter looks at the effects of changes in demand for different gender and age categories within the export manufacturing sector (controlling for labor demand in other sectors), I need to identify this sector in my labor market data. I define a 3-digit manufacturing sector as an export sector if more than 50 percent of output was exported in year 2000. The export and output data come from the Trade, Production and Protection 1976-2004 database (Nicita and Olarreaga 2007).[14] The characteristics of the export sector in the IMSS data (for the municipalities represented in MxFLS) are summarized in Table 1.2.

1.3.2 Empirical Strategy

My empirical strategy takes advantage of the segregated nature of the labor market for older versus younger women in the Mexican manufacturing sector. I exploit the geographic heterogeneity in demand across municipalities for younger versus older female labor within the Mexican export manufacturing sector between 2002-2005. In this section, I first explain how I measure women's bargaining power and what I expect to observe as the effect of changes in labor demand on women's bargaining power. Next, I explain how I measure investment in children's health and then, based on the predictions of the

[14]The industry categories used by IMSS and the 3-digit ISIC classification (Rev. 2) were matched by hand.

theoretical framework, I discuss the general econometric model used to do the empirical analysis. Finally, I introduce the two different methodologies I use to estimate changes in labor demand for different gender-age categories.

1.3.2.1 Change in Women's Bargaining Power

When trying to measure changes in women's bargaining power within households or estimate the effect of an increase in the bargaining power of women on household decisions using household level data, researchers usually face two sorts of challenges. The first challenge is that one doesn't observe spouses' bargaining power directly. Because of that, the literature usually examines the changes in household outcomes over which spouses might have different preferences. Examples of these outcomes are spending on men's, women's, and children's clothing (Lundberg et al. 1997; Phipps and Burton 1998; Bobonis 2009), on alcohol and tobacco (Phipps and Burton; Bobonis; Hoddinott and Haddad 1995), on food (Duflo and Udry 2004; Bobonis), and children's health and education (Schultz 1990; Thomas 1990, 1994; Haddad and Hoddinott; Duflo 2003; Duflo and Udry).

The other challenge is that the variables used as the determinants of women's bargaining power, such as the relative earned or un-earned income, could be correlated with unobserved household characteristics that directly affect household outcomes over which spouses have different preferences. Using these household outcomes as indicative of women's bargaining power would lead to biased estimates. For example, if a woman earns more because she has

a certain type of job that requires more spending on clothing, that increases spending on women's clothing without really changing the woman's bargaining power. Also, as has been argued in Lundberg et al. (1997), differences in earned or unearned income of spouses are likely to be correlated with differences in wage rates and differences in preferences that are not observable and affect the bargaining power of spouses.

In this study, I am able to address these concerns in a variety of ways. First I use panel data at the household level. This enables me to control for fixed unobserved household characteristics that could affect households' decisions. I also look at who makes the different decisions within households, that is the most direct way to observe spouses' bargaining power. The literature has not looked at this measure of bargaining power though, since household surveys rarely ask these kinds of questions.[15] MxFLS has data on whether a husband or wife (or both) makes the decision in 12 different categories. In this chapter, I make use of this data to construct a qualitative measure of both spouses' bargaining power; the share of decisions made by each partner. I use this (along with the expenditure share of different goods) to reveal whose preferences are reflected to a greater degree in household decisions and interpret an increase in this variable for each spouse as an increase in her/his bargaining power.

[15] An exception is Friedberg and Webb (2006) which looks at the data on whether a husband or wife in the Health and Retirement Study has the final say when making major decisions in a household.

Finally, I utilize the segmented nature of the labor market for older versus younger women in the Mexican manufacturing sector to construct an exogenous determinant of the bargaining power of women within households. A feature of many export industries across developing countries, including Mexico, has been the employment of female labor. However, in the Mexican manufacturing sector, there is a segregated labor market, not only for men and women, but also for younger women, who are mostly single, and older women, who are mostly married. There are sizeable and persistent differences in the share of older female labor across different industries. In some female-intensive export manufacturing industries, such as manufacturing of apparel older, female labor (25 and older) constitutes around 90 percent of the total female labor, and in others, such as manufacturing of automobile electric systems, this ratio decreases to almost 50 percent. The same pattern is observed in male-intensive export manufacturing industries such as manufacturing of electric batteries and manufacturing of cars and vessels. Across 4-digit manufacturing industries in Mexico, the average difference between the share of older labor out of total female labor between 2002-2005 is only 0.03 with the standard deviation being 0.03.

An increase in labor demand in industries with strong preferences for hiring young single women hardly affects the employability and the wage rate of older, married, women, and therefore their bargaining power. I utilize differential demand shocks to different industries to estimate changes in labor demand for younger females (15-24), composed primarily of single women,

and women 25 and older, who are primarily married.[16] Consistent with the segmented labor market hypothesis, I show that an increase in demand for older women is associated with higher wage rate and employment only for that group of women and not the younger women. Similarly, a demand shock for younger women does not affect older women's wage and employment. Everything else being fixed, I would expect a positive demand shock for older women to raise the relative bargaining power of women within households.

1.3.2.2 Investment in Children's Health

The evidence from many developing countries supports the idea that mothers are more willing to allocate resources to health services than fathers are. They are also, relative to fathers, more supportive of daughters. As a result, I would expect an increase in the relative bargaining power of the mother to increase investment in daughters' health.

[16]The age cutoff could be anything as long as it takes into account some industries' preference for hiring younger workers who are physically able to do the work (electronics) and also the fact that jobs in some industries are more suited for single women because of the nature of the jobs (long hours, night shifts, etc). Given that the aggregated IMSS data reports the employment data for 5-year age-categories (15-19, 20-24, 25-29, etc) I picked the age cutoff at 25 for the following reasons. According to the MxFLS 2002, among women 25 years and older only a small minority (10 percent) are single and among those in the age category of 15-24, the majority (75 percent) are single. Having the age cutoff at 29 is problematic since 45 percent of women younger than age of 30 are not single. This generates an identification problem (although I get similar results with less statistical significance using this cutoff). The age cutoff at 19 also does not work for two reasons. Compared to the number of workers older than the age of 19, there are very few workers younger than 19. This makes it difficult to infer from changes in demand in this age category. Also it is very unlikely that industries that look for young labor because of physical fitness (electronics) to have a preference for workers younger than age of 19.

As mentioned earlier, a threat to the validity of interpretation, that it is mother's bargaining power that drives a change in investment in girls when demand for older women goes up, is that increase in investment in girls' health happens because of an improvement in the prospect of labor market participation for girls when they grow up. In other words, parents invest more in their daughters because there is a higher return to that investment. As explained before, since different industries have different preferences for hiring younger workers, there is a segmented labor market for younger vs. older female labor in the Mexican manufacturing sector and I am able to separately measure shocks to younger vs. older female labor. If that is the case that parents respond to more labor market opportunities for their daughters in the labor market by investing more in their health, one would expect to see that households react to the changes in demand for younger women as well; this is not what I find in the data.

Along with the expenditure share of health services within households, I separately look at two measures of health investment for girls and boys. The first variable is "health condition of the child". The questionnaire in MxFLS asks about the health condition of each child and the answer could be very good, good, regular, bad, and very bad. Based on these categories, I create a binary variable that is equal to 1 if the child's health is good or very good and 0 otherwise.[17] Using this binary variable, I construct the fractions of girls

[17]The results are not sensitive to the cutoff; results are similar if 1 includes regular, good, or very good.

or boys in good health in a given household. For example, if a household has three girls and two of them are in good health and one of them is not, then $\frac{2}{3}$ of the girls are in good health in this household.

The second variable that I use to proxy for investment in children's health is whether a child older than the age of 4 has completed the vaccination course. As reported in the MxFLS, there are a total of 8 different preventive vaccinations that any child could receive before the age of 4: tuberculosis, sabin polio, diphtheria, pentavalent, triple virus, measles, hepatitis B, and TD.

1.3.2.3 Empirical Specification

As discussed in Section 1.2, households have demand functions for private and public goods as functions of the Pareto weight, aggregate household resources (total expenditure), and individual and household characteristics. For household i, the basic regression specification is:

$$\begin{aligned} q_{jimt} &= \sum_a \beta_{f,a} D^E_{fem,a,m,t} + \sum_a \beta_{m,a} D^E_{male,a,m,t} + \beta D_{m,t} + \alpha_w y^w_{i,m,t} + \alpha_h y^h_{i,m,t} \\ &+ \zeta x_{i,m,t} + \gamma_{i,m,t} + \delta_i + \epsilon_{jimt} \end{aligned} \tag{1.3.1}$$

where q_{jimt} is outcome variable j, representing the natural logarithm of the expenditure share of a household item, share of household decisions made by one of the spouses, or a proxy for investment in children's health in house-

hold i in year t.[18] $D^E_{fem,a,m,t}$ and $D^E_{male,a,m,t}$ are demand for female and male labor belonging to age-category a in municipality m in export manufacturing sector (superscript E represents the export sector) and $D_{m,t}$ is demand for labor in all other sectors of the economy in municipality m. The argument in this study is that, when a identifies older women who are mostly married, $D^E_{fem,a,m,t}$ is a determinant of women's bargaining power in the marriage.[19] $y^w_{i,m,t}$ and $y^h_{i,m,t}$ represent the wife's and husband's non-labor income, respectively, and are included in the specification since the theoretical framework considers spouses' non-labor income as a potential source of bargaining power. $x_{i,m,t}$ is total household expenditures. $\gamma_{i,m,t}$ is a set of controls for household characteristics, including the number of children by gender and age (0-5, 6-10, and 11-15 years) and each parent's age and education. δ_i represents the household fixed effect. By including household fixed effects in the reduced form regression I am able to control for the unobservable fixed household characteristics that could affect the household decisions. ϵ_{jimt} are unobservable determinants of the outcome variables.

One concern about the specification above could be that the households' earned income is excluded from the regression. If changes in labor demand for women affect the dependent variables through changes in earned income,

[18] Having natural logarithm of the outcome variables as dependent variables allows easy interpretation of the empirical model coefficient estimates. However, the empirical results are robust to the choice of the form for dependent variables.

[19] Other than being consistent across genders, there is no specific reason for dividing demand for male labor within the export sector into demand for younger versus older male. Not doing that does not change the results.

the coefficient estimates for the changes in labor demand for women would be biased. However, in my estimation, the earned income is controlled for, by using total household income as an instrument for total expenditures. Usually it is the case that in datasets that report expenditures on high-frequency basis (e.g., monthly), one would observe unusually high or low expenditures on a consumption good. For example, if a household spends money on clothing for one of the household members in a given month, the same expenditure might not happen again for the next few months. When the dependent variable is an expenditure share of a certain good, this could induce a correlation between the error term and total expenditures. To deal with this, Browning and Chiappori (1998), among others, uses total household income as an instrument for total expenditures because it is correlated with aggregate household expenditures, but conditioning on it should have no effect on the distribution of expenditures. Therefore, in this study, I exploit variation in total household income as an instrumental variable for variation in total expenditures.

Also, when I estimate the effect of changes in labor demand on women's bargaining power, I do the empirical analysis separately for the full sample of households and the households that the wife does not work (and generates no earned income as a result). One should note that, according to the theory of women's bargaining power, for women who do not work, similar to women who do work, bargaining power should go up as the value of their outside option increases. This happens when there are more opportunities for them to participate in the labor market and when their wage rate increases.

Given the panel nature of my dataset and the fact that there are two rounds of data available, the empirical specification that is actually estimated is the difference version of equation (1.3.1).

1.3.2.4 Estimating Demand

The problem with using the change in total employment as a proxy for demand shift is that the employment growth in a local labor market can be driven by shifts in local labor supply (through population growth, migration, etc.) as well as demand. As it is not obvious how to best measure labor market demand shocks, and to check the robustness of my results, I use two different methodologies to estimate changes in demand for different gender-age categories within each municipality:

Methodology I: Nationwide change in employment

The first methodology was originally developed by Bartik (1991) and was used by Blanchard and Katz (1992), Bound and Holzer (2000), and Autor and Duggan (2003), among others. It involves creating a demand index for each gender-age-municipality cell based on the nationwide changes in employment of that gender-age category in different industries, weighted by the local labor market-specific shares of employment in each industry. In other words, I exploit the fact that municipalities have different industrial composition and different gender-age groups play different roles in various export industries.

Predicted growth of labor employment within the export sector in the period 2002-2005 for gender g in age-category a residing in municipality m is given by:

$$\begin{aligned} \hat{D^E}_{g,a,m,t} &= (D^E_{g,a,m,2005} - D^E_{g,a,m,2002}) \\ &= \sum_{k=1}^{K} \gamma_{k,m} \eta^{g,a}_{-m,k} \end{aligned} \tag{1.3.2}$$

K is the number of three-digit industries within export manufacturing sector and $\gamma_{k,m}$ is the fraction of workers in municipality m in year 2002 employed in industry k $\left(\frac{e_{m,k,2002}}{e_{m,2002}}\right)$. $\eta^{g,a}_{-m,k}$ is the log change in national employment of gender g-age category a labor in industry k between 2002 and 2005. The subscript $-m$ in $\eta^{g,a}_{-m,k}$ indicates that each municipality's industry k-gender g-age category a employment is excluded in calculating the national employment change.

This index is a weighted average of the growth in employment in the export manufacturing sector for each gender-age category in each municipality, where the weights represent the different distributions of employment across industries in each municipality. This is built to capture exogenous shifts in local labor demand that are predicted by the municipality-specific industry mix, while avoiding the endogeneity associated with local employment changes. In other words, this methodology predicts what each municipality's change in employment for a gender-age category in the export manufacturing sector would be if municipality-level industrial composition was fixed in the short

term and changes in industry-level employment happened uniformly across municipalities.

In demand index (1.3.2), the second term, the log change in national employment of gender g-age category a labor in industry k, excludes employment in municipality m to avoid the endogeneity associated with local employment growth rates. This addresses the concern that the observed change in national employment is driven by the concentration of an industry in a specific municipality. Of course, if a large share of people employed in an industry live in a specific municipality, then one might think that the change in employment in other municipalities does not predict the change in demand in the industry. Looking at the share of each municipality in the employment mix of different industries reveals that, excluding Mexico City from the analysis, no municipality has a share bigger than 11 percent (followed by 8 percent) in the employment of any industry.[20]

Similarly, the predicted growth of demand for labor in all other sectors in municipality m in the period 2002-2005, is given by:

$$\begin{aligned} \hat{D}_{m,t} &= (D_{m,2005} - D_{m,2002}) \\ &= \sum_{l=1}^{L} \gamma_{l,m} \eta_{-m,l} \end{aligned} \tag{1.3.3}$$

[20]Even including Mexico City, which has the biggest share of employment in 7 industries among all municipalities, gives us a maximum of 19 percent.

L is the number of all three-digit industries of the economy outside export manufacturing sector, $\gamma_{l,m}$ is the fraction of workers in municipality m in year 2002 employed in industry l $\left(\frac{e_{m,l,2002}}{e_{m,2002}}\right)$, and $\eta_{-m,l}$ is the log change in national employment in industry l.

Methodology II: China's entry into the WTO as a source of change in labor demand

As a robustness check, I test the sensitivity of my results to an alternative measure of labor market demand shocks: the effects of increases in Chinese exports to the U.S. following China's admission to the WTO in 2001 on Mexican export industries. More than 80 percent of Mexican exports go to the United States and evidence suggests that, among Latin American countries, Mexico has the largest number of common products with China in the U.S. market, meaning that the increases in Chinese exports to the U.S. had a significant negative effect on demand for exports from Mexico (Shafaeddin 2002).[21] Increases in Chinese exports, however, had differential effects by industry.[22]

[21]In addition, Hanson and Robertson (2008) explores the impact of China's increased export capacity on Latin American countries' exports of the top manufacturing industries and finds that without the increase in Chinese supply of these products, export growth in these products could have been 3 percentage points higher in Mexico. Gallagher et al. (2008) finds that in recent years Mexico's main non-oil exports' relative share in the US market is either declining or growing slower than China's. They observe that this is a new trend and begins after China's entry into the WTO.

[22]Bloom, Draca, and Van Reenen (2011) argues that increases in Chinese exports following joining WTO have had differential effects by industry in the destination market depending on whether the industry is one in which China has a comparative advantage.

For estimation, I use the same specification as previously described but replace the measures of demand for different gender-age categories with the corresponding measures of employment:

$$\begin{aligned} q_{jimt} &= \sum_a \beta_{f,a} Emp^E_{fem,a,m,t} + \sum_a \beta_{m,a} Emp^E_{male,a,m,t} + \beta Emp_{m,t} + \alpha_w y^w_{i,m,t} \\ &+ \alpha_h y^h_{i,m,t} + \zeta x_{i,m,t} + \gamma_{i,m,t} + \delta_i + \epsilon_{jimt} \end{aligned} \tag{1.3.4}$$

where Emp represents the natural logarithm of employment. However, using the change in employment as a proxy for a demand shift is problematic, in that employment growth in a local labor market can be driven by both shifts in supply as well as demand. To deal with this problem, I use the changes in demand that result from China's entry to the WTO as an instrument for overall employment changes.

My instrument is similar in spirit to the earlier measure of demand shocks I was using, except in this case, I am using the variation induced by China's entry into the WTO. I first classify export industries as "negatively affected" by China. I, then, look at the employment composition within a municipality to determine the employment share of an industry negatively affected by increasing Chinese competition when China joined the WTO. I then weight this by the share of each gender-age cell in that industry. Municipalities with a large share of exports in affected industries will be disproportionately hurt by the China's entry to the WTO, and if older female workers constitute

a large share of employees in those industries, then this would represent a negative demand shock for older female in those municipalities.

Industries are classified as "negatively affected" by China as follows. I examine two time periods: 1995-2000 and 2000-2005. If in the second period the growth in exports from Mexico to the U.S. in a particular industry was lower than the earlier period growth while the growth in exports from China to the U.S. increased relative to their earlier period growth rate, an industry is classified as "negatively affected". I end up with 5 out of 11 export industries being classified as negatively affected by Chinese competition. These are textile, machinery, basic metals, clothing, and other manufacturing. While this is clearly a noisy measure of the industries affected by China's increased exports, it is comforting to see that the industries I find to be affected are the same industries classified as such in earlier research.[23]

Given this classification, I then construct the instrument for $\Delta Emp^{E}_{g,a,m}$:

$$D^{C}{}_{g,a,m} = \sum_{k=1}^{N} \left(\frac{e^{g,a}_{-m,k,2002}}{e_{-m,k,2002}} \right) \left(\frac{e_{m,k,2002}}{e_{m,2002}} \right) \tag{1.3.5}$$

where N is the number of three-digit industries within the export manufacturing sector that were negatively affected by China's entry into the WTO.

[23]Lopez-Cordova et al. (2008) shows that during the 2000-2003 period, Chinese exports of apparel and textiles to US grew at 7.3 percent annual rate, while Mexican exports declined 8 percent a year. In machinery and equipment, while China's exports grew by 15 percent a year, exports from Central America went down at almost 18 percent per year.

The methodology assumes that, everything else being the same across municipalities, industries that were negatively affected by Chinese competition were affected with the same magnitude that, of course, does not match the reality. What I am trying to do is to make a separation between municipalities that concentrate in industries that were negatively affected by Chinese exports to the U.S. and the ones that were not.

The idea can be illustrated using a simple example. For simplicity, assume that there is only one age category. Suppose there are two municipalities, A and B, and two industries, 1 and 2. Industry 1 is negatively affected by China's entry into the WTO and only employs female labor. Industry 2 is not negatively affected by China's entry into the WTO and employs both male and female labor. Municipality A employs all of its employees in industry 1 and municipality B employs all of its employees in industry 2. When the shock (increased Chinese competition) happens, demand for female labor in municipality A goes down. However, one does not observe any changes in employment of female (or male) labor in municipality B.[24]

The first stage is strong: in each municipality, the share of employment in industries that were negatively affected by China's entry into the WTO combined with the role of a gender-age category in those industries has a negative and significant impact on changes in employment for that gender-age category in the export manufacturing sector (F statistic 12.61).

[24]I am assuming that industries respond to lower level of production by demanding less labor force.

1.4 Results

Before presenting the results of the empirical analysis, first I provide more evidence that there is a segmented labor market for older vs. younger women in the Mexican manufacturing sector and, therefore, we should expect a positive demand shock for older female labor to increase married women's bargaining power within households. Next, separately for the two methodologies used for estimating changes in labor demand, I present the effects of changes in demand for different gender-age categories on women's bargaining power within households and investment in children's health. Finally, using just the household level data and the measures of spouses' bargaining power, I argue that, consistent with evidence from other developing countries, it is indeed the case that an increase in mothers' bargaining power within households is associated with more investment in daughters' health.

1.4.1 Segmented Labor Market for Younger vs. Older Female Labor

As discussed earlier, various industries in the Mexican manufacturing sector have different preferences over hiring younger vs. older female labor. If this is the case, women in different age categories could face differential shocks to their labor market opportunities as the result of shocks to different industries. Hence, one would expect that an increase in demand for older women to be associated with higher wage rate and employment only for that group of women and not the younger women or men. Similarly, a demand shock

for younger women should not affect older women's wage and employment. Column (1) in Table 1.3 shows the results from running a regression in which the dependent variable is the logarithm of the average wage of working women in the age-category of 25 years and older in each municipality (represented in IMSS data) that women participate in export manufacturing sector. The explanatory variables are changes in demand for different gender-age categories of labor in the export manufacturing sector, controlling for changes in demand in other sectors of the economy and the state specific time trend.

The results indicate that a 1 percent increase in demand for older women, caused by a demand shock to the export manufacturing sector, is associated with 1.1 percent increase in the average wage of older women. Changes in demand for other groups do not seem to be significantly associated with the average wage of older women. In column (2) I do the same analysis with the dependent variable being the average wage of working women in the age-category of 15-24 years old. Changes in demand for older women do not affect younger women's average wage and the effect of an increase in demand for younger women in the export sector is positive but not statistically significant. Columns (3) and (4) report the results when the dependent variable is the number of employment for the two groups. Results are consistent with the segmented labor market hypothesis.

Next I present the results of the empirical analysis separately for the two methodologies used for estimating changes in demand.

1.4.2 Demand Estimation Methodology I

1.4.2.1 Changes in Labor Demand and Women's Bargaining Power

In this section I show that an increase in demand for older female labor (who are mostly married) in the export sector raises women's bargaining power within households.

If q_{jit} in equation (1) represents a proxy for women's bargaining power or the expenditure share of a commodity that is assumed to be valued more by women, and the gender-specific demand is calculated for two age-groups (a); $15-24$ and $25-$ (25 years and older), what I expect to see as the result of estimating the effect of changes in demand for different gender-age categories is that $\beta_{f,25-}$ is positive and significant, increasing demand for older women increases the bargaining power of women within households. I also expect the estimate for the effect of other gender-age categories not to be statistically significant; controlling for demand for older women, bargaining power of women in households is not affected by a change in demand for other gender-age categories in the labor market.

Table 2.4 shows the effect of changes in labor demand for different gender-age categories on the expenditure share of five different items that have been discussed in the literature as indicative of women's bargaining power within households. To show that it is actually demand for older women that affects married women's bargaining power, for each dependant variable, the first column reports the results of specification (1) when demand for female labor is aggregated and the second column reports the results when demand

for female labor is disaggregated into demand for younger and older female labor. It is important to note that, for the analysis in this section, the sample consists of only families with both wife and husband present in the household, since I am interested in the change in the relative power of women versus men in the household.

The five consumption goods, whose expenditure share could be indicative of women's bargaining power, are women's clothing, child's clothing, tobacco and gambling, health services, and food.[25] The coefficient estimates indicate that a 1 percent increase in demand for women 25 years and older, caused by a demand shock to the export manufacturing sector, leads to a 6.2 percent increase in the expenditure share of women's clothing and a 4 percent increase in health services expenditure share. [26] It also leads to a 4 percent decrease in the expenditure share of tobacco and gambling, consistent with an increase in women's bargaining power within households.[27] When the dependent variables are child's clothing and food, the sign of coefficient estimates for changes in labor demand for older women are consistent with an increase

[25]Food includes meat, fruit, vegetable, and grains and does not include spending on meals outside household, which could complicate the interpretation of the results since if women start working, as the result of the new opportunities in the labor market, and spend less time at home, the household spending on meals could go up.

[26]Note that these are the effects of a 1 percent increase in demand in the labor market, generated solely by demand shocks to the export sector. Given that in a typical Mexican municipality export manufacturing sector employs around 20 percent of workers, the effects are equivalent to the effect of a 5 percent increase in demand within the export sector.

[27]It is usually assumed that tobacco and gambling are commodities favored more by men, and one should expect an increase in women's bargaining power to lead to a smaller expenditure share for those commodities.

in women's bargaining power, although they are not statistically significant.[28]

Table 1.12 shows the effect of changes in demand for different gender-age groups on other expenditures reported in MxFLS that are not necessarily expected to change in a specific direction with a change in the bargaining power of women.

As explained earlier, I use another variable, the share of decisions made by each spouse within the household, to observe whose preferences are reflected to a greater degree in household decisions.[29] I use this variable to reveal whose preferences are reflected to a greater degree in household decisions and interpret an increase in this variable for each spouse as an increase in her/his bargaining power.

The first two columns of Table 1.5 show that, although increase in aggregate demand for female labor has a positive effect on the share of decisions made by wives, it is an increase in demand for older women that drives the result. The magnitude of coefficient estimate on demand for older women implies that a 1 percent growth in demand for older women, caused by a demand shock to the export sector, translates into 1.3 percent increase in the share of decisions made by women, all else fixed. In column (3) the dependent variable is the share of decisions made by man in the household. The results

[28]Note that households who receive some kind of non-labor income constitute only about one eighth of my sample and I cannot get any significant estimate for parents' non-labor income.

[29]I assume a decision is made by a specific partner if it is made either solely by that partner or is made jointly.

imply that, men's bargaining power does not change by more labor market opportunities for them.

If in the analysis above demand for older women is a determinant of women's bargaining power within households, one would expect that the pattern in Table 1.4 not to be repeated, and measures of women's bargaining power not to change, if the sample of households is limited to the ones with single women who live by themselves or with their children. Table 1.6 summarizes the results for that group of households. Unlike Table 1.5, here I cannot use the share of decisions made by the wife as a measure of women's bargaining power, since there is no husband in the household and the woman takes all the decisions. The estimates show that changes in demand for women in the labor market do not affect bargaining power of single mothers and women who live alone.

The Case of Non-Working Women

The theoretical framework and, as the result, the empirical specification, takes into account the possibility of changes in the earned income for both partners by controlling for total household expenditures instrumented by total household income. However, for women who do not work, similar to women who do work, bargaining power changes with no associated changes in family income and I should be able to identify the changes in women's bargaining power when I look at the subsample of non-working women. For this group of women, like

other women, bargaining power goes up as the value of their outside option increases. This happens when there are more opportunities for them to participate in the labor market and when the wage rate increases. Table 1.7 summarizes the results of the same estimations as in Tables 1.4 and 1.5 among households in which the wife does not work in the period of my analysis.

I find the same patterns as in Tables 1.4 and 1.5. Although some of the coefficient estimates of changes in demand for older women are less significant when the dependent variable is a household expenditure share. Importantly, the share of decisions made by the wife (that is the best measure of women's bargaining power in this analysis) goes up significantly as the result of changes in demand for older female labor. The coefficient estimates imply that, all else fixed, a 1 percent increase in demand for older women, caused by a shock to the export sector, translates into 1.1 percent increase in the share of decisions made by women who do not work in the period of my analysis.

1.4.2.2 Changes in Labor Demand and Health Investment

As explained earlier, in addition to the expenditure share of health services, I separately look at two measures of health investment for girls and boys; the reported health condition of the child, and whether a child, older than the age of 4, has completed the preventive vaccination course. What I am interested to see is how changes in demand for different gender-age categories of labor affect investment in children's health. I estimate equation (1) with the dependent variables being the indicators of investment in children's health

and the gender-specific demand is constructed for two age-groups (a); $15-24$ and $25-$ (25 years and older).

The first column of Table 8 replicates column (8) in Table 1.4, when the dependent variable is the logarithm of the expenditure share of health services within households. The estimates indicate that a 1 percent increase in demand for older women, caused by a shock to the export sector, translates into a 4 percent increase in health services expenditure share within households. Increases in demand for other gender-age groups do not seem to significantly affect the expenditure share of health services.

The next columns in Table 1.8 report the coefficient estimates for the regression analysis (1.3.1) when the dependent variables are the logarithm of the average health condition of children, and the chance of a child older than the age of 4 completing the vaccination course. The results are reported separately for girls and boys. The results imply that an increase in demand for older women positively affects the girls' reported health condition and does not affect that of boys. Controlling for other factors, a 1 percent increase in demand for older women raises the chance of a daughter to be characterized as in good health by 1.1 percent.

The same increase in demand for older women raises the chance of a girl completing the vaccination course by 1.4 percent. Column (5) reports the estimates when the dependent variable is the chance of a boy older than the age of 4 completing the vaccination course. An increase in labor demand for older women does not have a significant effect and increase in demand for

younger men has a positive effect.

The results, in general, seem to show that an increase in labor demand for older women in the labor market raises investment in daughters' health with no significant effect on boys' health. Also, an increase in labor demand for younger women in the labor market does not affect investment in daughters' health, ruling out the scenario that households invest more in their daughters' health as the prospect of labor market participation for them improves. If households invested in daughters' health as the result of better employment prospects for them (as opposed to increased bargaining power of mothers), one would expect a positive demand shock for younger women to result in a positive and significant effect on investment in girls' health as well. It is harder to argue the same for boys, since as demand for younger men goes up in the labor market we observe that there is a higher chance that boys complete the vaccination course.

1.4.3 Demand Estimation Methodology II

Next I present the effects of changes in labor demand for different gender-age categories on women's bargaining power and investment in health using the demand estimation methodology that utilizes China's entry into the WTO as an exogenous shock to different Mexican export industries.

Table 1.9 uses the dependent variables as in Tables 4 and 5 to estimate the effect of changes in labor demand on women's bargaining power within households. The results follow the pattern observed using the other demand

estimation methodology, although the coefficient estimates for changes in demand for older women are generally smaller and less significant. However, when the dependent variable is the share of decisions made by women within households, the coefficient estimate for changes in demand for older women is statistically significant and implies that, a 1 percent increase in demand for older women, caused by a demand shock to the export sector, translates into 0.9 percent increase in the share of decisions made by women within households.

Table 1.10 replicates Table 1.8, on the effects of changes in labor demand for different gender-age categories on investment in health. The results are consistent with what has been argued in this chapter and what is reported in Table 1.8. The magnitudes I find suggest that, a 1 percent increase in demand for older women, caused by a demand shock to the export manufacturing sector, raises the expenditure share of health services by 3.4 percent and the chance of a daughter being characterized as in "good health" by 0.8 percent. The probability of a son being characterized as in "good health" does not change. The effect of an increase in labor demand for older women on the chance of a girl older than the age of 4 completing the vaccination course is positive but not statistically significant.

1.4.4 Women's Bargaining Power and Investment in Children's Health

Given that increase in labor demand for older women raises women's bargaining power within households, if women display a relatively greater altruism for girls than for boys compared to men or discriminate less against their daughters than their husbands do, one would expect to see that increases in labor demand for older women to result in greater investments in girls' health relative to boys', as observed here in this analysis.

Evidence from different developing countries suggests that it is actually the case that mothers value daughters relatively more than fathers do (Behrman (1997) surveys the evidence for this observation). Among others, Thomas (1990) shows that in Brazil mothers prefer to devote resources to improve the nutritional status of their daughters and Thomas (1994) demonstrates that women's non-labor income has a positive effect on daughters' health but not on sons' health. Duflo (2000) finds that in South Africa pensions received by women had a large impact on the anthropometric status of girls but little effect on that of boys.

Table 1.11 shows the results from a regression analysis, using data from my sample of Mexican households (MxFLS), in which the dependent variables are the measures of investment in children's health I have used throughout the empirical analysis. I use the logarithm of the share of decisions made by women and men in the household as measures of their bargaining power to explain changes in investment in children's health, controlling for other

household attributes. The results suggest that mothers' bargaining power is positively and significantly associated with investment in girls' health. The evidence is consistent with what other studies have found in other developing countries. The magnitudes I find imply that, a one percent increase in the share of decisions made by the mother is associated with 0.65 percent increase in the chance of a girl being characterized as in "good health" and 1.08 percent increase in the chance of a girl older than the age of 4 completing the vaccination course. More decision making power for women does not affect investment in boys' health.

The results presented here, are consistent with the hypothesis that an increase in mother's bargaining power, which results from an increase in demand for older women in the labor market, raises investment in girls' health relative to boys. Increase in demand for younger women does not positively affect investment in girls' health, ruling out that the observed increase in investment in girls' health is because of an improvement in the prospect of employment for girls.

On the other hand, changes in demand for older women, and mother's bargaining power as the result, does not appear to change boys' health status. It is consistent with the previous literature that, across many developing countries, an increase in women's bargaining power only affects girls' health without any significant effect on boy's health.

1.5 Conclusion

In this chapter I find that increases in demand for older women in the labor market, who are mostly married, raise women's bargaining power within households, as proxied by the share of decisions made by wife in the household as well as the expenditure share of goods that are assumed to be favored more/(less) by women. Increases in demand for older women also positively affect investment in girls' health without affecting that of boys. I find no evidence that increases in labor demand for younger women, who are mostly single, have the same effect, ruling out the possibility that households invest more in their daughters' health as the prospect of labor market participation for them improves. Consistent with evidence from other developing countries, I also find that an increase in women's decision making power within households is associated with more investment in girls' health. The results, in general, suggest that an increase in the wage rate and employability of older women in the labor market raises women's bargaining power within households and, ultimately, investment in the health of girls relative to that of boys.

This is particularly important since despite our understanding of the effect of different parental characteristics and household environment on parental decisions to invest in children's human capital, we know much less about the role of the state of the labor market. My results suggest that different patterns of a country's job market opportunities could have different effects on the decisions made within households about investment in children's health. More specifically, specialization in industries with preference for hiring older

female labor results in more investment in girls' health. My findings have implications for designing industrial policies in developing countries. When the gender gap in health is a concern, as it is in many developing countries, my results suggest that specialization in industries in which older (married) women have comparative advantage could induce parents to invest more in their girls.

Table 1.1: Household Characteristics in MxFLS

Panel A: Year 2002			
	mean	sd	observations
Wife's education*	3.79	1.79	5467
Husband's education*	4.07	2.03	5291
Wife's age	38.18	9.075	5537
Husband's age	41.63	10.406	5487
Woman working**	0.29	0.45	5522
Man working**	0.89	0.40	5493
Number of boys***	1.32	1.37	4100
Number of girls***	1.49	1.96	4100

Panel B: Year 2005			
	mean	sd	observations
Wife's education*	3.82	1.84	5443
Husband's education*	4.09	2.03	4911
Wife working**	0.26	0.44	5479
Husband working**	0.87	0.47	5406
Number of boys***	1.35	1.48	4021
Number of girls***	1.53	2.14	4021

* Education data is divided into 10 categories. 1.No education, 2.Preschool, 3.Elementary , 4. Secondary, 5.Open secondary 6.High school, 7.Open high school, 8.Normal Basic, 9. College, and 10.Graduate.

** This variable is 1 if the person works outside home and 0 if not

*** Number of boys and girls is conditioned on families having children.

Note: The data does not include the extended households. Children are limited to the children of the parents in the household who are 15 years old or younger.

Table 1.2: Export Sector Characteristics in IMSS

Panel A: Year 2002					
	mean	min	max	sd	observations
Share of export manufacturing sector in municipality's composition of employment	0.20	0.003	0.945	0.20	108 municipalities
Share of female labor in the export sector	0.37	0.0	0.869	0.21	108 municipalities
Share of female labor across different manufacturing export sectors	0.33	0.14	0.19	0.60	11 sectors
Share of younger female labor (15-24) out of total female labor across different export sectors	0.30	0.05	0.20	0.39	11 sectors
Panel B: Year 2005					
Share of export manufacturing sector in municipality's composition of employment	0.18	0.0	0.910	0.18	108 municipalities
Share of female labor in the export sector	0.34	0.0	0.875	0.19	108 municipalities
Share of female labor across different manufacturing export sectors	0.32	0.16	0.17	0.60	11 sectors
Share of younger female labor (15-24) out of total female labor across different export sectors	0.31	0.06	0.19	0.41	11 sectors
Growth in labor Demand for Women in Different Age Categories Across Municipalities in The Export Sector: $\Delta D^{E}_{fem,a,m,t}$					
Younger female labor (15-24)	-0.19	-0.28	-0.10	0.04	108 municipalities
Older female labor (25 and older)	0.03	-0.09	0.20	0.05	108 municipalities

Note: This table only covers the municipalities that are represented in the MxFLS.

Table 1.3: The Effect of Labor Demand on Women's Wage and Employment

	Dependent variable: Ln(...)			
	Average wage of women in the age category of...		Women's employment in the age category of...	
	25 and older	15-24	25 and older	15-24
Demand for ... labor	(1)	(2)	(3)	(4)
15-24 female	-0.897	0.546	-3.128	6.915***
	(1.298)	(0.413)	(2.538)	(2.599)
25 and older female	1.154**	0.392	4.117*	-3.308
	(0.551)	(0.501)	(2.213)	(2.646)
15-24 male	3.223	-1.214	6.163	-4.991
	(2.229)	(0.931)	(5.401)	(5.472)
25 and older male	-0.716	0.194	0.984	3.175*
	(0.632)	(0.272)	(1.235)	(1.679)
Demand in other sectors	-0.542	0.351	-5.513*	-1.042
	(1.463)	(0.918)	(3.248)	(3.365)
Observations	932	914	932	914

Notes: Standard errors are reported in parentheses. Controls include state specific time trend. Sample in the regression is composed of all municipalities in IMSS data in which women participate in the export sector.
* Significance at the 90 percent confidence level. ** Significance at the 95 percent confidence level. *** Significance at the 99 percent confidence level.

Table 1.4: Labor Demand Shocks and The Expenditure Share of Items Indicative of Women's Bargaining Power

	Dependent Variable: Ln (Expenditure share of ...)									
	Women clothing		Child clothing		Tobacco and gambling		Health services		Food	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Demand for ..... labor										
Female	0.796		1.170		0.808		3.168**		0.320	
	(1.444)		(0.735)		(0.815)		(1.480)		(0.622)	
15-24 female		-3.197		-1.103		0.769		-4.836		-0.449
		(2.202)		(0.782)		(1.154)		(4.870)		(1.006)
25 and older female		6.204***		3.601		-3.946*		3.981**		1.765
		(1.988)		(2.578)		(2.229)		(1.948)		(2.162)
15-24 male	-2.188	-1.814	1.399	2.289	-0.965	-0.937	-2.994	-1.564	-0.926	-1.817
	(3.120)	(1.336)	(2.892)	(2.911)	(1.712)	(0.685)	(3.332)	(3.568)	(1.620)	(2.166)
25 and older male	-1.063	-0.596	-1.091	-1.536*	0.897	1.385*	-2.143*	-2.530	-0.324	-0.406
	(0.580)	(1.003)	(0.887)	(0.790)	(0.709)	(0.774)	(1.204)	(1.300)	(0.599)	(0.608)
Demand in other sectors	1.552	3.574*	-0.727	0.780	0.037	0.343	0.040	0.175	0.412	1.516
	(1.684)	(1.878)	(1.258)	(2.164)	(0.882)	(0.394)	(1.715)	(1.537)	(0.844)	(1.676)
Wife's non-labor income	0.04	0.04	0.004	0.004	-0.089*	-0.089*	0.054	0.054	0.017	0.017
	(0.046)	(0.046)	(0.080)	(0.080)	(0.047)	(0.047)	(0.059)	(0.059)	(0.011)	(0.011)
Husband's non-labor income	-0.006	-0.006	0.027	0.027	0.032*	0.032*	-0.043	-0.043	-0.01	-0.01
	(0.021)	(0.021)	(0.046)	(0.046)	(0.017)	(0.017)	(0.052)	(0.052)	(0.006)	(0.006)
Total HH expenditures	-0.005	-0.005	-0.006***	-0.006***	-0.009**	-0.009**	0.083	0.083	-0.008**	-0.008**
	(0.009)	(0.009)	(0.003)	(0.003)	(0.004)	(0.004)	(0.104)	(0.104)	(0.004)	(0.004)
Observations	4720	4720	4100	4100	4247	4247	4899	4899	4731	4731
Mean of Dep. Var.	0.024	0.024	0.039	0.039	0.012	0.012	0.037	0.037	0.112	0.112

Notes: Standard errors are clustered at the municipality level and reported in parentheses. Controls include wife's and husband's education, age, and number of children by gender and age group (0-5, 6-10, 11-15 years). Sample in the regression is composed of all couples in union. Monetary values are reported in thousands of pesos. * Significance at the 90 percent confidence level. ** Significance at the 95 percent confidence level. *** Significance at the 99 percent confidence level.

Table 1.5: The Effect of Labor Demand on The Share of Decisions Made by Women and Men within Households

	Dependent Variable: Ln(...)		
	Share of decisions made by the wife		Share of decisions made by the husband
	(1)	(2)	(3)
Demand for ... labor			
Female	0.320**		
	(0.135)		
15-24 female		-0.213	0.318
		(0.367)	(0.359)
25 and older female		1.343*	0.582
		(0.746)	(0.801)
15-24 male	-0.629	-0.878	-0.975
	(0.632)	(0.635)	(0.760)
25 and older male	-0.211**	-0.484	0.232
	(0.106)	(0.209)	(0.201)
Demand in other sectors	0.370	0.887*	0.497
	(0.398)	(0.528)	(0.639)
Mother's non-labor income	0.004	0.003	-0.004
	(0.015)	(0.015)	(0.015)
Father's non-labor income	0.001	0.001	0.001
	(0.004)	(0.004)	(0.004)
Observations	4518	4518	4518
Mean of Dep. Var.	0.716	0.716	0.672

Notes: Standard errors are clustered at the municipality level and reported in parentheses. Controls include wife's and husband's education, age, and number of children by gender and age group (0-5, 6-10, 11-15 years). Sample in the regression is composed of all couples in union. Monetary values are reported in thousands of pesos. * Significance at the 90 percent confidence level. ** Significance at the 95 percent confidence level. *** Significance at the 99 percent confidence level.

Table 1.6: The Effect of Labor Demand on The Measures of Bargaining Power for Women Who Live Alone or with Their Children

	Dependent Variable: Ln (Expenditure share of ...)				
	Women's clothing	Children's clothing	Tobacco and gambling	Health services	Food
	(1)	(2)	(3)	(4)	(5)
Demand for...labor					
15-24 female	1.958	-7.271	0.914	2.403	1.069
	(3.700)	(7.034)	(2.108)	(5.110)	(2.254)
25 and older female	-0.846	3.083	-0.709	5.230	-0.685
	(0.904)	(10.671)	(0.873)	(16.054)	(3.368)
15-24 male	2.589	3.333	2.339	-9.863	-2.780
	(5.793)	(2.574)	(5.174)	(15.434)	(4.090)
25 and older male	1.957	-2.299	2.502*	0.221	0.449
	(1.915)	(4.054)	(1.355)	(2.549)	(1.341)
Demand in other sectors	-3.032	-1.064	-5.866	2.653	1.193
	(7.388)	(5.291)	(4.873)	(11.728)	(2.749)
Mother's non-labor income	0.065	0.013	-0.036	-0.007	-0.006
	(0.019)	(0.034)	(0.025)	(0.129)	(0.011)
Total HH expenditures	-0.048***	-0.021	-0.084***	-0.078***	-0.044
	(0.007)	(0.026)	(0.025)	(0.026)	(0.031)
Observations	537	501	524	607	612

Notes: Standard errors are clustered at the municipality level and reported in parentheses. Controls include the woman's education, age, and number of children by gender and age group categories (0-5, 6-10, 11-15 years). Sample in the regression is composed of all wome who live alone or with their children in the original sample of households. Monetary values are reported in thousands of pesos. * Significance at the 90 percent confidence level. ** Significance at the 95 percent confidence level. *** Significance at the 99 percent confidence level.

Table 1.7: The Effect of Labor Demand on Non-Wroking Women's Bargaining Power

	Dependent Variable					
		Ln (Expenditure share of ...)				
	Share of decisions made by the wife	Women clothing	Child clothing	Tobacco and gambling	Health services	Food
	(1)	(2)	(3)	(4)	(5)	(6)
Demand for...labor						
15-24 female	0.119	-2.418	-3.246**	0.431	-1.243	-0.274
	(0.289)	(1.758)	(1.365)	(1.268)	(5.563)	(0.826)
25 and older female	1.104*	5.582**	2.873	-5.129	2.047	1.543
	(0.606)	(2.608)	(2.227)	(3.190)	(1.176)	(1.852)
15-24 male	-0.806	-5.771	1.968	-1.013	-0.152	-1.639
	(1.254)	(3.847)	(2.844)	(0.717)	(5.084)	(1.928)
25 and older male	-0.548	-0.622	-1.440*	1.216	0.477	-0.349
	(1.265)	(0.893)	(0.761)	(0.856)	(1.195)	(0.530)
Demand in other sectors	-0.157	6.699*	0.951	2.757	-1.127	1.231
	(0.489)	(3.815)	(1.947)	(2.206)	(4.491)	(1.482)
Wife's non-labor income	0.006	-0.001	-0.086	-0.201**	0.0004	0.042*
	(0.031)	(0.96)	(0.121)	(0.085)	(0.117)	(0.022)
Husband's non-labor income	-0.001	0.006	0.02	0.063**	-0.078	-0.015*
	(0.012)	(0.028)	(0.054)	(0.026)	(0.045)	(0.009)
Observations	3056	3106	3458	3001	3459	3319
Mean of Dep. Var.	0.681	0.022	0.039	0.015	0.036	0.131

Notes: Standard errors are clustered at the municipality level and reported in parentheses. Controls include wife's and husband's education, age, and number of children by gender and age group (0-5, 6-10, 11-15 years). Sample in the regression is composed of all couples in union. Monetary values are reported in thousands of pesos. * Significance at the 90 percent confidence level. ** Significance at the 95 percent confidence level. *** Significance at the 99 percent confidence level.

Table 1.8: The Effect of Labor Demand on Investment in Health

	Dependent Variable: Ln(...)				
	Expenditure share of health services	Chance of a ....being characterized "as in good health"		Chance of a ... completing the vaccination course	
		Girl	Boy	Girl	Boy
	(1)	(2)	(3)	(4)	(5)
Demand for...labor					
15-24 female	-4.836	0.458	0.384	-0.901*	0.040
	(4.850)	(0.657)	(0.655)	(0.533)	(0.099)
25 and older female	3.981**	1.059**	-0.593	1.449*	-2.209
	(1.948)	(0.476)	(1.134)	(0.809)	(2.573)
15-24 male	-1.564	0.025	0.374	0.773	3.844**
	(3.258)	(1.072)	(1.106)	(2.182)	(1.649)
25 and older male	-2.530	-0.001	0.163	-0.379*	0.516
	(1.300)	(0.265)	(0.319)	(0.210)	(0.475)
Demand in other sectors	0.175	0.597	-0.537	0.447	-4.115**
	(1.537)	(0.870)	(0.823)	(1.539)	(2.007)
Mother's non-labor income	0.054	0.011	-0.001	-0.033	0.006
	(0.059)	(0.015)	(0.020)	(0.052)	(0.011)
Father's non-labor income	-0.043	-0.005	-0.004	-0.015	-0.012
	(0.052)	(0.006)	(0.005)	(0.021)	(0.013)
Observations	4809	2947	2967	2113	2174
Mean of Dep. Var.	0.037	0.704	0.731	0.775	0.806

Notes: Standard errors are clustered at the municipality level and reported in parentheses. Controls include wife's and husband's education, age, and number of children by gender and age group categories (0-5 years, 6-10 years, 11-15 years). Monetary values are reported in thousands of pesos.
* Significance at the 90 percent confidence level. ** Significance at the 95 percent confidence level. *** Significance at the 99 percent confidence level.

Table 1.9: The Effect of Labor Demand caused by China's entry into the WTO on Women's Bargaining Power

	Dependent Variable					
		Ln (Expenditure share of ...)				
	Share of decisions made by the wife	Women clothing	Child clothing	Tobacco and gambling	Health Services	Food
	(1)	(2)	(3)	(4)	(5)	(6)
Demand for...labor						
15-24 female	-0.546	-1.631	-0.527	3.989**	-5.896	-3.136
	(1.244)	(2.320)	(0.991)	(1.702)	(4.183)	(4.681)
25 and older female	0.919*	3.088	1.307	-1.882	3.376*	2.456
	(0.489)	(2.029)	(1.703)	(1.153)	(2.009)	(2.327)
15-24 male	-1.059	1.124	3.049	-1.668	-1.672	-1.446
	(1.166)	(1.239)	(2.291)	(2.125)	(4.026)	(2.741)
25 and older male	-0.513	-0.601	-0.790	0.645*	-1.932	0.305
	(0.594)	(1.195)	(0.934)	(0.318)	(2.899)	(0.552)
Demand in other sectors	0.181	-0.438	0.328	-0.019	0.269	0.101
	(0.414)	(0.844)	(0.953)	(0.032)	(0.736)	(0.391)
Wife's non-labor income	0.025**	0.04	0.004	-0.133	0.054	0.082
	(0.013)	(0.047)	(0.080)	(0.254)	(0.059)	(0.148)
Husband's non-labor income	0.054	-0.006	0.027	-0.039	-0.043	-0.005
	(0.072)	(0.021)	(0.046)	(0.119)	(0.052)	(0.045)
Total HH expenditures	0.11*	-0.005	-0.006**	-0.01**	0.083	0.011
	(0.655)	(0.009)	(0.003)	(0.004)	(0.104)	(0.374)
Observations	4518	4720	4100	4247	4899	4083
Mean of Dep. Var.	0.716	0.024	0.039	0.012	0.037	0.112

Notes: Standard errors are clustered at the municipality level. Changes in employment for each gender-age labor category has been instrumented by the role of China's competition in affecting demand for that group in each municipality. The usual controls exist. Monetary values are reported in thousands of pesos. * Significance at the 90 percent confidence level. ** Significance at the 95 percent confidence level. *** Significance at the 99 percent confidence level.

Table 1.10: The Effect of Labor Demand caused by China's entry into the WTO on Investment in Health

	Dependent Variable: Ln(...)				
	Expenditure share of health services	Chance of a ....being characterized "as in good health"		Chance of a ... completing the vaccination course	
		Girl	Boy	Girl	Boy
	(1)	(2)	(3)	(4)	(5)
Demand for...labor					
15-24 female	-5.896	-0.456	-0.103	-0.739	-0.376
	(4.183)	(0.635)	(0.461)	(1.592)	(0.780)
25 and older female	3.377*	0.836*	0.238	1.822	-2.229
	(2.010)	(0.490)	(0.331)	(2.402)	(2.422)
15-24 male	-1.672	-0.544	0.268	0.906	3.794
	(4.033)	(1.128)	(0.473)	(1.612)	(3.492)
25 and older male	-1.932	0.542	-0.039	-0.689	0.969
	(2.899)	(0.754)	(0.071)	(0.673)	(0.785)
Demand in other sectors	0.270	-0.053	0.001	1.198	-3.440**
	(0.700)	(0.173)	(0.004)	(2.787)	(1.445)
Mother's non-labor income	0.054	0.011	-0.001	-0.033	0.006
	(0.059)	(0.015)	(0.020)	(0.052)	(0.011)
Father's non-labor income	-0.043	-0.005	-0.004	-0.015	-0.012
	(0.052)	(0.006)	(0.005)	(0.021)	(0.013)
Observations	4320	964	940	964	940
Mean of Dep. Var.	0.037	0.704	0.731	0.775	0.806

Notes: Standard errors are clustered at the municipality level. Changes in employment for each gender-age labor category has been instrumented by the role of China's competition in affecting demand for that group in each municipality. The usual controls exist. Monetary values are reported in thousands of pesos. * Significance at the 90 percent confidence level. ** Significance at the 95 percent confidence level. *** Significance at the 99 percent confidence level.

Table 1.11: Spouses' Bargaining Power and Investment in Children's Health

	Dependent Variable: Ln(...)			
	Chance of a ....being characterized "as in good health"		Chance of a ... completing the vaccination course	
	Girl	Boy	Girl	Boy
	(1)	(2)	(3)	(4)
Share of the decisions made by the mother	0.651**	0.355	1.082*	-0.460
	(0.321)	(0.331)	(0.616)	(0.792)
Share of the decisions made by the father	0.237	-0.159	-0.373	-0.649
	(0.214)	(0.187)	(0.319)	(0.547)
Observation	2912	2933	2082	2114

Notes: Standard errors are clustered at the municipality level and reported in parentheses. Controls include total household expenditure, mother's and father's non-labor income, education, age, and number of children by gender and age group categories (0-5 years, 6-10 years, 11-15 years). Sample in the regression is composed of all households with a positive number of children in 2002 and 2005.
* Significance at the 90 percent confidence level. ** Significance at the 95 percent confidence level. *** Significance at the 99 percent confidence level.

Table 1.12: The Effect of Labor Demand on The Expenditure Share of Items That Are Not Indicative of Women's Bargaining Power

	Dependent Variable		
	Ln (Expenditure share of ...)		
	Transportation	Men Clothing	Other items
15-24 female	-0.788	-1.524	1.888***
	(1.950)	(3.141)	(0.287)
25 and older female	-2.764	2.990	-2.593*
	(3.224)	(2.452)	(1.415)
15-24 male	4.593*	-4.400	-0.581
	(2.597)	(5.227)	(1.163)
25 and older male	-0.097	-2.137	0.765**
	(1.074)	(1.825)	(0.306)
Demand in other sectors	-3.864**	4.481	-0.750
	(1.874)	(3.569)	(1.014)
Mother's non-labor income	0.02	0.009*	-0.042***
	(0.021)	(0.005)	(0.012)
Father's non-labor income	-0.008	-0.04***	0.026***
	(0.013)	(0.01)	(0.008)
Total HH expenditures	-0.020***	-0.006***	-0.002
	(0.006)	(0.001)	(0.002)
Observations	4352	4634	4838

Notes: Standard errors are clustered at the municipality level and reported in parentheses. Controls include wife's and husband's education, age, and number of children by gender and age group categories (0-5 years, 6-10 years, 11-15 years). Sample in the regression is composed of all couples in union. Monetary values are reported in thousands of pesos. * Significance at the 90 percent confidence level. ** Significance at the 95 percent confidence level. *** Significance at the 99 percent confidence level.

Chapter 2

Parental Response to Changes in Return to Education for Children: The Case of Mexico

2.1 Introduction

Previous research has shown that school enrollment responds to the changes in return to education in a variety of developing countries.[1] However, we do not know much about whether other forms of investment in education, such as parental spending on children's education, that could affect the quality of the education received by children are also affected by the changes in return to education. This is important because, similar to the quantity of education, the quality of education could affect the labor market outcomes of students (Card and Krueger 1992; Betts 1995; Evans and Schwab 1995).[2]

This chapter examines the effect of decreases in the return to education for children, generated by an increase in labor market opportunities for unskilled labor in the Mexican export manufacturing sector, on spending on children's education while they are enrolled at school. It has been shown in

[1] Oster and Millet (2010) and Shastry (2010) document higher school enrollment in India as high-skill service export jobs are created. Atkin (2010) shows that school enrollment drops in Mexico as the result of higher wages offered to unskilled workers in the export manufacturing sector.

[2] Psacharopoulos and Patrinos (2004) provides a survey on the rate of return to the quantity of education.

many emerging economies that firms in the export sector pay more for a given level of skill. In Mexico, most of the jobs in the export manufacturing sector are low-skill jobs and by paying more for these jobs the return to education goes down (Atkin 2010). I construct demand indexes for different gender-age categories and interpret the effect of changes in demand for the age group of 15-19 years old male and female labor (that is mostly composed of low-skill workers who have not finished high-school) on spending on children's education as the parental reaction to the decrease in return to education.[3]

To do this (as in chapter 1), following Bartik (1991), Blanchard and Katz (1992), Bound and Holzer (2000), and Autor and Duggan (2003), and using data from the Social Security Institute of Mexico (IMSS), I construct demand indices that capture exogenous shifts in local labor demand for different gender-age categories: women and men in the age category of 15-19 years and women and men who are 20 years of age or older. The demand index for each gender-age-municipality cell is constructed based on the nationwide changes in employment of that gender-age category in different industries, weighted by the local labor market-specific shares of employment in each industry.

Next, I use two panel waves of the Mexican Family Life Survey to identify the effect of an increase in demand for young female and male labor on spending on children's schooling. I find that households reduce their expendi-

[3]The labor market data comes in an aggregate form at the municipality-gender-age level and I have access to employment data for male and female labor in 5-year age categories: 15-19, 20-24, 25-29, etc.

tures on education-related expenses of their children while they are at school in response to the higher wages offered to unskilled workers in the export sector. The magnitudes I find suggest that a 1 percent increase in demand for female labor in the age category of 15-19 years old, caused by a demand shock to the export manufacturing sector, leads to a 5.2 percent decrease in the educational expenses for each schoolgirl. Also, a 1 percent increase in demand for male labor in the age category of 15-19 years old leads to a 8.2 percent decrease in the educational expenses for each schoolboy.

To shed more light into why educational expenses of children change, I also look at the changes in spending on two major components of educational expenses; school fees and cost of school materials. I find that increases in demand for young male labor reduces spending on school fees for schoolboys, that could result in lower quality of education received by children, but increases in demand for young female labor does not affect the school fees for schoolgirls. Cost of school materials is negatively affected for boys and girls as demand for young male and female go up in the Mexican export manufacturing sector. To check the robustness of my results I do the analysis using spending on children's clothing as the dependent variable. If changes in the return to education are responsible for spending less on children's education, one would expect to see no effect on spending on children's clothing. The results confirm this prediction.

By focusing on the export sector, this study contributes to the very recent literature on how the proliferation of export jobs changes the incentives

to invest in education (Oster and Millet 2010; Shastry 2010; Jensen 2010; Atkin 2010). In recent decades many developing countries have relied on exports for growth and, since education is considered a major determinant of long run growth (Lucas 1988), it is important to understand how investment in education responds to the growth in exports. The results of this study imply that the negative effect of higher wages offered to unskilled workers is not limited to higher dropout rate and even if governments make policies to ensure students' education decisions remain unchanged by the arrival of new export jobs (as suggested in Atkin 2010), the quality of the education gained by children might be affected.

The remainder of this chapter proceeds as follows. Section 2.2 discusses the data, empirical strategy, and empirical specification. Section 2.3 shows the results, and Section 2.4 concludes.

2.2 Empirical Implementation

2.2.1 Data

This study combines two datasets to examine how changes in demand for young, unskilled, labor within the Mexican export manufacturing sector affect households' spending on children's education. The household level data come from the Mexican Family Life Survey (MxFLS). MxFLS is a multi-thematic and longitudinal database that collects a wide range of information on socioeconomic, demographic and health indicators of the Mexican popu-

lation. I use two waves of the data collected in 2002 and 2005. The dataset is nationally representative, covers more than 100 municipalities in Mexico, and gathers information from more than 8000 households. Table 1.1 shows some of the household characteristics in MxFLS. The data used in this study (and presented in Table 1.1) does not include the extended households. Also, children are limited to the children of the parents in the household who are 15 years old or younger.

Labor market (municipality-level) data come from the Mexican Social Security Institute (IMSS). It includes monthly employment data from all formal private-sector establishments and reports data on each employee's age, gender, and salary. It also reports the employer's id, the 2-digit, 3-digit, and 4-digit industry of activity, as well as the state and municipality of the firm.[4] The universal coverage of this dataset originates from the fact that IMSS provides health insurance and pension coverage and all employees must enroll.

To identify export manufacturing sector in the labor market data, I define a 3-digit manufacturing sector as an export sector if more than 50 percent of output was exported in year 2000. The export and output data come from the Trade, Production and Protection 1976-2004 database (Nicita and Olarreaga 2007).[5]

[4]The aggregations from the firm to industry-municipality level were carried out at the central office of IMSS in Mexico city where the data is held securely.

[5]The industry categories used by IMSS and the 3-digit ISIC classification (Rev. 2) were matched by hand.

2.2.2 Empirical Specification

In addition to the individual and household characteristics, I let demand for young unskilled labor in the export sector, that could change the return to investment in education, to be a potential determinant of spending children's education. For household i, the basic regression specification is:

$$q_{jimt} = \sum_a \beta_{f,a} D^E_{fem,a,m,t} + \sum_a \beta_{m,a} D^E_{male,a,m,t} + \beta D_{m,t} + \alpha x_{i,m,t} + \gamma_{i,m,t} + \delta_i + \epsilon_{jimt} \tag{2.2.1}$$

where q_{jimt} is outcome variable j, the natural logarithm of a variable representing spending on boys or girls education in household i in year t.[4] $D^E_{fem,a,m,t}$ and $D^E_{male,a,m,t}$ are demand for female and male labor belonging to age-category a in municipality m in export manufacturing sector (superscript E represents the export sector) and $D_{m,t}$ is demand for labor in all other sectors of the economy in municipality m. The argument in this study is that, when a identifies the very young age-group, $D^E_{fem,a,m,t}$ and $D^E_{male,a,m,t}$ affect return to education for girls and boys respectively. $x_{i,m,t}$ is total household expenditures. $\gamma_{i,m,t}$ is a set of controls for household characteristics, including the number of children by gender and age (0-5, 6-10, and 11-15 years) and each parent's age and education. δ_i represents the household fixed effect. By including household fixed effects in the reduced form regression I am able to

[4]Having natural logarithm of the outcome variables as dependent variables allows easy interpretation of the empirical model coefficient estimates. However, the empirical results are robust to the choice of the form for dependent variables.

control for the unobservable fixed household characteristics that could affect the household decisions. ϵ_{jimt} are unobservable determinants of the outcome variables.

The reason behind looking at sex-specific investment in children's education is the fact that, as discussed in Majlesi (2012), there is a segregated labor market for men and women. Some export industries like apparel and the manufacturing of electric systems are dominated by female labor and the share of female labor out of total labor remaines almost unchanged between 2002-2005. On the other hand, male labor constitutes the majority of labor in industries like car and truck manufacturing. As a further evidence, I also show in Majlesi (2012) that a shock to demand for female or male labor, only affects the wage rate and employment of the respective group and not the other. An implication of this segregation is that a shock to a particular industry mainly affects the labor market opportunities for female or male labor (not both) and, as a result, it is changes in demand for female (male) labor that could potentially affect investment in girls' (boys') education through changing return to education.

One concern about the specification above could be that the households' income is excluded from the regression. If changes in labor demand for young adults affect the dependent variables through changes in earned income, the coefficient estimates for the changes in labor demand would be biased.[6]

[6]Although, one could think that the bias from not including the household income would be positive and the actual coefficient estimate for demand for young labor is more negative.

However, in my estimation, the earned income is controlled for, by using total household income as an instrument for total expenditures. Usually it is the case that in datasets that report expenditures on high-frequency basis (e.g., monthly), one would observe unusually high or low expenditures on a consumption good. For example, if a household spends money on school materials for one of the household members in a given month, the same expenditure might not happen again for the next few months. When the dependent variable is spending on school material, this could induce a correlation between the error term and total expenditures. To deal with this, Browning and Chiappori (1998), among others, uses total household income as an instrument for total expenditures because it is correlated with aggregate household expenditures, but conditioning on it should have no effect on the distribution of expenditures. Therefore, in this study, I exploit variation in total household income as an instrumental variable for variation in total expenditures.

2.2.3 Estimating Demand

I use the same methodology as in chapter 1 to estimate changes in demand. In other words, To estimate changes in demand for different gender-age categories within each municipality, I use a methodology that was originally developed by Bartik (1991) and was used by Blanchard and Katz (1992), Bound and Holzer (2000), and Autor and Duggan (2003), among others. It involves creating a demand index for each gender-age-municipality cell based on the nationwide changes in employment of that gender-age category in different

industries, weighted by the local labor market-specific shares of employment in each industry. In other words, I exploit the fact that municipalities have different industrial composition and different gender-age groups play different roles in various export industries.

Predicted growth of labor employment within the export sector in the period 2002-2005 for gender g in age-category a residing in municipality m is given by:

$$\begin{aligned} \hat{D^E}_{g,a,m,t} &= (D^E_{g,a,m,2005} - D^E_{g,a,m,2002}) \\ &= \sum_{k=1}^{K} \gamma_{k,m} \eta^{g,a}_{-m,k} \end{aligned} \tag{2.2.2}$$

K is the number of three-digit industries within export manufacturing sector and $\gamma_{k,m}$ is the fraction of workers in municipality m in year 2002 employed in industry k $\left(\frac{e_{m,k,2002}}{e_{m,2002}}\right)$. $\eta^{g,a}_{-m,k}$ is the log change in national employment of gender g-age category a labor in industry k between 2002 and 2005. The subscript $-m$ in $\eta^{g,a}_{-m,k}$ indicates that each municipality's industry k-gender g-age category a employment is excluded in calculating the national employment change.

This index is a weighted average of the growth in employment in the export manufacturing sector for each gender-age category in each municipality, where the weights represent the different distributions of employment across industries in each municipality. This is built to capture exogenous shifts in

local labor demand that are predicted by the municipality-specific industry mix, while avoiding the endogeneity associated with local employment changes. In other words, this methodology predicts what each municipality's change in employment for a gender-age category in the export manufacturing sector would be if municipality-level industrial composition was fixed in the short term and changes in industry-level employment happened uniformly across municipalities.

In demand index (2.2.2), the second term, the log change in national employment of gender g-age category a labor in industry k, excludes employment in municipality m to avoid the endogeneity associated with local employment growth rates. This addresses the concern that the observed change in national employment is driven by the concentration of an industry in a specific municipality. Of course, if a large share of people employed in an industry live in a specific municipality, then one might think that the change in employment in other municipalities does not predict the change in demand in the industry. Looking at the share of each municipality in the employment mix of different industries reveals that, excluding Mexico City from the analysis, no municipality has a share bigger than 11 percent (followed by 8 percent) in the employment of any industry.[6]

Similarly, the predicted growth of demand for labor in all other sectors in municipality m in the period 2002-2005, is given by:

[6]Even including Mexico City, which has the biggest share of employment in 7 industries among all municipalities, gives us a maximum of 19 percent.

$$\begin{aligned}\hat{D}_{m,t} &= (D_{m,2005} - D_{m,2002}) \\ &= \sum_{l=1}^{L} \gamma_{l,m}\eta_{-m,l} \qquad (2.2.3)\end{aligned}$$

L is the number of all three-digit industries of the economy outside export manufacturing sector, $\gamma_{l,m}$ is the fraction of workers in municipality m in year 2002 employed in industry l $\left(\frac{e_{m,l,2002}}{e_{m,2002}}\right)$, and $\eta_{-m,l}$ is the log change in national employment in industry l.

2.2.4 Outcome: Spending on Children's Education

IMSS does not report the education level of employees and it prevents constructing demand variables for different skill categories. Because of that, one cannot directly estimate the effect of changes in demand for skilled or unskilled labor on households' investment in their children's education using this data. However, as presented in Atkin (2010), most of the jobs created in the Mexican export manufacturing sector between 1985-2000 were low-skill jobs that (when compared to other sectors of the economy) paid higher salaries for the same level of skills. In other words, in most cases, an increase in manufacturing export jobs decreased the perceived rate of return to education, possibly inducing children to drop out of high-school and get the new jobs.

Even if one assumes all the jobs created in the export manufacturing sector are low-skill (which is not the case since some of the highest skill jobs are

also created in the same sector), interpreting the effect of changes in demand for labor in this sector on parents' investment in children is more difficult, as parental reaction to lower rate of return to education is confounded by the effect of changing parents' bargaining power within households (Majlesi 2012).

To circumvent this problem, I make use of the fact that the jobs created in the age group of 15-19 are mostly low-skill jobs, since most of the people in this category could not have possibly finished high-school, and interpret the effect of changes in demand for that age category on investment in children's education as a proxy for parental response to a lower return to education. Atkin (2010) documents that in the export manufacturing sector around 25 percent of employees have high-school or college degrees. This ratio is definitely much smaller in the age-category of 15-19 since (according to the same paper) at least half of the workers in the age category of 15-19 are younger than 18 years old and could not have possibly finished high school.[7] Even if education information were available, an advantage of looking at demand for the $15-19$ age group, compared to demand for low-skill jobs in general, to predict parental response to a lower return to education is that I can look at the effect of an increase in jobs that arguably lower the return to education without worrying about confounding that effect with other factors, namely bargaining power of parents, since an increase in demand for very young single workers does not affect parents' bargaining power.

[7] As the next step, I am trying to get the employment data for the age category of 15-17 to make sure that all people in my "young" age group are low-skill labor.

For each gender, I construct demand variables for two age-categories; $15-19$, and 20 years and older, using the methodology explained before. When the model is estimated with the dependent variable being investment in girls' education, in case that parents respond to the lower return to education by investing less in their children's education, I expect $\beta_{f,15-19} < 0$. If parents make the decisions only based on what happens to demand for very young females in the labor market, and not very young males, $\beta_{m,15-19}$ should not have a significant effect on the dependant variables. Similarly, when the dependent variable is investment in boys' education, I expect $\beta_{m,15-19} < 0$ with $\beta_{m,15-19}$ not having significant effect. If these predictions hold in data, it could be suggested that, controlling for other factors, an increase in low-skill export jobs in general contributed to less spending on children's education.

One should notice that a more negative effect of an increase in demand for very young male (female) labor on spending on boys' (girls') education does not necessarily mean that parents respond more strongly for changes in return to education for boys (girls), since it could be the case that the jobs that are created for young male (female) labor decrease the return to education more than the jobs that are created for female (male) labor.

2.3 Results

In this section I show how parents change spending on children's education in response to an increase in demand for young, unskilled, labor in the export manufacturing sector and, as a result, changes in return to education.

Table 2.1 shows the effect of changes in labor demand for different gender-age categories on the average educational expenses for each schoolgirl and schoolboy separately. The coefficient estimates in column (1) indicate that a 1 percent increase in demand for female labor in the age category of 15-19 years old, caused by a demand shock to the export manufacturing sector, leads to a 5.2 percent decrease in the educational expenses of each schoolgirl. Changes in demand for male workers (as well as older female labor) do not appear to affect spending on girls' education.[8]

Column (2) reports the same coefficient estimates when the dependent variable is the natural logarithm of the educational expenses for each schoolboy. The coefficient estimates indicate that a 1 percent increase in demand for male labor in the age category of 15-19 years old, caused by a demand shock to the export manufacturing sector, leads to a 8.2 percent decrease in the educational expenses for each schoolboy. Similar to the estimates in column (1), changes in demand for opposite sex labor do not affect spending on boy' education.

Increases in demand for older women do not seem to affect spending on education. However, as discussed before, it could be argued that this effect contains both the effect of changes in women's bargaining power and return to education and if the effect of return to education is big and negative it would

[8]Note that these are the effects of a 1 percent increase in demand in the labor market, generated solely by demand shocks to the export sector. Given that in a typical Mexican municipality export manufacturing sector employs around 20 percent of workers, the effects are equivalent to the effect of a 5 percent increase in demand within the export sector.

overcome the effect of bargaining power.

2.3.1 Disaggregating Spending on Education

In addition to spending on each child's education separately, MxFLS reports spending on two major categories of education as well; school enrollment fee and school materials. Analyzing the effect of changes in demand for young, unskilled, labor on these two categories could be helpful in analyzing what exactly changes when educational expenses go down.

The dependent variable in the first and second columns of Table 2.2 are the logarithm of the average school enrollment fee for each schoolgirl and schoolboy respectively. The coefficient estimates imply that changes in demand for young, unskilled, women do not affect the school enrollment fee for schoolgirls, while an increase in demand for young, unskilled, men negatively affects the school enrollment fee for schoolboys. More precisely, 1 percent increase in demand for male labor in the age category of 15-19 years old, caused by a demand shock to the export manufacturing sector, leads to a 8.8 percent decrease in spending on school enrollment fee for each schoolboy. If school enrollment fee is an indicator of the school quality, it might be the case that as demand for unskilled male labor in the export manufacturing sector rises, parents have less incentive to send their boys to higher quality schools.

Table 2.3 repeats the same analysis using the other component of spending on children's education, cost of school materials, as dependent variables. The coefficient estimates imply that a 1 percent increase in demand for female

labor in the age category of 15-19 years old, caused by a demand shock to the export manufacturing sector, leads to a 4.9 percent decrease in spending on school materials for schoolgirls and a 1 percent increase in demand for male labor in the age category of 15-19 years old leads to a 4.5 percent decrease in spending on school materials for schoolboys.

The results here suggest that a lower return to education make parents to spend less on both school enrollment fees and school materials for boys but to only lower spending on school materials for girls. The reason for this could be that labor market returns to education is a more important determinant of investment in boys' education compared to girls'. However, it could also be the case that changes in demand for young male labor

2.3.2 Robustness Check

If it is the change in return to education that makes families to spend less on children's education, one would expect to see no changes in other types of spending on children as demand for very young labor goes up. Table 5 reports the coefficient estimates when the same empirical model is used and dependent variables are spending on girls' and boys' clothing. As expected, changes in demand for young labor does not affect how much households spend on children's clothing.

2.4 Conclusion

The previous research has shown that in many developing countries, including Mexico, export manufacturing sector pays more for a given level of skill and creating low-skill jobs in this sector lowers the return to education. This study finds that an increase in demand for young (mostly unskilled) labor in the Mexican export manufacturing sector, and therefore a decrease in return to education, reduces spending on children's education while they are enrolled at school.

Table 2.1: The Effect of Labor Demand on The Educational Expenses of Children

	Dependent Variable: Ln (Educational expenses for each...)	
	Schoolgirl	Schoolboy
15-19 female	-5.162*	-3.029
	(3.031)	(4.319)
20 and older female	1.529	7.971*
	(4.565)	(4.411)
15-19 male	3.358	-8.275**
	(2.701)	(3.705)
20 and older male	-4.795	-1.871
	(3.887)	(2.561)
Demand in other sectors	3.608	5.833*
	(3.243)	(3.260)
Total HH expenditures	0.271***	0.397***
	(0.051)	(0.054)
Observations	2083	2137

Notes: Standard errors are clustered at the municipality level and reported in parentheses. Controls include wife's and husband's education, age, and number of children by gender and age group categories (0-5 years, 6-10 years, 11-15 years). Sample in the regression is composed of households with school age children in both periods. Monetary values are reported in thousands of pesos.
* Significance at the 90 percent confidence level. ** Significance at the 95 percent confidence level. *** Significance at the 99 percent confidence level.

Table 2.2: The Effect of Labor Demand on The School Fee

	Dependent Variable: Ln (School enrollment fee for each...)	
	Schoolgirl	Schoolboy
15-19 female	-1.432	0.346
	(8.857)	(5.523)
20 and older female	-0.926	-2.120
	(8.842)	(7.425)
15-19 male	-3.554	-8.823**
	(4.292)	(4.390)
20 and older male	3.419	12.154
	(6.926)	(4.981)
Demand in other sectors	4.005	4.318
	(44.692)	(45.130)
Total HH expenditures	0.025	0.038
	(0.049)	(0.056)
Observations	2129	2186

Notes: Standard errors are clustered at the municipality level and reported in parentheses. Controls include wife's and husband's education, age, and number of children by gender and age group categories (0-5 years, 6-10 years, 11-15 years). Sample in the regression is composed of households with school age children in both periods. Monetary values are reported in thousands of pesos.
* Significance at the 90 percent confidence level. ** Significance at the 95 percent confidence level. *** Significance at the 99 percent confidence level.

Table 2.3: The Effect of Labor Demand on School Material Expenditure

	Dependent Variable: Ln (Cost of school material fee for each...)	
	Schoolgirl	Schoolboy
15-19 female	-4.926*	2.813
	(2.863)	(4.999)
20 and older female	-6.678	2.039
	(4.727)	(6.574)
15-19 male	4.205	-4.544*
	(2.862)	(2.524)
20 and older male	6.787	1.445
	(4.703)	(5.712)
Demand in other sectors	3.392	1.945
	(36.329)	(43.470)
Total HH expenditures	0.060	0.237***
	(0.043)	(0.054)
Observations	2110	2173

Notes: Standard errors are clustered at the municipality level and reported in parentheses. Controls include wife's and husband's education, age, and number of children by gender and age group categories (0-5 years, 6-10 years, 11-15 years). Sample in the regression is composed of households with school age children in both periods. Monetary values are reported in thousands of pesos.
* Significance at the 90 percent confidence level. ** Significance at the 95 percent confidence level. *** Significance at the 99 percent confidence level.

Table 2.4: The Effect of Labor Demand on Children's Clothing Expenditure

	Dependent Variable: Ln (Cost of clothing for each...)	
	girl	boy
15-19 female	-3.773	0.484
	(6.247)	(5.509)
20 and older female	4.110	-2.231
	(6.852)	(6.685)
15-19 male	-2.465	4.441
	(2.862)	(4.247)
20 and older male	2.504	-0.977
	(6.347)	(6.383)
Demand in other sectors	2.886	-2.391
	(5.074)	(4.676)
Total HH expenditures	0.004***	0.005***
	(0.0009)	(0.0007)
Observations	2952	2978

Notes: Standard errors are clustered at the municipality level and reported in parentheses. Controls include wife's and husband's education, age, and number of children by gender and age group categories (0-5 years, 6-10 years, 11-15 years). Sample in the regression is composed of households with school age children in both periods. Monetary values are reported in thousands of pesos.
* Significance at the 90 percent confidence level. ** Significance at the 95 percent confidence level. *** Significance at the 99 percent confidence level.

Chapter 3

Are Liquidity Constraints Irrelevant After All? Financial Constraints and Decision to Export

3.1 Introduction

One of the observations made by trade economists in the past three decades has been that exporters and non-exporters are different. For example, compared to non-exporters, exporters usually enjoy higher productivity and are larger in terms of number of employees, capital intensity, and financial flows (Bernard and Jensen 1995; Aw and Hwang 1995; Wagner 2007). While these differences are usually substantial, they do not indicate whether exporters are different from non-exporter before entering the export market (the causality channel) or if being an exporter help them to differentiate themselves.[1] The answer to this question is important in order to design policies that could promote exports.

One of the differences between exporters and non-exporters is that exporters are usually less liquidity constrained than non-exporters. However, firm level studies offer mixed results on the effect of ex-ante liquidity constraints on firms' export status. In other words, it is not clear whether being

[1]Using data from U.S. manufacturing sectors, Bernard and Jensen (1999) show causality goes from productivity to exporting.

less liquidity constrained helps a firm to become an exporter or firms become it is just that less liquidity constrained as they become exporters. Manova (2008) provides evidence that credit constraints are an important determinant of international trade flows. On the other hand, using a panel of UK manufacturing firms over the period 1993-2003, Greenaway et al. (2007) finds no evidence that that firms enjoying better ex-ante financial health are more likely to start exporting, and also strong evidence that participation in export markets improves firms financial health. Studies that support the idea that liquidity constraint is a determinant of firms' export status usually base their reasoning on the fact that exporting to foreign markets involves a fixed cost. This includes setting up distribution networks, acquiring information about the new market, etc. These costs are substantial and should mostly be paid up-front and, as a result, only firms that have access to enough liquidity to pay for the fixed cost are able to potentially enter the export market.

In this chapter, I use a model introduced in Chaney (2005) to derive testable hypotheses on the effect of ex-ante liquidity constraints on firms' export status and test those hypotheses, using data from a panel of Mexican manufacturing plants in the period 1986-1990. In Chaney (2005) when the exchange rate appreciates some of the firms, that could profitably export before but were held back because of not having enough liquidity to pay for the fixed cost, start exporting. This is because the value of domestic assets relative to the foreign market goes up. In other words, for firms with high enough productivity that do not export, an exchange rate appreciation could play the

role of having access to more liquidity. I use this line of reasoning to arrive at two testable hypotheses. I show that, controlling for firms' productivity level and given that firms were not exporters in the previous period, the effect of a larger appreciation of exchange rate (more negative change in the real exchange rate) should decrease the probability of being an exporter and this effect should not be smaller for the less liquidity-constrained group of firms.

To test the hypotheses above, I divide manufacturing firms in different four-digit industries into different groups in terms of how liquidity -constrained they are and estimate the average partial effect of an increase in the real exchange rate appreciation on the probability of non-exporter firms in different groups becoming exporters. Estimating average partial effects in the binary fixed effects setting is not trivial and, when possible, needs assumptions. To do this, I use the methodology introduced by Chamberlain (1980) and Mundlak (1978) that specifies a distribution for the fixed effect given the explanatory variables.

I find that an appreciation of the real exchange rate positively affects the probability of firms becoming exporters and this effect is larger for less liquidity constrained firms. The results are robust to different measures of productivity, liquidity constraint, and also to the number of liquidity constraint groups. Adding explanatory variables used in other studies, namely the ones in Greenaway et al. (2007), and taking into account sources of real exchange rate appreciation does not change the results.

The remainder of this chapter is organized as follows. Section 3.2 in-

troduces the theoretical framework and discusses the new implications that I derive from the model. Section 3.3 describes the data. Section 3.4 provides the empirical analysis. Is section 3.5 I do the robustness check, and in section 3.6, given the support I find for the model, I try to identify the least liquidity-constrained manufacturing industries in Mexico. Section 3.7 concludes.

3.2 Theoretical Framework

Appendix B.1 presents the model introduced in Chaney (2005) in detail. In this model it is the characteristics of the firms that shape their export status. The model adds a liquidity dimension to Melitz (2003) so that having a minimum level of productivity is not enough to start exporting and, given their productivity level, firms should also have access to a minimum level of liquidity to pay for the fixed cost of exporting.

The only factor of production is labor and there are two sectors; one produces a freely tradable homogeneous good and the other supplies a continuum of differentiated goods. The homogeneous good is used as the numeraire, its price is set equal to 1, and it is produced under CRS. The labor requirement for producing one unit of the homogeneous good at home is $\frac{1}{w}$ ($\frac{1}{w^*}$ abroad). Assuming that each country produces the homogeneous good, the wages will be w and w^*.

In order to start exporting, firms have to pay a fixed cost of C_f in terms of foreign labor, w^*C_f in terms of the numeraire. From one unit of a differentiated good shipped to the foreign market, only the fraction $1/\tau$ arrives

(the iceberg cost). In the domestic market, in order to start production, a firm must pay an entry cost of C_d in terms of domestic labor, wC_d in terms of the numeraire.

For a firm with productivity x, the cost of producing q_d units of good for the domestic market is

$$c_d(q_d) = q_d \frac{w}{x} + wC_d$$

and the cost of producing q_f units for the foreign market is

$$c_f(q_f) = q_f \frac{\tau w}{x} + w^* C_f$$

Given the profit functions, implicitly two productivity thresholds, $\overline{x}_d$ for survival in the domestic market, and $\overline{x}_f$ for profitable entry into the foreign market, can be defined through:

$$\Pi_d(\overline{x}_d) = 0 \text{ and } \Pi_f(\overline{x}_f) = 0$$

Before introducing any other constraint namely, the liquidity constraint here, any firm with a productivity above $\overline{x}_f$ would export as in Melitz (2003).

3.2.1 Liquidity constraints

A fundamental difference between this model and previous models is that all previous models assume there is a perfect financial market and therefore all firms with productivity above the threshold can export. However, for

different reasons, it seems like a false assumption, especially in under-developed financial markets.

In this model firms can only use their own existing liquidity to pay for the fixed entry costs into export markets. It is assumed that firms inherit an exogenous amount of liquidity which may be thought of as a trustworthiness capital that gives access to financial markets. Each firm is endowed with a random liquidity shock A. It is clearly a simplified view of liquidity constraints, however it serves two important features that can be seen in the real world; one is that liquidity constraints are more severe for exporting than for domestic activity. The other one is that there is heterogeneity among firms in terms of available liquidity and the level of constraint is not perfectly correlated with productivity.

As mentioned before, to be able to export, a firm needs to have enough liquidity to cover the entry cost. As the result, the liquidity constraint is:

$$\Pi_d(x) + wA \geq w^* C_f$$

One should notice that firms with higher productivity generate larger profits in the domestic market and therefore are less dependent on external finance. $\overline{x}(A)$ is defined as the productivity level below which firms with liquidity A cannot acquire enough liquidity to pay the fixed cost of exporting and it is given by the following equation:

$$\Pi_d(\overline{x}(A)) + wA = w^* C_f \tag{3.2.1}$$

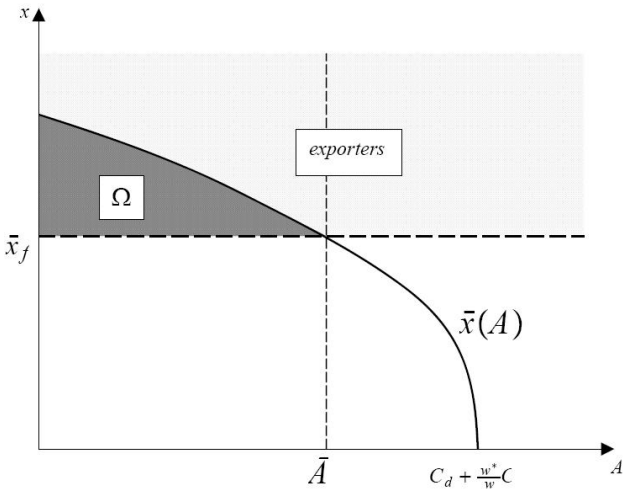

Figure 3.1: Liquidity Constrained exporters

Rearranging the profit functions and Eq. (1), one gets two thresholds for exporting:

$$\overline{x}_f = \Big(\frac{\tau w}{w^*}\Big)\Big(\frac{C_f}{C_d^*}\Big)^{(\frac{1}{\sigma-1})} g(C_d^*) \tag{3.2.2}$$

$$\overline{x}(A) = \Big(\frac{C_d + \frac{w^*}{w}C_f - A}{C_d}\Big)^{(\frac{1}{\sigma-1})} g(C_d) \tag{3.2.3}$$

in which $g(.)$ is defined for convenience:

$$g(\cdot) : \overline{x}^{\sigma-1} = \Big(\frac{\sigma}{\mu}\int_{x\geq\overline{x}} x^{\sigma-1} dF_x(x)\Big)C \Leftrightarrow \overline{x} = g(C) \tag{3.2.4}$$

Figure (3.1) shows how the two thresholds work out in hindering some firms from exporting. Firms identified by the set Ω are the ones that could potentially export but are liquidity-constrained i.e. $\overline{x}_f < x < \overline{x}(A)$.

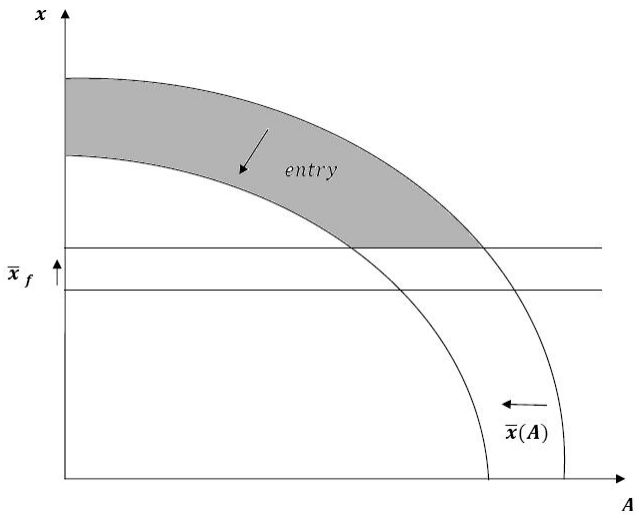

Figure 3.2: Some of the liquidity constrained firms start exporting following an exchange rate appreciation

Similar to Atkeson and Burstein (2007), an exchange rate shock is modeled as a shock to relative wages. An exchange rate appreciation is defined as an increase in the productivity of the domestic homogeneous sector. This will increase the domestic wage w. Therefore, given (2) and (3), when exchange rate appreciation happens $\overline{x}_f$ goes up and $\overline{x}(A)$ goes down (given that the fixed cost of operating in domestic and foreign market does not change). What it means is that some of the firms that were liquidity-constrained start exporting, but the status of productivity-constrained firms does not change. Figure (2) illustrates this change in export status.

3.2.2 Testable implications

The gray area of figure (3.2), that includes firms that were not exporters before and enter the export market after the real exchange rate appreciation, reveals an interesting observation.

Proposition 1 *If we fix the level of productivity (x) in the liquidity constrained area, a firm with larger A (less liquidity constraint) is equally or more likely to start exporting following the appreciation than a firm with smaller A (more liquidity constraint).*

Proof. See Appendix B.2.

Therefore, for a given level of productivity, if we compare different groups of non-exporter firms with different levels of liquidity-constraint (so that all firms in one group are either more or less constrained than the firms in another group), a larger appreciation of the exchange rate would have an equal or larger effect on the probability of a firm being an exporter in the group with lower level of liquidity-constraint.

If the model's predictions are correct, after controlling for the productivity level and given that the firms were not exporters in the previous period, the effect of a larger appreciation of exchange rate (more negative change in the real exchange rate) on the probability of being an exporter should have

two characteristics:[2]

- It should be negative. A larger appreciation means a more negative change of real exchange rate and since it should have a positive effect on the probability of being an exporter, the effect should be negative.
- In absolute values, this effect should not be smaller for the less liquidity-constrained group.[3]

3.3 Data

I use a panel survey conducted annually by Mexico's Instituto Nacional de Estadisticas Geografia e Informacion (INEGI), the statistical branch of Mexican government. The dataset covers the period 1984-1990 and includes data for 3216 firms. Because the export data is missing for 1984 and 1985, the analysis will examine the period 1986-1990.[4]

Table (3.2) reports summary statistics.[5] Consistent with the findings in the literature, exporters are larger in terms of employment and total sales and

[2]Since Chaney (2005) focuses on appreciation of exchange rate, I do the same here. However, both the theoretical and empirical analysis of a depreciation is discussed in Appendix D.

[3]As mentioned before, an implicit assumption is that the fixed cost of operation did not change during the period of study. Although Mexico went through trade reforms in 80's but it involved reducing different kinds of import tariffs and there is no reason to believe that C_d and C_f changed for Mexican firms.

[4]Recently, there have been studies working with the panel data that covers until 2001. However, for using that dataset one has to go to the INEGI offices in Aguascalientes and work over there.

[5]Verhoogen (2008) provides statistics for these plus some other variables for the 1993-2001 panel

pay higher wages (Bernard and Jensen (1999) made the same observation in U.S. data). Also, exporters have higher share of foreign ownership and benefit from more assets.

There are a number of advantages to using data from Mexico. More than 80 percent of the Mexican exports go to the U.S, therefore using variations in a single exchange rate (between Mexico and U.S.) seems to be an almost perfect proxy for variations in the exchange rate values that could potentially affect firms in the home country in Chaney's model.

The monthly real exchange rate data comes from the Data and Statistics division of the IMF. I have taken the average value of the exchange rate over the months of a year to calculate the annual exchange rate.

3.4 Empirical analysis

In this section I explain the methodology used to estimate the effect of change in the real exchange rate appreciation on the probability of being an exporter for different groups of firms and verify that the two implications of the model hold. For each group of firms, I am interested in estimating the average value of:

$$\frac{\partial Pr(EX_{i,k,t} = 1 | EX_{i,k,t-1} = 0)}{\partial \Delta e_{t-1}} \tag{3.4.1}$$

in which i represents a firm and EX is a binary variable indicating the export status of a firm. The reason for why I am using $\Delta e_{t-1} = e_{t-1} - e_{t-2}$

and not Δe_t will be explained along with the rationale behind other variables used in the empirical model later.

I use a probit function to model the probability of being an exporter.[6] To form the probability function, I exactly follow Chaney's theory; the probability of being an exporter is a function of previous TFP, liquidity constraint, and the changes in the exchange rate:

$$Pr(EX_{i,k,t} = 1) = \Phi(\beta_1 TFP_{i,t-1} + \beta_2 d_{il,t-1} + \beta_s d_{is,t-1}\Delta e_{t-1} + \beta_l d_{il,t-1}\Delta e_{t-1} + c_i + industry\ dummies + \beta_t Year_t) \quad (4.2)$$

where the subscript i indicates firms, k the industries, and t the time. $TFP_{i,t-1}$ denotes the firm's productivity in the previous period and is estimated using the Levinshon-Petrin (2003) method.[7] In the theoretical model, the minimum level of liquidity required for start exporting is a function of the firm's productivity, as a result I control for TFP in the empirical model.

d_l is a dummy variable equal to 1 if the firm is large. Large firms are the ones that are less liquidity constrained than the small ones. The large-small terminology comes from the measure used in Gertler and Gilchrist (1994) in which they argued less assets means a higher level of liquidity-constraint. Since, during this study I make comparisons with Greenaway et al. (2007), I

[6] A linear probability model does not work very well here since in my dataset most of the firms always or never export throughout the period, and this kind of model is problematic in the proximity of 0 and 1.

[7] In Appendix C I explain the methodology and production function coefficients.

am going to use the same measure they used for the level of liquidity-constraint, with the liquidity ratio defined as $\frac{assets-debt}{assets}$. Being large or small here is determined using the median level of liquidity ratio (LR) in each industry. In each four-digit industry, a firm is categorized as large if its liquidity ratio is larger than that of the median firm. This takes into account the differences in the level of liquidity required for working in different industries.

The reason why I use d_l instead of the actual level of liquidity ratio, as the second term of the probability function, is that the coefficient estimate of LR does not provide any useful information. It just says how much the value of the term inside Φ changes if LR increases by one. However, since the range of LR values varies a lot among different industries, a fixed increase in the value of LR might have very different results in different sectors. On the other hand going, from small to large has a very clear meaning, since large/small is defined in each four-digit industry.[8] Similarly, d_s is the dummy to indicate if the firm is small.

The change in exchange rate and the measure of liquidity constraint are interacted since I want to compare the effect of change in exchange rate in different groups and at this stage we are not interested in the aggregate effect of Δe_{t-1}. [9] In the model above, c_i is the firm fixed effect and $Year_t$ is the time dummy.

[8] section 5.1.3 provides a sensitivity analysis for using LR instead of d_l.

[9] An alternative way is to estimate the aggregate effect of Δe_{t-1} and estimate the average effects for different groups separately.

The rationale behind using lagged time-varying regressors has been explained in detail in the literature (Roberts and Tybout 1997; Bernard and Jensen; 1999, 2004) and it involves the timing of paying for the fixed cost and starting to export. A firm can start exporting after paying the fixed cost. If a firm is exporting in this period, it means that it has already paid the entrance cost (it could have happened at the beginning of this period or the end of last period). Firms can pay this fixed cost either through the profit gained in the domestic market, that is a function of productivity, or the available liquidity. That is why the productivity and liquidity-constraint levels show up in the model as lagged variables.[10]

The Lagrangian multiplier test rejects the Random Effects specification for model (6). Therefore, there should be a relationship between the fixed effects and explanatory variables. It is intuitive since it can easily be thought that the productivity of the firm or level of access to financial resources is likely correlated with managerial abilities or firm's location.

Estimating average partial effects (APE) in the binary fixed effects setting is not trivial and, when possible, needs further assumptions. In order to obtain consistent partial effects we need a consistent estimator of c_i and getting that is not achievable under all circumstances. An established method for estimating the APE in the case of probit fixed effects specification is Cham-

[10]Although the timing of the model is consistent with using lagged regressors but the results are robust to using contemporaneous variables. Robustness analysis will be provided later in the chapter.

berlain (1980)-Mundlak (1978). A restrictive feature of this method is that we can only estimate the effects of time-varying elements of explanatory variable. If the model contains a time-constant explanatory variable (industry dummies here) its effect cannot be distinguished from c_i.

This method can be performed under different sets of assumptions. The most general set of assumptions are:

$$Pr(EX_{ik,t} = 1|x_i, c_i) = Pr(EX_{ik,t} = 1|x_{it}, c_i) = \Phi(x_{it}\beta + c_i) \tag{3.4.3}$$

$$c_i|x_i \sim Normal(\psi + \overline{x_i}\xi, \sigma_a^2) \tag{3.4.4}$$

x_i contains x_{it} for all t. Assumption (3.5.3) requires x_{it} to be strictly exogenous conditional on c_i i.e. once c_i is conditioned on, only x_{it} appears in the response probability at time t. Keeping in mind that the goal is to test Chaney's model, this assumption makes sense since the model actually claims that whether a firm is exporter or not is explained by the variables we have included as the regressors in (9).

$\overline{x_i}$ in assumption (3.5.4) is the average of x_{it} over time, $t = 1, ..., T$ and σ_a^2 is the variance of a_i in (9):

$$c_i = \psi + +\overline{x_i}\xi + a_i \tag{3.4.5}$$

While assumption (8) is restrictive in that it specifies a distribution

for c_i given x_i, it allows for some dependence between c_i and x_i.[10] Under assumptions (7) and (8), one can estimate scaled versions of ψ, β, and ξ. Under these assumptions we have:

$$Pr(EX_{ik,t} = 1|x_i) = \Phi[(\psi + x_{it}\beta + \overline{x_i}\xi).(1 + \sigma_a^2)^{-0.5}] \equiv \Phi(\psi_a + x_{it}\beta_a + \overline{x_i}\xi_a) \tag{3.4.6}$$

Here the subscript "a" means that a parameter has been multiplied by $(1 + \sigma_a^2)^{-0.5}$. in (13), ψ_a, β_a, and ξ_a can be consistently estimated using a pooled probit regression of $EX_{ik,t}$ on 1, x_{it}, and $\overline{x_i}$, $t = 1, ..., T$, $i = 1, ..., N$. Table (3.3) summarizes some of the scaled coefficient estimates. The standard errors are robust and clustered at the firm level. The coefficients for both $d_{s,t-1}\Delta e_{t-1}$ and $d_{l,t-1}\Delta e_{t-1}$ are statistically significant.

Given the estimations above, in the next step, I estimate $\Phi(\hat{\psi}_a + x_{it}\hat{\beta}_a + \overline{x_i}\hat{\xi_a})$ for each observation. Having those, makes it possible to estimate the partial effect of the explanatory variables for each observation:

$$\frac{\partial\Phi(\hat{\psi}_a + x_{it}\hat{\beta}_a + \overline{x_i}\hat{\xi_a})}{\partial x_{itj}} \tag{3.4.7}$$

Chamberlain-Mundlak prove that the APE of the explanatory variable x_{itj} can be consistently estimated using the expression below:

[10] Another option is to use a fixed effect logit model that allows to estimate β's without any assumption about how c_i is related to x_i. However, in that case one cannot estimate the partial effects unless a value for c is plugged in. Since the distribution of c_i is unrestricted, it is difficult to know what to plug in for c.

$$\frac{1}{\Sigma_{i=1}^{N} T_i} \Sigma_{i=1}^{N} \Sigma_{t=1}^{T_i} \hat{\beta_{aj}} \phi(\hat{\psi_a} + x_{it}\hat{\beta}_a + \overline{x_i}\hat{\xi_a}) \tag{3.4.8}$$

in which T_i represents the number of observations for agent i. Notice that what I am interested to estimate at the end is the APE of $d_{s,t-1}\Delta e_{t-1}$ and $d_{l,t-1}\Delta e_{t-1}$ conditional on that the firms have not been exporters in the previous period. In the next step, I drop the observations in which a firm has been an exporter in the previous period and take the average (12) for the remaining observations. Given that this average has a negative value, its absolute value tells us by how much the probability of becoming an exporter goes up in each group if the change in real exchange rate Δe_{t-1} increases by one unit.

3.4.1 Results

Based on 7231 observations, the APE of $d_{s,t-1}\Delta e_{t-1}$ is -0.0047, the APE of $d_{l,t-1}\Delta e_{t-1}$ is -0.0082, and both are significant at the one-percent level. The hypothesis that the two averages are equal is strongly rejected. These estimates satisfy the two implications of the model. They are both negative and, in absolute values, the effect is larger for the less liquidity-constrained group. On the economic significance of these estimates, it should be noticed that from January 1987 to December 1990 Mexico faced a 6 unit appreciation of real exchange rate. What it means is that, on average, the probability of less liquidity-constrained firms becoming exporters changed by about 5 percent, all else fixed.

3.5 Robustness Check

In this section I test the robustness of my results to various specifications. One important extension of the model is to increase the number of groups and investigate if the same pattern is observed. The other robustness check is to check the results using a different measure of productivity. Although the TFP obtained from Levinshon-Petrin (2003) method is a better measure of productivity, in the literature the ratio of sales per worker has also been used. I use sales per hour of working and check if, and how, the results change. I also check the sensitivity of the results to the use of the actual value of liquidity constraint instead of the dummy variable as a control variable. I will also look for the causes of real exchange rate appreciation in Mexico and try to control for the endogeneity of that. The last robustness check uses the contemporaneous explanatory variables instead of the lagged ones.

3.5.1 Increasing the number of groups

To do this, I divide the firms in each four-digit industry into three groups: small, medium, and large (one third of firms in each) and follow the same steps as before and estimate the APE of $d_{s,t-1}\Delta e_{t-1}$, $d_{m,t-1}\Delta e_{t-1}$, and $d_{l,t-1}\Delta e_{t-1}$, given that the firms were not exporters in the previous period. The APE of $d_{s,t-1}\Delta e_{t-1}$ is -0.0073, the APE of $d_{m,t-1}\Delta e_{t-1}$ is -0.0075, and the APE of $d_{l,t-1}\Delta e_{t-1}$ is -0.0081. All estimates are significant at the one-percent level and I can strongly reject that the APE's are equal. Similar to the previous estimation, these variables are negative and in absolute values,

the effect is larger for the less liquidity-constrained group. I attribute the smaller difference between the APE's here to the fact that we have increased the number of groups and the fact that the firms in neighboring groups are more similar to each other.

3.5.2 Alternative measure of productivity

Using sales per hour of working as the measure of productivity and following the same procedure results in the value of -0.0062 for the APE of $d_{s,t-1}\Delta e_{t-1}$, and -0.0092 for the APE of $d_{l,t-1}\Delta e_{t-1}$.[11] Although, in absolute values, the estimates have increased, they follow the patterns predicted by the model.

3.5.3 Liquidity Ratio instead of group dummy

Here I use the actual level of Liquidity Ratio instead of the group dummy as a control in the empirical model. It is to estimate the following probit model:

$$\begin{aligned} Pr(EX_{ik,t}=1) &= \Phi(\beta_1 TFP_{i,t-1} + \beta_2 LR_{i,t-1} + \beta_s d_{is,t-1}\Delta e_{t-1} + \beta_{il} d_{l,t-1}\Delta e_{t-1} \\ &+ c_i + industry\ dummies + \beta_t Year_t) \end{aligned} \tag{3.5.1}$$

The APE of $d_{s,t-1}\Delta e_{t-1}$ is -0.0055 and The APE of $d_{l,t-1}\Delta e_{t-1}$ is -0.0070. Both are statistically significant at one-percent level.

[11] Throughout this study, I can strongly reject the hypothesis that the APE's are equal and I do not repeat this finding any more.

3.5.4 Including other explanatory variables

In addition to the lagged TFP and LR, Greenaway et al. (2007) uses three other variables as explanatory variables to estimate the probability of British firms becoming exporters. They are lagged average wage, a dummy variable indicating whether foreigners are among the owners or not, and another dummy variable indicating whether a firm has subsidiaries. To make this study more comparable to theirs, I use two of those three variables here (I don't have access to subsidiaries data) and see if that affects the results.

The estimate for the APE of $d_{s,t-1}\Delta e_{t-1}$ is -0.0037 and for the APE of $d_{l,t-1}\Delta e_{t-1}$ is -0.0064. Being foreign-owned has a large positive effect in the first stage of the estimation.

3.5.5 The endogeneity of exchange rate appreciation

In late 1987 Mexico entered a phase of real exchange rate appreciation that continued until 1995. It is important to know the cause(s) behind this since it might independently affect the export status of firms and therefore bias make my estimates.

Dabos and Juan-Ramon (2000) specifically studies the causes of exchange rate fluctuation in Mexico in the period of 1982-1994 and shows that there is a long-run relationship between the real exchange rate and terms of trade. To analyze the effect of changes in terms-of-trade I would need the price index for Mexican exports and imports, that I cannot construct from the available dataset. Instead, I use $\frac{CPI(US)}{CPI(Mexico)}$ as a proxy for terms-of-trade

and add it to the explanatory variables of (9). Doing this will result in an estimate of -0.0028 for the APE of $d_{s,t-1}\Delta e_{t-1}$ and an estimate of -0.0113 for the APE of $d_{l,t-1}\Delta e_{t-1}$. The estimates are consistent with the implications of the model.

3.5.6 Using contemporaneous variables

My results are also robust to using contemporaneous variables instead of the lagged ones. The APE of $d_{s,t-1}\Delta e_{t-1}$ in this case is -0.011 and The APE of $d_{l,t-1}\Delta e_{t-1}$ is -0.013, both statistically significant at one percent level.

3.6 An identification experiment

In the last section of this chapter, based on the support I found for Chaney (2005), I try to identify the manufacturing sectors in Mexico with non-exporters distributed denser behind the minimum level of liquidity required for exporting. Governments across the globe design programs to help firms enter into the export market. Knowing which sectors are more ready to use liquidity in order to start exporting could help governments design more effective policies.

The analysis in the previous part suggests that, if we control for the level of productivity and liquidity in the previous period, sectors with a higher percentage of non-exporting firms close to the $\overline{x}(A)$ border should respond more to an exchange rate appreciation. To identify these sectors, I use the following probit function the probability of a foim to be an exporter:

$$
\begin{aligned}
Pr(EX_{ik,t}=1) &= \Phi(\beta_1 TFP_{i,t-1} + \beta_2 d_{il,t-1} + \Sigma_{m=1}^{9}\beta_m \Delta e_{t-1} d_{im} + c_i \\
&+ industry\ dummies + \beta_t Year_t) \qquad (3.6.1)
\end{aligned}
$$

in which m represents the nine manufacturing sectors and d_{im} is a dummy equal to 1 if firm i belongs to sector m. In the next step, I calculate the average value of the following expression for each sector:

$$
\frac{\partial Pr(EX_{ik,t}=1|EX_{ik,t-1}=0)}{\partial \Delta e_{t-1}} \qquad (3.6.2)
$$

Next, I follow the same steps used before to estimate the APE of exchange rate appreciation on the probability of firms becoming exporters. The following table summarizes the results.

The estimates imply that the chemical industry and paper and paper products, are the sectors in Mexico with non-exporters distributed denser behind the minimum level of liquidity required for exporting. Metal products, non-metallic products, and woods products come after. Also it can be concluded that textile industry and other manufactures sectors are the ones with the least density of firms behind $\overline{x}(A)$.

3.7 Conclusion

This chapter provides evidence in support of the hypothesis that less liquidity-constrained firms are more likely to start exporting, all else being

Manufacturing sector	APE
Paper and paper products	-0.0073
	(0.000009)
Metal products	-0.0108
	(0.000014)
Wood products	-0.0030
	(0.000004)
Non-metallic minerals	-0.0061
	(0.000008)
Chemical industry	-0.0104
	(0.000013)
Food products	-0.0032
	(0.000004)
Iron and Steel	-0.0112
	(0.000015)

Table 3.1: The Average Partial Effect of Exchange Rate Appreciation in Different Manufacturing Sectors

equal. I do this by deriving two testable implications of the model introduced in Chaney (2005) and testing them using a panel of Mexican manufacturing firms in the period of 1986-1990.

I show that, for a fixed level of productivity and given that firms were not exporters in the previous period, a larger appreciation of the exchange rate has a positive effect on the probability of a firm being an exporter and this effect is larger in a group of firms with lower level of liquidity-constraint. This result is robust to the number of groups, the measure of productivity. The results are also robust to the inclusion of explanatory variables used in other empirical papers that have studied the same question namely; foreign-

ownership and wages paid by the firm. Using contemporaneous explanatory variables instead of lagged ones and controlling for terms of trade as a cause of change in real exchange rate appreciation does not affect the results.

Based on these results, I also try to identify the manufacturing sectors in Mexico with non-exporters distributed denser behind the minimum level of liquidity required for exporting. This could potentially help governments to design more effective policies and target financial help towards sectors with more potential to develop exporters.

In practice, firms in different industries face different exchange rate. As a next step, I could use industry-specific exchange rates instead of an aggregate one and see if I get the same results.

Table 3.2: Firms' Characteristics in INEGI

	Non-exporters	Exporters	All firms
Total sales*	18125.5	67115.1	22343.1
Employment	221.9	551.2	293.2
Blue-collar wage*	4.4	6.2	4.9
White-collar wage*	9.3	14.6	10.8
Foreign ownership (Percentage)	14.2	32.0	19.3
Assets*	10346.3	45482.9	20330.3

* Thousands of Pesos

Table 3.3: The scaled coefficients of the probit model using Chamberlain-Mundlak method

Productivity	0.00002***
	(0.0002)
Lare liquidity dummy	-0.17282***
	(0.0.0526)
Small liquidity dummy * change in RER	-0.00744*
	(0.0049)
Large liquidity dummy * change in RER	-0.0321***
	(0.0063)
constant	0.0037
	(0.2639)

Notes: * Significance at the 90 percent confidence level. ** Significance at the 95 percent confidence level. *** Significance at the 99 percent confidence level.

Table 3.4: APE of $d_{s,t-1}\Delta e_{t-1}$ and $d_{l,t-1}\Delta e_{t-1}$ in Different Specifications

	APE of $d_{s,t-1}\Delta e_{t-1}$	APE of $d_{l,t-1}\Delta e_{t-1}$
Model specification		
Original model	-0.005***	-0.008***
	(0.00002)	(0.00004)
Alternative measure of productivity	-0.006***	-0.009***
	(0.00001)	(0.00002)
Liquidity Ratio instead of group dummy	-0.005***	-0.007***
	(0.00005)	(0.00006)
Including other explanatory variables	-0.004***	-0.006***
	(0.00002)	(0.00004)
Terms of trade shocks	-0.003***	-0.011***
	(0.00003)	(0.00006)
Using contemporaneous variables	-0.011***	-0.013***
	(0.00001)	(0.00002)

Notes: * Significance at the 90 percent confidence level. ** Significance at the 95 percent confidence level. *** Significance at the 99 percent confidence level.

Appendices

Appendix A

A.1 Household Decision Making Model

The household solves the following static maximization problem:

$$\begin{aligned}
&\max_{c^w,l^w,c^h,l^h,H_g,H_b,E} \lambda U^w(c^w, l^w, H_g, H_b; \mu, \Theta) + (1-\lambda)U^h(c^h, l^h, H_g, H_b; \mu, \Theta) \\
&\text{s.t.} \quad c^w + c^h + w^w l^w + w^h l^h + H_g + H_b = w^w + w^h + y^w + y^h \\
&\lambda = \lambda(z, y^w, y^h, w^w, w^h; \mu, \Theta)
\end{aligned} \tag{A.1.1}$$

In which, superscripts w and h represent wife and husband respectively. c is the private good, l represents the fraction of time spent on leisure and H is a public good. Here, H_g and H_b represent investment in girls and boys (e.g. amount spent on their health), accordingly. w^w and w^h are the wage rates in the labor market. Extrahousehold environmental parameters have been denoted by z. The vectors μ and Θ represent, respectively, observed and unobserved heterogeneity in individual and household characteristics and preferences that affect utilities.

λ is the weight assigned to wife's utility in the household. In this paper I focus on demand for older female labor, which affects both their employabil-

ity ($\overline{E}^w$ from now on) and wage rate, as an environmental variable affecting married women's bargaining power.

The solution to the household problem can be thought of as a two stage process. In the first stage, parents agree on public expenditures, as well as on the distribution of the residual non labor income between them. At stage two, each parent chooses his/her level of consumption and labor supply, conditional on the level of public expenditures and budget constraint resulting from the decision made at stage one.

Let c^{i*} and l^{i*}, $i = w, h$, be the solution to (7), and define ρ^i as

$$\begin{aligned} \rho^i(w^w, w^h, y^w, y^h, \overline{E}^w; \mu, \Theta) &= c^{i*}(w^w, w^h, y^w, y^h, \overline{E}^w; \mu, \Theta) \\ &+ w^i l^{i*}(w^w, w^h, y^w, y^h, \overline{E}^w; \mu, \Theta) - w^i \end{aligned}$$

In words, ρ^i is the fraction of residual non labor income allocated to member i to spend on private consumption and leisure after purchasing the public goods. Therefore,

$$\rho^w + \rho^h = y^w + y^h - H_g^*(w^w, w^h, y^w, y^h, \overline{E}^w; \mu, \Theta) - H_b^*(w^w, w^h, y^w, y^h, \overline{E}^w; \mu, \Theta)$$

Assuming that $V^i(w^i, \rho^i, H_g, H_b)$ is the attained level of utility of individual i when the level of the public goods are fixed at H_g and H_b, then in the first stage of households problem (7) the family chooses the level of H_g and H_b, and ρ^i:

$$\max_{\rho^w,\rho^h,H_g,H_b} \lambda V^w(w^w,\rho^w,H_g,H_b;\mu,\Theta)+(1-\lambda)V^h(w^h,\rho^h,H_g,H_b;\mu,\Theta)$$
$$\text{s.t.} \quad \rho^w+\rho^h+H_g+H_b=y^w+y^h$$
$$\lambda=\lambda(\overline{E}^w,y^w,y^h,w^w,w^h;\mu,\Theta) \tag{A.1.2}$$

Assuming an interior solution, the first order conditions result in

$$\lambda\frac{\partial V^w}{\rho^w}=(1-\lambda)\frac{\partial V^h}{\partial\rho^h}=\lambda\frac{\partial V^w}{\partial H_g}+(1-\lambda)\frac{\partial V^h}{\partial H_g}=\lambda\frac{\partial V^w}{\partial H_b}+(1-\lambda)\frac{\partial V^h}{\partial H_b}$$

and therefore,

$$\begin{aligned}\frac{\partial V^w/\partial H_g}{\partial V^w/\partial\rho^w}+\frac{\partial V^h/\partial H_g}{\partial V^h/\partial\rho^h}&=1\\ \frac{\partial V^w/\partial H_b}{\partial V^w/\partial\rho^w}+\frac{\partial V^h/\partial H_b}{\partial V^h/\partial\rho^h}&=1\end{aligned} \tag{A.1.3}$$

$\frac{\partial V^i/\partial H}{\partial V^i/\partial\rho^i}$ is marginal willingness to pay of partner i for the public good and condition (9) states that the individuals'marginal willingness to pay must add up to the price of the public good. Using these conditions, Blundell, Chiappori, and Meghir (2005) show that H is increasing in λ if and only if

$$\frac{\partial V^w/\partial H}{\partial V^w/\partial\rho^w}>\frac{\partial V^h/\partial H}{\partial V^h/\partial\rho^h} \tag{A.1.4}$$

Which means that expenditure on the public good is increasing in λ if and only if the wife's marginal willingness to pay for H is bigger than that of husband. Blundell, Chiappori, and Meghir (2005) proves this result for one public good, but the proof can be easily generalized to as many public goods as desired.

Appendix B

B.1 Chaney (2005)

Model consists of two countries, home and foreign. The only factor of production is labor and there are two sectors; one produces a freely tradable homogeneous good and the other supplies a continuum of differentiated goods. The homogeneous good is used as the numeraire, its price is set equal to 1, and it is produced under CRS. The labor requirement for producing one unit of the homogeneous good at home is $\frac{1}{w}$ ($\frac{1}{w^*}$ abroad). Assuming that each country produces the homogeneous good, the wages will be w and w^*. As in Melitz model, each firm is a monopolist for the variety it produces.

B.1.1 Demand

The only consumers are the workers and each is endowed with one unit of labor. The agent's utility is defined by U:

$$U \equiv q_0^{1-\mu}\Big(\int_{x\in X} q(x)^{(\frac{\sigma-1}{\sigma})}dx\Big)^{\frac{\sigma}{\sigma-1}\mu} \tag{B.1.1}$$

with $\sigma > 1$. σ is the elasticity of substitution between two varieties of the differentiated good. In (16) q_0 represents units of the homogeneous good, $q(x)$ units of variety x of the differentiated good, and X the set of the

differentiated goods that is determined in equilibrium.

The following price index is defined for differentiated goods:

$$P = \Big(\int_{x \in X} p(x)^{1-\sigma} dx \Big)^{\frac{1}{1-\sigma}} \tag{B.1.2}$$

The representative agent spends $r(x)$ on each variety x:

$$r(x) = \mu w L \Big(\frac{p(x)}{P} \Big)^{1-\sigma} \tag{B.1.3}$$

$\mu w L$ is what spent on differentiated goods.

B.1.2 Production and Trade

In order to start exporting, firms have to pay a fixed cost of C_f in terms of foreign labor, $w^* C_f$ in terms of the numeraire. From one unit of a differentiated good shipped to the foreign market, only the fraction $1/\tau$ arrives. In the domestic market, in order to start production, a firm must pay an entry cost of C_d in terms of domestic labor, wC_d in terms of the numeraire.

For a firm with productivity x, the cost of producing q_d units of good for the domestic market is

$$c_d(q_d) = q_d \frac{w}{x} + wC_d$$

and the cost of producing q_f units for the foreign market is

$$c_f(q_f) = q_f \frac{\tau w}{x} + w^* C_f$$

The optimal prices of the goods at home and abroad would be given by

$$p_d(x) = \frac{\sigma}{\sigma - 1}\frac{w}{x}, p_f(x) = \frac{\sigma}{\sigma - 1}\frac{\tau w}{x}$$

A firm with productivity x potentially generates profits $\Pi_d(x)$ in the domestic market, and $\Pi_f(x)$ in the foreign market:

$$\Pi_d(x) = \frac{r_d(x)}{\sigma} - wC_d = \frac{\mu}{\sigma}wL\Big(\frac{\sigma}{\sigma - 1}\frac{w}{xP}\Big)^{1-\sigma} - wC_d$$

$$\Pi_f(x) = \frac{r_f(x)}{\sigma} - w^*C_f = \frac{\mu}{\sigma}w^*L^*\Big(\frac{\sigma}{\sigma - 1}\frac{\tau w}{xP^*}\Big)^{1-\sigma} - w^*C_f$$

Given the profit functions, implicitly two productivity thresholds, $\overline{x}_d$ for survival in the domestic market, and $\overline{x}_f$ for profitable entry into the foreign market, can be defined through:

$$\Pi_d(\overline{x}_d) = 0 \text{ and } \Pi_f(\overline{x}_f) = 0$$

Before introducing any other constraint (namely, the liquidity constraint here), any firm with a productivity above $\overline{x}_f$ would export.

B.1.3 Liquidity constraints

Firms can only use their own existing liquidity to pay for the fixed entry costs into the export markets. It is assumed that firms inherit an exogenous amount of liquidity which may be thought of as a trustworthiness capital that gives access to financial markets. In the model each firm is endowed with a random liquidity shock A. (A, x) are drawn from a joint distribution with c.d.f. $F(A, x)$.

As mentioned before, to be able to export, a firm must have enough liquidity to cover the entry cost. Therefore, the liquidity constraint is:

$$\Pi_d(x) + wA \geq w^* C_f$$

$\overline{x}(A)$ is defined as the productivity level below which firms with liquidity A cannot acquire enough liquidity to pay the fixed cost of exporting and it is given by the following equation:

$$\Pi_d(\overline{x}(A)) + wA = w^* C_f \tag{B.1.4}$$

B.1.4 Open economy equilibrium

In this model price indices only depend on prices set by local firms and therefore the new price index is given by the following:

$$P \approx \Big(\int_{x \geq \overline{x}_d} p_d(x)^{1-\sigma} L dF_x(x) \Big)^{\frac{1}{1-\sigma}}$$

For the convenience of analysis $g(.)$ is defined as:

$$g(\cdot) : \overline{x}^{\sigma-1} = \Big(\frac{\sigma}{\mu} \int_{x \geq \overline{x}} x^{\sigma-1} dF_x(x) \Big) C \Leftrightarrow \overline{x} = g(C) \tag{B.1.5}$$

Rearranging the profit functions and Eq. (19), we have,

$$\overline{x}_f = \Big(\frac{\tau w}{w^*} \Big) \Big(\frac{C_f}{C_d^*} \Big)^{(\frac{1}{\sigma-1})} g(C_d^*) \tag{B.1.6}$$

$$\overline{x}(A) = \Big(\frac{C_d + \frac{w^*}{w} C_f - A}{C_d} \Big)^{(\frac{1}{\sigma-1})} g(C_d) \tag{B.1.7}$$

B.2 Proof of proposition 1

Proposition 1 (reminded) *If we fix the level of productivity (x) in the liquidity constrained area, then a firm with larger A (less liquidity constraint) is equally or more likely to start exporting following the appreciation than a firm with smaller A (more liquidity constraint).*

Proof. Suppose that subscript b points to the value of a variable before appreciation and subscript a indicates the value after appreciation.

From section 2.4 we know that following an appreciation we have $\overline{x}_{fa} > \overline{x}_{fb}$. From the set Ω (the liquidity-constrained firms) those with productivity levels $x < \overline{x}_{fa}$ clearly cannot export because they do not pass the productivity threshold and therefore the probability of them become exporter is zero.

In Ω, set a productivity level $x > \overline{x}_{fa}$. What I want to show is:

$$Pr(x > \overline{x}_a(A_1)) \geq Pr(x > \overline{x}_a(A_2))$$

Given that $A_1 > A_2$, $(x, A_1) \in \Omega$, and $(x, A_2) \in \Omega$

This is equivalent to proving that:

$$1 - F(\overline{x}_a(A_1)) \geq 1 - F(\overline{x}_a(A_2))$$

in which $F(.)$ is the c.d.f. of variable x. Alternatively, I can show that:

$$F(\overline{x}_a(A_1)) \leq F(\overline{x}_a(A_2))$$

However, if we write down the expression for $x_a(A)$ from (7) we have:

$$\overline{x}_a(A) = \Big(\frac{C_d + \frac{w_a^*}{w_a} C_f - A}{C_d}\Big)^{(\frac{1}{\sigma - 1})} g(C_d)$$

This expression is clearly non-increasing in A, and the proposition has been proved. ■

B.3 Productivity estimation

The important obstacle in estimating productivity is that input levels are correlated with unobserved productivity shocks. This phenomenon makes the OLS estimation biased. The Levinsohn-Petrin method emerged as a substitute for Olley-Pakes method in which investment is used as a proxy for unobservable shocks. Levinsohn-Petrin show that investment is very lumpy and does not respond smoothly to the productivity shocks. Instead they discuss the conditions under which using the intermediate variables can solve the simultaneity problem. This avoids truncating all of the zero investment firms, which is very usual when working with datasets from developing countries.

To use the Levinsohn-Petrin method, I have assumed a production function of the Cobb-Douglas form:

$$y_t = \beta_0 + \beta_l l_t + \beta_k k_t + \beta_m m_t + \epsilon_t \tag{B.3.1}$$

in which y_t is the logarithm of firm's output and most of the times it is measured by gross revenue or value added of the firm. In my estimation, I have used the logarithm of total product sales. k_t is the logarithm of capital

for which I have used the logarithm of machinery and equipment value. m_t is the logarithm of the intermediate variable. This paper uses the electricity purchased by the firm as the intermediate input. l_t is the logarithm of the labor input which is measured by the total hours worked in my paper.

In STATA the estimation looks like this:

levpet dependent-var free(labor var) proxy(intermediate var) capital(capital var) revenue justid grid

predict TFP, omega

The word "revenue" indicates that the dependent variable is a revenue variable and not a value-added one. Table below summarizes the coefficients and their standard errors:

	Coefficient	Standard error
Labor	0.2237	0.001
Capital	.21	0.019
Intermediate input	0.44	.0242975

Table B.1: Production function estimation using Levinsohn-Petrin method

B.4 Theoretical and empirical analysis of RER depreciation

When depreciation happens $\overline{x}(A)$ goes up and $\overline{x}_f$ goes down. It means that some of the firms that where productivity-constrained start exporting, but the status of liquidity-constrained firms does not change. For a given level of liquidity-constraint, if we compare different groups of firms with different

levels of productivity, a larger depreciation of the exchange rate would have an equal or larger effect on the probability of a firm being an exporter in the group with higher level of productivity given that it has not been an exporter in the previous period.

If the model's predictions are correct, then after controlling for the level of liquidity constraint and given that the firms were not exporters in the previous period, the effect of a larger depreciation of exchange rate on the probability of being an exporter should have two characteristics:

- It needs to be positive.
- It should not be larger for the lower-productivity group.

The empirical model in this case is:

$$\begin{aligned} Pr(EX_{ik,t} = 1) &= \Phi(\beta_1 LR_{i,t-1} + d_{il,t-1} + \beta_s d_{is,t-1}\Delta e_{t-1} + \beta_l d_{l,t-1}\Delta e_{t-1} \\ &+ c_i + industry\ dummies + \beta_t Year_t) \end{aligned} \tag{B.4.1}$$

d_{il} is a dummy variable equal to 1 if the firm is large and 0 otherwise. A large firm is defined as the one with a TFP larger than the median TFP in its own four-digit industry. I follow the same steps as in section 3.5 to obtain the coefficient of interest. The coefficients for both $d_{s,t-1}\Delta e_{t-1}$ and $d_{l,t-1}\Delta e_{t-1}$ are significant. Based on 11955 observations, the APE of $d_{s,t-1}\Delta e_{t-1}$ is 0.0141 and the APE of $d_{l,t-1}\Delta e_{t-1}$ is .0151089. These estimated satisfy the predictions of the model.

Bibliography

[1] Aguayo-Tellez, E., Airola, J., Juhn, C., 2010. Did Trade Liberalization Help Women? The Case of Mexico in the 1990s. NBER Working Paper No. 16195.

[2] Aizer, A., 2010. The Gender Wage Gap and Domestic Violence. American Economic Review, 100(4), 1847-59.

[3] Anderson, K., King, E., 2002. Market returns, transfers and demand for schooling in Malaysia. Journal of Development Studies, 39(3), 1-28.

[4] Atkeson, A., Burstein, A., 2007. Pricing to Market in a Ricardian Model of International Trade. American Economic Review, Papers and Proceedings.

[5] Atkin, D., 2010. Endogenous Skill Acquisition and Export Manufacturing in Mexico. Working Paper, Yale University.

[6] Atkin, D., 2009. Working for the Future:Female Factory Work and Child Health in Mexico. Unpublished Manuscript, Yale University.

[7] Attanasio, O., Lechene, V., 2002. Tests of Income Pooling in Household Decisions. Review of Economic Dynamics, 5(4), 720-748.

[8] Aw, B., Hwang, A.-R., 1995. Productivity and the export market: A firm-level analysis. Journal of Development Economics. 47(2), 313332.

[9] Baird, S., Friedman, J., Schady, N., 2011. Aggregate Income Shocks and Infant Mortality in the Developing World. The Review of Economics and Statistics, 93(2), 847-856.

[10] Barham, B.- L., Gitter, S., R., 2008. Women's Power, Conditional Cash Transfers, and Schooling in Nicaragua. World Bank Economic Review, 22(2), 271-290.

[11] Bartik, T., 1991. Who Benefits from State and Local Economic Development Policies? Kalamazoo: W.E. Upjohn Institute for Employment Research.

[12] Beck, T., 2002. Financial Development and International Trade. Is There a Link? Journal of International Economics. 57, 107-131.

[13] Becker, B., Greenberg, D., 2007. Financial Development, Fixed Costs and International Trade. Harvard Business School mimeo.

[14] Behrman, J.- R., Wolfe B.- L., 1987. How does mother's schooling affect family health, nutrition, medical care usage, and household sanitation? Journal of Econometrics, 36(1-2), 185-204.

[15] Behrman, J.- R., 1997. Intrahousehold Distribution And The Family. Handbook of Population and Family Economics. Edited by M.R. Rosenzweig and O. Stark. Elsevier Science.

[16] Bernard, A.-B., Jensen, J.-B., 1995. Exporters, jobs, and wages in U.S. Manufacturing, 19761987. Bookings Papers on Economic Activity, Microeconomics. Washington DC.

[17] Bernard, A., Jensen, J., 1999. Exceptional exporter performance: cause, effect, or both? Journal of International Economics. 47, 1-25.

[18] Bernard, A., Jensen, B., 2004. Why some firms export. Review of Economics and Statistics. 86, 561-569.

[19] Betts, J.-R., 1995. Does School Quality Matter? Evidence from the National Longitudinal Survey of Youth. The Review of Economics and Statistics, 77(2), 231-250.

[20] Blanchard, O.-J., Katz, L.-F., 1992. Regional Evolutions. Brookings Papers on Economic Activity 1, 175.

[21] Blundell, R., Chiappori P.-A., Meghir C., 2005. Collective labor supply with children. Journal of Political Economy, 113(6), 12771306.

[22] Bobonis, G., 2009. Is the Allocation of Resources within the Household Efficient? New Evidence from a Randomized Experiment. Journal of Political Economy, 117, 453-503.

[23] Bound, J., Holzer, H.-J., 1993. Industrial Shifts, Skill Levels, and the Labor Market for White and Black Males. Review of Economics and Statistics. 75, 38796.

[24] Bourguignon, F., Browning, M., Chiappori, P.-A., 2009. Efficient Intra-household Allocations and Distribution Factors: Implications and Identification. Review of Economic Studies. 76(2), 50328.

[25] Butcher, K.-F., Case, A., 1994. The effect of sibling sex composition on women's education and earnings. The Quarterly Journal of Economics. 109(3), 531-563.

[26] Campa, J.-M., Shaver, J.-M., 2002. Exporting and capital investment: on the strategic behavior of exporters. Discussion Paper No. 469. IESE Business School, University of Navarra.

[27] Card, D., Krueger, A.-B., 1992. Does School Quality Matter? Returns to Education and the Characteristics of Public Schools in the United States. Journal of Political Economy, 100(1), 1-40.

[28] Chaney, T., 2005. Liquidity constrained exporters. Working Paper, University of Chicago.

[29] Chiappori, P.- A., 1992. Collective Labor Supply and Welfare. Journal of Political Economy, 100(3), 437-467.

[30] Chiappori, P.- A., Donni, O., 2006. Learning from a Piece of Pie: The Empirical Content of Nash Bargaining. IZA Discussion Paper No. 2128.

[31] Clardia, R.-H., Gali, J., 1994. Sources of Real Exchange Rate Fluctuations: How Important are Nominal Shocks? NBER Working Paper No. 4658.

[32] Dabos, M., Juan-Ramon, V.-H., 2000. Real Exchange Rate Response to Capital Flows in Mexico: An Empirical Analysis. IMF Working Paper WP/00/108.

[33] Desai, S., Alva, S., 1998. Maternal education and child health: Is there a strong causal relationship? Demography, 35(1), 71-81.

[34] Doepke, M., Tertilt, M., 2011. Does Female Empowerment Promote Economic Development? IZA Discussion Paper No. 5637.

[35] Duflo, E., 2003. Grandmothers and Granddaughters: Old Age Pension and Intra-household Allocation in South Africa. World Bank Economic Review, 17(1), 1-25.

[36] Duflo, E., Udry, C., 2004. Intrahousehold Resource Allocation in Cote d'Ivoire: Social Norms, Separate Accounts and Consumption Choices. NBER Working Paper No. 10498.

[37] Duflo, E., 2005. Gender Equality in Development. Manuscript, Department of Economics, MIT.

[38] Edwards, S., 1994. Real and Monetary Determinants of Real Exchange Rate Behavior: Theory and Evidence from Developing Countries. in Estimating Equilibrium Exchange Rates. ed. by Williamson, J. (Peterson Institute).

[39] Edwards, S., 1998. Capital Flows, Real Exchange Rates, and Capital Controls: Some Latin American Experiences. in Capital Flows to Emerging Markets. ed. by Edwards, S. (University of Chicago Press).

[40] Evans, W.-N, Schwab, R.-M., 1995. Finishing High School and Starting College: Do Catholic Schools Make a Difference? The Quarterly Journal of Economics, 110(4), 941-974.

[41] Friedberg, L., Webb, A., 2005. Retirement and the Evolution of Pension Structure. Journal of Human Resources, 40(2), 281-308.

[42] Friedberg, L., Webb, A., 2006. Determinants and consequences of bargaining power in households. NBER Working Paper No. 12367.

[43] Gallagher, K.-P., Moreno-Brid, J.-C., Porzecanski, R., 2008. The Dynamism of Mexican Exports: Lost in (Chinese) Translation? World Development. 36(8), 1365-1380.

[44] Gertler, M., and Gilchrist, S., 1994. Monetary Policy, Business Cycles and the Behavior of Small Manufacturing Firms. Quarterly Journal of Economics. 109, 309-340.

[45] Greenaway, D., Guariglia, A., Kneller, R., 2007. Financial factors and exporting decisions. Journal of International Economics. 73, 377-395.

[46] Hanson, G.-H., Robertson, R., 2008. China and the Manufacturing Exports of Other Developing Countries. NBER Working Paper No. 14497.

[47] Hoddinott, J., Haddad, L., 1995. Does female income share influence household expenditures? Evidence from Cte d'Ivoire. Oxford Bulletin of Economics and Statistics, 57(1), 77-96.

[48] Jensen, R., 2010. Economic Opportunities and Gender Differences in Human Capital: Experimental Evidence for India. NBER Working Paper 16021.

[49] Levinsohn, J., Petrin, A., 2003. Estimating Production Functions Using Inputs to Control for Unobservables. Review of Economic Studies. 70, 317-342.

[50] Majlesi, K., 2012. Labor Market Opportunities and Sex Specific Investment in Children's Human Capital: Evidence from Mexico. Working Paper. University of Texas at Austin.

[51] Manova, K., 2006. Credit Constraints, Heterogeneous Firms and International Trade. Working Paper, Stanford University.

[52] Manova, K., 2008. Credit Constraints, Equity Market Liberalizations and International Trade. Journal of International Economics. 76, 33-47.

[53] Oster, O., Millet, M.-B., 2010. Do Call Centers Promote School Enrollment? Evidence from India. NBER Working Paper 15922.

[54] Lundberg, S.-J., Pollak, R.-A., Wales, T.-J. 1997. Do Husbands and Wives Pool Their Resources? Evidence from the U.K. Child Benefit. Journal of Human Resources, 32(3), 463-480.

[55] Matsuyama, K., 2005. Credit Market Imperfections and Patterns of International Trade and Capital Flows. Journal of the European Economic Association. 3(2-3), 714-723.

[56] McElroy, M.-B., Horney, M.- J., 1981. Nash-bargained Household Decisions: Toward a Generalization of the Theory of Demand. International Economic Review, 22(2), 333-349.

[57] Melitz, M., 2003. The impact of trade on intra-industry reallocations and aggregate industry productivity. Econometrica, 71(6), 1695-1725.

[58] Mendoza, E., 1995. The Terms of Trade, The Real exchange Rate, and Economic Fluctuations. International Economic Review, 36(1), 101-137.

[59] Morduch, A., 2000. Sibling Rivalry in Africa. The American Economic Review, 90(2), 405-409.

[60] Oster, O., Millet, M.-B., 2010. Do Call Centers Promote School Enrollment? Evidence from India. NBER Working Paper 15922.

[61] Parish, W.-L., Willis, R.-J., 1993. Daughters, Education, and Family Budgets Taiwan Experiences. The Journal of Human Resources, 28(4), 863-898.

[62] Phipps, S., Burton, P., 1998. What's Mine is Yours? The Influence of Male and Female Incomes on Patterns of Household Expenditure. Economica, 65, 599-613.

[63] Pollak, R.-A., 2005. Bargaining Power in Marriage:Earnings, Wage Rates and Household Production. NBER Working Paper 11239.

[64] Pollak, R.-A., 2011. Family Bargaining and Taxes: A Prolegomenon to the Analysis of Joint Taxation. CESifo Economic Studies, 57(2), 216244.

[65] Psacharopoulos, G., Patrinos, H.-A., 2004. Returns to investment in education: a further update. Education Economics, 12(2), 111-134.

[66] Qian, N., 2008. Missing Women and The Price of Tea in China: The Effect of Sex-Specific Earnings on Sex Imbalance. The Quarterly Journal of Economics, 123(3), 1251-1285.

[67] Rangel, M.-A., 2006. Alimony Rights and Intra-household Allocation of Resources: Evidence from Brazil. Economic Journal, 116(513), 627-58.

[68] Roberts, M., Tybout, J., 1997. The decision to export in Colombia: an empirical model of entry with sunk costs. American Economic Review, 87(4), 545-564.

[69] Rosenzweig, M.-R., Schultz, T.-P., 1982. Market Opportunities, Genetic Endowments, and Intrafamily Resource Distribution: Child Survival in Rural India. The American Economic Review, 72(4), 803-815.

[70] Satish Agnihotri, R.-P.-J., Parikh, A., 2002. Missing women in Indian districts: a quantitative analysis. Structural Change and Economic Dynamics, 13(3), 285-314.

[71] Sawadaa, Y., Lokshin, M., 2009. Obstacles to school progression in rural Pakistan: An analysis of gender and sibling rivalry using field survey data. Journal of Development Economics, 88(2), 335-347.

[72] Shastry, G.-K., 2010. Human Capital Response to Globalization: Education and Information Technology in India. mimeo, Wellesley College.

[73] Strauss, J., Thomas, D., 1995. Human resources: Empirical modeling of household and family decisions. Handbook of Development Economics, 3(A), 1883-2023.

[74] Thomas, D., 1990. Intra-Household Allocation: An Inferential Approach. Journal of Human Resources, 25(4), 635-664.

[75] Thomas, D., 1994. Like Father, Like Son; Like Mother, Like Daughter Parental Resources and Child Height. Journal of Human Resources, 29(4), 950-988.

[76] Thomas, D., Contreras, D., Frankenberg, E., 1997. Child Health and the Distribution of Household Resources at Marriage. Manuscript. Santa Monica, CA, RAND Corp.

[77] Thomas, D., Strauss. J., Henriques M.-H., 1991. How does mother's education affect child height? Journal of Human Resources, 26(2), 183-211.

[78] Verhoogen, E., 2008. Trade, Quality Upgrading and Wage Inequality in the Mexican Manufacturing Sector. Quarterly Journal of Economics, 123(2), 489-530.

[79] Vogl, T.-S., 2011. Sisters, Schooling, and Spousal Search: Evidence from South Asia. Working Paper, Princeton University.

[80] Wagner, J., 2007. Exports and Productivity: A Survey of the Evidence from Firm-level Data. The World Economy, 30(1), 6082.

[81] Wooldridge, J., 2002. Econometric Analysis of Cross Section and Panel Data. MIT Press.