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# WORKING FOR CHANGE: THE EFFECT OF FEMALE LABOR FORCE PARTICIPATION ON FERTILITY AND GENDERED VIOLENCE

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PRESENTA

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*Para las mujeres.*

*Mexicana mía, preciosa María*
*No te olvides nunca que eres poderosa*
*A tu manto, pasión colorida*
*Yo le canto mi copla y mi prosa*[1]

[1] "Mexicana Hermosa", Natalia LaFourcade

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*This thesis is inherently a work about family, and there are no words sufficient to honor their contributions to making this possible.*

*To my advisor, Fernanda; without her guidance and support this work would not exist.*

*And finally to my compañeros at CIDE who have accompanied me in the Master's program these two years.*

## Abstract

*We exploit the dramatic fall in washing machine prices post trade reforms in the 1990's in Mexico to estimate the causal effect of female labor force participation (FLFP) on fertility and gendered violence. We construct a panel of municipalities in Mexico and instrument FLFP with relative washing machine price, as these appliances have been found to increase FLFP by liberating women from domestic work, to study the effects of FLFP on overall fertility, age-specific fertility, fertility timing, and marital status at the time of birth as well as instances of fatal gendered violence. We find large effects of FLFP on both raising the average age of mothers, especially in the year of their first birth, and on lowering fertility rates. These effects are larger for women of lower socioeconomic status. We find no evidence of an effect on gendered violence, though we do find some evidence of increased violence against women of low socioeconomic status, as is consistent with a male backlash effect.*



*Clasification JEL: J12, J13, J01, J16, C01*

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# 1 Introduction

Women's entry to the labor force has been accompanied by important transformations not only for the labor market but for many other relevant economic measures such as fertility, child health, marriage and household structure and optimization. Although it can be difficult to distinguish home production from market work in highly informal economies such as Mexico's, indicators suggest that in 2017, only 44% of women in Mexico participated in the labor force, while in the United States, 56% participated, a difference of more than 25% of the Mexican rate between neighboring countries (The World Bank, 2017). If women in Mexico are under-participating in the labor force, there is a strong potential not only for a misallocation of labor (if market-productive women engage solely in home production), but also for the underproduction of other externalities that affect welfare such as child health (Qian, 2008; Skoufias & Parker, 2006), domestic violence (Anderberg, Rainer, Wadsworth, & Wilson, 2016; Papageorge et al., 2016) and a vicious cycle of self-propagation through underinvestment in human capital and increased fertility (Goldin, 1995; Anderson & Dimon, 1998; Vogl, 2016).

Despite the importance and multi-faceted nature of outcomes that are known to be associated with female labor force participation (FLFP), more is known about how factors such as fertility and violence affect the decision to participate in the labor market than the reverse relationship. Much evidence has shown that domestic violence (Bobonis, González-Brenes, & Castro, 2013) and fertility (Ferrero Martínez and Iza (2004), Angrist and Evans (1998)) often keep women in the home, but less is known about the effect that FLFP has on these outcomes. Does working allow them to change fertility decisions towards fewer children or delayed fertility? Can market work shield women from gendered violence? This paper seeks to establish the causal effect of FLFP on different dimensions of the fertility decision, such as how many children women have or when to have them, and incidences of fatal gendered violence in Mexico.

Fertility outcomes are important not only as indicators of and factors contributing to women's health, but because the timing of fertility and total fertility have important consequences for household wellbeing and child health. Research has shown that early pregnancy has lasting

effects on women's educational attainment (Arceo-Gomez & Campos-Vazquez, 2014), and that lower overall fertility permits increased investment per child (Vogl, 2016). Questions oriented towards gendered violence have also gained social and political importance in the world and particularly in Mexico today, as more and more attention is drawn to the constant presence in time of what has become known as "feminicide", the murder of a woman for being a woman (Merino & Torreblanca, September 19, 2016). While homicide rates for men fluctuate and often respond to policy changes such as the war on drugs, violence against women appears to resist intervention and to be determined by factors different to those affecting general violence trends.

This paper exploits exogenous variation in appliance prices in the early 1990's in Mexico to establish a causal relationship between FLFP and gendered violence and fertility. In the late 1980's, Mexico implemented several trade liberalizations that resulted in a dramatic fall in washing machine prices at the beginning of the 1990's, thus liberating women's time that was previously allocated to time-consuming household chores. I utilize the relative price of washing machines as an instrument for FLFP in order to estimate the causal effect of FLFP on fertility and violence. This instrument and the use of a panel of municipalities, allows for the exploitation of variation in time while controlling for time-invariant characteristics. Additionally, the use of rich data from several sources allows me to explore heterogeneous effects at the municipal and individual level in order to fully understand the mechanisms driving the observed effects.

The main finding of this paper, which is robust to various specifications and tests, is that FLFP had a strong, statistically significant effect on several facets of the fertility decision. FLFP caused significant decreases in fertility, especially for women aged 18-29. The average age of mothers increased, and in particular the average age of mothers in the year of first birth increased, providing evidence that increases in FLFP caused women to delay childbearing. The effects are strongest for women of low socioeconomic status. I also find that FLFP had little effect on feminicides, though some evidence suggests that FLFP could increase violence for women of low socioeconomic status. These changes in fertility are not only interesting from a population standpoint, but have important ramifications for family dynamics, household bargaining power,

and investments in children.

## 1.1 Literature Review

Because of the methodology of two-stage least squares, my work falls into two areas of study: the impact of trade and access to appliances on female labor force participation, which is used to establish the instrument, and the impact of FLFP on health outcomes (namely, fertility and violence against women), which is the concern of the second stage. I review both areas in the following two sections.

### Trade, Appliance Prices and FLFP

In the body of work which explores the causes of the stunning rise in FLFP in the United States during the 20th century, the “Engines of Liberation" model (Greenwood, Seshadri, & Youkoglu, 2005) stands out as one of the most revisited. In this paper, the authors develop an equilibrium model in which the driving factor of increasing FLFP is not the closing of the gender wage gap but rather the adoption of time-saving household appliances such as washing machines and microwave ovens. This paper most closely follows an extension of the Engines of Liberation hypothesis to the developing world in the work of Cubas (2016), in which the inclusion of access to the necessary infrastructure for the use of these appliances, such as running water and electricity, qualitatively explains cross-country differences in participation. Cavalcanti and Tavares (2008) report similar findings from a cross-country analysis, and Engines of Liberation is also tested by Coen-Pirani, León, and Lugauer (2010) for the United States, who find that ownership of a washing machine is a significant factor in the shift from part to full time employment of married women. LaFerrera, Chong, and Duryea (2012) also explore how other types of goods that are not necessarily time-saving can FLFP. In Brazil, the introduction of soap operas that featured women who had fewer children was associated with decreases in fertility (LaFerrera et al., 2012).

While this body of work has established important relationships between appliances and FLFP on the macro level, it is unable to provide a more detailed analysis of the consequences of

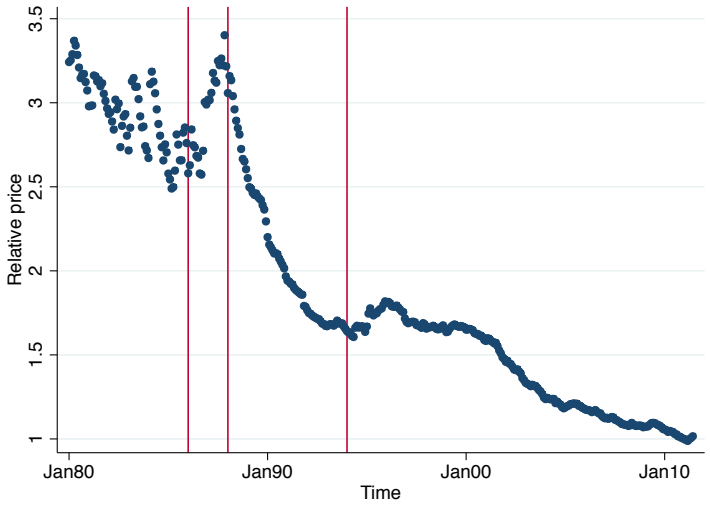
appliance ownership. My work extends these analysis to the micro level, and extends the scope of study to include the consequences of increases in FLFP on health.

The effects of appliance ownership or access on FLFP signal the trade-off many women experience between home production and market work. Studies from Mexico have documented the trade-off between home responsibilities and market work for women: grandparent health is a significant factor influencing the choice to work in the market for Mexican women (van Gameren & Velandia Naranjo, 2015), and a wife's participation in market work can shield investments in child human capital from adverse macroeconomic shocks (Skoufias & Parker, 2006). This tension between home and market is central to the relevance of my instrument in the first stage estimation, which measures the effect of the relative price of washing machines on FLFP.

In this paper, I exploit the fall in the relative price of washing machines in the 1990's in Mexico as a result of several trade liberalizations undertaken by the Mexican government in the late 1980's. In 1986, Mexico signed onto the international GATT agreement, and by 1988, had eliminated almost all fixed import price restrictions (Secretaría de Economía [SE], 2018). As trade opened with the rest of the world, cheaper, foreign-made appliances entered the Mexican economy, driving down the price of several household appliances. Specifically, the price of washing machines relative to the general CPI fell dramatically, as can be seen in Figure 1. In general, however, the impact of trade liberalization on FLFP is ambiguous. In a cross-country analysis, Meyer (2006) finds that trade liberalization only increases FLFP in middle-income countries. While the model developed by Sauré and Zoabi (2014) predicts that trade liberalization actually decreases FLFP, their results are only for a capital-rich country trading with a relatively poor country, which was not the case of Mexico in the 1990's.

Specific to the case of Mexico, Aguay-Tellez, Airola, and Juhn (2012) find that in Mexico, women's share of the wage bill increased in the 1990's due to a shift towards female-dominated sectors. My research builds on this base of knowledge concerning the effect of trade liberalization for women in Mexico.

Figure 1: Relative Price of Washing Machines




Notes: Municipal-level CPI for washing machines divided by the national general CPI, calculated monthly. The first vertical line indicates 1986, when Mexico signed GATT. The second represents 1988, the second round of trade reforms. Elaborated by the author using data from Banco de Mexico.

### FLFP and Fertility

The literature treating the effect of health outcomes such as fertility, domestic violence and crime on FLFP is extensive. Recent empirical work suggests that domestic violence has a negative impact on FLFP (Papageorge et al., 2016), and several studies have shown a negative causal effect of fertility and motherhood on female labor supply in the United States and in developing countries such as Mexico and Argentina (Angrist & Evans, 1998; Baily, 2006; Cruces & Galiani, 2007; Albanesi & Olivetti, 2007). However, research that establishes causality in the opposite direction is scarcer. This paper helps to fill in this gap, studying instead the effect of FLFP on these health variables.

There is limited research studying the causal effect of FLFP on fertility. Vogl (2016) develops a model to explain why fertility has been shown to follow a hump-shaped curve in relation to skill and wealth. His model suggests that macroeconomic processes of human capital accumulation will have a negative impact on fertility in countries farther down the skill-accumulation path, such as Mexico, one of the richer developing countries. Microeconomic models of household bargaining have also been developed to explain how relative income and fertility can be both

determinants and results of bargaining power. Iyigun and Walsh (2007) model men and women as differentiated only by the time cost that fertility presents, and this results in lower fertility in households where women work. This is because working permits women to bargain to continue working and therefore maintain their bargaining power. I add to this literature by analyzing not only total fertility, but also fertility timing, in order to better understand how FLFP affects the fertility decision.

Another branch of research has studied the effect of the increases in FLFP and the relative earnings of women observed in the second half of the 20th century on the marriage market. Bertrand, Kamenica, and Pan (2015) find that when a wife's income (or potential income) exceeds that of her husband, the marriage is less stable. Relevant to this paper is their finding that a significant portion of the decline in marriage rates can be explained by women's higher earnings potential, which prevents marriage in a society where threats to the "breadwinning husband" identity makes marriage less attractive. Autor, Dorn, and Hanson (2018) study the effect of negative shocks to male-dominated manufacturing sectors, and find that male unemployment decreases the marriage value of young men, resulting in lower marriage rates and increases in the share of children in single-headed households. Conversely, they find that negative shocks to female sectors increase marriage rates.

These findings contribute to an interpretation of marriage as dependent on the relative "value" or contribution of each member of the couple, which is influenced by the labor force participation of women. This research adds to an understanding of the marriage market by studying how FLFP affects the proportion of mothers that are married, cohabiting, and single in the year of childbirth. Following the results of Bertrand et al. (2015) and Autor et al. (2018), I hypothesis that participation in the labor market decreases the gains to marriage for women, resulting in fewer marriages.

**FLFP and Violence**

Research on the effect of FLFP on violence generally falls into two categories of study: empirical analysis and game theory models. Both branches of study attempt to study the effect of relative income and bargaining power on household dynamics such as abuse and consumption allocation. (Qian, 2008) shows that increases in relative female wage lead to higher survival rates for girls and higher educational attainment for both sexes of children in post-Mao China; higher relative female wage in California have also been shown to cause decreases in domestic violence (Aizer, 2010). In Mexico, several authors have exploited the transfers made to mothers through *Oportunidades*, a conditional cash transfer (CCT) program, to study the effect of an increase of relative *income* on household dynamics. Angelucci (2008) establishes a negative relationship between female income and domestic abuse in rural Mexico, though the effect depends greatly on characteristics of the male head of household. Bobonis et al. (2013) exploit rich domestic abuse data from Mexico, and their research suggests that abuse changes from physical to emotional when female income rises.

This brief review of the literature on domestic or gendered violence shows that it is not necessarily clear what effect we should expect FLFP to have on gendered violence. While some research suggests that female work and higher relative income protects them from violence, a phenomenon that I summarize in the term *liberation effect*, other research points to negative male reactions, or *backlash* to increased female independence. This paper contributes to understanding which of these cases is true for Mexico, an important task for informing public policy. My work is also able to partially abstract away from income as a driver of differential bargaining power in using FLFP instead of wages or income, therefore commenting on changes in more abstract gender dynamics such as "liberation" on violence.

# 2 Empirical Approach

## 2.1 Data and Summary Statistics

I construct a balanced panel of 63 municipalities in Mexico from the years 1990 to 1995 by aggregating individual-level survey and administrative data. Municipal-level price data comes from the central bank of Mexico (Banco de México).[2] Prices are expressed as the municipal washing machine price index relative to the national consumer price index. FLFP is gathered from the ENEU[3], a nationally representative individual-level survey of urban employment, and considers the percent of women surveyed participating in the labor force. Participation in this context is defined at women over the age of 15 who are working or are seeking work. The ENEU survey, as well as the local price data, covers exclusively urban municipalities. Therefore, the results are valid specifically for urban areas of Mexico, though the sample includes municipalities with as few as 9,000 residents over the age of five. I also use rates of ownership of home appliances from the National Survey of Income and Home Expenses (ENIGH).[4] Finally, fertility and mortality data are elaborated from the Vital Statistics records of the INEGI[5] and population data from CONAPO.[6]

In order to study heterogeneous effects, I use individual-level population data from Vital Statistics Records for natality and mortality. Natality records report variables about the mother, such as municipality of residence, age, marital status, number of children, education and labor force participation. For fertility outcomes, education is reported as a seven-category variable ranging from no schooling to completion of a professional degree. Mortality data contains information about the deceased such as cause of death, type of violent death (homicide, suicide, accident), age, and educational attainment. For the mortality data, exact educational attainment is

[2] http://www.banxico.org.mx/estadisticas/

[3] The ENEU was implemented from 1987-2004, and in 2005 was replaced by the ENOE, a survey not limited to urban areas. Accessed: http://www.beta.inegi.org.mx/proyectos/enchogares/historicas/eneu/

[4] http://www.beta.inegi.org.mx/proyectos/enchogares/regulares/enigh/tradicional/1984/default.html

[5] http://www.beta.inegi.org.mx/proyectos/registros/vitales/natalidad/default.html

[6] CONAPO is the Consejo Nacional de Población, or The National Board of Population. Accessed: http://www.conapo.gob.mx/es/CONAPO/Datos_Abiertos_Sistema_Urbano_Nacional

not available, so education is represented here as an indicator for completion of primary school, an educational level that around half of the women in the sample have attained.

In order to examine the multi-dimensionality of both fertility and violence, I examine sets of variables for each. In analyzing changes to the fertility decision, I am interested not only in the number of children but also in the timing and circumstances of childbearing. Therefore, outcome variables include the birth rate (births per 1,000 women), the fertility rate (average number of children per woman in childbearing age), the average age of mothers at time of birth, the average age of mothers at time of the first birth, age-specific fertility rates, and the proportion of births by age category (divided into five-year intervals starting at age 10). Finally, the civil status of mothers in the year of birth is also included as an outcome variable.

Because of the difficulty that measuring gendered violence presents, gendered violence is measured in this paper using a set of variables related to distinct aspects of homicides of women. All homicides of women are not feminicides, but a precise definition of what makes the murder of a woman gender-related has not been established. I follow the suggestion of some authors and use narrow aspects of homicides against women, such as occurring in the home, strangulation, and a sexual component to the death, to separate feminicides from other types of violence against women (Torreblanca, 2018). These aspects are chosen because of their highly personal nature, and because they are correlated with the perpetrator being a spouse, significant other, or close family member, which are key aspects of feminicides (Merino & Torreblanca, September 19, 2016). Though this is not a perfect method, it helps isolate a certain type of violence. Therefore, I use as violence outcomes variables of composition of the types of death such as proportion of homicides that are due to strangulations and sexual violence, and the proportion of homicides that occur in the home. These rates per 1,000,000 women are also included in order to measure their overall presence (I use per million women instead of per 100,000 solely for readability of numbers). Finally, feminicides per million women are measured by a variable which indicates a death with any of the aforementioned characteristics.

Table 1 presents some summary statistics on female labor force participation, including labor

force participation, involvement in the informal sector, and wages. Additionally, it includes the same statistics (and their differences) for men. As can be seen in Table 1, men and women in this sample have, on average, very different characteristics in the labor market. In 1990, women were less likely to participate in the labor force and more likely to work part-time. They were also less likely to work informally (as proxied by working without health insurance or any legally-required benefits), though in time their trends in the informal sector were similar to those of men. Women were also more heavily concentrated in lower paid categories, and, while the proportion of both men and women earning one to two minimum wages decreased from 1990-1995, women saw greater decreases in the lowest wage category. Overall, differences between the male and female market were lessened in the time period covered by the data.

A potential concern is that these differences are affected by the economic crisis that Mexico suffered in 1995. Table A.2 in the Appendix reports differences between 1994 and 1990. The results are qualitatively similar, suggesting that the differenced observed were not due completely to the crisis. The main difference is that the losses of both men and women in the highest pay category are not observed in 1994, suggesting that the top-down wage compression observed in 1995 was most likely due to the crisis.

Table 2 presents summary statistics on mortality of women by labor force participation status for women. Only women aged 10 to 60 are included in order to exclude geriatric mortality and infant and child mortality. The data presents averages for being married and ages at the time of death, educational attainment and some causes of violent death. The variable *more than primary* indicates that the deceased completed at least six years of schooling, the variable *more than secondary* indicates having completed nine years of schooling, and the variable *more than high school* indicates completion of at least 12 years of schooling. As can be seen in Table 2, in 1990 and in 1995, women who participated in the labor force died at a younger age and were more likely to die by homicide, but were less likely to be murdered in their own home. These correlations are puzzling, and hold when excluding deaths related to workplace accidents (as shown in Table A.3 in the Appendix). The fact that economically active women die younger and

Table 1: Labor Market Characteristics: Men and Women

**A. Women**

| | 1990 | | 1995 | | Difference | |
|---|---|---|---|---|---|---|
| | Mean | Std. Dev. | Mean | Std. Dev. | Diff | t-test |
| Econ. active | 0.33 | 0.47 | 0.35 | 0.48 | 0.02*** | (9.46) |
| Employed | 0.29 | 0.46 | 0.33 | 0.47 | 0.04*** | (15.54) |
| No IMSS | 0.48 | 0.50 | 0.78 | 0.42 | 0.30*** | (65.13) |
| No benefits | 0.35 | 0.48 | 0.44 | 0.50 | 0.09*** | (18.78) |
| Part time | 0.29 | 0.45 | 0.26 | 0.44 | -0.03*** | (-8.20) |
| 1-2 min. wages | 0.86 | 0.35 | 0.53 | 0.50 | -0.39*** | (-14.63) |
| 2-5 min. wages | 0.13 | 0.34 | 0.11 | 0.31 | -0.01 | (-0.32) |
| 5-10 min. wages | 0.01 | 0.10 | 0.02 | 0.14 | 0.04*** | (3.83) |
| $>$10 min. wages | 0.11 | 0.31 | 0.00 | 0.05 | -0.12*** | (-9.07) |
| Observations | 66,602 | | 60,789 | | 127,431 | |

**B. Men**

| | 1990 | | 1995 | | Difference | |
|---|---|---|---|---|---|---|
| | Mean | Std. Dev. | Mean | Std. Dev. | Diff | t-test |
| Econ. active | 0.72 | 0.45 | 0.72 | 0.45 | -0.01*** | (-3.83) |
| Employed | 0.68 | 0.47 | 0.68 | 0.47 | -0.00 | (-0.59) |
| No IMSS | 0.53 | 0.50 | 0.82 | 0.39 | 0.28*** | (88.00) |
| No benefits | 0.45 | 0.50 | 0.52 | 0.50 | 0.08*** | (22.36) |
| Part time | 0.14 | 0.35 | 0.12 | 0.33 | -0.01*** | (-3.17) |
| 1-2 min. wages | 0.67 | 0.47 | 0.36 | 0.48 | -0.34*** | (-21.16) |
| 2-5 min. wages | 0.29 | 0.45 | 0.21 | 0.41 | -0.07*** | (-4.55) |
| 5-10 min. wages | 0.02 | 0.15 | 0.09 | 0.28 | 0.09*** | (10.00) |
| $>$10 min. wages | 0.23 | 0.42 | 0.02 | 0.13 | -0.20*** | (-17.00) |
| Observations | 60,325 | | 54,920 | | 115,281 | |

Notes: Variables employment, etc., are not rates but rather the proportion of the sample employed. Calculations made based on individual-level data from ENEU. $^{*}p < 0.1,^{**}p < 0.05,^{***}p < 0.01$

are more likely to die by homicide could point to the possibility that *male backlash* is a factor contributing to violence against women. This paper will attempt to separate a causal effect of FLFP on feminicides, if any exists.

Table 3 presents the differences from 1990 to 1995 in characteristics of mothers during the year of birth for working women and non-working women. Working women were older on average at the time of birth, and in particular were older when they had their first child. They were also more likely to be single, both in 1990 and 1995. The trend in age at birth between 1990 and 1995 also differed between working and non-working women; working women were almost half a year older on average in 1995 and were older for the first birth, while non-working women

Table 2: Female Mortality by Labor Force Participation Status

| **A. Economically Active** | | | | | | |
|---|---|---|---|---|---|---|
| | 1990 | | 1995 | | Difference | |
| | Mean | Std. Dev. | Mean | Std. Dev. | Diff | t-test |
| Married | 0.44 | 0.50 | 0.45 | 0.50 | 0.01 | (0.65) |
| Age | 39.35 | 12.48 | 40.53 | 11.97 | 1.19*** | (3.78) |
| $>$ primary | 0.77 | 0.42 | 0.80 | 0.40 | 0.04*** | (3.34) |
| $>$ secondary | 0.56 | 0.50 | 0.61 | 0.49 | 0.05*** | (3.92) |
| $>$ high school | 0.37 | 0.48 | 0.42 | 0.49 | 0.04*** | (3.47) |
| Homicide | 0.05 | 0.21 | 0.04 | 0.19 | -0.01* | (-1.70) |
| Murdered in home | 0.06 | 0.23 | 0.07 | 0.26 | 0.02 | (1.02) |
| COD strang. | 0.00 | 0.06 | 0.00 | 0.07 | 0.00 | (0.67) |
| Observations | 2,799 | | 3,281 | | 6,080 | |
| **B. Economically Inactive** | | | | | | |
| | 1990 | | 1995 | | Difference | |
| | Mean | Std. Dev. | Mean | Std. Dev. | Diff | t-test |
| Married | 0.69 | 0.46 | 0.67 | 0.47 | -0.02*** | (-3.42) |
| Age | 44.50 | 13.21 | 44.97 | 13.00 | 0.47*** | (3.05) |
| $>$ primary | 0.48 | 0.50 | 0.53 | 0.50 | 0.05*** | (8.32) |
| $>$ secondary | 0.24 | 0.43 | 0.26 | 0.44 | 0.01*** | (2.90) |
| $>$ high school | 0.13 | 0.33 | 0.13 | 0.34 | 0.01* | (1.88) |
| Homicide | 0.01 | 0.11 | 0.01 | 0.11 | 0.00 | (1.34) |
| Murdered in home | 0.08 | 0.27 | 0.07 | 0.26 | -0.00 | (-0.24) |
| COD strang. | 0.00 | 0.02 | 0.00 | 0.03 | 0.00 | (1.06) |
| Observations | 13,999 | | 15,396 | | 29,395 | |

Notes: Averages for women aged 10-60 at time of death to exclude infant and geriatric mortality. Calculations made from Vital Statistics data, INEGI. $^{*}p < 0.1,^{**}p < 0.05,^{***}p < 0.01$

saw little change in overall average age and an increase in the average age at first birth. Working women had fewer children than non-working women in both 1990 and 1995, and saw a greater decrease in the average number of children from 1990 to 1995. The same educational differences between working and non-working women seen in Table 1 are reflected in Table 3.

These tables point to a relationship between FLFP and fertility and violence, however, establishing a causal relationship is complicated because of the endogeneity of FLFP. The following section discusses the endogeneity problems of FLFP, and establishes the econometric model used in this paper.

Table 3: Fertility Statistics by Labor Force Participation Status

**A. Economically Active**

| | 1990 | | 1995 | | Difference | |
|---|---|---|---|---|---|---|
| | Mean | Std. Dev. | Mean | Std. Dev. | Diff | t-test |
| Mother's age | 26.55 | 5.59 | 26.94 | 5.74 | 0.39*** | (29.60) |
| Age at first birth | 24.36 | 4.99 | 24.77 | 5.19 | 0.40*** | (23.25) |
| # children | 2.10 | 1.58 | 1.95 | 1.32 | -0.15*** | (-42.88) |
| No schooling | 0.04 | 0.20 | 0.02 | 0.14 | -0.02*** | (-47.87) |
| Primary incomplete | 0.08 | 0.28 | 0.05 | 0.21 | -0.04*** | (-65.61) |
| Primary complete | 0.17 | 0.38 | 0.15 | 0.36 | -0.02*** | (-21.34) |
| Secundary complete | 0.28 | 0.45 | 0.32 | 0.46 | 0.03*** | (31.36) |
| High School complete | 0.15 | 0.36 | 0.21 | 0.41 | 0.05*** | (57.59) |
| Prof. degree | 0.27 | 0.44 | 0.26 | 0.44 | -0.01*** | (-10.83) |
| Married | 0.64 | 0.48 | 0.62 | 0.49 | -0.02*** | (-21.13) |
| Cohabiting | 0.18 | 0.39 | 0.22 | 0.42 | 0.04*** | (39.44) |
| Single | 0.17 | 0.38 | 0.16 | 0.37 | -0.01*** | (-15.27) |
| Observations | 332,777 | | 401,599 | | 734,376 | |

**B. Economically Inactive**

| | 1990 | | 1995 | | Difference | |
|---|---|---|---|---|---|---|
| | Mean | Std. Dev. | Mean | Std. Dev. | Diff | t-test |
| Mother's age | 25.21 | 6.26 | 25.31 | 6.22 | 0.10*** | (15.54) |
| Age at first birth | 20.99 | 4.41 | 21.32 | 4.54 | 0.33*** | (40.32) |
| # children | 2.89 | 2.23 | 2.65 | 2.00 | -0.24*** | (-109.87) |
| No schooling | 0.12 | 0.32 | 0.09 | 0.28 | -0.03*** | (-93.92) |
| Primary incomplete | 0.23 | 0.42 | 0.18 | 0.38 | -0.06*** | (-134.83) |
| Primary complete | 0.32 | 0.47 | 0.33 | 0.47 | 0.00*** | (9.57) |
| Secundary complete | 0.23 | 0.42 | 0.28 | 0.45 | 0.05*** | (109.64) |
| High School complete | 0.06 | 0.24 | 0.09 | 0.29 | 0.03*** | (101.41) |
| Prof. degree | 0.03 | 0.18 | 0.04 | 0.18 | 0.00*** | (17.73) |
| Married | 0.71 | 0.45 | 0.67 | 0.47 | -0.04*** | (-79.86) |
| Cohabiting | 0.24 | 0.42 | 0.28 | 0.45 | 0.04*** | (87.98) |
| Single | 0.06 | 0.23 | 0.05 | 0.23 | -0.00*** | (-6.25) |
| Observations | 1,840,902 | | 1,778,527 | | 3,619,429 | |

Notes: Characteristics at time of birth. Calculations made from Vital Statistics data, INEGI.
$^{*}p < 0.1,^{**}p < 0.05,^{***}p < 0.01$

## 2.2 Econometric Model

In order to study the causal effect of FLFP on fertility and violence, one could posit the following fixed effects estimation:

$$Y_{m,t} = \alpha + \sigma_m + \lambda_t + \beta FLFP_{m,t} + u_{m,t} \tag{0.1}$$

where $Y_{m.t}$ for municipality *m* in year *t* represents the various fertility and violence outcomes of interest, $\sigma_m$ and $\lambda_t$ are municipal and year fixed effects, and $\beta$ is the parameter of interest. Direct OLS estimates of the causal effect of FLFP on violence and fertility may suffer from several endogeneity problems. Controlling for fixed effects, as is the case of Equation 0.1, alleviates some concerns of endogeneity by controlling for time-invariant municipal characteristics and time trends. However, several endogeneity problems remain which would result in a biased estimate of $\beta$. Of principal concern is reverse causality; the presence of gendered violence could discourage female work, or increase the risk involved in working. Childbearing discourages FLFP through a different mechanism, by increasing the time needed for home production and competing with market work for women's time. OLS and fixed effects regressions of fertility or violence on FLFP would therefore yield negatively biased estimators due to reverse causality. On the other hand, to the extent that women who work are also those who are more likely to delay fertility or avoid violent relationships, OLS estimates would overestimate the effect of FLFP, attributing the effects of personality to FLFP and creating omitted variable bias.

To avoid these endogeneity problems, I exploit the time dimension of panel data, and the exogeneity of washing machine price changes to instrument FLFP and establish a causal relationship using two-stage least squares (2SLS). As discussed in the literature review, increased access to home appliances has been shown to free women to participate in the labor force. Therefore, the identification strategy uses the fall in the relative price of washing machines in the 1990's in Mexico as an instrument for FLFP, yielding FLFP predicted by a vector *Z* of variables:

$$FLFP_{m,t} = \gamma + \theta_m + \pi_t + \delta Z_{m,t} + v_{m,t} \tag{0.2}$$

where $\theta_m$ represents municipal fixed effects and $\pi_t$ represents time fixed effects. The instrument *Z* includes the price of washing machines relative to the national CPI in municipality *m* in year *t*. In a preliminary first stage, the interaction of price with proxies for municipal socioeconomic status and infrastructure are included to get a sense for which municipalities responded more to price changes. Infrastructure is measured by an indicator equal to one if a municipality's rate of electrification was above the median in 1990. Socioeconomic status is proxied by an indicator for municipalities above median schooling in 1990. Schooling and electrification are fixed at their 1990 levels to avoid endogeneity; any subsequent changes in either schooling or electrification that may affect changes in gendered violence or fertility are thus independent of changes in the outcome variables. Both (0.1) and (0.2) include standard errors clustered at the municipal level.[7]

The interaction with schooling is included as a proxy for socioeconomic status because it is likely that municipalities with higher levels of schooling (which may in turn be more developed municipalities) see less of an effect from price changes. This is because to the extent that schooling provides a measure for socioeconomic status, municipalities with higher socioeconomic status may be less constrained in appliance access, as households may already own a washing machine. Therefore, I anticipate that the sign of the schooling interaction term will be positive, counteracting the negative effect of appliance prices on FLFP.

The interaction with electrification in 1990 is included as a proxy of infrastructure development, though anticipating the sign of this coefficient is more complicated. If electrification captures development in terms of infrastructure, then the interaction would function as a compliment to schooling in measuring socioeconomic status, and would be positive. However, if

[7]Equation (0.2) is estimated for the first stage, but 2SLS estimations do not include time fixed effects in the first stage. This is because it has been shown that the first stage is equivalent to estimating a predicted FLFP for each year when using 2SLS with balanced panel data (Wooldridge, 2005). Therefore, including additional fixed effects results in high multicollinearity and biased results. Clustering at the municipal level in 2SLS (which is done in this 2SLS estimation) is equivalent to estimating a robust variance matrix, correcting for heterskedasticity and serial autocorrelation (Wooldridge, 2005).

municipalities below the median do not have the infrastructure to support home appliance ownership, then they are not likely to see an effect from appliance price changes (Cubas, 2016). This would result in a negative sign, as municipalities with high electrification see a greater effect of prices on FLFP. However, this hypothesis is less likely given that the median electrification and access to running water in my sample is over 95% of households, as the municipalities are mainly urban due to data availability. Therefore, essentially all municipalities have enough infrastructure to support widespread appliance adoption.

Two-staged least squares estimates the local average treatment effect (LATE) on compliers, but I am also interested in which women in these municipalities drive the results seen. Therefore, I also test for heterogeneous effects of socioeconomic status through individual-level reduced-form regressions. This model takes the form

$$\begin{aligned} Y_{i,m,t} = \phi + \alpha_m + \theta_t + \beta PRICE_{m,t} + \gamma EDUC_{i,m,t} + \\ \delta PRICE_{m,t} \times EDUC_{i,m,t} + u_{i,m,t} \end{aligned} \tag{0.3}$$

where $Y_{i,m,t}$ represent the individual-level fertility and violence outcomes previously mentioned for woman *i* in municipality *m* in year *t*. Equation 0.3 represents the reduced-form effect of prices on fertility and violence, and will give a sense of whether the effects observed in the IV estimates are driven by high or low educated women.

# 3 Results

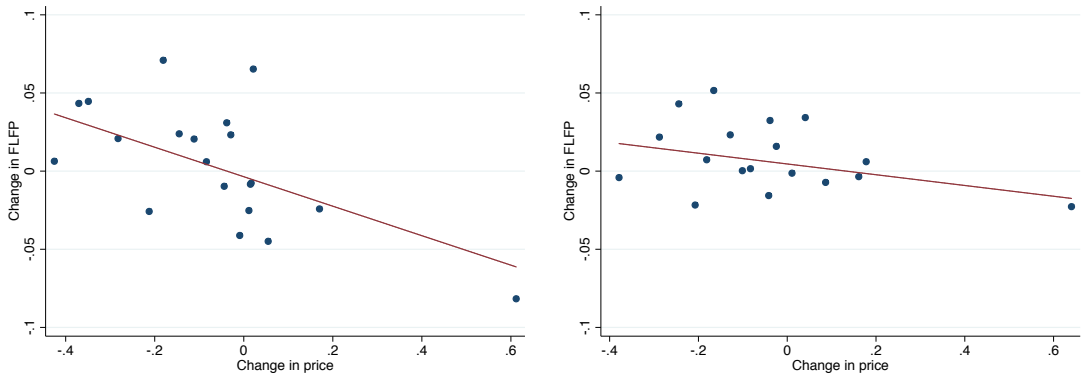
## 3.1 First Stage

As Mexico liberalized trade, the price of home appliances began to fall, making them more accessible for Mexican households. My identification strategy exploits this empirical finding. In particular, first stage estimations capture how the decreases in the relative price of washing machines post-GATT reforms affected changes in FLFP. In following with the hypothesis of

Greenwood et. al (2005), greater access to time-saving home appliances could decrease the demands of home production and free women to work outside of the home, particularly in areas with lower levels of development or less previous access to appliances.

Figure 2 shows the relationship between *changes* in the relative price of washing machines and *changes* in FLFP. The panel on the left shows the relationship for municipalities below the median level of educational attainment in 1990, while the right panel shows the relationship for municipalities above the median level of schooling in 1990. Though a negative relationship is observed for both sub-samples, the relationship is clearly larger for municipalities with lower levels of education in 1990. This pattern presents preliminary evidence to support the hypothesis that areas with lower development or lower educational attainment may have less overall direct access initially to washing machines or facilities for washing clothing, and would therefore be more responsive to changes in washing machine prices. Furthermore, because washing machines are a durable good, price changes are likely to induce first-time buying as opposed to adding additional washing machines to households that already own one.

Figure 2: First Stage: Changes in price decrease changes in FLFP




(a) Below median schooling (b) Above median schooling

Notes: Changes in price, FLFP are the first differences of relative washing machine price and female labor force participation. Graphs are generated with *binscatter*, a non-parametric plotting method that separates the data into bins of equal size then plots the average of the observations in each bin. Solid lines represent linear regressions of changes in price on changes in FLFP. Elaborated by the author with data from INEGI.

Table 4 reports the first stage estimations for the entire sample, for women, and for men. Labor force participation for all estimates is normalized at baseline; that is, by subtracting the

Table 4: First stage results: Reduced washing machine prices increase FLFP

| | All | | | Female | | | Male | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| log Price | -0.138 | -2.060*** | -2.060** | -0.970*** | -1.571** | -1.571* | 0.760*** | -0.896 | -0.896 |
| | (0.292) | (0.734) | (0.882) | (0.270) | (0.710) | (0.856) | (0.264) | (0.571) | (0.669) |
| × Educ. | 0.906*** | 0.889 | 0.889 | 0.845*** | 1.307* | 1.307 | 0.304** | 0.290 | 0.290 |
| | (0.161) | (0.717) | (0.704) | (0.148) | (0.694) | (0.867) | (0.145) | (0.558) | (0.914) |
| Price+(× Educ.) | | -1.17 | -1.17 | | -0.26 | -0.26 | | -0.61 | -0.61 |
| SE | | 0.94 | 0.94 | | 0.91 | 0.91 | | 0.73 | 0.73 |
| Mean Y | 0.52 | 0.52 | 0.52 | 0.50 | 0.50 | 0.50 | 0.28 | 0.28 | 0.28 |
| Municip. | 63 | 63 | 63 | 63 | 63 | 63 | 63 | 63 | 63 |
| Observ. | 378 | 378 | 378 | 378 | 378 | 378 | 378 | 378 | 378 |
| R-sq. | 0.09 | 0.65 | 0.65 | 0.15 | 0.64 | 0.64 | 0.06 | 0.73 | 0.73 |
| F-stat. | 12.38 | 11.18 | 8.98 | 22.14 | 11.93 | 9.53 | 7.59 | 5.00 | 4.56 |
| Muni FE | no | yes | yes | no | yes | yes | no | yes | yes |
| Time FE | no | yes | yes | no | yes | yes | no | yes | yes |
| Cluster | no | no | yes | no | no | yes | no | no | yes |

Notes: The dependent variable is labor force participation at the municipal level, standardized by subtracting mean FLFP in 1990 and dividing by the standard deviation of FLFP in 1990. *log Price* is the log of washing machine price normalized by the national CPI. *Price+(× Educ.)* represents the estimate for the sum of the price coefficient with its interaction with education. Not shown are the coefficients for electrification. Standard errors clustered at municipal level in parentheses in Columns (3) (6) and (9). Elaborated by the author with data from INEGI.
$^{*}p < 0.1,^{**}p < 0.05,^{***}p < 0.01$

mean and dividing by the standard deviation in 1990. Columns (1), (4) and (7) present the results of an OLS estimate of the effect of price on LFP including interaction terms of price with indicator variables for being above the median schooling and electrification levels in 1990. These estimations are not very useful principally because of the likelihood that any effect due to unobserved characteristics of municipalities or time trends is picked up by the estimate for price. To correct for this, Columns (2), (3), (5), (6), (8), and (9) include time and municipal fixed effects which control for any observed or unobserved municipality characteristics that are time-invariant and time trends that are not necessarily linear.

Columns (3), (6) and (9) include clustered standard errors at the municipal level. Columns (5) and (6) then reflect the effect of prices on FLFP. As hypothesized, washing machine prices have a negative effect on FLFP, and a $1\%$ increase in relative price decreases FLFP by approximately 1.5 standard deviations from the mean at baseline (1990). Given that mean FLFP in 1990 was approximately $33.9\%$, this represents a decrease of almost 10 percentage points, or approximately $26\%$ compared to the mean for municipalities below median socioeconomic status. Columns (5) and (6) also show that municipalities above the median level of education in 1990 saw smaller and statistically insignificant effects, as predicted, though this difference is not statistically distinguishable from zero when clusters are included in Column (6). The F-stats for Columns (5) and (6) are 11.93 and 9.53 respectively, indicating that the instrument is relevant for FLFP.

Columns (8) and (9) of Table 4 report the estimates for the same model run for male labor force participation. The effect of washing machine prices on male labor force participation is not statistically significant, even before clustering standard errors. In no estimation did municipalities with higher levels of schooling in 1990 see a differential response to prices for men. Additionally, the F-stats for male labor force participation in Columns (8) and (9) are 5.00 and 4.56, respectively, indicating that washing machine prices would provide a very weak instrument for male labor force participation. These estimates for male labor force participation provide a robustness check for the exogeneity of washing machine prices as an instrument. The fact that washing machine prices had no effect on male labor force participation provides evidence that prices did not have

effects through other channels relevant to the general labor market. The effect on women's labor market and the lack of one on men's alleviates concerns regarding the instrument's exogeneity. Further evidence of the exogeneity of the instrument is presented in Section 4.

## 3.2 IV Estimates

The central results of this paper show the effect of FLFP on fertility and violence using two-staged least squares. Because prices had different effects on FLFP for municipalities with high educational attainment and low educational attainment, I present the estimates separated by educational attainment in 1990.

### Fertility

Table 5 shows 2SLS estimates of the effect of FLFP on the birth rate, fertility, average age of mothers overall and in the year of first birth, and the civil status of mothers in the year of the recorded birth. As in the first stage, FLFP is standardized using the mean and standard deviation across municipalities in 1990. Panel A shows the estimates of the fixed effects model from Equation (0.1) for the pooled sample of municipalities. Panel B1. reports estimates for municipalities with average schooling below the median in 1990, while Panel B2. of Table 5 estimates the same model for municipalities with an average level of schooling above the median in 1990. In 1990, the median completed schooling for municipalities in this sample was slightly above 8 years, or slightly above completion of secondary school.

Columns (1) and (2) in Table 5, Panel B1. show that female labor force participation in less educated municipalities had a negative, statistically significant effect both on the overall birth rate and on the more specific indicator of fertility (average number of births per woman in reproductive age). The effect on the birth rate and fertility is large; an increase of one standard deviation at baseline in FLFP caused a decrease of around $27\%$ of the mean birth rate and a decrease in approximately $3.5\%$ of mean fertility. Both these estimates indicate the FLFP caused women to have fewer children. FLFP also had a positive, statistically significant effect on the

age of mothers, particularly on the average age of mothers at the time of the first birth, shown in Column (4), Panel B1. An increase of one standard deviation at baseline in FLFP caused an increase in the average age at first birth of almost three-fourths of a year. This indicates that FLFP caused women to have children later overall, and in particular caused them to delay the start of fertility.

Finally, FLFP also changed the civil status of mothers. Female labor force participation had a positive effect on the proportion of women who were cohabiting in the year of birth, and decreased the proportion of women who were married in the year of birth in almost the same amount. This is consistent with both the lower value of marriage hypothesis (Autor et al., 2018) and with the potential undesirability of marriages where women have larger incomes (Bertrand et al., 2015), though from these results it is not possible to separate whether the decrease in marriages was spurred by women's devaluation (as would be more the case of Autor et. al (2018)), or by men reluctant to enter marriage with lower relative income (as argued in Bertrand et. al (2015)).

In Table 5, Panel B2., the same model is run for municipalities above median educational attainment in 1990. The F-stats from the first stage for these estimations are lower than for municipalities with lower socioeconomic status, reflecting the increased strength of the instrument in less educated municipalities. The 2SLS estimates for the high-socioeconomic status municipalities in Panel B2. are across the board larger in absolute value than the estimates for municipalities with lower socioeconomic status, and in some cases are more than double the size. Therefore, although FLFP was more responsive to washing machine prices in municipalities with less education, the small responses of FLFP in more educated municipalities resulted in a larger effect on fertility decisions. This could be the result of the kind of labor market participation that women engaged in in more educated municipalities. Another possibility is that a greater baseline level of education in 1990 compounded with FLFP resulted in greater relative bargaining power for women or greater access to resources for family planning, as postulated in the model of endogenous bargaining power and fertility of Iyigun and Walsh (2008).

Table 5: The Effect of FLFP on Fertility

**A. Fixed Effects Estimation**

| | | | Mother's Age | | Civil Status | | |
|---|---|---|---|---|---|---|---|
| | (1) Birth rate | (2) Fertility | (3) Avg. Age | (4) Age 1st Birth | (5) Married | (6) Cohabiting | (7) Single |
| Stand. FLFP | 0.819* | -0.000 | 0.036 | 0.026 | 0.000 | 0.000 | -0.001 |
| | (0.474) | (0.006) | (0.024) | (0.023) | (0.003) | (0.002) | (0.001) |
| Mean dept. var. | 47.11 | 2.42 | 25.38 | 22.44 | 0.68 | 0.25 | 0.07 |
| F-stat. | 78.15 | 14.00 | 19.81 | 40.74 | 30.43 | 24.90 | 4.99 |
| Municipalities | 63 | 63 | 63 | 63 | 63 | 63 | 63 |
| Observations | 378 | 378 | 378 | 378 | 378 | 378 | 378 |

**B1. Low educ.**

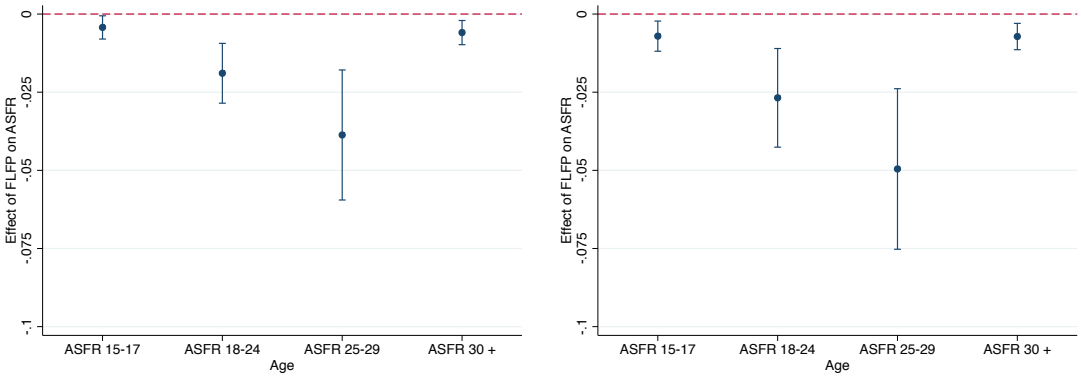
| | Fertility | | Mother's Age | | Civil Status | | |
|---|---|---|---|---|---|---|---|
| | (1) Birth rate | (2) Fertility | (3) Avg. Age | (4) Age 1st Birth | (5) Married | (6) Cohabiting | (7) Single |
| Stand. FLP | -12.468*** | -0.090*** | 0.385*** | 0.737*** | -0.023*** | 0.024*** | -0.001 |
| | (2.994) | (0.028) | (0.067) | (0.134) | (0.009) | (0.008) | (0.002) |
| Mean dept. var. | 46.80 | 2.56 | 25.26 | 22.16 | 0.65 | 0.28 | 0.08 |
| Municipalities | 32 | 32 | 32 | 32 | 32 | 32 | 32 |
| Observations | 192 | 192 | 192 | 192 | 192 | 192 | 192 |
| F (1st stage) | 30.53 | 30.53 | 30.53 | 30.53 | 30.53 | 30.53 | 30.53 |

**B2. High educ.**

| | Fertility | | Mother's Age | | Civil Status | | |
|---|---|---|---|---|---|---|---|
| | (1) Birth rate | (2) Fertility | (3) Avg. Age | (4) Age 1st Birth | (5) Married | (6) Cohabiting | (7) Single |
| Stand. FLP | -17.525*** | -0.118*** | 0.839*** | 1.302*** | -0.044*** | 0.049*** | -0.005** |
| | (4.684) | (0.025) | (0.228) | (0.322) | (0.013) | (0.014) | (0.002) |
| Mean dept. var. | 47.42 | 2.27 | 25.51 | 22.73 | 0.71 | 0.22 | 0.07 |
| Municipalities | 31 | 31 | 31 | 31 | 31 | 31 | 31 |
| Observations | 186 | 186 | 186 | 186 | 186 | 186 | 186 |
| F (1st stage) | 13.29 | 13.29 | 13.29 | 13.29 | 13.29 | 13.29 | 13.29 |

Notes: The independent variable is FLFP normalized by subtracting mean FLFP in 1990 and dividing by the standard deviation across municipalities in 1990. "Low education" indicates that the average level of schooling in a municipality in 1990 was less than the median, approximately 8 years. Birth rate measured as number of births per 1,000 women. Fertility is the average number of children per mother. All regressions include municipality fixed effects and time fixed effects. Standard errors clustered at the municipal level in parenthesis. Elaborated by the author with data from INEGI. $^{*}p < 0.1,^{**}p < 0.05,^{***}p < 0.01$

Figure 3: The Effect of FLFP on Age-Specific Fertility Rates




(a) Below median schooling (b) Above median schooling

Notes: Each point represents the coefficient for *FLFP* from a separate 2SLS regression. The dependent variable, $ASFR_j$, is the number of births born to mothers in age group j normalized by the number of women in that age group. Regressions take the same form as the previous tables, with municipality and time fixed effects and clustered standard errors at the municipal level. Vertical lines represent $95\%$ confidence intervals. Elaborated by the author with data from INEGI.

Table 5 shows that FLFP caused women to start having children later and to be older on average for all births, but it is also of interest how different age groups of women changed their behavior. Figure 3 plots the coefficients for the causal effect of FLFP on various age-specific fertility rates (ASFR). Each point therefore is the coefficient from a separate 2SLS estimate where the dependent variable, $ASFR_j$, is the number of births to women in age group *j* normalized by the total population of women in age group *j*. These estimates are again separated by low and high socioeconomic status in 1990. The coefficients are similar in size and pattern for municipalities of high and low socioeconomic status, although again municipalities above median schooling in 1990 show slightly larger effects. Figure 3 shows that although fertility decreased in all age categories, the primary decreases came from women aged 25-29.

Given the interpretation in 2SLS as a local average treatment effect (LATE), this model reports the effects of FLFP on the women who entered the work force *because* of the increased access to washing machines. That is, because LATE captures the treatment effect for compliers, it does not capture the effect of FLFP on women unaffected by washing machine prices. Therefore, the fact that larger results are observed for women most likely to be married and running a household (aged 25-29) is consistent with the largest effects being seen for women who were most likely to

be compliers with treatment.

Finally, Figure A.1 in the Appendix plots the coefficients for the causal effect of FLFP on the proportion of births absorbed by 5-year intervals of mother's ages. Each point represents the coefficient from a separate 2SLS estimate, where the dependent variable is the number of births born to each age group divided by the total number of births. These estimates give a sense for how the *composition* of mothers was affected by increased FLFP. Both samples show a clear shift in births away from the youngest age groups and towards categories over the age of 25, indicating a composition effect away from young mothers. For more educated municipalities, this shift culminates in the peak increase of births going to the 30-34 age category, while this peak occurs in the 25-29 age category for less educated municipalities, indicating that for more educated municipalities women delayed birth more than in less educated municipalities. It is also worth noting that the primary decreases in the fertility share are seen for the the 15-19 age group, even though only around $10\%$ of economically active women were under the age of 19 in both municipalities. This strong decrease for 15-19 year old women may have important welfare implications as there is evidence of worse long-term outcomes for teenage mothers (Arceo-Gomez & Campos-Vazquez, 2014).

In summary, FLFP increased the age of mothers, and in particular increased the age of the first birth. Fertility rates fell primarily for women aged 18-29, and the share of births shifted towards older age groups. FLFP also had a negative effect on fertility and the overall birth rate, and increased the share of cohabiting mothers while decreasing the share of married mothers. These results indicate that increases in FLFP have a significant impact not only on how many children women have, but when they decide to have them and under what marital circumstances.

**Violence**

Table 6 reports the 2SLS estimates of the causal effect of FLFP on several variables representing gendered violence. The estimations are again separated by municipal socioeconomic status. Panel A reports estimates for the fixed effects model, while Panel B1., reports estimates for municipali-

ties with lower socioeconomic status in 1990. The estimates are not statistically different from 0 for any of the indicators for gendered violence, neither for overall presence (Columns (1), (2), (4) and (6)) or the composition of homicides (Columns (3), (5) and (7)). The same pattern is observed in Table 6, Panel B2., for municipalities below median educational attainment, with only the estimates for strangulations significant at a $10\%$ level. Panel A shows that the 2SLS estimates and the fixed effects estimates yield qualitatively similar results, suggesting that controlling for fixed effects may be sufficient to correct for endogeneity.

The absence of a statistically identifiable effect of FLFP on gendered violence could be explained by one of two theories. One is that gendered violence is independent of FLFP, and therefore estimates of a causal effect would result in statistically insignificant coefficients. The other is that the effects of *male backlash* and *liberation* counteract one another, summing to a net effect of zero. If this is the case, then some women who decide to work because of the change in washing machine prices face backlash from men who perceive newfound independence (in terms of time or income) as a threat, and these women were more likely to be a victim of gendered violence as a result (Tauchen, Witte, & Long, 1991). Simultaneously, other women gain bargaining power from participating in the labor force, and are less likely to face feminicide as a result (Bobonis et al., 2013). Therefore, in aggregate, the net effect of increases in FLFP on violence could be zero (Tauchen et al., 1991). That changes in women's status result in different responses depending on characteristics of the woman (and man) in question has been documented by Angelucci (2008) for the case of the *Oportunidades*, where she finds that when relative female income increases in the household, domestic violence increases in households with less education and decreases in households with higher education. I explore these potential heterogeneous effects in the following section.

Table 6: 2SLS Regressions: The Effect of FLFP on Gendered Violence

**A. Fixed Effects Estimation**

| | Homicide Rate | Feminicides | In the home | | Strangulations | | Sexual Violence | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) Overall | (4) Prop. | (5) Overall | (6) Prop. | (7) Overall | (8) Prop. |
| Stand. FLFP | -3.701** | -0.794 | -1.086 | -0.010 | -0.260 | 0.016 | 0.035 | -0.001 |
| | (1.713) | (1.412) | (0.719) | (0.046) | (0.269) | (0.015) | (0.063) | (0.004) |
| Mean dept. var. | 26.67 | 16.54 | 9.46 | 0.37 | 2.25 | 0.09 | 0.14 | 0.01 |
| F-stat. | 1.95 | 0.34 | 1.21 | 2.12 | 1.42 | 1.66 | 1.43 | 1.34 |
| Municipalities | 63 | 63 | 63 | 59 | 63 | 59 | 63 | 59 |
| Observations | 377 | 377 | 377 | 283 | 377 | 283 | 377 | 283 |

**B1. Below median educ.**

| | Homicide Rate | Feminicides | In the home | | Strangulations | | Sexual Violence | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) Number | (3) Number | (4) Prop. | (5) Number | (6) Prop. | (7) Overall | (8) Prop. |
| Stand. FLP | -4.239 | -2.562 | -3.637 | -0.052 | 0.152 | -0.017 | 0.062 | -0.002 |
| | (4.459) | (3.393) | (2.951) | (0.081) | (1.179) | (0.059) | (0.060) | (0.004) |
| Mean dept. var. | 21.28 | 14.78 | 8.30 | 0.43 | 1.98 | 0.11 | 0.10 | 0.01 |
| Municipalities | 32 | 32 | 32 | 24 | 32 | 24 | 32 | 24 |
| Observations | 192 | 192 | 192 | 118 | 192 | 118 | 192 | 118 |
| F (1st Stage) | 30.53 | 30.53 | 30.53 | 38.86 | 30.53 | 38.86 | 30.53 | 38.86 |

**B2. Above median educ.**

| | Homicide Rate | Feminicides | In the home | | Strangulations | | Sexual Violence | |
|---|---|---|---|---|---|---|---|---|
| | (1) | (2) Number | (3) Number | (4) Prop | (5) Number. | (6) Prop. | (7) Number | (8) Prop. |
| Stand. FLP | -14.283 | 1.006 | -2.055 | -0.070 | 2.964* | 0.120* | 0.126 | 0.009 |
| | (8.800) | (5.514) | (2.720) | (0.120) | (1.570) | (0.070) | (0.306) | (0.011) |
| Mean dept. var. | 32.27 | 18.37 | 10.66 | 0.33 | 2.52 | 0.09 | 0.19 | 0.01 |
| Municipalities | 31 | 31 | 31 | 30 | 31 | 30 | 31 | 30 |
| Observations | 185 | 185 | 185 | 160 | 185 | 160 | 185 | 160 |
| F (1st Stage) | 13.33 | 13.33 | 13.33 | 9.64 | 13.33 | 9.64 | 13.33 | 9.64 |

Notes: The independent variable is FLFP standardized to mean 0, standard deviation 1. *Homicide rate* refers to the number of homicides per million women. For the outcomes *Occurring in the home*, *Strangulations* and *Sexual Violence*, "Overall" refers to the number of deaths with those characteristics per million women. "Prop." refers to the proportion of homicides that had that characteristic. *Strangulations* refers to deaths in which the cause of death was strangulation. *Sexual Violence* is similarly defined. All regressions include municipality fixed effects and time fixed effects. Standard errors clustered at municipal level in parentheses. Elaborated by the author with data from INEGI. $^{*}p < 0.1,^{**}p < 0.05,^{***}p < 0.01$

## 3.3 Heterogeneous Effects: Reduced-Form Estimates

The first and second stage regressions showed that municipalities with lower socioeconomic status were more responsive to the variation in washing machine prices in terms of FLFP, but that municipalities with higher socioeconomic status saw greater responses of fertility to FLFP. However, the question remains of *which* women were behind the changes in fertility, and if different types of women experienced different responses in terms of violence. This section uses reduced-form regressions from individual-level data to identify the presence of heterogeneous treatment effects based on individual socioeconomic status.

Table 7 reports individual-level estimates of the effect of price and its interaction with educational attainment on mother's age, age at first birth, and civil status of mothers in the year of birth. Columns (1) and (2) report the estimates for mother's age and age at first birth. The coefficient is larger for age at first birth, which is consistent with the larger causal effect that FLFP had on the age at first birth in Table 5. In both columns the interaction with education is positive, indicating that the effect is smaller for more highly educated women. Because the variable *Education* is a categorical variable for educational attainment with seven categories, the coefficient of price reflects the effect of price for the least educated women (those with incomplete primary). The effect of price on the most educated women (those with professional degrees) is then seen by multiplying the interaction term by seven and adding the coefficient for price. This exercise shows that for the most educated women, the effect of price was around zero, and was much more negative for the least educated women. Therefore, although more educated *municipalities* saw greater changes in fertility, it appears that the less educated *women* were the ones changing their fertility decisions.

Table 8 reports reduced-form estimates of the effect of washing machine price and its interaction with an indicator variable for primary school completion on gendered violence indicators. In all estimates the coefficient on price is not statistically significant at the $5\%$ level, reflecting the lack of causality observed in the 2SLS estimates in table 6. In the estimates for *feminicides* (Column (2)) and *In the home* (Column 3), the interaction term is statistically different

Table 7: Reduced-form Estimates: Heterogeneous effects of Education on Fertility

| | (1) Mother's age | (2) Age if first birth | (3) Married | (4) Cohabiting | (5) Single |
|---|---|---|---|---|---|
| log Price | -0.331*** | -0.519*** | 0.027*** | -0.038*** | 0.011*** |
| | (0.040) | (0.054) | (0.003) | (0.003) | (0.002) |
| × Educ. | 0.047*** | 0.084*** | -0.007*** | 0.009*** | -0.002*** |
| | (0.005) | (0.007) | (0.000) | (0.000) | (0.000) |
| Mean dept. var. | 25.68 | 21.97 | 0.64 | 0.28 | 0.08 |
| Observations | 13,259,816 | 4,567,079 | 13,101,270 | 13,101,270 | 13,101,270 |
| R-sq. | 0.03 | 0.07 | 0.15 | 0.16 | 0.02 |

Notes: The dependent variables are mother's age, age at time of first birth, and whether the mother was married, cohabiting or single in the year of birth. Log price is the log of municipal washing machine price normalized by the national CPI. $\times Educ.$ represents the interaction of price with a categorical variable representing completed schooling. *Education* takes a value of 0 for no schooling, 1 for 1-3 years (of 6 total) of primary school, 2 for 4-5 years of primary school, 3 for completion of primary school, 4 for completion on secondary school (8 years of schooling), 5 for completion of high school (12 years of schooling) and 7 for completion of a professional degree. Elaborated by the author with data from INEGI. $^{*}p < 0.1,^{**} p < 0.05,^{***} p < 0.01$

Table 8: Reduced-form Estimates: Heterogeneous effects of Education on Gendered Violence

| | (1) Homicide | (2) Feminicide | (3) In the home | (4) Strang. | (5) Rape |
|---|---|---|---|---|---|
| log Price | -0.002 | -0.002 | -0.007 | -0.001* | -0.000 |
| | (0.002) | (0.002) | (0.005) | (0.001) | (0.000) |
| × Primary | 0.001 | 0.001** | 0.007* | 0.000 | -0.000 |
| | (0.002) | (0.001) | (0.004) | (0.000) | (0.000) |
| Price+(× Primary) | -0.001 | -0.001 | 0.000 | -0.001 | -0.000 |
| SE | 0.003 | 0.001 | 0.004 | 0.000 | 0.000 |
| Mean dept. var. | 0.01 | 0.00 | 0.01 | 0.00 | 0.00 |
| Observations | 183,670 | 183,670 | 33,998 | 183,670 | 183,670 |
| R-sq. | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

Notes: The dependent variables are all indicator variables. *Homicide* indicates that the death was presumed a homicide. *In the home* indicates the murder of a women that occurred in the home. *Strangulation* and *Rape* are causes of death as indicated by the ICD-9 for 1990-1994, and the ICD-10 for 1995. *Feminicide* indicates homicides that either occurred in the home or were strangulations or rape. Elaborated by the author with data from INEGI. $^{*}p < 0.1,^{**} p < 0.05,^{***} p < 0.01$

from the coefficient for price alone at the $5\%$ and $10\%$ levels, respectively. This provides some evidence that any possible increases in feminicides and more specifically homicides that occur in the home as a result of the decreases in washing machine prices were less likely to be observed for women with educational attainment above primary school. Though the evidence is weak because neither the coefficient of price nor the sum with its interaction are significantly different from zero, these results are consistent with the presence of male backlash in less educated households, as in Angelucci (2008).

# 4 Robustness Checks

## 4.1 Placebo tests

The instrumental variables approach is a powerful econometric tool for answering endogeneity, but must satisfy certain conditions in order for it to be a valid approach, namely relevance and exogeneity. Exogeneity of the instrument could be called into question if fluctuations in price affected violence or fertility through channels other than FLFP. Because relative price here is defined at the ratio of the washing machine CPI and the national consumer price index, the instrument does not reflect changes in overall price levels that could impact outcomes. Additionally, the null effect of this price change on men observed in Table 4 provides a robustness check, because it indicates that price changes did not impact the male labor market. This also provides evidence that overall labor demand did not change in with the decrease in washing machine prices. This section provides additional evidence supporting the exogeneity of washing machine prices as an instrument.

If changes in the price of other types of appliances that were not time-saving also impacted FLFP, then we may be concerned that price changes were not operating through the theoretical channel discussed. Specifically, exogeneity could be called into question if changes in the price of washing machines, which are expensive durable goods, had an income effect for households that affected fertility or violence. Table 9 shows results of an alternative first stage specification using

relative refrigerator price instead of washing machine price. Refrigerators, like washing machines, are durable home appliances, but unlike washing machines they do not reduce significantly the amount of the time needed to complete chores in the home.[8] The model estimated is a modified version of Equation (0.2), with relative refrigerator prices used instead of washing machine prices. As before, the specification includes interactions with indicator variables for schooling and electrification in 1990, time and municipal fixed effects, and clustered standard errors at the municipal level.

Column (2) reports the estimation for FLFP, and the coefficient for refrigerator price is not significant for municipalities with either high or low socioeconomic status. Additionally, the magnitude of the coefficient is around $2\%$ the size of the coefficient of washing machine prices. This provides evidence that washing machine prices did not affect FLFP in any kind of general sense relevant to other appliances, but rather that it was the time-saving aspect of washing machines that impacted FLFP.

Table 9: First Stage: Decreases in refrigerator prices have no effect on FLFP

| | (1)<br>All | (2)<br>Female | (3)<br>Male |
|---|---|---|---|
| Refrig. price | -0.062 | -0.002 | -0.085 |
| | (0.065) | (0.084) | (0.068) |
| $\times$ Educ. | -0.048 | -0.137* | 0.027 |
| | (0.061) | (0.071) | (0.075) |
| Mean dept. var. | 0.58 | 0.35 | 0.82 |
| Municipalities | 30 | 30 | 30 |
| Observations | 180 | 180 | 180 |
| R-sq. | 0.58 | 0.60 | 0.67 |
| F-stat. | 8.29 | 13.86 | 2.77 |

Notes: Dependent variables are overall labor force participation (proportion of adults 15 years old or above who are either employed or unemployed/searching for work) normalized at baseline (minus mean LFP in 1990, divided by the standard deviation in 1990), FLFP and male labor force participation. Refrigerator price is the municipal CPI for refrigerators normalized by the national CPI. *Educ.* is an indicator variable for municipalities above median schooling in 1990. Not shown is the coefficient for the interaction with an indicator for being above median electrification in 1990. All regressions include time and municipal fixed effects as well as clustered standard errors at the municipal level. Elaborated by the author with data from INEGI. $^{*}p < 0.1,^{**} p < 0.05,^{***} p < 0.01$

[8] Although other durable home goods that are not time-saving in nature could be used, such as televisions, radios, etc, I focus on refrigerators because they are the only home appliance for which price data is consistently reported before the year 2000.

Theoretically, it is also not clear that FLFP should impact violence against men. One key characteristic of feminicides is that their tendencies in time are generally not related to violence against men (Merino & Torreblanca, September 19, 2016). Therefore, if prices have a significant impact on violence against men, we may be concerned that the instrument is not exogenous to violence outcomes. Table 10 reports reduced-form estimates of the impact of prices on the number of homicides in which the victim was a man per million male inhabitants. Price has no significant effect on homicides, homicides in the home, or strangulations of men, and the F-stats are all less than three. Table 11 reports 2SLS estimates of the effect of FLFP on the number of homicides of men per million male residents. Table 11, Column (1) reports results from the full sample of municipalities, while Columns (2) and (3) report results for municipalities below and above median schooling in 1990, respectively. None of the models present statistically significant coefficients, providing evidence that prices did not have an effect on overall violence. This evidence supports the hypothesis of the exogeneity of the instrument for violence outcomes.

Table 10: Reduced-form Estimates for Violence Against Men: Prices have no effect on male violence

| | (1)<br>Homicides | (2)<br>In the home | (3)<br>Strangulations |
|---|---|---|---|
| log Price | 35.873 | -88.028 | -3.234 |
| | (78.676) | (60.070) | (9.458) |
| $\times$ Educ. | -33.821 | 58.853* | -2.398 |
| | (91.691) | (33.054) | (8.700) |
| Mean dept. var. | 224.23 | 123.80 | 5.92 |
| Municipalities | 63 | 63 | 63 |
| Observations | 377 | 377 | 377 |
| R-sq. | 0.79 | 0.65 | 0.42 |
| F-stat. | 0.54 | 1.76 | 2.50 |

Notes: Dependent variables are number of homicides, number of homicides that occurred in the home, and number of homicides that were strangulations, all normalized per million male inhabitants. Not shown is the coefficient for the interaction with electrification. All estimates include time and municipal fixed effects as well as clustered standard errors at the municipal level. Elaborated by the author with data from INEGI.
$^{*}p < 0.1,^{**}p < 0.05,^{***}p < 0.01$

Finally, the exogeneity of the instrument could also be threatened if price changes in some way spurred migration into municipalities where prices fell most. This could change FLFP,

Table 11: 2SLS Estimates of the Impact of FLFP on Violence against Men

| | (1) All | (2) Low educ. | (3) High educ. |
|---|---|---|---|
| Stand. FLFP | -28.452 | -30.520 | -27.456 |
| | (20.446) | (38.075) | (24.066) |
| Mean dept. var. | 224.23 | 263.35 | 186.54 |
| Municipalities | 63 | 31 | 32 |
| Observations | 377 | 185 | 192 |
| F (1st Stage) | 37.69 | 13.33 | 30.53 |

Notes: Dependent variable is number of homicides in which the victim was a man, normalized per million male inhabitants. All estimates include time and municipal fixed effects as well as clustered standard errors at the municipal level. Elaborated by the author with data from INEGI. $^{*}p < 0.1,^{**} p < 0.05,^{***} p < 0.01$

especially if the women who migrate share characteristics related to fertility or violence. Table A.4 reports fixed effects estimations of the effect of prices on total population overall, of men, and of women. The specification is the same as Equation (0.2), but population is the dependent variable instead of FLFP. Column (1) shows that prices had no effect on overall population, and more specifically Column (2) reports the estimate for total female population, which is not statistically different from zero. This provides evidence that price changes were not associated with any other general economic changes that would have spurred migration.

## 4.2 Pre-treatment time trends

The use of fixed effects in the instrumental variables model estimated in this paper means that 2SLS regressions estimate the local average treatment effect of *changes* in FLFP on observed *changes* in fertility and violence. In this context of "treatment effects", assignment to treatment occurred through price changes. Therefore, one can interpret these results as a type of difference-in-differences estimator, where the control group is a set of municipalities which saw little change in prices. Under this interpretation, there may be concern that if *treatment* and *control* groups did not have similar trends in outcomes pre-treatment, then they are not comparable after treatment.

To answer this concern, I estimate a modified Equation (0.1) for the years previous to treatment, 1987 and 1988, and the first years of price change, 1989 and 1990. Instead of FLFP,

I include interactions of an indicator for the control group with year indicator variables.[9] The control group is defined as municipalities in the 25th percentile or below of global price change between 1990 and 1995. Therefore, if the coefficient of the interaction term is statistically zero, that would indicate that municipalities that saw little price change from 1990 to 1995 (control group) had similar trends in outcomes as municipalities with greater changes in price (treatment group), the justifying assumption of difference-in-difference estimators.

Table 12 reports the estimates of time dummies and their interaction with an indicator for the control group for the various fertility outcomes available for the years 1987-1990. Only the coefficients for the interaction terms are reported. In Columns (1) to (5) not a single estimate is significant at the $5\%$ level for the years 1987-1989, indicating that the time trends between treatment and control groups are indistinguishable before 1990. In 1990, the first year of consideration in the 2SLS estimates, the trends begin to diverge for *Marriage* (Column (3)) and *Single* (Column (5)), but in other variables the treatment and control groups maintain their similarities in time.

[9]This methodology is adapted from the work of Galiani, Gertler and Schargrodsky (2005).

Table 12: Time Trends Pre-treatment: Control and Treatment groups had similar trends

| | (1) Mother's age | (2) Age at first birth | (3) Married | (4) Cohabiting | (5) Single |
|---|---|---|---|---|---|
| 1987 | -0.021 | 0.090 | -0.041* | 0.026 | 0.015 |
| | (0.190) | (0.192) | (0.020) | (0.028) | (0.025) |
| 1988 | 0.008 | 0.018 | -0.015 | 0.015 | -0.000 |
| | (0.103) | (0.153) | (0.015) | (0.022) | (0.008) |
| 1989 | -0.036 | 0.035 | -0.024* | 0.016 | 0.009 |
| | (0.121) | (0.180) | (0.013) | (0.017) | (0.006) |
| 1990 | -0.049 | 0.032 | -0.029*** | 0.016* | 0.013*** |
| | (0.083) | (0.055) | (0.009) | (0.009) | (0.002) |
| Mean dept. var. | 25.12 | 21.93 | 0.71 | 0.22 | 0.07 |
| Mun. $\times$ Yr. | 315 | 315 | 315 | 315 | 315 |
| Municip. | 63 | 63 | 63 | 63 | 63 |
| R-sq. | 0.94 | 0.95 | 0.98 | 0.98 | 0.83 |

Notes: Each independent variable represents the interaction of a year dummy variable with an indicator equal to one if a municipality is in the control group. The control group is defined as municipalities in the 25th percentile or below in terms of global price change between 1990-1995. Not shown are the coefficients for non-interacted year indicator variables. All specifications include municipal fixed effects and clustered standard errors at the municipal level. Elaborated by the author with data from INEGI. $^{*}p < 0.1,^{**}p < 0.05,^{***}p < 0.01$

## 4.3 Contemporaneous change in television programming

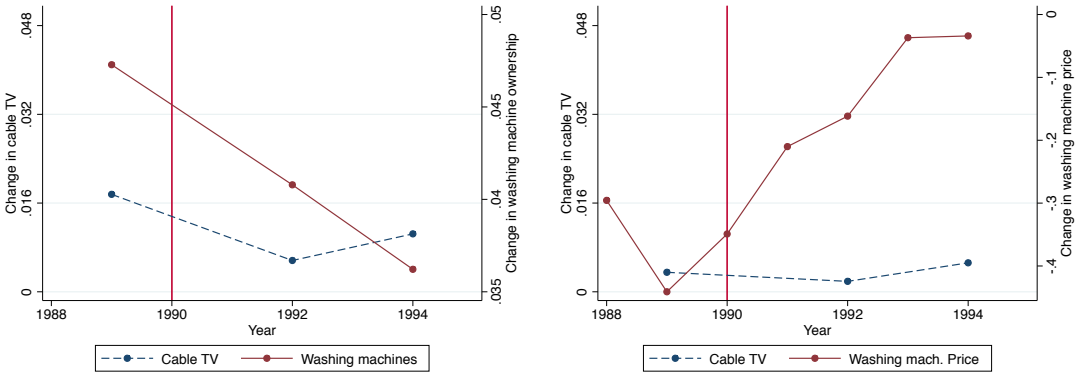
Another potential source of bias is if the lowering of washing machine prices permitted households to obtain other goods which themselves had an effect on violence or fertility. Specifically, increased access to "modern" television programs could have spurred women to change their fertility decisions, as has been explored in the case of Brazil (La Ferrara, Chong, & Duryea, 2012). This could be via an income effect, if lowered washing machine prices allowed households to purchase a television or pay for cable television. Alternatively, if households that were induced to purchase a washing machine were also exposed to different television programming, the effect seen from price changes could be confounded by contemporaneous changes in television programming.

Part of this concern is mitigated by the fact that television ownership and use in this period was already high, so there is no reason a priori why *changes* in usage or content was related to changes in washing machine prices. Therefore, it is likely that changes in washing machine access are likely orthogonal to access and use of national television, especially since this paper

focuses on urban areas. However, access to cable television may be more complicated, either because cable television became cheaper in the same municipalities where washing machine prices fell, or because of a household income effect. Unfortunately, neither television price nor disaggregated data on cable subscriptions in Mexico is available for the time period that is the focus of this paper. However, Figure 4 plots changes in the proportion of households that paid for cable or satellite television together with the proportion of households that owned washing machines in Panel A and the relative price of washing machines in Panel B.

Figure 4 depicts these changes for the years available, 1984-1989, 1989-1992, and 1992-1994, showing that the changes in trends for ownership of washing machines and cable television subscriptions at a national level were not strongly correlated. Figure 5 depicts the same figures but in percent changes, and the tendencies again appear to be unrelated. Additionally, Figure A.2 in the Appendix shows that if indeed the trend of cable subscriptions increased, it was not until slightly later in the decade. This is consistent with changes in the industry that resulted from the signing of the Federal Telecommunications Act (in Spanish, la Ley Federal de Telecommunications, 1995) in 1995, which resulted in an increase in foreign investment in telecommunications and an increase in the number of licenses from just four prior to the bill, to 117 in 1996 (Gómez & Sosa, 2010). Although this data is only available at the national level, this evidence alleviates concerns that the same municipalities that saw changes in washing machine access also saw changes in television consumption.

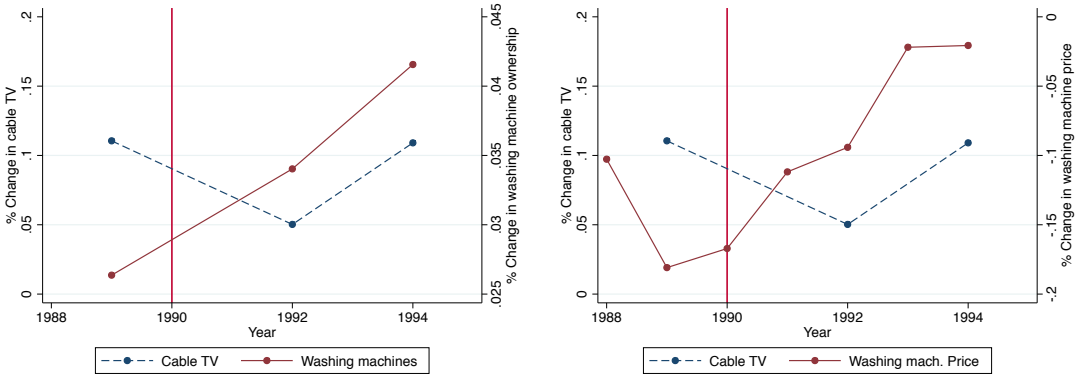
Figure 4: Changes in Cable TV Subscriptions, and Washing Machine Ownership, Prices




(a) Cable TV and Washing machine ownership (b) Cable TV and Washing machine prices

Notes: Cable subscriptions are aggregated from the National Survey of Home Expenses and Income (ENIGH). Each point in both graphs represents the first difference of cable subscriptions, washing machine ownership, and washing machine price. The left axis for both panels represents the change in the proportion of households that paid for cable or satellite television in the trimester before being surveyed. The right axis in Panel A represents the change in rates of washing machine ownership. The right axis in Panel B displays the scale for changes in the national washing machine CPI normalized by the overall national CPI (solid line). Elaborated by the author with data from Banco de México, ENIGH.

Figure 5: Percent Change in Cable TV Subscriptions and Washing Machine Ownership, Prices




(a) Cable TV and Washing machine ownership (b) Cable TV and Washing machine prices

Notes: Each point in both graphs represents the percent change in cable subscriptions, washing machine ownership, and washing machine price. The left axis for both panels represents the percent change in the proportion of households that paid for cable or satellite television in the trimester before being surveyed. The right axis in Panel A represents the percent change in the change in rates of washing machine ownership. The right axis in Panel B displays the scale for percent change in the national washing machine CPI normalized by the overall national CPI (solid line). Elaborated by the author with data from Banco de Mexico, ENIGH.

# 5 Conclusion

It has long been evident that family planning and fertility have important consequences for the labor market participation and conditions of women's work, but less has been done to establish the effect that participating in the labor market can have on these outcomes. The dynamics of gendered violence taken to its most extreme form, feminicide, have also escaped clear understanding of their causal elements.

This paper researches the role that FLFP has in influencing fertility and gendered violence. The model employed exploits the fall in time-saving home appliance prices in the early 1990's in Mexico that resulted from various trade liberations in the late 1980's as a source of exogenous variation between municipalities. The model uses this variation between municipalities to instrument FLFP, and estimates the causal effect of FLFP on fertility and violence outcomes.

The results indicate that increases in FLFP have a significant effect on various aspects of fertility, including the total number of children and the timing of fertility. I find that FLFP increases not only the average age of mothers, but delays the start of childbearing and strongly decreases fertility rates for women aged 18-29. These effects are more pronounced for women of lower socioeconomic status. I do not find a significant effect of FLFP on feminicides, though there is some evidence of male backlash, as women of lower socioeconomic status were more likely to see increases in violence as a result of increased FLFP.

These results contribute to answering some questions about the effect that work has on household dynamics and decision-making, but in its limitations this research also raises other important questions. An important limitation is the use of feminicide as a measure of gendered violence, which excludes non-fatal domestic abuse. Though this research found no effect of FLFP on violence resulting in death, there may well exist effects on non-fatal abuse. The results for fertility also raise questions about spillover effects to women's work and the mechanisms driving the reductions in fertility seen. These are important questions for future research and a more nuanced understanding of household decision-making.

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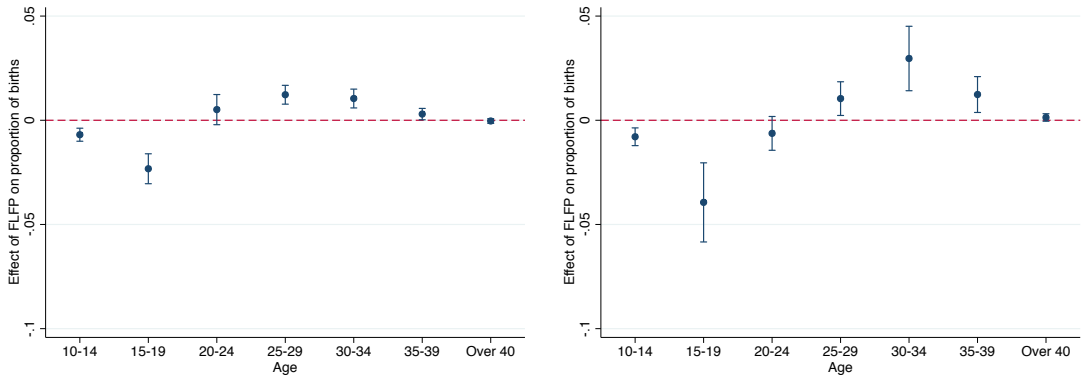
# 1 Appendix

## 1.1 Appendix Figures

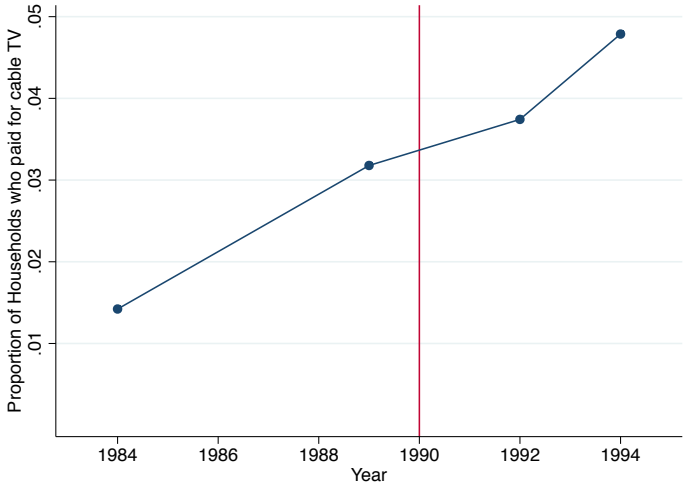
Figure A.1: 2SLS Regressions: The Effect of FLFP on the Proportion of Births born to Various Age Groups




(a) Below median schooling (b) Above median schooling

Notes: Each point represents the coefficient for *FLFP* from a separate 2SLS regression including only the births to women of each age group. The dependent variables are the share of births absorbed by each age category; $\beta_{10-14} = \frac{mothers\ aged\ 10-14}{Total\ \$\ of\ births}$. Regressions take the same form as the previous tables, with municipality and time fixed effects. Vertical blue lines represent the $95\%$ confidence interval.

Figure A.2: Proportion of Households Paying for Cable TV: 1984-1994




Notes: Cable television subscriptions aggregated from the ENIGH, an individual-level survey of home expenses and goods. Each point represents the proportion of households in the survey that paid for cable or satelite television in the last trimester. Points are nationally representative for the years 1984, 1989, 1992, and 1994.

## 1.2 Appendix Tables

Table A.1: First Stage Results: A reduction in washing machine prices increases FLFP

| | All | | | Female | | | Male | | |
|---|---|---|---|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| log Price | -0.138 | -2.060*** | -2.060** | -0.970*** | -1.571** | -1.571* | 0.760*** | -0.896 | -0.896 |
| | (0.292) | (0.734) | (0.882) | (0.270) | (0.710) | (0.856) | (0.264) | (0.571) | (0.669) |
| × Educ. | 0.906*** | 0.889 | 0.889 | 0.845*** | 1.307* | 1.307 | 0.304** | 0.290 | 0.290 |
| | (0.161) | (0.717) | (0.704) | (0.148) | (0.694) | (0.867) | (0.145) | (0.558) | (0.914) |
| × Elec | -0.041 | 0.919 | 0.919 | 0.503*** | 0.900 | 0.900 | -0.532*** | 0.023 | 0.023 |
| | (0.161) | (0.726) | (0.788) | (0.148) | (0.702) | (0.928) | (0.145) | (0.564) | (0.958) |
| Price+(× Educ.) | | -1.17 | -1.17 | | -0.26 | -0.26 | | -0.61 | -0.61 |
| SE | | 0.94 | 0.94 | | 0.91 | 0.91 | | 0.73 | 0.73 |
| Mean Y | 0.52 | 0.52 | 0.52 | 0.50 | 0.50 | 0.50 | 0.28 | 0.28 | 0.28 |
| Municip. | 63 | 63 | 63 | 63 | 63 | 63 | 63 | 63 | 63 |
| Observ. | 378 | 378 | 378 | 378 | 378 | 378 | 378 | 378 | 378 |
| R-sq. | 0.09 | 0.65 | 0.65 | 0.15 | 0.64 | 0.64 | 0.06 | 0.73 | 0.73 |
| F-stat. | 12.38 | 11.18 | 8.98 | 22.14 | 11.93 | 9.53 | 7.59 | 5.00 | 4.56 |
| Muni FE | no | yes | yes | no | yes | yes | no | yes | yes |
| Time FE | no | yes | yes | no | yes | yes | no | yes | yes |
| Cluster | no | no | yes | no | no | yes | no | no | yes |

Notes: The dependent variable is fabor force participation at the municipal level, standardized by subtracting mean FLFP in 1990 and dividing by the standard deviation of FLFP in 1990. Standard errors clustered at municipal level in parentheses in Columns (3) (6) and (9). $^{*}p < 0.1,^{**} p < 0.05,^{***} p < 0.01$

Table A.2: Labor Market Characteristics of Men and Women: 1990, 1994

| | Women | | | | | | Men | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1990 | | 1994 | | Difference | | 1990 | | 1994 | | Difference | |
| | Mean | Std. Dev. | Mean | Std. Dev. | Diff | t-test | Mean | Std. Dev. | Mean | Std. Dev. | Diff | t-test |
| Econ. active | 0.33 | 0.47 | 0.37 | 0.48 | 0.05*** | (19.53) | 0.72 | 0.45 | 0.75 | 0.43 | 0.03*** | (10.23) |
| Employed | 0.29 | 0.46 | 0.32 | 0.47 | 0.04*** | (14.76) | 0.68 | 0.47 | 0.70 | 0.46 | 0.01*** | (4.34) |
| No IMSS | 0.48 | 0.50 | 0.49 | 0.50 | 0.02*** | (4.82) | 0.53 | 0.50 | 0.52 | 0.50 | -0.00 | (-0.87) |
| No benefits | 0.35 | 0.48 | 0.39 | 0.49 | 0.04*** | (7.88) | 0.45 | 0.50 | 0.45 | 0.50 | 0.01*** | (3.56) |
| Part time | 0.29 | 0.45 | 0.31 | 0.46 | 0.01** | (2.50) | 0.14 | 0.35 | 0.14 | 0.35 | 0.01*** | (2.88) |
| 1-2 min. wages | 0.86 | 0.35 | 0.68 | 0.47 | -0.20*** | (-7.64) | 0.67 | 0.47 | 0.53 | 0.50 | -0.19*** | (-11.23) |
| 2-5 min. wages | 0.13 | 0.34 | 0.28 | 0.45 | 0.16*** | (6.17) | 0.29 | 0.45 | 0.39 | 0.49 | 0.08*** | (5.17) |
| 5-10 min. wages | 0.01 | 0.10 | 0.03 | 0.17 | 0.03*** | (3.54) | 0.02 | 0.15 | 0.05 | 0.22 | 0.06*** | (7.48) |
| >10 min. wages | 0.11 | 0.31 | 0.22 | 0.41 | 0.10*** | (4.15) | 0.23 | 0.42 | 0.31 | 0.46 | 0.08*** | (5.39) |
| Observations | 66,602 | | 60,403 | | 127,045 | | 60,325 | | 54,521 | | 114,882 | |

Notes: Variables employment, etc., are not rates but rather the proportion of the sample employed. Calculations made based on individual-level data from ENEU.
$^{*}p < 0.1,^{**}\ p < 0.05,^{***}\ p < 0.01$

Table A.3: Female Mortality by Labor Force Participation Status, Excluding Workplace Accidents

| | Economically active | | | | | | Not economically active | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1990 | | 1995 | | Difference | | 1990 | | 1995 | | Difference | |
| | Mean | Std. Dev. | Mean | Std. Dev. | Diff | t-test | Mean | Std. Dev. | Mean | Std. Dev. | Diff | t-test |
| Married | 0.45 | 0.50 | 0.45 | 0.50 | 0.00 | (0.22) | 0.69 | 0.46 | 0.67 | 0.47 | -0.02*** | (-3.55) |
| Age | 39.81 | 12.30 | 40.78 | 11.91 | 0.97*** | (3.07) | 44.53 | 13.19 | 44.98 | 13.00 | 0.45*** | (2.96) |
| $>$ primary | 0.77 | 0.42 | 0.80 | 0.40 | 0.04*** | (3.26) | 0.48 | 0.50 | 0.53 | 0.50 | 0.05*** | (8.35) |
| $>$ secondary | 0.56 | 0.50 | 0.61 | 0.49 | 0.05*** | (3.99) | 0.24 | 0.43 | 0.26 | 0.44 | 0.01*** | (2.92) |
| $>$ high school | 0.38 | 0.48 | 0.42 | 0.49 | 0.04*** | (3.41) | 0.13 | 0.33 | 0.13 | 0.34 | 0.01** | (1.97) |
| Homicide | 0.04 | 0.19 | 0.03 | 0.18 | -0.00 | (-0.65) | 0.01 | 0.10 | 0.01 | 0.11 | 0.00 | (1.35) |
| Murdered in home | 0.07 | 0.26 | 0.09 | 0.28 | 0.02 | (0.85) | 0.08 | 0.27 | 0.07 | 0.26 | -0.00 | (-0.21) |
| COD strang. | 0.00 | 0.04 | 0.00 | 0.06 | 0.00 | (1.17) | 0.00 | 0.02 | 0.00 | 0.03 | 0.00 | (1.31) |
| Observations | 2,685 | | 3,182 | | 5,867 | | 13,967 | | 15,373 | | 29,340 | |

Notes: Averages for women aged 10-60 at time of death to exlude infant and geriatric mortality. Calculations made from Vital Statistics data, INEGI.
$^{*}p < 0.1,^{**}\ p < 0.05,^{***}\ p < 0.01$

Table A.4: Fixed Effects Model: The Effect of Washing Machine Prices on Total Population

| | (1)<br>All | (2)<br>Women | (3)<br>Men |
|---|---|---|---|
| log Price | 6,679 | 1,860 | 4,820 |
| | (45,128) | (22,911) | (22,240) |
| × Educ. | -65,378 | -30,913 | -34,466 |
| | (62,683) | (31,229) | (31,486) |
| Price+(× Educ.) | 90,220.144 | 43,404.767 | 46,815.377 |
| SE | 72,616.391 | 36,042.615 | 36,602.708 |
| Mean Y | 441,416.18 | 226,741.99 | 214,674.19 |
| F-stat. | 4.59 | 4.46 | 4.71 |
| Municip. | 63 | 63 | 63 |
| Obs. | 378 | 378 | 378 |

Notes: Dependent variables are total municipal population, total female population, and total male population. $\times Educ$ represents the interaction of price with an indicator for municipalities above median schooling in 1990. *Price+(×Educ.)* is an estimation for the sum of the coefficients of price and its interaction with education. Not shown is the interaction of price with electrification. All models include municipal and year fixed effects. Standard errors clustered at the municipal level in parenthesis. $^{*}p < 0.1,^{**}p < 0.05,^{***}p < 0.01$