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Women at Work: The Impact of Female Employment on Value Added in Mexico*

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Abstract

We estimate the effect of a rise in female employment on municipal-level value added in Mexico. We combine economic census data with administrative records on the expansion of the Full-Time Schools Program (FTSP) to construct a shift-share instrument that links baseline female employment to predicted FTSP exposure between 2003 and 2018. Our estimates indicate that increasing female employment as a share of total employment increases the value added to gross output and fixed assets, as well as value added per worker, with no effect on wages, suggesting improvements in capital and labor efficiency. These effects are concentrated in municipalities with higher initial female employment rates, greater female educational attainment, and lower poverty levels. Such gains are driven primarily by increases in female employment in managerial and ownership roles. These results highlight the potential for increased female employment to enhance economic outcomes in contexts such as Mexico, where the female labor force participation rate remains stagnant.

Keywords: Female employment, Value Added, Productivity, Shift-Share.

JEL Codes: D20, J20, O40

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1 Introduction

Over the past two decades, Mexico has made significant progress in terms of increasing educational attainment among women.[1] Furthermore, female labor force participation has also increased—rising steadily from 24% to 47% between 1990 and 2015—, led by increases in women's education, declining fertility, and shifts in the occupational structure of the workforce (Bhalotra and Fernández, 2024). Despite these advances, Mexico continues to exhibit a persistent gender gap in labor force participation, with male participation rates close to 77%. A gap exists not only with respect to male participation but also to female labor force participation (FLFP) levels in other countries with similar levels of income and at a similar stage of development (World Bank, 2021). This is despite the fact that aggregate studies have long since found a relationship between female labor participation and economic performance (Goldin, 1986) and that female labor force participation has increased total factor productivity in the U.S. (Albanesi, 2019), as well as improving economic growth internationally (Baerlocher et al., 2021; López-Marmolejo and Rodríguez-Caballero, 2023). The research has also indicated that closing the female labor force participation gap in Mexico could raise per capita GDP by as much as 22% (Cuberes and Teignier, 2018), underscoring the high opportunity cost of underutilizing female human capital.

In this paper, we examine the causal effect of higher female employment levels on measures of value added to gross output and to fixed assets, and per worker, as well as the effect on wages (as value-added measures include changes in wages), by aggregating firm-level data at the municipal level. For this, we leverage previous literature on the impact on female employment of the Full-Time Schools Program (FTSP) in Mexico (Padilla-Romo and Cabrera-Hernández, 2019; Cabrera-Hernández and Padilla-Romo, 2021), and implement a *shift-share* strategy—linking the

[1] For example, in 2024, net access was higher for women at all basic education levels: 95.5% for girls and 95.2% for boys in elementary school (ages 6 to 11); 93.2% and 91.2% in middle school (ages 12 to 14); and 78.7% and 71.7% in high school (ages 15 to 17). Moreover, dropout rates were comparable in elementary school (0.6%) and lower for girls in both middle (2.6% vs. 3.8%) and high school (9.1% vs. 13.5%) (SEP, 2024).

FTSP roll-out across municipalities and years to baseline levels of female participation in the labor market—in order to instrument female employment and test to see if increases in women's work improve value-added measures as a proxy for labor and capital efficiency. Introduced in 2007/08, Mexico's Full-Time Schools Program (FTSP) extended the school day from roughly four and a half to eight hours. The program effectively provides an implicit childcare subsidy, thereby reducing barriers to women's entry into the labor market. Moreover, by 2018, the gradual roll out of full-time schools reached 80% of Mexican municipalities, resulting in substantial variation in both the timing and intensity of policy adoption across the country, which allows us to study the effects of female employment on value added.

To do this, we construct a unique database for Mexico by utilizing the Economic Census conducted every five years by the country's National Institute of Statistics (INEGI in Spanish) from 2003 to 2018. The census gathers information on value-added measures, wages, and shares of female workers from all firms with a registered address in Mexico across all economic sectors. To construct our instrument, we then merge this data with the predicted shares of full-time school places at the municipal level, based on administrative data provided by Mexico's Secretariat of Education. Our data enable us to identify firms located in municipalities with higher or lower shares of full-time-school places, as well as the proportion of women working in each of those firms, including those who are either owners or members of owner-families, those in executive or managerial roles, or those employed in production, sales, or services. We also merge Mexico's 2005 Population Census to explore heterogeneous effects by baseline levels of female employment, municipal poverty levels, and average education levels. To the best of our knowledge, this is the first study to provide causal evidence of the effects of female employment on value-added measures and on wages as a proxy for labor and capital efficiency in a developing country.

We find that increased female employment leads to higher value added to gross output, greater value added relative to fixed assets, and higher value added per worker—suggesting improved efficiency in the use of both labor and capital—. These effects are not driven by changes in wages, indicating that the gains reflect genuine productivity improvements rather than shifts in labor compensation. Notably, these positive effects are driven by women's increased presence in positions of ownership and in leadership roles. Our effects are concentrated in municipalities with higher baseline female employment and schooling, suggesting that the gains in efficiency stem from the incorporation of women with higher human capital. These findings highlight the potential for female employment to enhance firm-level efficiency and underscore the economic opportunity to be had from closing Mexico's gender employment gap, particularly in a context in which female labor force participation remains stagnant.

A growing literature (e.g., Gaddis and Pieters, 2012; Dasgupta and Verick, 2016; Kuhn et al., 2024) suggests that a rising female labor supply can be a catalyst for structural transformation—the reallocation of labor from lower- to higher-productivity sectors—in developed economies, particularly when women are as educated as men. For example, Kuhn et al. (2024) argue that from 1976, the share of females in services and manufacturing has remained relatively unchanged in the U.S., thus the sudden influx of women into the labor market has shifted the productive structures of local economies toward sectors (mainly services) that utilize this newly available and often highly qualified labor more effectively.[2] However, while the female share of employment is also higher in the services sector in developing economies (particularly Mexico[3]), the productivity of the manufacturing and services sectors often overlaps and is usually higher in the exporting manufacturing (see Fentanes and Levy, 2024). At the same time, productivity within subsectors is quite heterogeneous.[4] It can certainly be argued too that structural change is what causes higher

[2] The authors suggest that the reallocation of employment from manufacturing to services was mainly due to the increased labor force participation of women, which accounts for about two-thirds of the structural change in the U.S. over the past five decades.

[3] According to the Economic Census conducted by Mexico's National Institute of Statistics , the share of female employment in agriculture is 19%, 31% in manufacturing, and 47% in the services sector.

[4] In Figure A.1 of the Appendix, we show the top and bottom five sectors with the highest/lowest value added to fixed assets in 2018, and the share of female employment within each subsector (identified by three-digit NAICS code). The

demand for female labor (Olivetti et al., 2014; Olivetti and Petrongolo, 2014; Buera et al., 2019). We do not explore structural change but do allow for it by presenting estimates of changes in female employment aggregated at the municipal level. We thus explore whether a higher average share of female employment *per se* raises productivity—regardless of the industry structure and the sector they form part of—given the recent positive trend in women's human capital accumulation.

Our study also contributes to the literature that examines how productive female employment (and increasingly in ownership and managerial roles) is compared to male. Previous studies of this kind utilize firm-level data on female employment and decompositions to explain gender differences in productivity.[5] Evidence based on firm-level data for non-agricultural sectors is mixed. Some studies suggest that productivity gaps may not exist once firm-level controls such as firm size and sector are considered (for Latin America, see Bruhn,2009; for Asia, Gui-Diby et al., 2017, and for Africa, Hallward-Driemeier, 2013). In contrast, recent literature examining whether differences in labor productivity (measured as sales per worker) exist between female-managed firms compared to their male-managed counterparts in 128 developing countries reveals a sizable gap, with labor productivity being approximately 11% lower among female-managed firms compared to those that are male-managed (Islam et al., 2018). Some studies have found a positive association between the share of female workers and firm performance (Achkar and Bouri, 2021) and sectoral value added (Yeboah et al., 2022).

However, these studies are primarily descriptive or exploit cross-country variations and employ fixed-effects estimations to identify the effects of female presence in firms. Most concentrate on female versus male management or ownership and fail to consider other types of

proportions suggest a considerable variation in value added within the services sector and in female employment across sectors with higher or lower value added.

[5] A significant portion of this literature has concentrated on explaining productivity gaps in the agricultural sectors of specific countries by using traditional Oaxaca-Blinder-type decompositions, and concluded that higher productivity is observed for males (Peterman et al., 2011; Kilic et al., 2015; Aguilar et al., 2015; Palacios-López and López, 2015; Ali et al., 2016; Guirkinger and Platteau, 2015).

female employment; others focus exclusively on microenterprises (see Chaudhuri et al., 2020). While we do not look into differences between males and females, we contribute to this literature by providing direct evidence on aggregate female shares based on firm-level census data on various value-added measures (not only gross value added per worker as in Bardasi et al., 2011 and Hallward-Driemeier, 2013), and also by identifying the effects of a policy change that extends throughout the country as an arguably exogenous alternative to female employment. Finally, while our paper is related to that of Comi et al. (2020)—who exploit a natural variation in female quotas on boards of directors of firms in Europe—, our study differs by exploring the causal effects of varying shares of females in diverse roles, including positions of ownership, executive and managerial roles, and production and sales positions.

The rest of this paper is structured as follows. Section 2 provides more information on the FTSP and details female labor force participation in Mexico. Section 3 describes our data sources and presents descriptive statistics. Section 4 describes our *shift-share* variable and our identification strategy. Section 5 presents our main results, including heterogeneous effects and robustness checks. Section 6 concludes.

2 Background

2.1 Full-Time Schools

Mexico's primary education system comprises four levels: preschool (ages 3 to 5), elementary school (grades 1 to 6), and middle school (grades 7 to 9), followed by high school (grades 10 to 12). Net enrollment rates have risen sharply over the past two decades. However, as in many developing countries, improving the quality of education remains a challenge. Students are not restricted to schools within their district of residence and may enroll in any school in the country that has places available. Nonetheless, according to the Mexican population census, approximately 91% of elementary school students attend school within their municipality of residence.

Starting in the 2007/08 academic year, the government created a Full-Time Schools Program (hereafter, the FTSP) aimed at improving education and promoting equity, which increased the length of the school day in public pre-, elementary, and middle schools that adopted the program (92% of Mexico's children are enrolled in public schools). An explicit secondary objective of the program was to support working mothers by serving as an implicit childcare subsidy. The schools affected extended their school day from four and a half to eight hours, starting at 8:00 a.m. This increased their instructional time from 800 to 1,250 hours per academic year. The program was introduced in 500 elementary schools, and by 2017/18 had extended to more than 25,000, comprising approximately 6,000 preschools and 16,500 elementary schools (i.e., approximately 9% and 19% of all preschools and elementary schools, respectively), reaching more than three million students across Mexico (or approximately 18% of all students in these school age groups).

Over the years, the FTSP was targeted at both urban and rural schools that previously offered morning classes only, schools with low academic achievement observed on standardized tests, and schools with one teacher per class, with preference given to those located in high-poverty areas. The federal government allocated the FTSP funds to Mexico's states and the respective state authorities chose the schools that would adopt the program, based on these characteristics and budget constraints. While targeting has proved challenging, schools from diverse socioeconomic backgrounds have participated in the program. The evidence indicates that the general selection rules for the program have been followed, particularly in more recent cohorts (Cabrera-Hernández, 2020; Padilla-Romo, 2022).

The staggered implementation of the program across space and time, as well as its intensity, is depicted in Figure 1. Panel (a) presents the predicted share of pre- and elementary FTSP school places out of the total places in each municipality.[6] In 2008, a relatively high proportion of FTSP

[6] Given that the size of schools and the supply of places may have endogenously changed with the presence of the

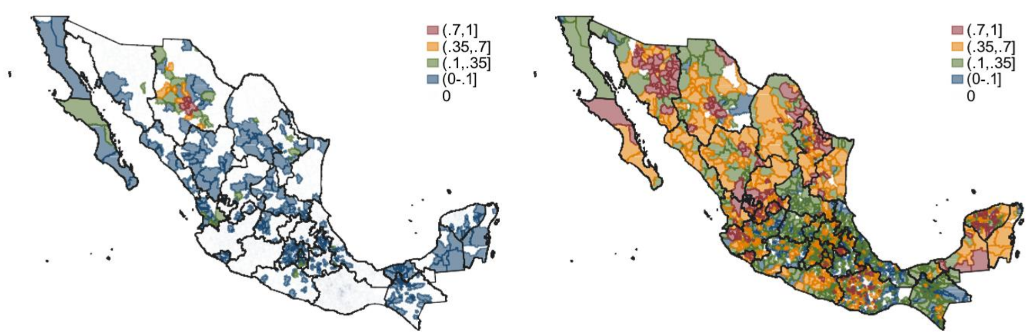
schools were concentrated in a relatively small subset of municipalities. By 2018 (Panel b), coverage had expanded dramatically to nearly 80% of municipalities nationwide, as evidenced by the larger swaths of orange and red areas, indicating a higher proportion of full-time-school places. This rapid growth in adoption—from just 500 schools in 2007 to over 25,000 by 2018—was characterized by considerable variation across space and time, a fact that becomes vital to understanding how this implicit childcare subsidy may influence female labor supply and broader economic outcomes. By 2018, the FTSP had gradually reached nearly 80% of Mexican municipalities, generating rich variation in the contexts in which the full-time schools were present.

2.2 Female Labor Force Participation

In recent decades, the participation of Mexican women in the labor market has steadily increased. The Mexican population census indicates that the share of women aged 18 to 65 participating in the labor force grew from 24.2% in 1990 to 45% in 2020. The biggest increase was among women

Figure 1: Proportion of FTSP Schools at the Municipal Level in 2008 and 2018

(a) 2008 (b) 2018



Notes: The maps show the predicted share of places in pre- and elementary FTSP schools out of the total number of places in each municipality. The program began in 2007, initially reaching 500 schools across 32 states in Mexico. By 2018, 80% of all municipalities across all states in the country had at least one FTSP school.

program, following Padilla-Romo and Cabrera-Hernández (2019), we compute the predicted share of available places at the municipal level. This is the share of full-time places in school *s* at time *t* as a proportion of the average baseline number of places in school *s* in the period 2001–2006. We explain this measure in detail in Equation 1 in Section 3.

aged 40 to 44, whose participation rate reached 57% in 2020, while the smallest was among older women, with only 30% of women aged 60 participating in the labor market that same year. As such, the female labor force participation (FLFP) rate remains low compared to other countries in the OECD (OECD, 2017). As expected, FLFP is even lower when a child is present at home. According to Mexico's 2018 National Survey of Occupation and Employment (ENOE in Spanish), only 37% of mothers between the ages of 30 and 65 participated in the labor market, representing an increase of six percentage points over the previous decade.

Evidence suggests that one of the primary reasons for women's low overall labor market participation is the lack of family-friendly policies (Blau and Kahn, 2017; Cascio et al., 2015; Thévenon, 2016; Winkler, 2016). Yet Mexico's spending on childcare and preschool has remained low at around 0.6% of GDP, averaging 900 USD per child aged 0 to 6 years (compared to the OECD average of 4,600 USD).[7] Hence, only 4% of children aged 0 to 2 years are enrolled in a formal public or private childcare institution. Despite a relatively high net enrollment in preschool (80% for ages 3 to 5) and virtually universal attendance in primary education, short school days imply a mismatch between school and work schedules, negatively affecting the labor force participation of mothers.

In this context, the implementation of the Full-Time School Program has led to increases in FLFP by closing the mismatch between the school day and the workday in Mexico (Padilla-Romo and Cabrera-Hernández, 2019; Cabrera-Hernández and Padilla-Romo, 2021) and in other countries (for the U.S., see Gibbs et al. 2024; for Italy, Bovini et al. 2023; for the Dominican Republic, Garganta and Zentner, 2021, and for Chile, Berthelon et al. 2023). In the case of Mexico, Padilla-Romo and Cabrera-Hernández (2019) find that the FTSP increased female labor force participation by approximately 5.5 percentage points, or 12% of the baseline participation rate. Therefore, Mexico presents the ideal setting for a case study into the effects of a significant

[7] These figures are expressed in constant 2015 U.S. dollars and are based on the most recent data available from the OECD Family Database, accessed in April 2020.

increase in FLFP, particularly in the context of limited formal childcare investment and historically low female labor force participation rates.

3 Data and Descriptive Statistics

For this work, we use several data sources. The first is provided by the Economic Censuses conducted every five years by INEGI for the period 2003 to 2018. These offer information on the main economic characteristics of approximately six million economic units[8] corresponding to all establishments that produce goods, market merchandise, and provide services (both private and public) in the following sectors: fishing and aquaculture; mining; electricity, water, and gas; manufacturing; construction; commerce; transportation and courier services.[9] This is the richest and most comprehensive statistical collection and reflects the state of the Mexican economy at a given point in time. It is published at the national, state, and municipal levels, disaggregated by sector and subsector (down to the activity class) in accordance with the North American Industry Classification System (NAICS 2018).[10]

These data include information on production, income, employment, share of female workers in each economic unit, salaries, expenses, and other key indicators that allow us to proxy productivity in the economic unit, such as overall measures of value added to gross output, fixed assets, and per employee (in pesos). Specifically, the value added to gross output, as reported in the economic census, represents the value added during the work process by the creative and

[8] Includes large enterprises with multiple branches or production units. In these cases, all geographic information refers to the location of the enterprise's headquarters.

[9] The Economic Census does not include agricultural, livestock, and forestry activities, which are part of the Agricultural Census. It also excludes activities such as urban and suburban collective passenger transport in fixed-route vehicles; passenger transport in taxis from fixed locations and street-hailed taxis; political associations and organizations; and households with domestic employees.

[10] The NAICS 2018 classification includes 20 economic sectors, divided into 94 subsectors, 306 branches, 615 sub-branches, and 1,084 activity classes. Of these, 994 are covered by the Economic Censuses.

transformational activities of employed labor, capital, and materials consumed in conducting the economic activity. The value added to gross output is calculated by subtracting intermediate consumption from total gross output, with no deductions from the consumption of fixed capital. The value added to fixed capital is calculated by dividing the gross value added by the total value of fixed assets, then multiplying by one hundred. Finally, the value added per employee is calculated by dividing the gross value added (in pesos) by the number of workers in the economic unit. Measures of value added to fixed capital and per worker serve as proxies for capital and labor efficiency, provided that there are no changes in wages (as wages are included in the measurement of value added).

Our second source of data comes from the administrative database of the Full-Time Schools Program, provided by Mexico's Secretariat of Education in Mexico (SEP in Spanish). This database includes the schools that adopted the program in the period 2007–2018. Given that the size of schools and the supply of places may have endogenously changed as the program was introduced, following Padilla-Romo and Cabrera-Hernández (2019), we compute the predicted share of available places at the municipal level in a given year following Equation (1):

$$\mathrm{FTS}_{mt} = \frac{\sum_{s\in m} \bar{e}_s \cdot \mathrm{FT}_{st}}{\sum_{s\in m} \bar{e}_s} \tag{1}$$

where $\bar{e}_s$ is our proxy for school capacity, or the pre-program (i.e., 2001–2006) average enrollment of school s; and FT_{st} is a dummy variable indicating whether school s has adopted the FTSP in year t or earlier.[11]

Finally, we use the measures of marginality level in 2005 of Mexico's National Population

[11] While enrollment data is reported by academic year, production outcomes are measured by calendar year. To align these, we split academic years into quarters and match them to the subsequent calendar year. For instance, exposure to the FTSP during the 2007–2008 academic year (September 2007 to June 2008) is matched to production outcomes for the 2008 calendar year, as measured by the Economic Census as of December 31, 2008.

Council (CONAPO in Spanish) to proxy for the baseline poverty levels of Mexican municipalities (i.e., before the introduction of the FTSP). We then combine these sources of data for the pre-FTSP year 2003 and the years 2008, 2013, and 2018, when the FTSP's rapid roll-out was already in place. This combined result enables us to identify the rollout of the FTSP across municipalities and time, and also how female labor employment changes; it also allows us to identify production and labor outcomes, such as wages, production value, and the described value-added measures at the municipal-year level. Finally, we use the 2005 Population Census to separate municipalities by median female years of education.

Table 1 presents descriptive statistics for municipalities that never adopted the Full-Time Schools Program (Non-FTS) compared to those that did (FTS), using data from 2003. Municipalities in the FTS group appear larger in economic terms, having notably more economic units per municipality and a greater number of workers per unit. They also report higher average wages, and a greater number of daily hours worked. Interestingly, these same municipalities show a smaller overall percentage of female workers, though a higher share of women in production and managerial roles in absolute terms. These contrasts suggest that, prior to the policy, municipalities with FTSP schools had relatively stronger economic foundations but potentially underutilized female labor, providing a context in which extending school hours might help shift women into more active or higher-value employment.

Table 1: Descriptive Statistics from the Economic Census: FTS and Non-FTS Municipalities in the Base Year 2003

	Non-FTS		FTS		Difference	
	Mean	Std. Dev.	Mean	Std. Dev.	Diff	t-test
Economic Units per Municipality	222.29	479.84	1549.81	4933.36	-1327.52***	(-6.54)
Workers per Economic Unit	2.67	4.28	6.00	11.77	-3.33***	(-6.43)
Female Workers per Economic Unit	1.18	1.13	2.03	3.81	-0.85***	(-5.10)
Value Added to Gross Output (%)	62.29	13.30	59.18	9.76	3.11***	(6.15)
Value Added to Fixed Assets (%)	63.28	20.50	66.35	15.45	-3.08***	(-3.88)
Value Added per Worker (pesos)	53715.36	60809.97	104506.16	96843.90	-50790.80***	(-12.03)
Gross Output per Worker (pesos)	95351.48	121035.78	257149.66	2463244.27	-161798.18	(-1.60)
Female Workers (%)	52.24	14.65	43.38	12.15	8.86***	(14.67)
Female Workers in Production/Sales (%)	20.60	20.07	29.73	15.36	-9.14***	(-11.65)

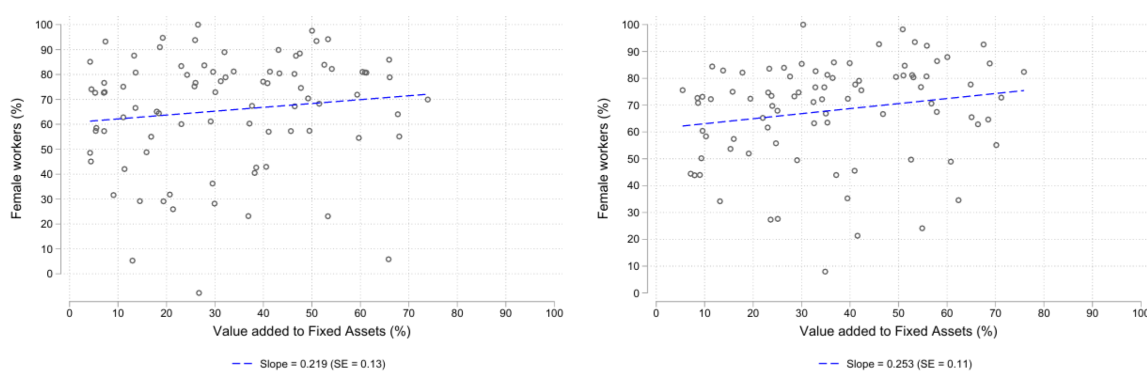
Female Workers in Exec./Managerial Roles (%)	3.95	8.09	12.62	14.62	-8.67***	(-13.78)
Female Workers in Owner/Owner-Family Member Roles (%)	51.73	15.39	41.87	13.01	9.86***	(15.34)
Daily Hours Worked	3.44	2.11	5.03	1.81	-1.60***	(-17.93)
Daily Wage per Worker (pesos)	53.38	54.90	112.63	82.73	-59.25***	(-16.33)
Observations	593		1854		2447	

Notes: This table compares the means and standard deviations of selected economic variables for municipalities that never adopted the Full-Time Schools Program (Non-FTS) and those that did (FTS), using data from the 2003 Economic Census. Pesos are in 2018 values. Column (6) shows the difference in means and Column (7) reports the t-statistics. *** indicates significance at the 1% level.

Figure 2 displays two scatter plots—one for 2003 and another for 2018—each depicting the relationship between the share of female workers and our measure of value added to fixed assets (while controlling for average wages in each industry). Both regressions show a positive slope, indicating that municipalities with higher female labor participation also exhibit greater value added to gross output. The correlation appears more pronounced in 2018, pointing to a strengthened link over time, one potentially driven by women's expanding roles in higher-skilled and higher-value-added positions.[12]

Figure 2: Relationship between the Percentage of Female Workers and the Percentage of Value Added to Fixed Assets, 2003 and 2018

(a) 2003 (b) 2018



Notes: Own elaboration using data from the Economic Censuses provided by INEGI. The estimated slope is derived from a simple OLS regression of the percentage of female workers in each industry (identified by NAICS code) on the percentage of value added to fixed assets and average industry wages. Each point denotes one industry.

[12] We present the same relationship for our measure of Value Added to Gross Output and without controlling for wages at the industry level in Figure A.2. The slope is also positive and of similar size, suggesting that higher value added is not related to higher levels of capital investment or higher wages in industries with a larger share of women.

4 Identification Strategy

We exploit the quasi-experimental rollout of the FTSP in order to study the impact of female employment on cross-municipality productivity outcomes in Mexico. We rely on the previous evidence showing that higher shares of predicted FTS places in Mexican municipalities cause higher levels of female labor force participation and female employment (see Padilla-Romo and Cabrera-Hernández, 2019; Cabrera-Hernández and Padilla-Romo, 2021) to propose an instrumental variable that uses the changes in the share of FTS places weighted by the negative shares of female employment in the baseline year. Following the most recent literature on shift-share instruments (Borusyak et al., 2024), we propose this measure of exposure to the FTSP weighted by the baseline share of female work, as in Equation 2:

$$Z_{mt} = \left(\frac{E^{f}_{s,m,t=2003}}{E_{s,m,t=2003}} \right) \times FTS_{m,t} \tag{2}$$

where $E^{f}_{s,m,t}$ represents total female employment in subsector *s* (at the 3-digit NAICS level) in municipality m in year 2003 over total employment in the same sector, year, and municipality (this is the *share*). These sector shares are averaged at the municipal level. FTS_{mt} is our predicted share of FTS places in municipality m for years 2003, 2008, 2013, and 2018 as described in Equation (1) (this is the *shift* as it changes across time). By definition, Z_{mt} equals zero in 2003 as FTS_{mt} in this year is zero (since the program doesn't launch until 2007) and ranges between 0 and 1 for $t \geq 2008$. We opt to weight the shifts by the baseline female employment because the previous evidence showed that the effects of FTS on FLFP are related to the baseline participation and/or municipal poverty levels (which are also related to baseline female employment). In other words, the effect of the FTSP on female employment is influenced by the baseline economic opportunities available to women (Padilla-Romo and Cabrera-Hernández, 2019; Cabrera-Hernández and Padilla-Romo, 2021).

Finally, while our share (baseline female employment) is likely endogenous, we argue that the

FTSP rollout (or our shifts) are exogenous to the characteristics of females and the productive characteristics of the municipalities. The setup of exogenous shifts has been thoroughly formalized in the recent literature (Borusyak et al., 2024). In this regard, Table 2 reports the results of regressions examining whether a municipality's baseline (2003) economic and labor characteristics predict the eventual presence of at least one full-time school in the municipality (FTS). Column (1) shows that while variables such as the share of female workers, or the share of female workers in production, appear to be correlated with future FTSP adoption, adding municipal-level controls related to poverty and income in Column (2) makes these relationships insignificant at the 95% level. While in Column (2) municipalities with a higher value-added-to-gross-output ratio (VA to Gross Output) appear significantly more likely to adopt the FTSP in at least one school, the estimate is economically insignificant.[13] In contrast, the evidence suggests that FTSP adoption is guided by municipal poverty levels (measured by the municipal marginality index provided by CONAPO), as poorer municipalities are less likely to adopt the FTSP. This is natural, as in its initial stages the program called for schools to have specific infrastructure and human capacities in order to be able to adapt to the extended school day. These findings suggest that while the expansion of the FTSP was not purely random but instead skewed toward areas with richer economic profiles, employing careful estimation strategies that compare (or contrast) municipalities with similar poverty levels allows for the use of the staggered rollout of the FTSP in a quasi-experimental setting.

[13] For example, a change of a hundred percentage points in Value Added to Gross Output would relate to an increase of 0.19 points in the probability of ever adopting one FTSP school in the municipality.

Table 2: Determinants of FTSP Adoption: Municipal Economic Characteristics

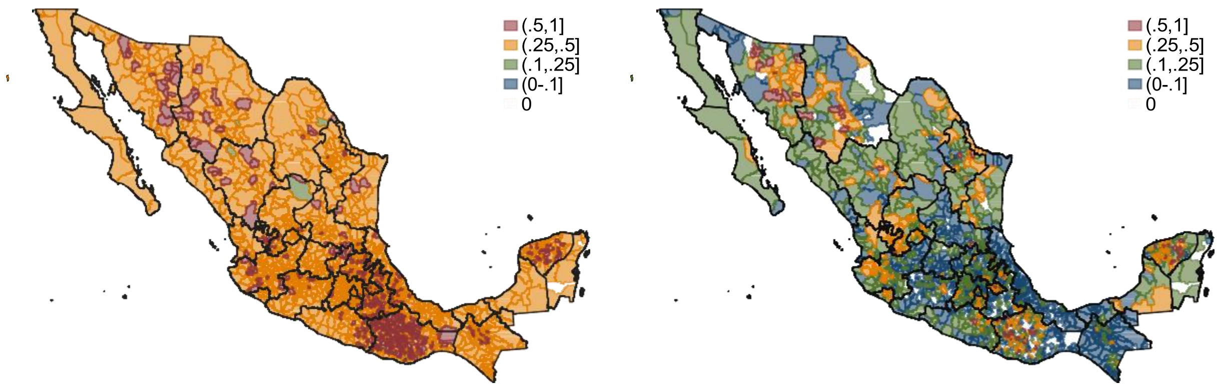
	(1)	(2)
	FTS	FTS
Total Workers per Municipality (1000)	-0.0004	-0.0004
	(0.0008)	(0.0008)
Economic Units per Municipality (1000)	0.0031	0.0046
	(0.0051)	(0.0051)
Workers per Economic Unit	0.0009	-0.0005
	(0.0018)	(0.0017)
Female Workers per Economic Unit	-0.0013	0.0003
	(0.0051)	(0.0051)
VA to Gross Production (p.p.)	0.0011	0.0019**
	(0.0009)	(0.0009)
VA to Fixed Assets (p.p.)	0.0001	-0.0002
	(0.0006)	(0.0006)
VA per Worker (pesos)	0.0000	-0.0000
	(0.0000)	(0.0000)
Yearly Gross Output p/w (pesos)	0.0000	0.0000
	(0.0000)	(0.0000)
Share of Female Workers (p.p.)	-0.0070***	-0.0010
	(0.0025)	(0.0026)
Female Share in Production (p.p.)	0.0035***	-0.0017*
	(0.0006)	(0.0009)
Female Share in Managerial Roles (p.p.)	0.0035***	-0.0006
	(0.0009)	(0.0010)
Female Share in Ownership/Owner-Family, Board Member Roles (p.p.)	0.0005	-0.0024
	(0.0024)	(0.0024)
Poor Municipality		-0.0835***
		(0.0203)
Log-Daily Wage		0.0956***
		(0.0155)
Observations	2334	2334

Notes: This table reports OLS regression results relative to a municipality's baseline (2003) economic and labor characteristics and the eventual presence of at least one full-time school in the municipality (FTS). Each column corresponds to a different regression. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Panel (a) of Figure 3 maps female employment as a share of total employment in the base year (2003), while Panel (b) maps our *shift-share* variable across Mexican municipalities in 2018. In the color scale, orange and red indicate higher levels, with lower levels in green and blue. Panel (a) suggests that most municipalities have an initial female employment rate between 25% and 50%, with fewer municipalities exceeding 50%. Our *shift-share* variable, mapped in Panel (b), shows fewer areas in which a larger initial presence of women in the workforce is associated with a greater predicted share of FTS places (red and orange areas). Blue and green regions are widespread and reflect lower *shift-share* values across Mexico, an indication of the variation caused by the rapid and arguably exogenous adoption of the FTSP. This visual dispersion highlights substantial heterogeneity in the way municipalities adopted the extended school-day program, generating the variation that serves as the basis for the instrumental variable strategy.

Figure 3: Municipality Distribution of Female Employment in 2003 and the *Shift-Share* in 2018

(a) Female Employment 2003 | (b) *Shift-Share* 2018



Notes: Own elaboration using data from the Economic Censuses conducted by INEGI, providing shares of female employment in the base year. Our *shift-share* comes from the baseline female employment and predicted share of FTS places in t = 2008−2018

We estimate the effects of female employment on value-added measures by using a two-stage least squares (2SLS) regression for the structural equation:

$$VA_{mt} = \zeta \hat{E}^{f}_{mt} + \phi_m + \nu_t + \xi_{t\text{-poor}} + \epsilon_{mt} \tag{3}$$

where VA_{mt} are our value-added measures in municipality m at time t. We also use hourly wage as a dependent variable, as changes in the supply of labor due to increased female employment may result in changes in wages that would be reflected in value-added measures.[14] The specification includes municipality ϕ_m, time ν_t. Given the relevance of poverty levels at the municipal level to FTSP adoption (as shown in Table 2), we introduce poor-by-time $\xi_{t-\text{poor}}$ fixed-effects. This allows our preferred estimation to obtain the ζ estimator of female employment E^f,

[14] Note that for this reason wages work as an outcome and that controlling for them when regressing value-added measures on female employment would bias our estimations.

instrumented with our *shift-share* measure Z_{mt}, as defined in Equation 2, by comparing changes in female employment within poor and non-poor municipalities across time. We compute robust standard errors and, following (Borusyak et al., 2024), weight our estimations by the total female employment in each municipality in 2003.

5 Results

In Table 3, we present the first-stage results of a Two-Way Fixed-Effects (TWFE) estimation regressing female employment on our *shift-share* variable, including municipality and year fixed effects plus poor-by-time fixed effects. Column (1) presents the estimator of interest for the full sample of municipalities from 2003 to 2018, which indicates a strong relationship between the instrument and contemporary female employment. Putting these results into context, going from zero to 100% of full-time schools in the municipality—given an average baseline employment of 0.41 in 2003—represents a 5.3 percentage point increase in female employment (i.e., 1*0.41*13).[15] The F-statistic of 19.26 also suggests a strong relevance of our instrument.

Columns (2) and (3) separate municipalities into those with a baseline female employment below the median of 2003 and those with a baseline above it, respectively. The results show that instrument relevance stems from the variation in the predicted share of FTS places across contexts with higher baseline female employment. It is highly likely that the industrial vocation of municipalities plays a role in the baseline and contemporary female employment shares that shape women's response to a larger presence of FTS schools. Therefore, our instrument plausibly captures a local effect on value added in municipalities that are already able to absorb a higher supply of female labor.

[15] Note that this estimation is in line with the effect estimated by Padilla-Romo and Cabrera-Hernández (2019) of the predicted share of FTS places on female employment using a Difference-in-Differences strategy.

Table 3: First Stage: Female Employment on the *Shift-Share* Variable for the Full Sample and by Quartile of Baseline Female Employment

	(1)	(2)	(3)
	Full Sample	Baseline Female Share Below Median	Baseline Female Share Above Median
Baseline Female Share x FTS Share	12.981***	1.944	10.084***
	(2.958)	(2.801)	(3.288)
Observations	9786	4894	4892
F-statistic	19.26	0.48	9.41

Notes: Each column originates from a distinct Two-Way Fixed-Effects (TWFE) plus poor-by-time fixed effects regression, where the dependent variable is the share of female employment and the independent variable is the instrument or the *shift-share* variable defined in Equation 2. Robust standard errors in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Table 4 presents the results of the 2SLS estimation on our value-added measures in Columns (1) to (3). The results for hourly wages are presented in Column (4). The estimated effects suggest a significant impact of greater female participation in employment on value added. An increase of one percentage point in female employment increases the percentage of value added to gross output by 0.4 percentage points. Given the first-stage estimators, a rise from zero to one in the predicted share of FTS places for the average baseline of female employment (2.7 percentage points) implies an increase of 1.1 percentage points in the value added to gross output. This represents an approximately 2% increase from the baseline value added to gross output of 57%. The results for value added to fixed assets (or net fixed capital including depreciation) are presented in Column (2). The results suggest that an increase of one percentage point in female employment increases value added to fixed assets by 0.7 percentage points (considering a baseline net value added of 68%). This suggests that female employment increases the efficiency with which capital is utilized to generate value added. Column (3) confirms the positive effect of female employment on value added per worker as a measure of labor productivity, with an increase of 2.3%.

Finally, gross and net value-added measures include labor compensation, for which increases in wages would be reflected in the measures of value added. Increases in value added are upwardly biased by increases in wages. We test this in Column (4), which shows the estimates of the effects of higher female employment on hourly wages. The effect reported is not significantly different from zero. This provides evidence that the documented increases in value-added measures indicate an increase in overall labor and capital efficiency.

Table 4: Effects of Share of Female Workers on Value-Added Measures and Hourly Wages

	(1)	(2)	(3)	(4)
	VA to Gross Output (p.p.)	VA to Fixed Assets (p.p.)	Ln(VA p/Worker)	Hourly Wage (pesos)
A. Overall				
Female Share (p.p.)	0.410**	0.685**	0.023**	0.243
	(0.178)	(0.292)	(0.012)	(1.687)

Notes: This table shows the average effect of increasing overall female employment by one percentage point on value-added measures at the municipal level. Female employment is instrumented with the *shift-share* variable defined in Equation 2. Each column originates from a distinct 2SLS regression, as depicted in Equation 3. The overall share of employed women in 2003 is 41.2%. Robust standard errors in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

5.1 Heterogeneous Effects

The Economic Census provides details of the share of female employees in total employment within three categories: a) women who are members of the owner family or are one of the owners of the firm,[16] b) women in executive or managerial roles, and c) the share of females employed in operative roles, specifically, production, sales, and general services.[17] In this regard, Table 5 separates the effects of female employment on value-added measures by job type. The results shown in Panel A suggest that increasing the share of female business owners leads to higher value added. The effects are similar to those reported in Table 4. Similarly, a higher share of female workers in executive and managerial roles (Panel B) suggests a higher value added. The coefficients are higher than those observed on average, but their statistical significance is lower

[16] Note that in Mexico, 99.8% of businesses are medium, small, and micro enterprises INEGI (2020). Furthermore, according to the Mexico's National Survey of Occupation and Employment (ENOE in Spanish), in the first quarter of 2025, approximately one third of employment relates to informal family businesses.

[17] The baseline share of women employed as part of the family business or as owners is 37%, in executive/managerial roles 20%, and the share of women in production/sales/service roles out of total employment in these roles is 33.5%

(i.e., significant at the 10% level). Notably, the share of women employed in operative roles does not significantly affect value-added measures.

Table 5: Heterogeneous Effects of Share of Female Workers on Value-Added Measures and Hourly Wages by Roles

	(1)	(2)	(3)	(4)
	VA to Gross Output (p.p.)	VA to Fixed Assets (p.p.)	Ln(VA p/Worker)	Hourly Wage (pesos)
A. Owner/Owner-Family Member				
Female share (p.p.)	0.406**	0.678**	0.023**	0.241
	(0.178)	(0.290)	(0.012)	(1.671)
B. Exec./Managerial				
Female Share (p.p.)	1.609*	2.687*	0.092	0.955
	(0.958)	(1.565)	(0.058)	(6.623)
C. Prod./Sales/Services				
Female Share (p.p.)	-2.828	-4.721	-0.161	-1.678
	(4.116)	(6.825)	(0.241)	(11.900)
Observations	9786	9786	9786	9786

Notes: This table shows the average effect of increasing overall female employment in owner/owner-family member and executive/managerial roles or production/sales/services, respectively, by one percentage point on value-added measures at the municipal level. Female employment is instrumented with the *shift-share* variable defined in Equation 2. Each column and row originates from a distinct 2SLS regression, as depicted in Equation 3. The share of women employed in 2003 as part of the family business or as owners is 37% and in executive/managerial roles 20%, while the share of women employed in production/sales/services as a percentage of total employment is 33.5%. Robust standard errors in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

In Table 6, we present further estimation effects on heterogeneous levels of interest. Panel A. presents the results of our preferred estimation (as presented in Equation 3) for the subsample of municipalities below and above the baseline median female employment rate in 2003. As expected (given the results presented in our first stage), the results are concentrated in municipalities above the median female employment rate and are similar to those observed for the full sample (after considering standard errors). Panel B in Table 6 uses INEGI's 2005 population (inter)census to measure average female schooling at the municipal level to separate them into those above and below the median. The results align with those observed in Panel A, as the effects are concentrated in municipalities with more educated women. Note that the estimations of value added to fixed assets and per worker are higher than those observed for the full sample (see Table 4). Finally, Panel C. presents the results on value-added measures using CONAPO's index of marginality to separate municipalities above the median index (i.e., poor) and those below (non-poor). The results are also in line with those observed in Panels A and B, suggesting that the effects of higher female employment on value added are concentrated in non-poor municipalities. Overall, the effects appear to be concentrated in more dynamic labor markets, particularly in non-poor municipalities with higher levels of female education.

Table 6: Heterogeneous Effects of Share of Female Workers on Value-Added Measures and Hourly Wages by Baseline Female Employment

	(1)	(2)	(3)	(4)
	VA to Gross Output (p.p.)	VA to Fixed Assets (p.p.)	Ln(VA p/Worker)	Hourly Wage (pesos)
Panel A. Baseline Female Employment in 2003				
Below Median				
Female Share (p.p.)	-2.862	-0.206	-0.290	5.134
	(4.372)	(3.228)	(0.415)	(14.763)
Above Median				
Female Share (p.p.)	0.598*	0.930*	0.046**	0.037
	(0.331)	(0.541)	(0.023)	(3.189)
Panel B. Municipal Average Female Education in 2005				
Below Median				
Female Share (p.p.)	0.083	0.028	-0.002	-0.171
	(0.180)	(0.303)	(0.012)	(2.273)
Above Median				
Female Share (p.p.)	1.071**	1.928**	0.072**	1.034
	(0.474)	(0.790)	(0.032)	(1.766)
Panel C. Municipal Poverty Level in 2005				
Poor				
Share of Female Workers (p.p.)	0.126	0.622	0.015	0.536
	(0.240)	(0.405)	(0.016)	(0.530)
Non-Poor				
Share of Female Workers (p.p.)	1.233***	0.868**	0.047**	-0.602
	(0.337)	(0.426)	(0.020)	(4.999)
Observations	9786	9786	9786	9786

Notes: This table shows the average effect of increasing overall female employment by one percentage point on value-added measures at the municipal level for the subsamples of municipalities below (A) and above the median (B) of female employment in the base year 2003; and for municipalities below (C) and above (D), the median education in year 2005. Female employment is instrumented with the *shift-share* variable defined in Equation 2. Each column and row originate from a distinct 2SLS regression, as depicted in Equation 3. The average female employment rates below and above the baseline median are 35.8% and 55.2%, respectively. Robust standard errors in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

5.2 Robustness Checks

In Table 7, we present our first-stage regression using the average share of male workers in the municipality. The results suggest that the variation created by FTS only relates to female participation in the labor market and does not influence male participation. This finding is consistent with previous evidence on the predicted share of FTS places and male employment (see Padilla-Romo and Cabrera-Hernández, 2019; Cabrera-Hernández and Padilla-Romo, 2021).

Finally, Table 8, presents our main results, but instrumenting the female share of workers with the predicted share of FTS school places at the municipal level (not linked with baseline female employment). This follows the proposal by Borusyak et al. (2024), the intuition being that our *shift* represents the plausibly exogenous part of the *shift-share* variable, so it should yield similar results. Meanwhile, the non-significant effects are of comparable size and direction, save for value-added to fixed assets.

Table 7: First Stage: Male Employment on the *Shift-Share* Variable for the Full Sample and by Quartile of Baseline Female Employment

	(1)	(2)	(3)
	Full Sample	Baseline Female Share Below Median	Baseline Female Share Above Median
Baseline Male Share x FTS Share	-0.004	0.006	0.005
	(0.012)	(0.018)	(0.014)
Observations	9551	4845	4706
F-stat	0.10	0.10	0.14

Notes: Each column originates from a distinct Two Way Fixed-Effects (TWFE) plus poor-by-time fixed effects regression, where the dependent variable is the share of male employment and the independent variable is the instrument or the *shift-share* variable defined in Equation 2. Robust standard errors in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

6 Conclusions and Discussion

This study exploits the plausibly exogenous variation in the rollout of the Full-Time Schools Program (FTSP) to instrument changes in female employment at the municipal level, which allowed us to estimate its effects on value-added measures. The results show that increases in the female share of employment are significantly associated with higher value added to gross output, greater value added relative to fixed assets, and higher value added per worker. Overall, these findings suggest that rising female employment is linked to more effective utilization of economic resources. The absence of significant effects on hourly wages further indicates that these gains are not solely driven by changes in labor costs, but rather by shifts in production efficiency.

Table 8: Alternative Instrument: Effects of Share of Female Workers on Value-Added Measures and Hourly Wages

	(1)	(2)	(3)	(4)
	VA to Gross Output (p.p.)	VA to Fixed Assets (p.p.)	Ln(VA p/Worker)	Hourly Wage (pesos)
Female Share (p.p.)	0.883	3.394	0.078	-0.597
	(1.203)	(3.201)	(0.092)	(9.866)
Observations	9786	9786	9786	9786
First Stage F-Statistic: 0.91				

Notes: This table shows the average effect of increasing overall female employment by one percentage point on value-added measures at the municipal level. Female employment is instrumented using the predicted share of FTS places in each municipality. Each column originates from a distinct 2SLS regression, as depicted in Equation 3. The overall share of employed women in 2008 is 46.3%. Robust standard errors in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

The effects are not homogeneous across municipalities and tend to be concentrated in areas with higher baseline female employment rates, higher average female education levels, and lower poverty levels. Furthermore, the gains in value added are primarily observed when female employment increases in ownership and executive roles. These results highlight the role of women in enhancing the internal efficiency of firms, particularly when they participate in decision-making or supervisory capacities. In the context of Mexico, where female labor force participation remains at just 47%, these findings underscore the substantial untapped potential of women's employment as a lever for improving economic outcomes at the local level. Expanding women's access to the labor market, especially into roles beyond low-skilled or informal employment, may thus represent a key pathway to strengthening firm-level performance and local economic development.

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Appendix

Table A.1: Effects of the Number of Female Workers on Value-Added Measures and Hourly Wages

	(1)	(2)	(3)	(4)
	VA to Gross Output (p.p.)	VA to Fixed Assets (p.p.)	Ln(VA p/Worker)	Hourly Wage (pesos)
Female Workers (100)	0.210**	0.288**	0.011*	0.125
	(0.093)	(0.142)	(0.006)	(0.744)
Observations	9786	9786	9786	9786

Notes: This table shows the average effect of increasing overall female employment by one percentage point on value-added measures at the municipal level. Female employment is instrumented with the *shift-share* variable defined in Equation 2. Each column originates from a distinct 2SLS regression, as depicted in Equation 3. The overall share of employed women in 2008 is 46.3%. Robust standard errors in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

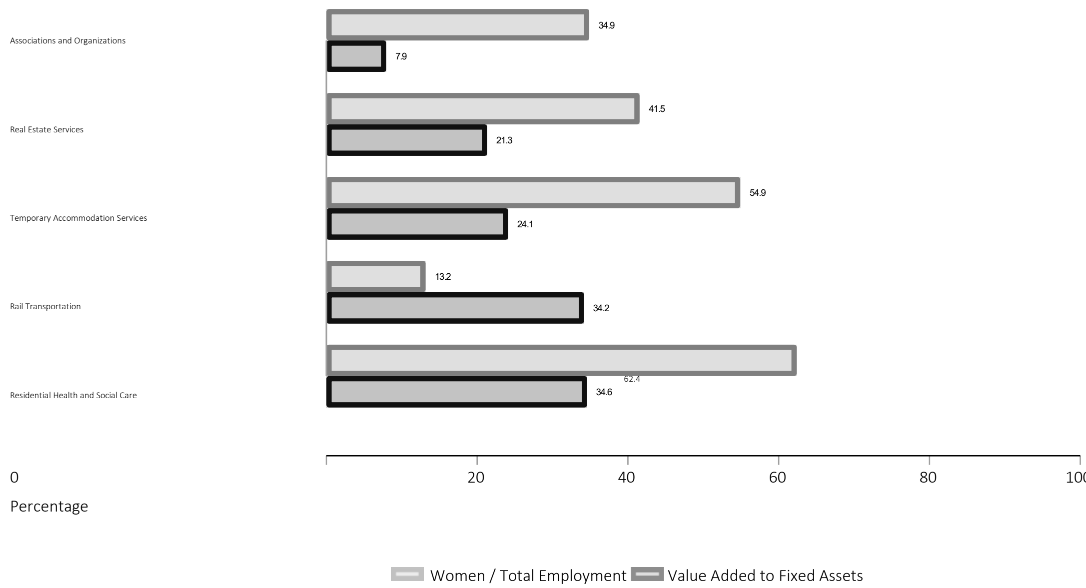
Table A.2: Effects of the Number of Female Workers on Value-Added Measures and Hourly Wages by Roles

	(1)	(2)	(3)	(4)
	VA to Gross Output (p.p.)	VA to Fixed Assets (p.p.)	Ln(VA p/Worker)	Hourly Wage (pesos)
A. Owner/Owner-Family Member				
Female Workers (100)	0.973**	1.333**	0.049**	0.579
	(0.385)	(0.604)	(0.025)	(3.437)
B. Executive/Managerial				
Female Workers (100)	1.750*	2.397*	0.089*	1.042
	(0.924)	(1.372)	(0.054)	(6.191)
C. Prod./Sales/Service				
Female Workers (100)	0.447**	0.613*	0.023*	0.266
	(0.211)	(0.319)	(0.013)	(1.581)
Observations	9786	9786	9786	9786

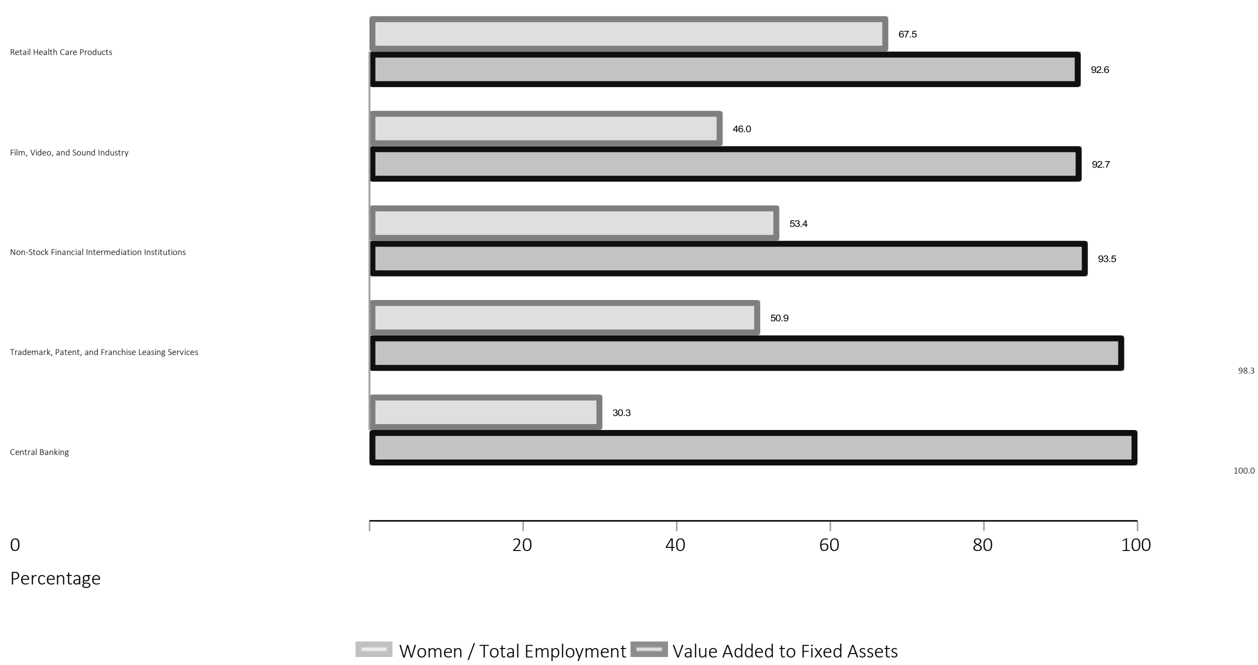
Notes: This table shows the average effect of increasing overall female employment in owner/owner-family member and executive/managerial roles or production/sales/service roles, respectively, by one percentage point on value-added measures at the municipal level. Female employment is instrumented with the *shift-share* variable defined in Equation 2. Each column and line originate from a distinct 2SLS regression, as depicted in Equation 3. The share of women employed in 2008 as part of the family business or as owners is 45.4% and in executive/managerial roles 12.8%, while the share of women employed in production/sales/services as a percentage of total employment is 29.7%. Robust standard errors in parentheses. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Figure A.1: Ratio of female to total employment in top and bottom value-added industries in the services sector in 2018

(a) Bottom five sectors



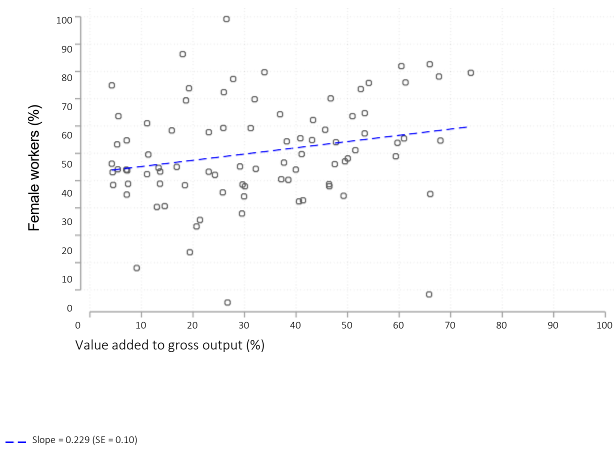
(b) Top five sectors



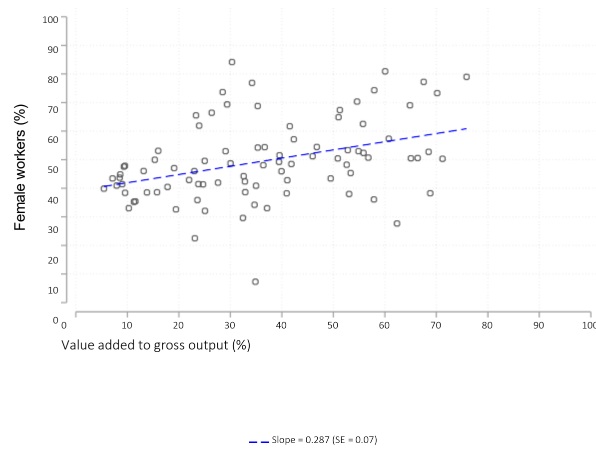
Notes: Own elaboration using data from the 2018 Economic Census conducted by Mexico's National Institute of Statistics (INEGI). Panel A. shows the five subsectors (identified by three-digit NAICS code) with the lowest value added to fixed assets and the share of female employment within these. Panel B shows the same for the highest value-added subsectors.

Figure A.2: Relationship between the percentage of female workers and the percentage value added to gross output, 2003 and 2018

(a) 2003



(b) 2018



Notes: Own elaboration using data from the Economic Censuses conducted by INEGI. The estimated slope is derived from a simple OLS regression of the percentage of female workers in each industry (identified by NAICS code) on the value added to gross output. Each point denotes one industry.