The Effects of Unbalanced FDI Inflow from Trade on the Gender Wage Gap in Mexico

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1 Abstract

There is an on going discussion of the numerous impacts of trade openness on Latin America's economy. In this study, I assess how the Mexico-EU Free Trade Agreement (FTA) of 2000 affected Mexico's gender wage gap. For Mexico, the policy encouraged FDI inflow from Europe; however, 91.5 percent of this FDI from Europe went to the Mexican states of the Mexico City Federal District, the state of Mexico, Nuevo León, Jalisco, and Puebla. FDI inflow tends to benefit foreign manufacturing company wages for the host country. These companies predominantly employ men as oppose to women. This is because of the higher work skills men have on average compared to women in Mexico. I use survey data from the years 1995 to 2004 and apply a difference-in-differences model to assess the effect of the policy on gender wage inequality. The empirical findings show that there was a higher difference in men's average monthly earnings and hourly wages compared to women after the enactment of the trade policy among these 5 states. The empirical evidence also indicates that there is no change in the average different amount of hours both genders work before and after the policy. My findings show that one cause for the gender wage gap increase in this region comes from the highly concentrated foreign direct investment inflow from the European Union.

2 Introduction

The EU is Mexico's second largest trading partner (only behind the United States). There is no doubt that trade liberalization with the EU dramatically impacted Mexico's economy considering how much the two regions currently work with one another. Among the potential economic variables that this trade liberalization could have is the gender wage gap in Mexico. Gender pay discrepancy has been a problem as old as time. According to the Gobierno de México in 2019, the wage gap between men and women worldwide is about 20 percent. In Mexico, the gap is 15.6 percent. Compared to a worldwide sample that includes the world's most impoverished areas, Mexico's wage gap is slightly smaller than the average. While Mexico has experienced some improvement over the last 30 years in the gender gap, there is still a lot more work to be done. The OECD book titled "The Pursuit of Gender Equality: An Uphill battle" brings to light how Mexico continues to have one of the biggest gender employment gaps in the OECD. It also highlights the improvement of female education rates. For the women in Mexico who do work, a significant chunk of them have informal jobs that offer little social protection, high insecurity, and low pay. Gender stereotypes and discrimination continue to hinder women's ability to reach their full potential in the labor market. Women complete over 75 percent of all unpaid childcare and housework. This unpaid, heavy set amount of labor dramatically limits a woman's ability to also be highly active in paid work. It is more culturally expected for the men of the household to have paid work. In addition, women continue to face high rates of violence both in public and at home. The fact that access to justice remains uneven among women further limits their ability to work paid jobs.

On the bright side, Mexico has made phenomenal progress when it comes to offering education programs for women. The country now has nearly full universal pre-school enrollment, a plethora of scholarships offered to female upper-secondary enrollment, and university enrollments for men and women are similar. There have also been a lot of investments toward estacias infantiles, which provides mothers with more child-care options. More child care options are vital for improving the female labour force since it makes it easier for women to find people to watch their kids while they work. Despite these advancements, only 44.9 percent of working-age Mexican women are employed. Among OECD countries, this is the third lowest employment rate for women. On the other hand, Mexican male employment rates are relatively high. The employment rate for men in this country is 78.5 percent. The OECD mentions that among households this major gender gap often widens during family formation years. In other words, motherhood has negative effects on women's labour force participation, pay, and advancement.

A 2019 article from El Universal provides more discouraging news about the gender wage gap in Mexico. The article indicated that the number of women with better paid jobs in Mexico over the past 12 years decreased, whereas the amount of females working low-paid jobs increased. This fact should not be met with indifference. More low paying jobs for women means an increase in job insecurity and wage precariousness. Well-paying jobs seem to be disappearing for women. The topic of what decreases or increases gender wage gaps is complex. When one adds how open trade impacts gender wage inequality, it gets even more complicated.

Mexico's most commonly known trade deal is the North American Free Trade Agreement (NAFTA), which the U.S., Canada, and Mexico enacted in 1994 and remained in force until 2020. NAFTA called for gradual reduction of tariffs, customs duties, and other trade barriers amongst the U.S., Mexico, and Canada. NAFTA had a large impact on Mexico's economy because their biggest trading partner is the U.S. According to the world bank, in 2019 77.85 percent of its imports came from the U.S. 45.28 percent of its exports also went to the U.S. Economists have long discussed the plethora of outcomes that resulted from such monumental policies such as NAFTA. Hanson (2003) examines the impacts of trade and investment liberalization on the wage structure in Mexico. He finds that NAFTA raised the demand for skill in the country. It further reduced rents in industries prior to NAFTA, paid their laborers high wages, and raised the premium paid to workers in states along the U.S. border. These factors resulted in increased wage dispersion among Mexico. In addition, Hanson points out that NAFTA raised capital inflows in part from raising investor confidence in the country's commitment to free trade. From 1980 to 1994, FDI averaged 1.3 percent of Mexico's GDP. From 1995 to 2000, it averaged 2.8 percent of GDP. Thus, it appears that Mexico moving toward freer trade encouraged more FDI inflows.

Economists have not solely analyzed how NAFTA and other free trade agreements increased demand for higher labor skills and FDI. A growing amount of empirical evidence also suggests that free trade policies in Mexico have led to larger gender wage inequality. For example, Artecona and Cunningham (2002) finds that trade liberalization from NAFTA led to higher gender wage gaps in the Mexican manufacturing sector. They argue that this is most likely due to an increased premium to men's higher work experience skills.

Just 3 years after NAFTA's enactment, Mexico began free trade negotiations with the European Union. In 2000, they enacted the Mexico-EU Free Trade Agreement (FTA). The EU has gone on to become Mexico's second largest trading partner. Policy makers intended for the Mexico-EU FTA policy to establish development of trade in goods and services between Mexico and the European union. The goal of the agreement was to account for the sensitivity of certain service sectors and products on the international market. The policy enforced reduced tariffs and equivalent custom duties on imports and exports. The FTA further placed quantitative restrictions on imports and exports with commensurate effects. The policy enforced trade benefits for multiple economic sectors such as agriculture and manufacturing.

Mexico's trade history seems to disproportionately impact men and women's wages. To add to this economic discussion, I will assess the impacts of the gender wage inequality from the Mexico-EU FTA in 2000. My empirical analysis attempts to answer whether this trade policy caused an increase in the gender wage gap. To do this, I use the National Employment Survey (ENE) for the years 1995 to 2004. This survey comes from Mexico's National Institute of Statistics and Geography (INEGI). With this survey data, I run a difference-in-differences model to assess the impact of the Mexico-EU FTA policy.

While the U.S. is Mexico's biggest trading partner, trade with the European Union still plays a significant role in the nation's economy. Reveles and Pérez-Rocha (2007) discusses the large influence the EU-Mexico FTA had on Mexico. He argues that this was the second most important trade deal for Mexico (only behind NAFTA). From 2000 to 2006, the EU was Mexico's second largest trading partner. From 2000 to 2006, Mexican exports to the

EU increased from 5,593,000 USD to 10,890,000 USD. Its imports from the EU from 2000 to 2006 also increased from 15,033,000 USD to 27,847,000. While this deal lead to a trade deficit for Mexico in this time period, it did result in higher FDI inflow. Roughly 20 percent of Mexico's FDI between 2000 to 2006 came from the European Union. Policy makers hoped this FTA would lead to diversified investment and that FDI would spur greater regional development. However, because the EU-Mexico FTA did not permit requirements related to factors such as geographic location of companies or orientation toward specific sectors, it did not serve as an effective tool for diversifying investment. Instead, it lead European FDI to be highly concentrated in five of Mexico's 32 states. These five states ended up representing 91.5 percent of European investment during this period: 58.1 percent in the Mexico City Federal District, 14.5 percent in the state of Mexico, 12 percent in Nuevo León, 3.6 percent in Jalisco, and 3.2 percent in Puebla. EU companies preferred to invest in these states because they already had the infrastructure and human resources conducive for profitable economic growth. Due to this severely disproportionate regional FDI, I use these five states as treatments and the other 27 as controls in my difference-in-differences model.

In order to break down the question of whether the disproportionate FDI in these 5 states from the Mexico-EU trade increased gender wage inequality in Mexico, the next section (3) will be a literature review of relevant research. Section 4 will explain the data that my empirical model uses. Section 5 will show empirical methods and results. Section 6 will discuss robustness checks, and section 7 will entail a discussion of the results and conclusion.

3 Literature Review

There are many variables impacting disparity between men and women economically. One important area to focus on is educational levels. Autor et al. (2016) discusses how women have surpassed men in educational development in the developing world. In 2011, in 29 of the 34 OECD countries, more females completed college than men. Even in the U.S., the female graduation rate in high school exceeded the male completion rate by 5 percentage points. For college, in the U.S. the graduation rate for females is 7 percentage points higher than males. This article uses new evidence matching birth and school administrative records to discover the degree to which school quality impacts the gender gap in educational and behavioral outcomes. They use tens of thousands of sibling pairs, brothers and sisters, attending thousands of Florida public schools. The authors find that boys benefited more from cumulative exposure to higher-quality schools than their sisters did.

There has been growing concern of the gender gap in math education. Nollenberger et al. (2016) quantifies the epidemiological approach and the effect of values and beliefs about female roles in society that family transmits from generation to generation. The epidemiological approach evaluates second-generation immigrants who have lived in a host country since their birth and remained among the same host-country's institutions. The family and cultural beliefs parents teach their second generation children greatly impacts their educational choices. This article finds that transmission of cultural beliefs on the role of women in society accounts for at least two-thirds of the overall contribution of the gender factors impacting the math gender gap. Math related fields tend to pay a lot of money; thus, more women training to work in higher paying jobs would lead to a decrease in gender wage gaps. Reassessing what values we instill in girls can no doubt change how much money women make.

In many areas of the world, gender wage gaps have decreased. Despite more women in developing countries earning college degrees, men still make significantly higher incomes than women on average. O'Neill (2003) argues that the main cause between why male and female productivity levels are different is that many women cannot commit to labor-market careers as a result of the division of labor with the family. Women are less likely to work continuously after school and hence less likely to gain experiences that one can only acquire on the job. This is because they are more likely to spend that time taking care of their family. In addition, anticipation of work interruptions from their children and the need to manage home responsibilities with market work are very likely to impact choice of occupation and the type of firms women work for. The more a country's culture pushes the beliefs of female roles in the household, the less likely women will be able to continuously earn income the way men do.

Improving the wage gap is not just important because it increases women's resources. It also improves their personal security. Aizer (2010) examines the impact of the gender wage gap on levels of domestic violence in the U.S. Aizer finds that decreases in the wage gap reduce violence against women. Poorer families tend to face domestic violence more often than wealthier ones. When women in poorer household make more money, they have more bargaining power and control over what goes on in their home. Women's husbands are less likely to beat them when they have higher individual incomes.

There is a large literature that discusses multiple effects of trade openness on Mexico's gender wage inequality. Mexico has indeed had its own interesting trends of gender wage disparity. Meza González (2001) discusses how the gender wage gap decreased from 1988 to 1996 but increased from 1996 to 1998. The study points out that this is an odd trend as both female education and labour involvement increased. A lot of work has been done to show how trade openness in Mexico has impacted a plethora of economic factors, including gender wages. Andrés-Rosales et al. (2019) discusses how NAFTA (1994-2018) led to a reorganization of Mexico's 32 metropolitan areas' productive structures. This affected what jobs areas offered in Mexico. This all included tertiary activity, which is what most employment in these metropolitan areas consist of. While Mendoza González et al. (2017) applies empirical evidence that argues the wage gap between men and women in Mexico declined after NAFTA, their work leaves out several key factors that Andrés-Rosales et al. (2019) highlights. The labor market played a fundamental role in Mexico's job insecurity. Workers in Mexico do not enjoy many labor protections, which gives way to outsourcing and subcontracting. This results in men losing their wage advantage over women. Indeed, the international trend of more openness Mexico has inserted itself in has declined worker protections. Less flexibility of the labor market has led to more job precariousness. The key point made in this article is that "greater precariousness for men and lessened precariousness for women turns out to be more relevant in explaining the wage differential between men and women than the factors linked to human capital". This no doubt raises a public concern. Trade openness with NAFTA led to reducing gender income inequality; however, it came at the expense of increasing job precariousness for men.

There is a lot of noticeable work discrimination in Mexico. Rodríguez Pérez and Castro-Lugo (2014) shows that from using the National Urban Employment Survey between 2000-2004 there are wage differences by sex in favor of men and more than 85 percent of these inequalities are linked to discrimination. Andrés-Rosales et al. (2019) argues that this discrimination study holds true for the period 2005 to 2018 as well. Trade openness can have many impacts on gender discrimination in the work force. Berik et al. (2004) argues that according to neoclassical theory if discrimination is costly then increased industry competitiveness with the international markets will lessen the incentive for employers to discriminate against women. However, empirical work concerning Taiwan and Korea suggests that competition with foreign trade in concentrated industries is positively associated with wage discrimination against women. This is particularly true of increased international competition within the manufacturing sector. Valdez and Sobrevilla (2021) states there is rough wage discrimination against females in Mexico. Pay is different between north, central, and southern regions of the country. Among the same regions, females earn less than men. Women earn less than men even when empirical evidence controls for the same economic activity and region where they work. This is despite the fact that Mexican women own more years of education than men and both sexes report the same amount of experience.

Artecona and Cunningham (2002) assesses the change in the gender gap in the manufacturing sector within urban Mexico over the trade liberalization period 1987-1993. They found that through difference-in-differences modeling trade liberalization was associated with higher gender wage gaps in the Mexican manufacturing sector due to increased premi-

ums to men's higher skills and experience. Within industries who faced more competition from international trade liberalization, the gender wage gap fell.

Domínguez-Villalobos and Brown-Grossman (2010) also asserts there is a negative impact of export orientation on men's and women's wages and the gender wage ratio. This suggests that women lose in both absolute and relative terms. White (2004) argues that NAFTA led to a poverty increase of 50 percent in the poorest female-headed households between 1992 and 2000. The article indicates this is due to female head-of-households having fewer marketable skills and lower education. Caceres and Salvador (2021) points out that NAFTA lead to the loss of female and male jobs in the industrial sectors, but the ratio of female to male industrial employment fell in Mexico. Floro (2003) argues that a positive benefit from the increase in the female to male employment ratio in a country leads to increased domestic savings.

Hakobyan and McLaren (2017) also analyzes the effects of NAFTA on U.S. wages, focusing on differences by gender. The paper's findings suggest that NAFTA tariff reductions were associated with substantially reduced wage growth for married blue-collar women. The argument Hakobyan and McLaren (2017) makes for this is selective non-participation in the market. However, they admit that this explanation leaves out a lot of what is causing this wage gap.

Menon and van der Meulen Rodgers (2009) assess a very interesting phenomena with the effect of trade openness and gender wage discrepancy in India. Their empirical work indicates that increasing openness to trade is associated with larger wage gaps in India's concentrated manufacturing industries. It is not just Latin America that has experienced an increase in the gender wage gap within the manufacturing sector, but also Asian countries such as India. This article shows that the power open trade policies have on gender wages in manufacturing is a consistent occurrence for multiple regions.

It is also important to analyze the effects of FDI. This is because I chose my empirical data's treatments based on their highly concentrated FDI compared to all other Mexican states. Pacheco-López (2005) evaluates the liberalization of FDI in Mexico starting in the late 1980s. He further assesses the relationship between FDI and exports and imports. The article finds that FDI liberalization eased the access of multinational corporations (MNCs) to Mexico, which influenced an increase in exports. Mühlen and Escobar (2020) argues that FDI flows to Mexico are substantial and have played an important role in Mexico's economy since the 1990s. They conducted empirical analysis over the years 2006 to 2016. Their results indicate that there is a positive effect from FDI on growth-enhancing structural change. They further state that this effect depends critically on the lag structure of FDI and also stems from direct investments in sectors such as manufacturing. Their results verify that the mechanism through which FDI positively affects structural change is a labour reallocation towards more productive sectors.

Liargovas and Skandalis (2012) evaluates the importance of trade openness for attracting FDI inflows. They use a sample of 36 developing economies over the period 1990 to 2008. Their main empirical findings show in the long run trade openness contributes positively to the inflow of FDI in developing economies. Johnson et al. (2006) also claim that FDI should have a positive effect on economic growth because of technology spillovers and physical capital inflows. Through cross-section and panel data analysis during the period 1980 to

2002, their empirical work reveals FDI inflows enhanced economic growth in developing economies, but not developed countries.

Aitken et al. (1996) looks into the relationship between wages and foreign investment in Mexico, Venezuela, and the United States. They contend that higher levels of foreign investment are associated with higher wages. For specifically Mexico and Venezuela, foreign investment is associated with higher wages only for foreign owned firms. Their analysis indicates there is no evidence of wage spillovers leading to higher wages for domestic firms.

Among the relevant literature, there are numerous factors to highlight. First, women are earning more education than men in the developing world. However, men on average still make more than women. In addition, culture plays a significant part in what education and working roles women choose. While there is some empirical evidence showing that the gender wage gap decreased in Mexico shortly after NAFTA, a large bulk of literature indicates trade openness leads to an increase in the gender wage gap. This is because trade openness in Mexico over the last 30 years increased the demand for higher work skill. This disproportionately benefited men. Furthermore, trade openness in Mexico led to more foreign investment. Such inflows lead to higher wages. When taking this vast literature into account, this paper attempts to answer how the individual Mexico-EU FTA impacted gender wag gaps in Mexico. Did highly concentrated European FDI disproportionately benefit men over women in the Mexico City Federal District, state of Mexico, Nuevo León, Jalsico, and Pueblo?

4 Data

My data comes from the National Employment Survey (ENE) from a joint project of the National Institute of Statistics and Geography and the Ministry of Labor and Social Welfare(STPS). Researchers conducted the survey from 1988 to 2004; however, INEGI did not have consistent annual data from the surveys until 1995. From 1995 to 1999 the surveys reflected data for each year's second quarter (April-June). From 2000 to 2004 the surveys include quarterly results. For consistency, this paper's empirical analysis includes annual data from each year's second quarter from 1995 to 2000. The data includes surveys from all 32 states at the household level. In addition, the surveys include the municipality that each household resides in. The data for the time period comprises of approximately 4.5 million surveys.

The surveys collected information on the private housing unit and members of the house hold. The data includes information of people's monthly wages, hourly wages, gender, education levels, hours worked in a week, age, and marital status. For my empirical results I assess survey's from individuals 14 years and older. The empirical work also only includes individuals that work. However, the data sample I use does not distinguish what sector people work in. It includes both people who work in agriculture, industry, manufacturing, construction, commercial, restaurant and accommodation services, transportation, social services, and for the government.

5 Empirical Methods and Results

To analyze whether the Mexico-EU FTA lead to a change in the gender wage gap in Mexico I use a difference-in-differences model. The model's single exogenous shock is the Mexico-EU FTA policy in 2000. My difference-in-differences model is the following:

$$Y_{m,t} = \beta_0 + \beta_1 EU + X_{m,t} + \alpha_m + \delta_t + \varepsilon_{m,t} \tag{1}$$

My analysis has three response variables, $Y_{m,t}$. They are the average differences between male and female monthly earnings (Gender Gap), hourly wages (Hourly Wage Gap), and weekly hours worked (Work Gap). To proxy each of these values, I average the aggregate values of men and women of each response variable . I then take the difference of these average aggregate values for each municipality in each year. To be clear, for each response variable I am subtracting the aggregate average value of men minus the aggregate average value of women. I average the aggregate values because the survey respondents vary each year. In other words, the data does not include the same households every single year.

Our variable of interest is EU. It represents the Mexico trade enactment in 2000. EU is an interaction term with the following value:

$$EU = Post_t * Treat_m \tag{2}$$

Both Post and Treatment are binary variables. Post is short for post treatment. Post equals 1 if $t \geq 2001$ and 0 otherwise. The reason this shock is not calculated at $t \geq 2000$ is because the annual data is for the second quarter of each year (April-June). Mexico and the EU did not enact this policy until July of 2000. Treatment represents states that the policy affected. European foreign direct investment was highly concentrated in Mexico's Federal District, the state of Mexico, Nuevo León, Jalisco, and Puebla. 91.5 percent of foreign direct investment inflow from Europe went to these five states. It is important to mention the limitations of this choice in treatment states. First, more than just these 5 states trade with the EU. Furthermore, trade openness policies have a plethora of potential spill over effects to numerous Mexican states. FDI is not the only economic benefit from freer trade. However, there is no denying that these 5 states experienced heavily concentrated FDI from Europe compared to all other 27 states. In this sense, these 5 states were dramatically impacted by the FDI that the FTA encouraged while the other 27 states' FDI inflow hardly changed. A lot of economic literature indicates that heavier FDI leads to higher wages in the host country among foreign firms. Considering this, intuitively these 5 states should see a larger change in wage difference between men and women from this FDI policy compared to the other 27 states, holding all other things constant.

The letters m and t represent municipalities and years, respectively. The model includes a two-way fixed effect for both municipalities and years. The empirical work spans the time of 1995 to 2004. The time fixed effect is for each individual year of this period. $X_{m,t}$ represents a set of controls for education, age, and marital status. Education is a dummy variable with a value of 1 if the survey respondent had a high school degree or higher, zero otherwise. Marital status is also a dummy variable with a value of 1 if the surveyor was married and zero otherwise. I use the aggregated average of all of these controls in each municipality and year to match each response variable. Lastly, $\varepsilon_{m,t}$ is the error term.

Table 1: Summary Statistics

Variables	**Obs**	**Mean**	**Std. Dev**	**Min**	**Max**
Gender Gap	6,479	1066.79	706.67	-3689.76	13933.38
Work Gap	6,479	21.25	6.50	-17	52.43
Hourly Wage Gap	6,479	5.26	4.24	-35.75	76.87
Age	6,479	36.78	3.18	15.5	56.41
Mar. Status	6,479	0.47	0.09	0	1
Education	6,479	0.35	0.18	0	1

Table 1 consists of the summary statistics for the empirical work's variables. Gender gap stands for the average difference in monthly earnings between men and women. Work gap stands for the average difference in hours worked between the two genders. Lastly, Hourly Wage Gap represents the difference of hourly earnings between men and women. There are negative values for the responses minimums because gender gap, work gap, and hourly wage gap are all the difference of the average male and female values. Thus, the negative minimum results represent municipalities where the women on average have higher values. This summary table displays the regular values of each variable. None of the response variables in Table 1 have log values.

Table 2 displays the regression results for the difference-in-differences equation 1. The regression columns are the same except they have different dependent variables. In addition, all regressions have two-way fixed effects for years and municipalities. For simplicity, all response variables are logged with a 1 value added (Ex: $Y_{m,t} = log(GenderGap+1), Y_{m,t} = log(HourlyWageGap + 1), Y_{m,t} = log(WorkGap + 1)$). Adding 1 to the log is necessary because many values are negative or equal 0. In column 1, the response variable is the difference between male and female monthly earnings. Our coefficient of interest, EU, has a value of 0.105. This suggests that the Mexico-EU FTA had a 10.5 percent increased impact on the gender monthly earnings gap in the treatment states. The coefficient is statistically significant with 0.001 confidence. This is a big coefficient value that suggests the shock had a big impact on the gender gap. Men seem to have disproportionately benefited in monthly earnings than women. All of the controls are statistically significant with 0.001 confidence as well. In addition, the R^2 value is 0.5. In column 2, the response variable is logged hourly wage differences between men and women. The EU policy coefficient value is 0.112 with a p value of 0.001. This suggests that the Mexico-EU FTA shock had an 11.2 percent increase in the hourly earnings of men within the treated states. This intuitively should make sense as the monthly earnings in column one increased. The R^2 value is 0.378. Lastly, in column 3 the response variable represents hours worked on a weekly basis. The EU coefficient is not statistically significant with a p-value above 0.75. This result indicates that the shock did not impact the difference between how many weekly hours men and women worked. This result further suggests that the increase of the gender gap of monthly earnings and hourly earnings did not result from an alteration of how much men and women worked.

The coefficient value for age is negative in every column. This result is consistent and

Table 2: Gender Gaps

	(1) Gender Gap	(2) Hourly Wage Gap	(3) Work Gap
EU	0.105^{***}	0.112^{***}	0.006
	0.031	0.280	0.018
Age	-0.021^{***}	-0.014^{***}	-0.014^{***}
	(.003)	(0.003)	(0.002)
Mar. Status	0.558^{***}	0.625^{***}	0.616^{***}
	(0.154)	(0.203)	(0.066)
Education	1.935^{***}	1.317^{***}	-0.613^{***}
	(0.058)	(0.047)	(0.025)
Constant	1.528	0.250	1.273
	(0.136)	(0.544)	(0.615)
Year FE	Yes	Yes	Yes
Municipality FE	Yes	Yes	Yes
Observations	6,433	6,419	6,469
R^2	0.500	0.378	0.333

Note: This table shows the results for three difference-in-differences regressions. Each column displays the empirical results of equation 1. The only difference between the columns are their response variables. Column 1's dependent is the logged aggregate average gender pay gap for monthly earnings + 1 ($Y_{m,t} = log(GenderGap + 1)$). Column 2's dependent is the logged aggregate average gender gap of hourly wages + 1 ($Y_{m,t} = log(HourlyWageGap + 1)$). The dependent of column 3 is the logged aggregate average difference of weekly hours worked between men and women + 1 $Y_{m,t} = log(WorkGap + 1)$). All regressions have two-way fixed effects for years and municipalities. $*p < 0.05; **p < 0.01; ***p < 0.001$.

could be explained for a few reasons. This may be because women have a longer life expectancy than men. As they get older they may be able to work longer hours than men. Being married also consistently results in an increase in wage gaps for men and women. This could be because Latin culture expects women to take on more household and family duties. If you are married in Mexico you are likely to have children and allocate more time to raising them. In columns 1 and 2, education's coefficient is positive. This could be because more men are choosing stem related degrees compared to women. Thus, education dis-proportionally benefits the amount of money men make because of their chosen course work. Stronger skills in stem could also favor men more because of the influx of foreign investment in to Mexico that requires higher job skills within foreign companies. However, the education coefficient value is negative. This makes sense because as more women get an education, they are likely to work more hours than they otherwise might have. Most of these women are likely going to college to establish a career. This would intuitively decrease the gap of how many hours men versus women work.

It is important to run a pre-trend test to make sure that the response variables did not already experience a significant change before the policy. In this common trend test I limit my sample to pre-treatment observations (before 2001). This common trend test will look like the following:

$$Y_{m,t} = \beta_0 + \beta_1 Treat + \beta_2 Year + \beta_3 (Treat * Year) + \beta_4 X_{m,t} + \alpha_m + \delta_t + \varepsilon_{m,t} \qquad (3)$$

Our coefficient of interest in this model is β_3 because we want to see whether there was a significant change in our response variables before the shock. The results for equation 3 are in Table 3. In table 3, EU represents the interactive term of Treat and Year (β_3). For columns 1 and 2, the EU coefficient value is not statistically significant. For column 1 and 2, the EU's p-value is 0.348 and 0.162, respectively. Our results when the left hand variable is either the gender wage gap of monthly earnings or hourly wage passes the common trend test. However, in column three the EU coefficient is statistically significant. This means that this regression does not pass the common trend test. It further indicates that no significant change before and after the shock took place for difference in hours worked between men and women.

Figure 1 depicts the logged gender gap of monthly earnings from 1995 to 2004. The blue line represents treated states while the red line signifies controlled states. From 1995 to 1999 the trends for both groups are very similar. However, in 2000 the treated states slowly rise above the control states. Between 2001 to 2002 the two groups experience the largest separation from one another. Intuitively this graph makes sense because negotiations for the Mexico-EU FTA began in 1997 and were not decided upon until 1998. Foreign investment began to increase in the treated states slightly before 2000 in anticipation of expected economic growth from trade benefits. This anticipation also encouraged a higher level of stock purchases in foreign companies located in Mexico. Keep in mind when surveyors completed the surveys, which was between April and June of each year. The policy's enactment was July of 2000. Thus, for the year 1999 Figure one's treatment and control trends are almost the same. Then in 2000, the trends diverge a little due to increased FDI investment from Europe in anticipation of the free trade agreement. By 2001 our data

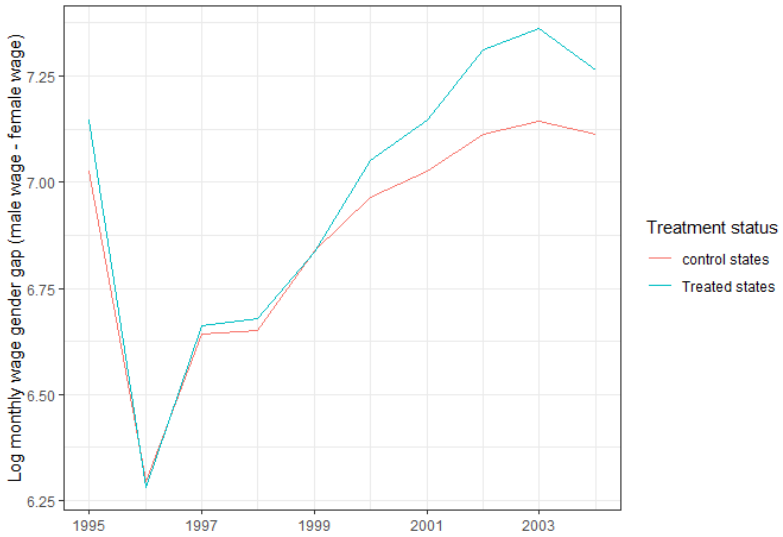
Table 3: Common Trend Test

	(1) Gender Gap	(2) Hourly Wage Gap	(3) Work Gap
EU	-0.013	-0.015	0.014^{*}
	0.014	0.011	0.006
Age	-0.022^{***}	-0.016^{***}	-0.014^{***}
	0.005	(0.004)	(0.002)
Mar. Status	0.421	0.424^{**}	0.559^{***}
	(0.237)	(0.144)	(0.085)
Education	1.974^{***}	1.322^{***}	-0.719^{***}
	(0.081)	(0.144)	(0.031)
Constant	26.969	27.096^{*}	-12.081
	(11.797)	(11.519)	$(5.613)^{*}$
Year FE	Yes	Yes	Yes
Municipality FE	Yes	Yes	Yes
Observations	3,362	3,353	3,376
R^2	0.506	0.471	0.413

Note: This table shows the results for three difference-in-differences regressions. Each column displays the empirical results of equation 1. The only difference between the columns are their response variables. Column 1's dependent is the logged aggregate average gender pay gap for monthly earnings + 1 ($Y_{m,t} = log(GenderGap + 1)$). Column 2's dependent is the logged aggregate average gender gap of hourly wages + 1 ($Y_{m,t} = log(HourlyWageGap + 1)$). The dependent of column 3 is the logged aggregate average difference of weekly hours worked between men and women + 1 $Y_{m,t} = log(WorkGap + 1)$). All regressions have two-way fixed effects for years and municipalities. $*p < 0.05; **p < 0.01; ***p < 0.001$.

finally accounts for the population that conducted the survey roughly 9 months after the Mexico-Eu FTA was in effect, which is when we see the biggest separation between the treatment and control groups. The most striking aspect of figure 1 is that after 1999 the monthly gender wage gaps remains consistently well above the control group for the rest of the data's time line. Figures 2 and 3 show the gender gaps for hourly wages and weekly hours worked, respectively. Figure 2 displays similar trends between the control and treated states. They alternate on which has higher wage gaps until roughly 2000. After 2000 the treated states consistently remain above the control states for up through 2004. Figure 3 depicts the trends for the difference in weekly hours worked between genders for the treated and control states. This image displays no major change between the treated states and control states. Both groups follow similar trends in Figure 3. This image suggests that the Mexico-EU FTA did not impact the difference of hours worked between genders

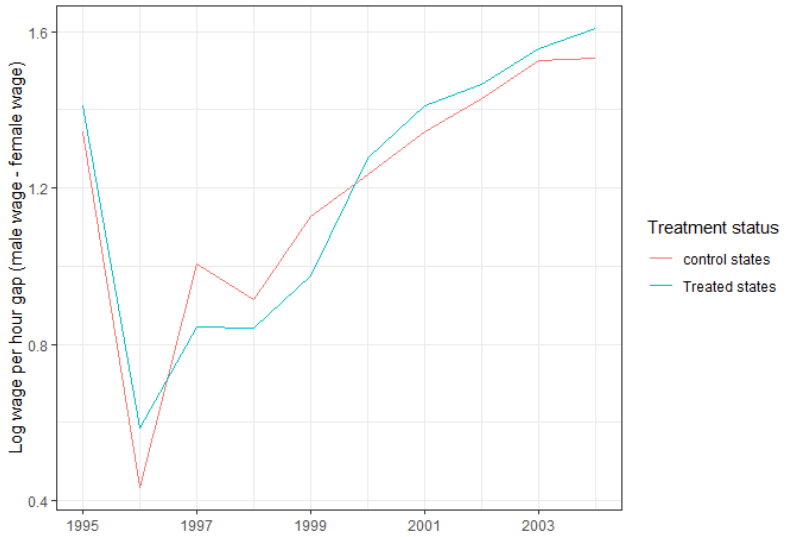
Figure 1: Monthly Wage Gap



This empirical work indicates a plethora of intriguing findings. The first is that the Mexico-EU FTA policy is heavily correlated with an increase of monthly earnings amongst the treated states rather than the control states. The amalgamation of Mexico's federal district, the state of Mexico, Nuevo León, Jalisco, and Puebla experienced significant increases in the average gender wage of monthly earnings and hourly wages. Within these states, men's wages increased substantially more than women's. Intuitively this makes sense why the data suggests this. Again, these five states experienced 91.5 percent of foreign direct investment from the EU during 1999 to 2006. This is an abnormally large concentration of FDI coming in from Europe when you consider there are 27 other states sharing the other 8.5 percent of FDI inflow. As discussed earlier, foreign direct investment has led to a lot more benefits to worker wages in manufacturing and higher skilled labor. All of these benefits have historically benefited men more than women. What the empirical data shows is for this short duration of time between 1999 to 2004 the Mexico-EU FTA increased men's wages more than women's on average. Due to the limitation of the data's 10 year time frame, the empirical evidence only suggests this major shift for solely this time period in Mexico.

This data's results are important for numerous reasons. The first is that when free trade deals in Latin America lead to incommensurate FDI that is highly concentrated in one area, men tend to benefit more from better wages within these areas than women. Latin Americas cultural expectation of women having to take care of household and family duties is one reason for this. This can force women to not put as much energy in their jobs as men who do not have these cultural expectations. This would also lead women to earn less high work skills over the years than men because they are busy taking care of their households. Secondly, men tend to get education in STEM fields more often than women in Mexico. These STEM skills translate well to jobs that demand more advanced skill sets in their workers.

Figure 2: Hourly Wage Gap: Treated and Control State Trends

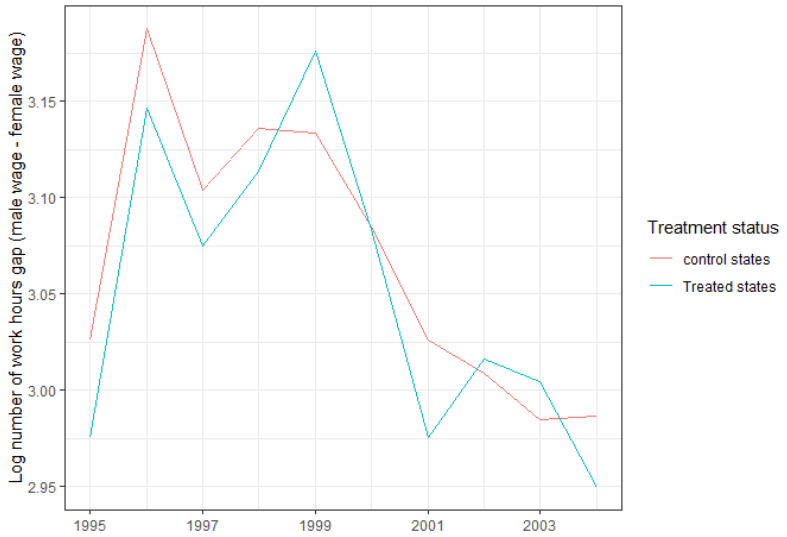


It naturally makes sense that the data would also suggest that men's hourly wages increased more than women's in this region. Higher hourly wages would lead to higher monthly earnings for men. However, while the data does not indicate this FTA impacted the difference between how much men versus women work in the treated states, it still tells us something worth noting. The cause for higher earnings among men in the sample is not because they worked more than women at an increased or decreased rate. The empirical analysis implies that despite the difference between how many weekly hours men and women worked went down for both the treated and control groups, the gap between how much income men versus women earn in the treated states still increased. Besides different career choices, these results could also come from biased preference of men in the workforce. Recruitment processes, academic background, training requirements, and social determinants often cause employers to avoid hiring women for management positions, which reduces their chances of enjoying higher wages.

While this analysis shows eye opening results, it still has many limiting factors. For one, the model would benefit from having more controls. The three controls I use in the model are qualitative, but adding more relevant right hand side variables would decrease coefficient bias. For example, the model does not take into consideration the population of each survey respondent's city. Difference in populated areas would also typically reflect regions with more economic opportunities. A person's location can have a major impact on what job opportunities are available for them.

A second hindrance of the data is it does not distinguish what type of jobs the surveyors work. The data from INEGI has this information available, this is something I need more time on to add to the empirical data's sample. Distinguishing among what industry sectors surveyors work in will provide more in-depth insight on wage discrepancies. For example, it could show whether the manufacturing, agricultural, and/or restaurant industry experienced wage increases after this FTA. Many economists have linked free trade to wage

Figure 3: Work Hour Gap: Treated and Control State Trends



increases specifically in the manufacturing sector. Seeing whether this data matches this insight would be useful for better understanding what is going on in the sample.

Another limitation of the empirical work is the measurement of the education control. It is a simple dummy variable that accounts for whether a person has a high school degree or more. The control does not distinguish between whether the surveyor went on to pursue college or not. This is an important factor to mention because a college education will play a big role in many people's ability to earn higher work skills that would lead to larger wages.

As I mentioned before, one of the biggest limitations to the empirical findings is the choice of treatment states. One can argue that a trade policy in Mexico will have some effect on every state in the country. In addition, foreign direct investment is not the only factor from freer trade that would impact Mexico's states. Freer trade policy can in theory do a plethora of things for an economy. In Mexico's case, the Mexico-EU FTA lead to a big trade deficit because Mexico ended up importing more goods than it exported to the EU. Freer trade can increase competition, create jobs, etc. While these are valid statements, this paper focuses specifically on how the Mexico-EU FTA disproportionately resulted in foreign direct investment inflow to 5 states. This high FDI concentration within these 5 states led to higher gender wage gaps of monthly earnings and hourly wages. The empirical work does have some limitation, which is why I discuss numerous robustness checks in the following section.

6 Robustness Checks

I took a few approaches to check the robustness of my results. For robustness checks I only evaluated changes that involved the gender pay gap of monthly earnings and hourly wages. My first robustness check was taking out each control variable one at a time for the regressions of columns 1 and 2 of Table 2. For both regressions, the coefficient value and statistical significance of EU remained very similar to the original results. Furthermore, EU's p-value remains close to 0 regardless of what control I omit from the analysis. This suggests the EU coefficient does not suffer from major omitted variable bias.

Another critical robustness check is to see how empirical results change when omitting outliers. Of the 91.5 percent of FDI inflows from Europe, 58.1 percent went to solely the Mexico City Federal District. Even when I only omit the Mexico City Federal District from the empirical data, the EU coefficient is statistically significant with a value of 0.02 and close to zero for monthly earnings and hourly wages, respectively. This shows that the results of the study are not influenced solely by one Mexican state.

One of the major concerns of the empirical analysis's merit is whether the right states are among the treated group. What if other states were treated instead? To test for this, I run a placebo test. To prevent my analysis from cherry picking states, I had RStudio randomly select other Mexican states other than the original treatments. The states in the placebo are Hidalgo, Quintana Roo, Michoacán, and Zacatecas. For this placebo, I run the regression from equation 1, but with these different treatment states. When using these states, the EU coefficent becomes statistically insignificant when the left hand variable is the gender gap of monthly earnings and hourly earnings. The results of the placebo are in Table 4. For column 1, the p-value of EU is more than 0.12. This suggests that for the new treated states, the Mexico-EU FTA did not impact the average difference of gender monthly income. For column 2, the p-value of EU is approximately 0.45. This also suggests that for the new treated states the FTA did not impact the average difference of hourly wage between genders. What is curious is that the EU's coefficient sign changes for both regressions. Perhaps the EU's coefficient is negative because men from these states moved to one of the original treated states because of better job opportunities.

These robustness checks help to alleviate concern about whether omitted variable bias is of major concern and whether the right states were chosen for treatment. Future robustness checks could assess how the empirical results change when you alter the shock period (another form of a placebo test). I should also omit the Mexico City Federal District from the regressions in Table 1 to see how that changes my results. This is because a large chunk of the FDI went to specifically this state.

Table 4: Placebo Test

	(1) Gender Gap	(2) Hourly Wage Gap
EU	-0.057	-0.027
	0.037	0.036
Age	-0.022^{***}	-0.015^{***}
	(.003)	(0.003)
Mar. Status	0.600^{***}	0.661^{***}
	(0.0.154)	(0.104)
Education	1.94^{***}	1.326^{***}
	(0.0.058)	(0.047)
Constant	1.528	0.181
	(1.463)	(0.550)
Year FE	Yes	Yes
Municipality FE	Yes	Yes
Observations	6,433	6,419
R^2	0.499	0.517

Note: This table shows the results for three difference-in-differences regressions. Each column displays the empirical results of equation 1. The only difference between the columns are their response variables. Column 1's dependent is the average gender pay gap for monthly earnings. Column 2's dependent is the average gender gap of hourly wages. All regressions have two-way fixed effects for years and municipalities. $*p < 0.05; **p < 0.01; ***p < 0.001$.

7 Discussion and Conclusion

There are a plethora of reasons why it is important to understand what causes increased gender wage inequality. More knowledge on why gender wage gaps increase can aid policy makers on how to reduce the issue. Women comprise of over half the world's total population. If there are ways to help them experience the same financial benefits men enjoy, then society can hopefully move in a direction where they can financially grow more. For women in financially poorer classes, personal increased income is linked with reduced domestic abuse from male partners. Furthermore, understanding how to make women better off can have numerous economic spill over effects that benefit their family and children. The major question society should be trying to answer is not whether comprehending gender wage inequality is important. Rather, we should be attempting to better understand what causes increased gender wage inequality and how to mitigate the issue.

The values and beliefs that families transmit from one generation to the next greatly impacts what educational choices students make. Latin America places a lot of importance on women taking up a strong bulk of household and family duties. For this reason, women often cannot commit to the labor market in the same way men do. This leads to smaller likelihoods of wage raises and promotions for women. Work discrimination can also harm a woman's ability to get higher paying positions if she lives in a society where many men prefer to hire other male employees.

A large set of literature also discusses how trade liberalization significantly benefits the manufacturing sector. Trade liberalization increases the demand for higher work skill. Men in Mexico have historically made educational choices that led to higher work skills. They have had this advantage in higher work skills on top of society expecting their wives to take up household responsibilities. Research has also linked freer trade policies to higher wages in the manufacturing sector. Therefore, freer trade leads to higher wages in a sectors that favors men because of the higher work skills it requires. The last portion of this paper's literature review then discusses how FDI inflows to the host country leads to wage increases in the host nations foreign manufacturing companies. Again, Mexican companies employ more men than women in this sector. Ease of FDI further eased access of multinational corporations to Mexico. This influenced Mexico's exports to increase. More FDI in Mexico has lead to growth-enhancing structural change in its foreign manufacturing sector and technology spill overs.

Policy makers intended for the Mexico-EU FTA to lead to more equal FDI spread among Mexico's states. This was because NAFTA had unequally benefited the Mexican state economies who border the United States as oppose to the nation's central and southern regions. The Mexico-EU FTA did not include a lot of necessary restrictions on many economic sectors in Mexico. As a result, FDI inflow went to Mexican states that already had good establishments conducive for effective production. This led 91.5 percent of FDI inflow from Europe to go to the five states of Mexico City Federal District, the state of Mexico, Nuevo León, Jalisco, and Puebla. These states are my 5 treatments in the empirical analysis. This is a heavily disproportionate amount of FDI benefits coming from the Mexico-EU FTA to these 5 states compared to Mexico's 27 other states. To test whether this phenomena lead to an increase in gender pay inequality in Mexico, I then ran

a difference-in-differences model with the Mexico-EU FTA as the exogenous shock over the period 1995 to 2004.

The empirical analysis of this study leads to many insights. First, the model suggests that the Mexico-EU FTA lead to a 10.5 percent increase in gender pay inequality of monthly income in the treated states. The empirical analysis further suggests that the FTA lead to an 11.2 percent increase in the gender pay gap of hourly wages. These results indicate that the policy increased men's average wages more than women's average wages. It is important to state that throughout this data's period, both the control group and the treatment group experience increases in gender pay inequality. This shows that there are other factors in the Mexican economy causing increased gender pay inequality. The goal of this paper is not discover all the causes for increased gender wage inequality, just a few. The Mexico-EU FTA lead the treated states to experience much higher inequality of average monthly earnings and hourly wage among men because of the higher concentration of FDI in these regions. Another important factor from the data is that the gap between how many weekly hours men work versus women decreased over the 10 year period. Despite convergence of the two genders working the same number of hours in Mexico, men still experienced higher monthly earnings and hourly wages after the shock. There is no statistical evidence from this sample supporting any notion that there were discrepancies in wages between men and women because men started working more hours. In short, the analysis finds that higher FDI concentration into the Mexican Federal District, the state of Mexico, Nuevo León, Jalisco, and Puebla lead these regions to experience higher gender pay inequality.

To account for the limitations of the analysis I run a common trends test and several robustness checks. The empirical data shows that both gaps on average monthly earnings and hourly wages between men and women passed the common trend test. When taking out any individual control, the results remain consistent. Furthermore, when treating different states, statistical significance for our coefficient of interest EU disappears.

The findings of this analysis provides insight that higher concentration of FDI inflow within these five Mexican states lead to higher gender wage inequality in this specific time period. Mexico has its own unique culture and complications with international trade. While the sample represents the economic activity of only one country, it can still be used as a lesson for other countries wishing to increase their international trading. This sample illustrates that trade regulations, or lack there of, can lead to unequal benefits across regions, industrial sectors, and gender wages.

8 Future Improvements

This is a working paper and there are a lot of things I want to add to this analysis. This first thing I intend to do in the future is evaluate separate trends between different economic sectors. It will be interesting to see how the gender wage gap changes among the agricultural and manufacturing sector of Mexico. In addition, I will evaluate trends between different educated groups. My ultimate goal is to include analysis for two other Latin American countries. With empirical work for two different countries, I will be able to compare how disproportionate FDI inflow impacts other nations. The literature review also needs a good revision that is condensed with more papers that better address my exact topic.

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