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Decomposing and Analyzing the Inverse Relationship between Wages and Educational Attainment by Gender in Mexico

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ABSTRACT

The wage gap between men and women has presented itself at the forefront of female discrimination. Educational attainment is a significant variable impacting one's wages. In developing countries, the lack of education for women is expected to result in lower female wages. However, Mexico presents itself as an interesting case as it presents no gap for educational attainment between men and women, yet it still experiences a growing gender wage gap. Given this, this thesis decomposes the gender wage gap by occupational segregation in order to estimate whether the wage gap is driven by individual worker differences (gender) or confounding sector factors (precarious working conditions.) This is achieved by running regression models that establish significant correlations between education and wages in Mexico. The Blinder Oaxaca Decomposition method is used to decompose the wage gap and estimate known and unknown differences.

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Chapter 1

Introduction

According to the Sustainable Development Goals set by the United Nations, one of the key goals is achieving gender equality (United Nations). A key aspect of gender equality is closing the gender gap between men and women. Historically, the wage gap between men and women has favored men, with full-time male employees making significantly more than women in the same occupation. The disparity between genders by health, education and access to opportunity is key in explaining the gender wage gap.

A key variable often used to explain the wage gap is access to educational opportunities. Education can be tied to wages through the metric of productivity. The higher an individual's education, the more productive they are in terms of time and output on the job. This high productivity can be correlated with higher income. However, discrimination by gender often restricts female access to education. The World Bank highlights the influence of gender bias, violence against women, poverty and child marriage as key factors that restrict women from achieving an education (World Bank, 2022.) These factors can be explored through the difference in female socialization, higher opportunity costs to educate women, and resource dilution.

Research has indicated that the low levels of female education may be rooted in the gendered socialization of girls at a young age. Post's research found that depending on their position in a

sibling relationship, girls are likely to drop out of school and engage in household work from a young age (Post, 2001). Additional research by Pinto and Ortiz also points to the traditional gendered division of work in family units, in that women are expected to take on household labor (Pinto & Ortiz, 2018). In Mexico, conservative social norms have intensified the impact of socialization, thus imploring women to focus on household responsibilities, as opposed to pursuing an education and career.

Additionally, some families may experience high opportunity costs of sending daughters to school. UNESCO proposes a variety of reasons to anticipate this opportunity cost. For instance, families may anticipate low returns to female human capital, given difficult and discriminatory labor laws in developing countries or may be reluctant in allowing daughters to travel long distances to pursue education or work (UNESCO, 2021.) Thus, investment in male education would increase and deepen the education gap.

The altruism hypothesis set forth by Parish and Willis is based on the assumption that parents care about the well-being of their children and work to maximize their welfare (Parish & Willis, 1993.) In doing so, parents may invest more in their sons, since they anticipate higher returns for the whole family, thus allowing them to transfer benefits to their "disadvantaged" children. Essentially, investing in male education is seen as an investment for the overall welfare of the family.

Education results in familial resource dilution due to the high financial investments that it demands. According to Parker and Pederzini, parents are thus likely to invest in children that they think will be in the condition to return resources (Parker & Pederzini, 2000.) Generally, sons are viewed as more capable to do so, a perception which is influenced by the overall social identity of genders in developing countries.

The aforementioned ideas highlight the reasoning behind the potential gap in educational attainment by gender. It is thus expected that a low educational gap would result in a low wage gap. However, results in Mexico deny is inconsistent with assumption. In Mexico, the educational gap is closing.

In developing countries, like Mexico, women in the past have lacked access to education in the capacity that men did not. Thus, a gap in educational attainment could be seen as a key contributor to the wage gap in Mexico. However, over the past few decades, Mexico has successfully experienced a closing in the education gap between men and women across all levels of education. This indicates external factors impacting the wage gap. Orraca found that between 2000-2010, the hourly wage earnings between men and women increased (Orraca, 2017.)

However, another finding by Orraca et al. highlighted how the gender wage gap varies by occupation. While women teachers make approximately 90% of male teachers, female industrial workers make only 66% of male workers. In addition, wage differences are even more pronounced when education is controlled for, with female technicians making 97% of the males,

and industrial workers making only 68.4% (Orraca et al., 2016.) This highlights the need to look at factors outside of education as an indicator of wage differences. More specifically, the sectoral and occupational differences by gender may provide an explanation for the gender wage gap.

Thus, by controlling for the level of education and the reduction in the educational attainment gap, this research will attempt to establish a correlation between occupational segregation and the gender wage gap in Mexico. While a correlation may already exist, it is necessary to explore the significance of this correlation. This will be done by using the Blinder Oaxaca Decomposition method from the individual level in Mexico.

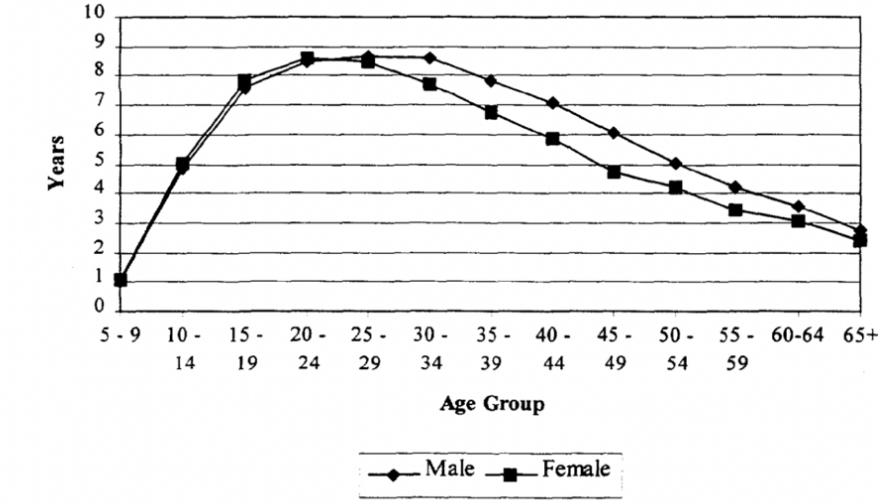
Chapter 2

Literature Review

This thesis is rooted in presenting Mexico as a challenge to the basic relationship between education and income. According to Gregorio and Lee, as educational attainment becomes more equal in distribution, income distribution also becomes equal (Gregorio & Lee, 2002.) Their research, however, highlights how the cross-country variation in income inequality continues to remain unexplained. Thus, this paper attempts to analyze the significance of educational attainment and occupation choice as factors impacting the gender wage gap and explore potential variables that explain this gap.

Analyzing the education gap in Mexico

Over the past few decades, Mexico has successfully experienced a closing in the education gap across all levels of education. The following figure, published by Parker and Pederzini graphs data from 1995 for the average years of completed schooling in Mexico (Parker & Pederzini, 2000.) As seen, historically the gap set in for individuals aged 20 to 24 and was more prevalent thereon after. In higher education, men dominated women in terms of enrollment and education attainment.



Source: Authors' calculations from Encuesta del Conteo 1995.

Figure 1: Educational Attainment Gap in Mexico

However, what's interesting is that this small gap has continued to reduce in Mexico. As seen, the following figure from the World Bank's Mexico Gender Assessment sheds light on the educational attainment by gender in Mexico in 2016 (World Bank, 2016.)

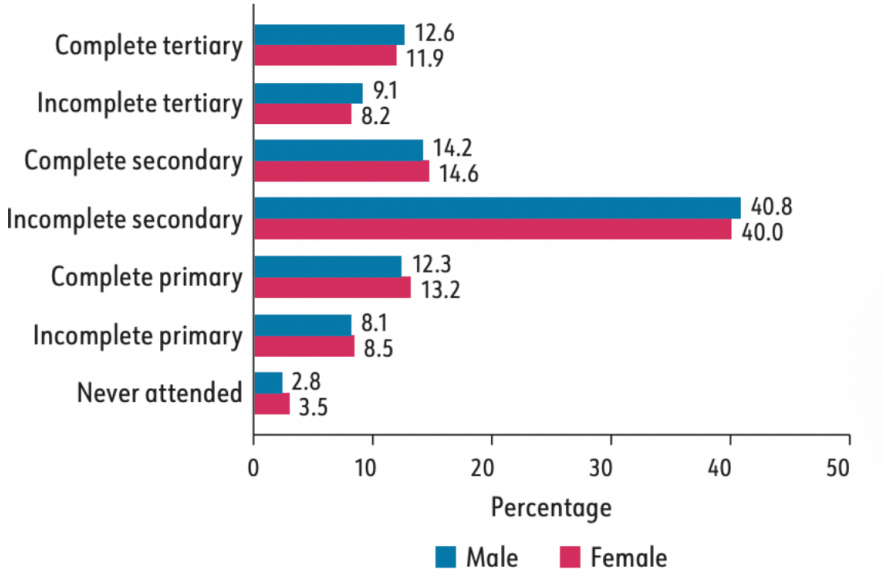


Figure 2: Gender Employment by Sector

At each level of education attainment, men and women present a low gap. In fact, in primary education and complete secondary education, women dominate educational attainment. The lack

of a significant difference points to the closed educational gap in Mexico. According to the World Bank, women in Mexico dominate the university population and other institutions of higher education (World Bank, 2016). Altogether, this implies that the distribution of education across genders is more equal than not.

In understanding the high presence of Mexican women in tertiary education, it is important to understand the significance of technical school in Mexico. Technical schooling is a level of educational attainment that can be achieved after primary, secondary or high school. It places an emphasis on specializing and training in a specific skill set. Many women in Mexico go to technical school to pursue fields like teaching or nursing. In addition, research by Levinson et al. has shown that when given educational opportunities, girls are likely to specialize faster and more frequently than boys their age (Levinson et al., 2000). This idea informs us of not just the equitable distribution of education, but also the access of women to high quality education in Mexico.

Analyzing the wage gap in Mexico

The increased specialization of women in education and the data above supports the idea that the educational gap in Mexico has closed over the decades. Given the high returns on education, educational attainment is usually linked with higher average lifetime earnings. Research by Miki and Yuval concludes that women who attain a higher level of education are successful in reducing the wage gap between them and their male counterparts (Miki and Yuval, 2011.) However, despite this theoretical assumption, the case of Mexico stands anomalously, in that, the gender wage gap in Mexico is still prevalent.

World Bank data corroborates this finding, as even after controlling for the same level of education, men earn 9.6% more than women on average. In addition to this, female-dominated jobs also earned 2.1% less than jobs in male-dominated fields. This difference is not only prevalent in the private, but also public sector where female workers on average earn 91 cents for every peso a man earns but experience a 30% wage gap in some departments (World Bank, 2016).

The pay gap becomes more stark, especially given the number of women receiving degrees in tertiary education. In 2019, women earned 18.8% less than men, and women in leadership positions earned 22% less than their counterparts (Catalyst, 2020.) This controls for women who not only work full time, but also have tertiary degrees. Such statistics makes Mexico the 66th highest pay gap by gender country in the world.

Given the generally positive relationship between educational attainment and wages, the data Mexico presents is interesting. It deviates from the assumption that a higher level of education will ensure higher wages, and thus reduce the wage gap.

Analyzing sectoral differences as a contributor to the wage gap

Within the industrial and occupational sectors in Mexico, there is a gender gap in the field of specialization and also in the wages received. The overall participation of women in the labor force has increased with time. However, only four in ten women are employed and participate in

the labor market. Despite making up 46% of university graduating classes, they only obtain 37% of the entry-level positions out of college, and only make 10% of executive-level positions (Catalyst, 2020.)

The World Bank document highlights the difference in sector wise employment of men and women. As seen in the graph below, women make up the majority of the tertiary sector, while men dominate the agricultural and manufacturing sectors.

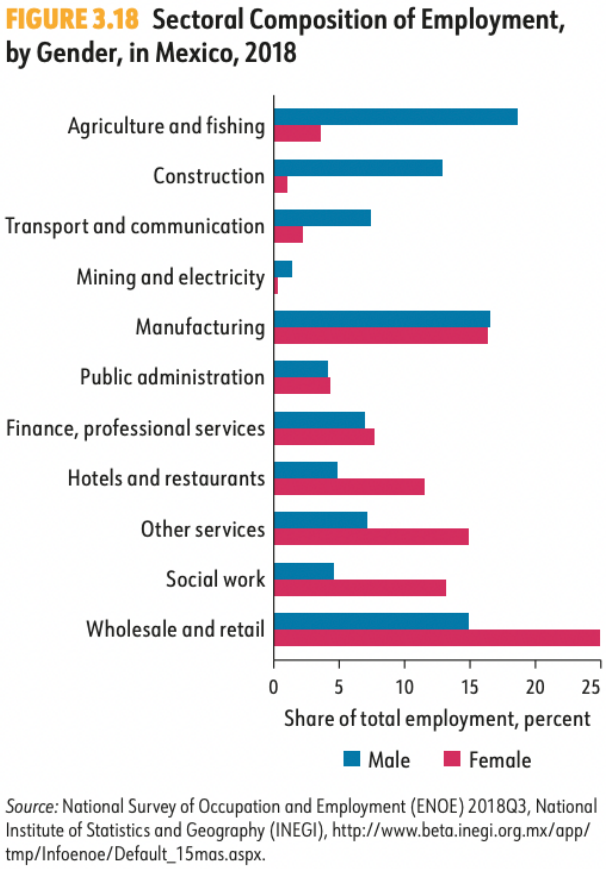


Figure 3: Occupational Segregation by Gender

The results highlight the significant participation of women in the service industry. 79.3% of female employment is concentrated in the service industry, compared to only 51.5% of male employment. Only 3.6% of women participate in the agricultural sector compared to 17.9% of

men. Lastly, female participation in the manufacturing sector is 17.1% while male employment is approximately 30% (World Bank, 2016.)

ILO data further highlights the gender wise composition of these occupations. This data highlights the vast gap between specific occupations in certain sectors in Mexico. For instance, in 2020, the educational occupations (tertiary sector) employed around 1579 females, compared to only 938 males (ILOSTAT.) The conclusion of this data is that women are more predominant in the tertiary sector and in service providing occupations like tourism.

The conclusion of aforementioned research is that even when occupations and sectoral differences are controlled for, men still make more wages on average than women. Regardless of having more jobs in the tertiary sector, and even being more educated, women continue to make less than men. This draws attention to precarious working conditions for women and discrimination that requires analyses.

Precarious working conditions for women and quantifying discrimination

Having established the uncorrelated relationship between education and income in Mexico, and the lack of wage payoffs for women even in women-centric fields, it is important to understand possible causes of this discrimination. It is possible that the high wage gap, despite educational attainment, dissuades women from working even more. When considering working women, it is important to consider the precariousness of sectors in which women work, in order to determine the scope for their success and growth. Research by Rosales et al., highlights how discrimination

and considerations of fragility and sensitivity (on behalf of women) partially explain the wage gap between men and women (Rosales et al., 2019.)

In Mexico, around 60% of women engage in informal sector employment. Informal sector jobs are associated with low pay, low social protection and high job insecurity, making it harder for women to make wages comparable to their male counterparts. They also perform 75% of household duties, giving them less time to engage in formal sector jobs (International Labor Organization, 2014.)

Female agricultural workers, for instance, face extreme levels of labor precariousness, which gives rise to lack of guaranteed rights, maternal health, and education. In addition to this, the ILO highlights how working conditions in Mexico exploit domestic workers (especially women) due to unprotected work and labor rights. This makes women more vulnerable to unfair wages, especially if they have no access to union rights or education.

Impacts of the pay gap

Identifying and quantifying the wage gap in Mexico is of significance, in order to not only improve working conditions for women but also to identify the impact of this wage gap on local communities in Mexico. The economic impact of this persistent gender inequality results in a low-income level for women and lesser family income, thereby perpetuating poverty. In specific, low-income levels means that women may not be able to fund a comfortable standard of living, or support children in the future. This perpetuates an unhealthy cycle of poverty and inequality.

Promoting an equal pay gap would not only improve standard of living for individual households but also boost the economy. As women earn more, it would increase spending and investments, thereby boosting the economy.

Socially, if women do not receive equal wages, a viable assumption to make is sthat those mothers will be less inclined to send their daughters to school in the future. As a result, women remain socially deprived and continue being marginalized in communities. With the persistent pay gap, women may not see high returns to investment for education, which they may have associated with a higher income inflow. Thus, families may be dissuaded from not only sending girls to school, but also ask them to focus on household work rather than investing in their productivity. This perpetuates a cycle of inequality and discrimination.

Chapter 3

Methodology

The unexplained differences causing the wage gap in Mexico are imperative to explore. The relationship between educational attainment and wage differences don't explain the gender gap in earnings as a product of educational differences. The main data in this thesis is derived from IPUMS. This section highlights the differences in wages across specific controls, thereby establishing the need for further exploration. It then explores the Blinder-Oaxaca Decomposition Method as an appropriate method of regression for the collected data.

Having established this, this thesis looks into sectoral differences by gender to explore the wage gap. This is unpacked by first exploring the differences in gendered employment across the tertiary, manufacturing and agricultural sector. The second leg of data collection highlights the differences in employment between the informal and formal sector. Data collected not only highlights employment differences but also wage differences across sectors.

Data Collection

In order to analyze the gender wage gap, this thesis made use of data from the Integrated Public Use Microdata Series (IPUMS). IPUMS is the world's largest individual-level database, and gives access to individual variable characteristics. It provides census and survey data across 103 countries, including individual level data in Mexico. This dataset in specific focuses on data at the individual level in Mexico between 1960-2015.

For each of the following variables, data is available for the years 1960, 1970, 1995 and 2015. Each year has approximately 50,000 observations. While having data for four years makes it difficult to establish an in-depth relationship, it still provides the opportunity to explore any changes in the variables over more than 50 years.

Given the aim of this thesis, the data is extracted to focus on INCEARN, YRSCHOOL, and SEX. The INCEARN variable reports an individual's total income, inclusive of wages earned through business or on a farm and is thus, the dependent variable of all conducted regressions. Yrschool highlights the years of educational attainment, both recorded by gender. For the purpose of this thesis, the top 0.5% of the population was excluded, to reduce the impact of outliers on model regressions.

The *yrschool* variable was preferred to the *edattain* variable that presented which level of education individuals achieved. *Yrschool* was easier to quantify, unlike *eduattain* where there was a lot of ambiguity with terms like "partial primary education" or "general education track." This makes it difficult to estimate exact educational attainment. Within the *yrschool* variable, all "none" codes were converted to 0 and any ambiguous years of schooling like "some primary schooling" were excluded from the dataset.

In addition to these variables, the other variable of interest is OCCISCO. This variable highlights occupation choices and divisions in Mexican individuals. Running regressions on this variables gives the opportunity to study occupational segregation by gender. Since educational attainment

between men and women is low, but the wage gap still persists, differences in occupation may be a strong indicator of wage differentials in the Mexican population.

Given these factors, the following graphs establish a relationship between income earned by genders. Figure 4 highlights the continued wage gap between men and women, from 1960-2015. The wage gap has consistently persisted between 1960 and 2015. While the gap has significantly reduced, men in 2015 made approximately $500 more. It is important to note that the graph reflects nominal wage values, however, still highlights a significant relationship between income earned and education.

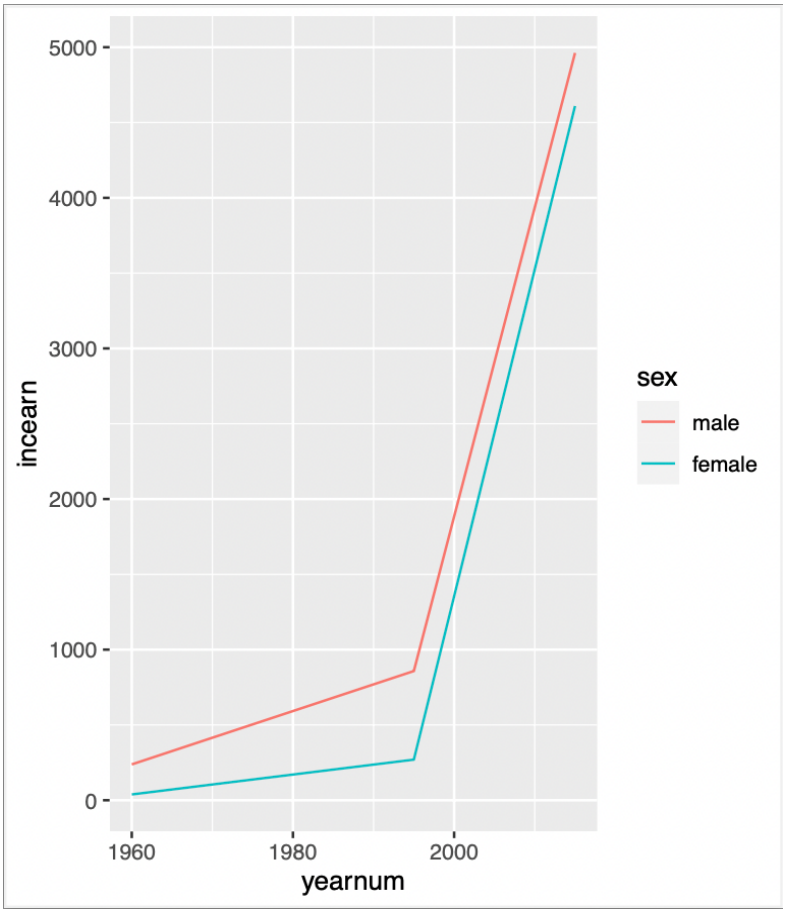


Figure 4: Income earned since 1960 in Mexico

However, noticing the decreasing wage gap isn't enough. The data isn't valuable alone, as it doesn't explain the wage gap itself. By controlling for the number of years of education, figure 5 shows the wage gap that exists regardless of women being educated, for data across the time series. As seen, despite the same years of schooling, men on average still earn more than women. The gap is the largest for 15 years of schooling or more, which indicates that the more individuals get educated, the more the wage gap between men and women increase.

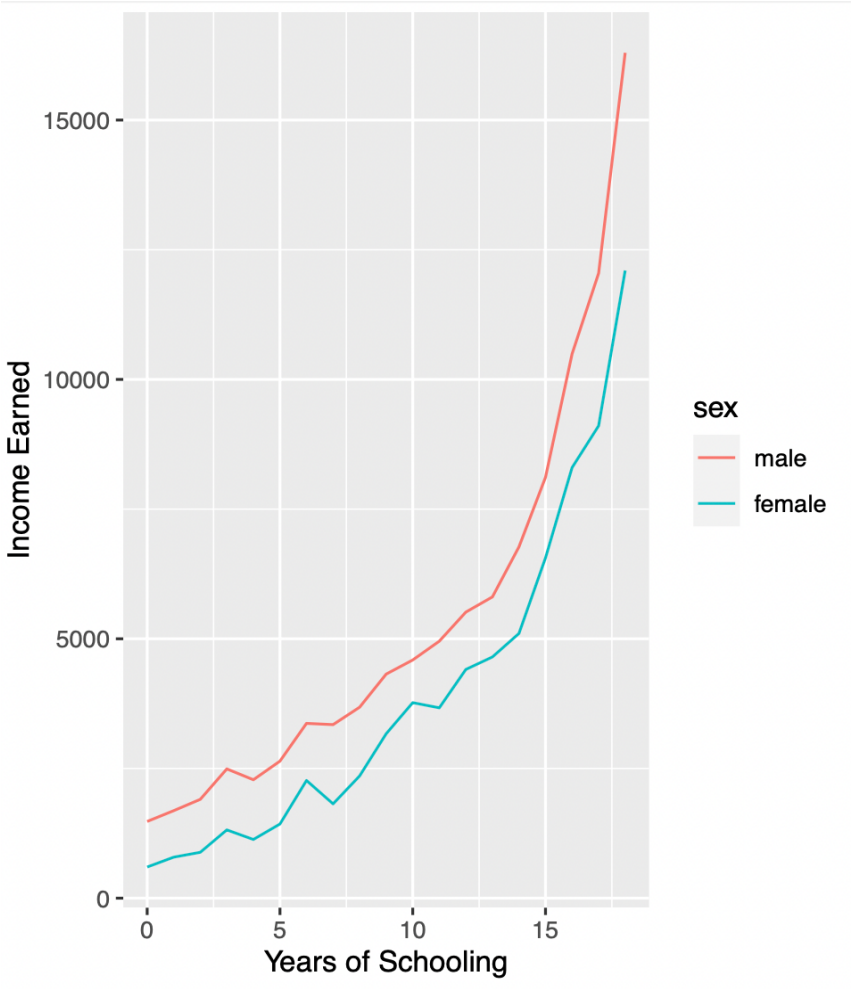


Figure 5: Relationship between years of schooling and income earned

Regression Models

The first step was to get a simple estimate for wages by running a regression. Income earned was the independent variable, impacted by years of school, days worked and sex. This was calculated based on the following linear regression:

$$Y = \beta_0 + \beta_1 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \ldots$$

In the aforementioned equation, Y is the average income earned by an individual. X1 reflects years of schooling, X2 reflects days worked and X3 reflects sex. For X3, the variable was coded to be 1 if an individual was a male and 0 if they were female.

Having established a multiple regression, the model then accounted for occupation differences, to study the impact of occupational segregation on income by sexes. By running two separate regressions, one which included occupational segregation and one that did not, helped achieve two goals. First, it helped establish the significant relationship (or lack thereof) between education attained and income earned as confirmed by previous literature, while also accounting for which occupation reflects the highest wage gap.

Blinder-Oaxaca Decomposition Method

As recorded by Rahimi & Nazari, the Blinder Oaxaca decomposition method is helpful in exploring inequalities across two groups, like gender (Rahimi & Nazari, 2021.) Through this model, a multiple regression can be decomposed to attribute inequality to certain factors. In this

case, the decomposition can be used to build on the understanding of why the wage gap exists in Mexico and which variables are most significant in explaining the distance.

The Blinder-Oaxaca Decomposition method is helpful in establishing the extent to which differences between groups stem from differences in level of observable characteristics. Given that this thesis explores multiple variables, the model is fit to run a multivariate regression. To decompose this, it is necessary to have multiple variables at the individual level, which in this case are *sex, yrschool, occisco* and *incearn.*

In statistical terms, this method is a combination of a multiple regression model and a t-test, thus adding to its overall validity. The model itself functions on the basis of holding certain constant individual differences across the board. An outcome variable (average wage) can be explained based on x variables. Let's assume a sample of *j* individuals, indexed by their gender g(m = males; f = females) and certain earnings determinants X_j^g. These earnings determinants can be individual differences like education attainment, years of schooling, age etc. The consequential average wage calculated is W_j^g the following regression model.

$$W_j^g = \beta_0^g + \beta_1^g X_j^g + \epsilon_j^g$$

With these variables, two regression models can be calculated, once with g=m and once with g=f. The result of this would be a regression coefficient for both male and female:

$$(1)\ \widehat{W}_j^m = \widehat{\beta}_0^m + \widehat{\beta}_1^m X_j^m$$

$$(2)\ \widehat{W}_j^f = \widehat{\beta}_0^f + \widehat{\beta}_1^f X_j^f$$

Thus, the mean difference in outcome is the following:

$$\widehat{W}_j^m - \widehat{W}_j^f = (\hat{\beta}_0^m - \hat{\beta}_0^f) + \hat{\beta}_{1t}^m(X_j^m - X_j^f) + X_j^f(\hat{\beta}_1^m - \hat{\beta}_1^f)$$

$\widehat{\beta_{1t}^m}(X_j^m - X_j^f)$highlights differences in wages due to certain worker characteristics. On the other hand, ($\widehat{\beta_0^m}$-$\widehat{\beta_0^f}$) and X_j^f ($\widehat{\beta_0^m}$-$\widehat{\beta_0^f}$) are informative of wage differences due to differences in the market treatment of men and women. Thus, this method looks at not only differences in individual opportunity but also market discrimination that may impact wage differences between men and women in Mexico.

While this model is useful and builds on existing simple regression models, the model is also subject to criticism. For instance, it is difficult to accurately pinpoint individual outcome distributions, as the model only provides the difference in mean predicted wages. As a result, while unexplained variables can be attributed to discrimination, it is difficult to accurately estimate the root of said discrimination or which part of the model is reflecting discrimination. Thus, discrimination as a determinant of the wage gap could be an over or under estimated in the case of this model.

Chapter 4

Results

The basic regression below calculated income earned as a function of number of years schooled, sex and the interaction between sex and year. The interaction term indicates the trend of income between men and women across the years. On average, women earned $632.07 less than men. The significant results in 2015 highlight a $422 wage gap between men and women.

Table 1: Regression Model 1

	Model 1
(Intercept)	-819.19 ***
	(25.72)
numyrschool	488.73 ***
	(1.05)
sexfemale	-632.07 ***
	(66.92)
year1995	-1288.29 ***
	(40.68)
year2015	1691.24 ***
	(26.89)
sexfemale:year1995	42.02
	(86.62)
sexfemale:year2015	-422.31 ***
	(67.73)
R^2	0.07
Adj. R^2	0.07
Num. obs.	3557430

*** p < 0.001; ** p < 0.01; * p < 0.05

Looking at the aforementioned model in isolation, however, lacks validity since it does not isolate the effect of the number of years schooled. Men and women, on average, are educated the same (around 8 years). The following box plot reflects the number of years of schooling for men

and women. However, more women than men pursue a higher education and study for longer. This can be seen from the fact that the 75th percentile for women is around 12.5 years of education, compared to 11 years for men.

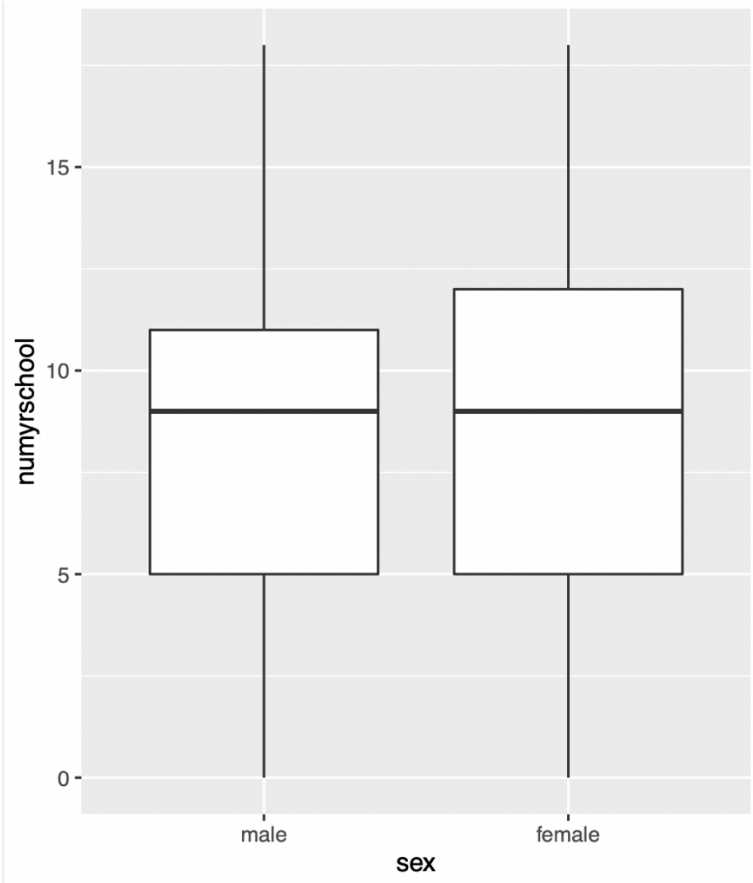


Figure 6: Educational attainment by Gender

The following regression model calculated income earned as a result of numbers of years of schooling and sex. Women on average make $461.75 less than what men make for the average years of schooling. Additionally, an individual makes $113.06 more for every additional year that they gain an education. However, the interaction term between number of years schooled and sex indicates that women make $63.52 less for than a man for every year that they are educated. Essentially, while individuals on average earn more through education, income doesn't

increase at the same rate for women. The close to 0 p-value for these results point to their significance.

Table 2: Regression Model 2

	Model 2
(Intercept)	252.75 ***
	(31.76)
numyrschool	113.09 ***
	(7.46)
sexfemale	-461.75 ***
	(22.37)
year1995	-137.30 *
	(56.94)
year2015	275.79 ***
	(33.53)
numyrschool:sexfemale	-63.52 ***
	(2.19)
numyrschool:year1995	69.20 ***
	(9.41)
numyrschool:year2015	415.76 ***
	(7.55)
R^2	0.07
Adj. R^2	0.07
Num. obs.	3557430

*** p < 0.001; ** p < 0.01; * p < 0.05

Differences in income due to occupation segregation

Having established the significance of years of schooling and year on wages by gender, the next regression included the variable occisco. Occisco is the occupation of individuals for each year. Occupations include, but are not limited to, agricultural workers, clerks, legislators, professionals etc. Within the dataset, the occupation for legislators is established as an automatic baseline. Having established this, the regression below reiterates the finding that women on average earn

less than men. The model below first establishes earnings compared to the base earnings of Legislators, and the interaction term between sex and occisco establishes how much women make in the same occupation.

As seen below, on average clerks, for instance, make $7458.07 less than Legislators on average. Women make $2913.31 less than men. Thus, the positive interaction value that indicates the wages for a female clerk is -2913.31+2112.06 = -801.25. Thus, female clerks make $801 less than male clerks. This trend is seen throughout the regression model, implying that for any profession, women on average make less than men.

However, the results to consider are those for professionals and agricultural and fishery workers. Agricultural and fishery workers are based in the primary sector of the economy and require the least level of skill in terms of being formally educated. Female agricultural and fishery workers make $156.06 less than male counterparts (-2913.31-2757.25.) On the other hand, female professionals that possess high level of skill and a high education level, make approximately $2331 less than their male counterparts (-2913.31+601.96.)

These results imply that in high skilled jobs, the wage gap between men and women is greater than in low skilled jobs. The wage gap between men and women increases as the skill level increases.

Table 3: Regression Model 3

```
Call:
lm(formula = incearn ~ sex + occisco + (sex * occisco), data = mydata3)

Residuals:
   Min     1Q Median     3Q    Max
-13660  -1976   -720    941 998180

Coefficients:
                                                    Estimate Std. Error  t value Pr(>|t|)
(Intercept)                                         13659.81      43.50  314.016  < 2e-16 ***
sexfemale                                           -2913.31      72.91  -39.955  < 2e-16 ***
occiscoprofessionals                                -1518.22      51.37  -29.555  < 2e-16 ***
occiscotechnicians and associate professionals      -5707.50      53.31 -107.062  < 2e-16 ***
occiscoclerks                                       -7458.07      55.50 -134.384  < 2e-16 ***
occiscoservice workers and shop and market sales    -8318.14      46.08 -180.510  < 2e-16 ***
occiscoskilled agricultural and fishery workers    -11684.06      44.72 -261.295  < 2e-16 ***
occiscocrafts and related trades workers            -8508.43      45.25 -188.014  < 2e-16 ***
occiscoplant and machine operators and assemblers   -8171.33      46.59 -175.383  < 2e-16 ***
occiscoelementary occupations                      -10123.71      45.82 -220.923  < 2e-16 ***
occiscoarmed forces                                 -4865.36     117.33  -41.467  < 2e-16 ***
occiscoother occupations, unspecified or n.e.c     -12334.23     737.57  -16.723  < 2e-16 ***
sexfemale:occiscoprofessionals                        601.96      84.25    7.145 9.03e-13 ***
sexfemale:occiscotechnicians and associate professionals  2112.06  83.62   25.259  < 2e-16 ***
sexfemale:occiscoclerks                               2238.87      85.52   26.178  < 2e-16 ***
sexfemale:occiscoservice workers and shop and market sales  1119.22  76.07  14.713  < 2e-16 ***
sexfemale:occiscoskilled agricultural and fishery workers  2757.25  83.25  33.121  < 2e-16 ***
sexfemale:occiscocrafts and related trades workers     421.47      79.27    5.317 1.05e-07 ***
sexfemale:occiscoplant and machine operators and assemblers  1488.63  83.37  17.856  < 2e-16 ***
sexfemale:occiscoelementary occupations               2240.31      76.41   29.321  < 2e-16 ***
sexfemale:occiscoarmed forces                         3449.13     659.98    5.226 1.73e-07 ***
sexfemale:occiscoother occupations, unspecified or n.e.c  2223.26  1260.05  1.764   0.0777 .
```

Blinder Oaxaca Results

Having obtained simple regression results from the model above, the Blinder Oaxaca Decomposition can help focus on the wage gap between male and female professionals, in specific, to estimate unexplained and explained differences. In order to run the decomposition, the data was first isolated by income earned by professionals of a specific sex. This was done by creating two separate data sets for men and women, the results of which are shown below.

As a result, the average income of men can be estimated by the following equation:

$$\widehat{W}_j^m = \hat{\beta}_0^m + \hat{\beta}_1^m X_j^m = 4288.93 + 7852.657 X_j^m$$

```
Call:
lm(formula = incearn ~ professional, data = mydata3men)

Residuals:
   Min     1Q Median     3Q    Max
-12142  -2789   -860    854 995711

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept)  4288.929      6.057   708.1   <2e-16 ***
professional 7852.657     29.755   263.9   <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 9355 on 2488800 degrees of freedom
Multiple R-squared:  0.02722,   Adjusted R-squared:  0.02722
F-statistic: 6.965e+04 on 1 and 2488800 DF,  p-value: < 2.2e-16
```

Figure 7: Estimating Male Professional Earnings

The average income of women can be estimated by the following equation:

$$\widehat{W}_j^f = \widehat{\beta}_0^f + \widehat{\beta}_1^f X_j^f = 3971.91 + 5858.39 X_j^f$$

```
Call:
lm(formula = incearn ~ professional, data = mydata3women)

Residuals:
   Min     1Q Median     3Q    Max
 -9830  -2272   -972   1028 996028

Coefficients:
             Estimate Std. Error t value Pr(>|t|)
(Intercept)  3971.906      8.079   491.6   <2e-16 ***
professional 5858.328     30.635   191.2   <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

Residual standard error: 8056 on 1068626 degrees of freedom
Multiple R-squared:  0.03309,   Adjusted R-squared:  0.03309
F-statistic: 3.657e+04 on 1 and 1068626 DF,  p-value: < 2.2e-16
```

Figure 8: Estimating Female Professional Earnings

The decomposition method allows us to decompose the income earned variable as a result of two comparison groups, which in this case are professional men and women being compared. Any observed difference will be a product of explainable and unexplained differences. The result is

the following equation, which stems from subtracting $\widehat{W_j^f}$ from W_j^m and resulting in the following equation:

$$\widehat{W}_j^f - \widehat{W}_j^m = 317.02 + 7852.657(X_j^m - X_j^f) + 1994.27X_j^f$$

In the regression above, $7852.657(X_j^m - X_j^f) = \widehat{\beta_{1t}^m}(X_j^m - X_j^f)$ and accounts for differences due to worker characteristics. This means that approximately a $7800 difference in wages can be explained due to professionals either being men or women. On the other hand, $317.02 = (\widehat{\beta_0^m} - \widehat{\beta_0^f})$ and $1994.27X_j^f = X_j^f(\widehat{\beta_1^m} - \widehat{\beta_1^f})$ account for unexplained differences. As seen by the different components in the equation, the higher weight for differences due to gender imply that gender itself is a driving force behind discrimination, and not external qualifications.

Chapter 5

Discussion

The regressions run first establish the idea that despite similarities in educational attainment, men and women earn different wages and there is a high wage gap that exists. However, based on this, it is difficult to say exactly why the wage gap is in play. Assuming the significant role of occupational segregation, the regressions that accounted for occupation differences highlighted that the largest wage gap exists for women that are more skilled and more educated. Even after this result however, it is not sufficient to conclude that gender itself is the reason for this gap. Thus, the Blinder Oaxaca Decomposition method was applied to understand wage differences between men and women who are professionals. The conclusion of this regression was that most of this gap can be accounted for by the individual gender differences.

The regression coefficients for men and women also imply that not only do male professionals have higher starting salaries, but that they earn more than women for every additional year they stay in the workforce. This also holds if the data was looked at for years of schooling. Even then, despite years of schooling being equal, men's earnings increase at a higher rate than women. The implication of this data is that the more women are educated, the less they earn as working conditions become more precarious and discrimination in the workplace prevails.

The primary take away from the results is that the wage gap between men and women stems mainly from the discrimination faced by women in the labor force. Having established close to equal levels of educational attainment, women cannot be excluded based on skill, since they have the same level of skill as their male counterparts. Furthermore, the more women are educated,

the more discrimination they face, which can be estimated by the Blinder Oaxaca decomposition and also from the graph below.

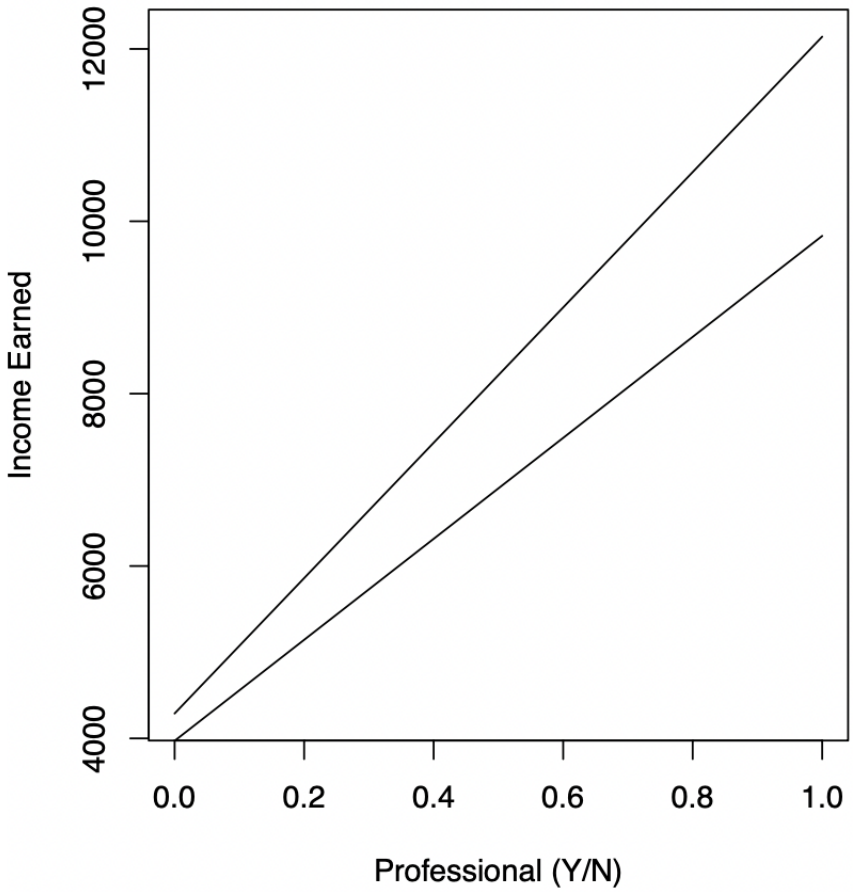


Figure 9: Blinder Oaxaca Decomposition Model

In this graph, a larger part of the wage gap is explained due to individual differences by sex itself. The rest of the factors remain unexplained. These results confirm the existing hypothesis that the wage gap is a product of discrimination, rather than an individual's skill level.

Methodology Limitations

While the data found produced significant results and was helpful in decomposing the wage gap, the presented methodology presents several limitations. The first limitation is that the data did not control for socio-economic status or family status of individuals in the study. The study only accounted for women who worked to earn their wages. This excludes women from high socio-economic statuses that may be running family or independent businesses as a stream of income.

In addition, the method didn't account for an individual's family status. A woman's marriage status or the number of children she has would be useful in establishing whether any gaps exist in the wages required by women versus how much they get. In addition to this, current earnings may reflect female wages adjusted for their family structure i.e., women getting paid more solely because they have large families.

Another limitation was that data available only focused on 1960, 1970, 1995 and 2015. The lack of data for more years does not allow for a continuous series. This could also result in regressions that overestimate the real nature of the wage gap. While the basic correlation may remind valid, the extent to which gender impacts wages (through the Blinder Oaxaca Decomposition) may vary.

Lastly, while the results achieved from the regression model 1 and 2 were significant, the model would be easier to interpret if the variables were measured in logs instead of the absolute levels. This would reduce heteroskedasticity and allow for the coefficients to reflect elasticities.

Suggested Policy Implications

The insight that occupational segregation does not cause as much of the wage gap as gender does, is insightful in setting policies. It implies that policies that merely increase female labor force participation are not sufficient. Today, Mexico stands to be one of the top three countries with the highest gender wage gap, but current policies have not been effective in encouraging female participation in the workforce. For instance, while Mexico started paternity leaves, the paternity leaves were only 5 days, and were very poor in their pay. This dissuaded men from taking paternity leaves that could equally benefit women in the workforce (OECD, 2017.)

The benefits of having more women in the workforce is monumental. Through the inclusion of a more female-centered workforce, Mexican companies can add a 55% greater profit margin and improve the GDP by 70% (McKinsey&Company, 2018.) Given the lack of current policy and the high payoffs of establishing gender equality in pay, more efforts need to be made to reduce female worker precariousness across industries.

The CLIMB (Commitment, Leadership Development, Infrastructure, Metrics and KPIs, Behaviors and Mindsets) model, introduced by McKinsey & Company highlights ways in which the gender wage gap can be mitigated in Mexico, and provides insight on what policies can be implemented (McKinsey&Company, 2018.). The policies suggested in this paper are in line with this model and attempt to mirror consistent efforts on a local and national level.

Commitment

According to McKinsey & Co., companies that have more female executives add a 28% higher economic value and have a higher level of productivity (McKinsey&Company, 2018.) By closing the gender gap, paying women more and promoting them to higher levels within an organization, companies can improve their performance. However, structural barriers make it difficult for women to excel in the workplace. A lack of maternity leaves, in specific, contribute greatly to barriers that women face when it comes to promotion cycles. In addition to this, women also receive less feedback and less training than their male counterparts. This makes for inequality of outcome and opportunity for women, thus making it difficult for them to improve their incomes earned.

As a result, a policy to commit to bringing equality to fruition would be to mandate paid maternity leaves on a government level, and also pushing for paid paternity leaves. This allows both men and women to split household and workforce responsibility. This model has proven to be effective in Lithuania and Hungary and present an effective model to follow. In addition to this, on a company level, it is necessary to have strong corporate policy that accounts for monthly feedback reports for each employee regardless of gender. In addition to this, it would also be helpful to have career mapping opportunities for women, so that they have the opportunity to recognize areas of growth in their career and make the associated monetary gains.

Leadership development

In line with the structural inefficiencies in place, it is also necessary to invest in training female employees in order to progress within companies. Through sponsorship, training modules and

women's network, policies can encourage not just more female workers, but more female executives. The high level of discrimination is easier to tackle if Mexico not only receives international support but also is pressured to improve its working conditions for women. For instance, the Partners of the Americas program recently received $10 million to improve working conditions in Mexico. Given this, Mexico faces more pressure to adhere to the working standards and gender equity goals set by the US-Mexico-Canada agreement, and thereby raise wages and equity. Working with the international community will provide a strong foothold for Mexican women to be promoted to leadership positions and fight for wages.

Infrastructure

Building programs and structures that promote inclusivity and flexibility are key to creating environments that help women thrive. Given the family-centric culture in Mexico, it is necessary that companies implement elements of the culture in the system, to reduce any systemic segregation and discrimination of women. Company policies should implement back to work programs and extended leave policies for women on maternity leave, thus making it easier for them to transition back to the workplace.

In addition to this, with the current system, employers decide salaries based on previous salaries rather than skill. Doing this perpetuates existing unequal pay levels, especially when highly qualified women come in on lower salaries than men. Salaries and sign on bonuses should thus be based on level of education and skill, which is likelier to ensure more equal pay, especially due to the very low educational attainment gap between genders.

Metrics and KPIs

By focusing on building transparency and making key performance indicators available to employees, female workers will have the opportunity to not only improve existing performance but also improve communication with high level executives, and gain business insight. Doing this is helpful in building employee relationships and female productivity on the job. In order to better transparency, wage differences rooted in discrimination are imperative to explore. By establishing stronger checking systems at local levels to monitor company audits, the state can monitor whether wages paid to women are aligned with their audited productivity. While this solution depends on the accuracy of reporting the correct productivity per worker, it may still prove effective in making sure that companies are compensating female workers ethically.

Behaviors and Mindsets

In general, establishing inclusive attitudes in workplaces in order to cater to female experiences is important to recognize and dissolve the wage gap. In specific, this can be done by implementing policies aimed at diversity recruitment and inclusive workplace mentality. A huge part of the gap stems from a nascent understanding in employees of female representation. Only 41% of women and 25% of men believe that women are underrepresented (McKinsey&Company, 2018.) Targeted policies should thus aim at improving diversity within company employees, and root such policies in also uplifting women to attain leadership positions.

Aiming at diversity recruiting in specific, can be helpful in tackling this dimension of the CLIMB model. Most companies that use HR information systems to hire individuals lack the

capacity to recognize and process gender gaps and biases in the system. By implementing policies that place a quota minimum in hiring a certain number of women might help bridge this gap.

Chapter 6

Conclusion

The results in this thesis indicate the inverse relationships between educational attainments by gender and the gender wage gap. As established, women earn less than men on average, regardless of being more educated and in high skilled professions. The simple regressions and Blinder Oaxaca Decomposition points to the fact that an individual's gender explains the wage gap more than external factors, thus giving us the opportunity to quantify the discrimination in Mexico to approximately $7000 and upwards.

Having established this, it is necessary to implement policies that are inclusive of women in the workforce and give women the opportunity to improve and earn more. McKinsey's CLIMB model presents us with a effective way to organize policy suggestions. Namely, inclusive training, recruitment and monitoring are important ways to localize the inclusion initiatives at a company level. On a national level, mandating maternity *and* paternity leave may prove effective.

Future research focused on understanding what confounding variables explain the "unexplained differences" in Blinder Oaxaca may be useful in better understanding factors that impact the wage gap in Mexico. On establishing this, it would also be effective to study the extent to which wages differ between urban and rural women in Mexico. Current research still provides insight on the extent to which discrimination is prevalent in Mexico, and highlights the need for gender equity initiatives in toady's precarious working conditions.

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PROFESSIONAL EXPERIENCE

RxNXT (SaaS platform for Pharmaceuticals) — **Remote**
Business Development and Strategy Intern — *May 2021 – August 2021*
- Surveyed market share and competitor landscape of PBMs, TPAs, healthcare brokers and health plan providers to implement batch savings analysis, cost projections and offer plan members with comparable drug prices
- Optimized outreach pipeline in HubSpot by reviewing win rate, lead status and prospect engagement metrics to onboard over 250 potential clients across four client segments
- Examined the pharmacy management system (PMS) market by market share, segmentation, growth drivers and integration barriers to create product value propositions used in partnership discussions
- Built a financial model adopted to optimize claim distribution for RxNXT solutions between seven discount card partners, aimed at maximizing revenue and profits
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SourceLIT Group, Audacious Giveback Program — **Remote**
National University Ambassador — *June 2020 - January 2021*
- Developed a COVID-19 relief fund and leadership program for 2000 low-income college students by strategizing key stakeholder relationships and allocating funds from 20 sponsors to 20 universities
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RW Promotions — **Mumbai, India**
Rural Development Intern — *July - August 2019*
- Assisted the CEO in pitching rural development schemes to the Government of Maharashtra, including water purification plans and female education reforms
- Re-engineered company website by optimizing SEO and altering user interface for easier navigation, boosting readership by 80 users
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Deloitte Leadership Development Center — **University Park, PA**
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- Produced five business simulations designed to assess leadership, conflict mitigation strategies and communication skills, analyzed data for 12 key competencies and created comprehensive leadership plans for 12 honor students at Penn State

Penn State Political Science Department — **University Park, PA**
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- Leveraged the Parlinc Database and Polity scale to explore the political landscape of six Asian countries and determine their transition to democracy based on party composition, voting system and presidential elections
- Tracked and logged the historical trajectories of 136 Indian political parties to outline the Indian political system in a case study exploring current democratic governments

Delta Sigma Pi Co-ed Professional Business Fraternity | Alpha Gamma Chapter — **University Park, PA**
Brotherhood Development Chair — *May 2020 – August 2021*
- Managed a budget of $150 to organize six diversity, equity and inclusion focused recruitment events, resulting in 16 new members and a 40% increase in brother engagement
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Ambitions Performance Company – PSU Dance Team — **University Park, PA**
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- Maintained a $2000 budget to plan effective fundraising activities, raised $500 and remained under budget by $200
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