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An Investigation on Wage Penalties: The Effect of Foreign-Born Status on Employee Wages, Salaries, and Incomes in the United States and Canada

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AN INVESTIGATION ON WAGE PENALTIES: THE EFFECT OF FOREIGN-BORN STATUS ON EMPLOYEE WAGES, SALARIES, AND INCOMES IN THE UNITED STATES AND CANADA

By

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ABSTRACT

This paper investigates whether there is a wage penalty that negatively affects foreign-born employees in the United States and Canada, addressing the following two questions: (1) Does being a foreign-born employee result in a wage penalty in the United States and Canada? And if so, (2) How does this penalty differ across the two countries over time? With data collected from the Integrated Public Use Microdata Series (IPUMs), four separate multiple linear regression models are estimated to compare the presence of wage penalties across various industries and occupations. These analyses cover the following comparisons: the United States in 1990 and 2000, Canada in 1991 and 2001, the United States in 1990 and Canada in 1991, and the United States in 2000 and Canada in 2001. For each comparison, this study finds that individuals who identify as foreign-born to the country they are employed, face a wage penalty. These findings indicate that this specific status (foreign-born) correlates to lower wages compared to the average employee and suggests changes in immigration policy in both countries over time as potential explanations. These results are important for future consideration of wage and salary incomes to individuals in both countries, regardless of foreign and domestic-born status.

ACKNOWLEDGEMENTS

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I. Introduction

As will be discussed in detail below, wage penalties are present in multiple industries and occupations throughout the world, affecting the lives and wellbeing of employees who are unfairly represented and treated by their respective jobs and employers. Law Insider, a subscription-based database for lawyers, describes a wage penalty as "the difference in pay between the Prevailing Wage and the wage paid to a covered employee" (Law Insider). Any individual who faces a wage-based penalty receives a wage lower than the average of other employees, and it can be based on numerous factors, including but not limited to race, gender, or even educational attainment. There is abundant research on wage penalties, exploring those based on the factors mentioned above and more, specifically ethnic status, firm and office makeup, multinationalism, foreign direct investments, and employment status.

Researchers find that several types of wage penalties are faced by employees without controlling for factors like birthplace country, industry, or occupation. In studies, they examine companies and firms, exploring the variable of focus to see whether it significantly contributes to the wage and/or salary received by employees. Many current studies find that large wage penalties result from factors such as foreign ownership, human capital, and education. Generally, this research looks at specific groups, and those which exist in smaller, narrower industries. However, once the scope is broadened, there is a gap in information– a lack of examination on larger sample groups which are represented in most industries and in many countries; one of these groups is foreign-born workers. According to an article published in late 2021 by CNBC, there are nearly 169 million international migrant workers, who "comprise almost 5% of the global workforce" (Anwar, Nessa, Jegarajah, CNBC). For such a large population, there is very little research examining the effect of their foreign status on their wage and salary incomes in the workforce, controlling for traits like documentation status, education status, or gender, for example.

This paper will work to fill this gap, through controlled multiple linear regression analysis, to identify the significance of foreign-born status on wage penalties, guided by the following questions: Does being a foreign-born employee result in a wage penalty in the United States and Canada, and if so, how does this penalty differ across the two countries during the years 1990, 1991, 2000, and 2001? Through this research, an answer to these questions will aim to provide insightful background on wages and salaries of employees, laying groundwork for

future discussions for employees and employers in various industries and workplaces. It will also allow for comparisons over time and across countries, offering insight into immigration policy from the past, informing similar policy, hopefully, for the future as well.

This paper will be structured as follows: Section 2 will examine current research on wage penalties, suggesting what information is missing from studies; Section 3 will describe the data that will be used, and it will overview the model and variables; Section 4 will examine the summary statistics and present the regression results; and Section 5 will conclude with a discussion on the paper's findings and implications.

II. Literature Review

In this section, I first review the literature on wage penalties to various groups of employees in multiple industries and backgrounds, followed by a more focused discussion of studies examining wage penalties to immigrant employees, like those conducted by economists Barry Chiswick and George Borjas, both leading labor and immigration economists. My paper will examine and identify the significance of foreign status on wage penalties in the United States and Canada. For the United States, the years 1990 and 2000 will be used and for Canada, the years 1991 and 2001 will be used to determine if wage penalties to immigrant employees change over time. The literature below adds perspective to this topic and frames the context of my research.

Studies on wage penalties to various employee groups from different backgrounds

There is an abundance of literature examining wage penalties to various employee groups from different backgrounds. Here, I will focus on research conducted on other minority groups since the group I study, foreign employees, is also a minority in the labor force in both the United States and Canada.

Beginning with studies conducted on women in the labor force, a study by Bardasi and Gornick examines wage penalties to women in their paper "Women and Part-Time Employment: Workers' 'Choices' and Wage Penalties in Five Industrialized Countries" (Bardasi et. al., 2000). They observe women who hold part-time employment positions and conclude that there is an "influence of dependent care responsibilities to the presence of young children and elderly

household members" (Bardasi et. al., 2000). They estimate the wage gap to find penalties to this sample, by comparing part-time versus full-time employees and estimating two human capital equations. Their results show the largest wage gaps existing in Italy and the United States, concluding that part-time employed women "suffer unadjusted wage penalties," as they hypothesized (Bardasi et. al., 2000).[1]

Another study looks again at wage penalties between women and men. In "Wage Penalties for Career Interruptions: An Empirical Analysis for West Germany," Beblo and Wolf examine how career interruptions and employment spells impact the wages received by employees (Beblo et. al., 2022). They find that career interruptions reduce wage rates; examples of interruptions in their analysis include unemployment, parental leave, and phone time. These human capital factors may in some cases limit experience and affect wages. For both women and men, their study concludes that "job experience accumulated many years ago contributes less to the current income level than recent employment spells" (Beblo et. al., 2022). For women specifically, their wages are dependent on their attachment to the labor market, consequently often leading to larger penalties.

In 2010, Fryer and Greenstone published a paper where they explore the significance of educational attainment on wage penalties for students who attended historically black colleges and universities (HBCU), compared to traditionally white institutions. Using data from the 1970s and 1990s, the paper "The Changing Consequences of Attending Historically Black Colleges and Universities" concludes that matriculation at HBCUs significantly correlates to higher wages "and an increased probability of graduation" (Fryer et. al., 2010). Further, they notice a decline in wage penalties "resulting in a 20 percent decline in the relative wages of HBCU graduates" (Fryer et. al., 2010). They note that this finding may potentially be caused by improvements in the "effectiveness at educating blacks" (Fryer et. al., 2010). This study and the two above offer examples of wage penalties to different employee groups from various backgrounds and industries, adding an additional perspective to wage penalties and how common they are in the labor force.

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[1] The authors calculated this unadjusted wage penalty, as opposed to adjusted, by taking the exponential of the difference between mean logged full-time and mean logged part-time wage.

Studies on wage penalties to immigrant employees specifically

There are additional studies that look specifically at wage penalties to immigrant employees. This selection of literature will more closely align with the study in my paper because the sample group for these studies is also immigrant employees.

First, the seminal study in this area was conducted by Barry Chiswick, "The Effect of Americanization on the Earnings of Foreign-born Men," (Chiswick, 1978). In his paper, Chiswick examines men who identify either as foreign or domestic-born, looking at the effects of schooling and postschool training to draw comparisons on their earnings over time. Using a human capital earnings function to run a multiple linear regression, Chiswick finds that "although initially [white male immigrants] have low earnings, their earnings rise rapidly, particularly during their first few years in the country" (920). Over time, he reports that the foreign-born earnings equal and even surpass those of domestic-born men. Chiswick's paper was the first to explore this topic, and from his research, many other economists began looking closely at wage penalties to immigrant employees.

George Borjas, a leading immigration economist, continued the study on immigrant employees with a group of papers that specifically analyze undocumented immigrants and the wage penalties they face. Borjas examines this topic with two papers that explore the significance and effects of wage penalties to undocumented immigrants. In his more recent paper with Cassidy, they investigate the "determinants of the wage penalty experienced by undocumented workers, defined as the wage gap between observationally equivalent legal and undocumented immigrants" (Borjas et. al., 2019).

In "The wage penalty to undocumented immigration," Borjas and Cassidy find that undocumented men have higher labor force participation and employment rates, compared to other groups and undocumented women (Borjas et. al., 2019). Their research shows "a positive and significant wage penalty to undocumented immigration;" however, contrasting their initial hypothesis, numerically the value is very small, between four and six percent (Borjas et. al., 2019). This paper also explores how the wage penalty changes and the trends it follows as it responds to increases and decreases in the undocumented immigrant population.

In 2017, Borjas also wrote "The Earnings of Undocumented Immigrants," where he "examines the determinants of earnings for undocumented immigrants" (Borjas, 2017). In this paper, he concludes that earnings for undocumented workers lie much lower than those for legal

immigrants and domestic workers, and notes that the gap between the two is very large. Defining the wage penalty "as the difference between what the average legal worker earns relative to what an observationally equivalent undocumented immigrant earns," this study finds that while controlling for several variables like age, education, and the state of residence, there is a prevalent wage penalty to undocumented employees (Borjas, 2017).

Investigating a specific labor market, "Ethnic Penalties in the Labour Market: Employers and Discrimination," examined the labor market in Britain (Heath et. al., 2006). Heath and Cheung study "the current position of ethnic minorities" to show if ethnic minority representation and achievement varies depending on employer characteristics (Heath et. al., 2006). After exploring these topics, they look to see how variations are linked to discrimination and penalties. Using data from labor force and household surveys from 1973-2001, they determine that ethnic minority groups including Pakistani, Bangladeshi, Black Caribbean, and Black African experience "higher unemployment rates, greater concentrations in routine and semi-routine work and lower hourly earnings" (Heath et. al., 2006). They find this to be true for men in these ethnic groups and emphasize that the differentials in their study cannot be explained by certain variables, like age and education.

Another study by Lightman, "The migrant in the market: Care penalties and high- and low-status care employment," uses data from eight liberal welfare regimes to evaluate wage penalties to high- and low-status care employment (Lightman, 2018). She concludes that jobs in the service and health, education, and social service industries are likely to be part-time and in the private sector, with higher penalties facing immigrants. The findings of this research provide meaningful insight on how well migrants are treated in the labor market in these regimes.

Other studies explore wage penalties to immigrants, focusing on human capital factors as explanatory variables. "Ethnic Wage Penalty and Human Capital Transferability: A Comparative Study on Recent Migrants in 11 European Countries" by Cantalina, Ghetto, and Panichella looks at factors related to human capital and segregation in occupational structures to determine whether there are significant wage penalties suffered by recent immigrants (Cantalina et. al., 2022). With probit models, they find that Eastern European migrants are "not systematically less penalized" than migrants in their study from Africa, Asia, and Latin America (Cantalina et. al., 2022). They found this to be true for all individuals in the study except for men in Italy and Greece. Additionally, they show that participants with higher levels of education, in

Mediterranean countries, have higher wage penalties but note that receiving and acquiring higher education after migration contributes to reduced wage penalties.

There are several studies on the nursing industry and wage penalties to immigrant employees participating in these labor markets in the United States and Canada. One paper "Foreign-Born Nurses in the US Labor Market" by Schumacher explores how being foreign impacts the wages for nurses in the United States (Schumacher, 2010). He concludes that the penalty faced by foreign nurses is emphasized during their first years of employment, however, after six years, the disadvantages are no longer significant. In this particular occupation, Schumacher examines an "analysis of a well-defined high-skilled labor market" (Schumacher, 2010).

Another study by Buhr controls for several variables to find that nurses in Canada who were educated out of Canada faced wage penalties whereas those educated in Canada, did not (Buhr, 2010). Assuming individuals born in Canada were educated in Canada, "Do Immigrant Nurses in Canada See a Wage Penalty? An Empirical Study" determines that "nurses educated outside of Canada do face wage penalties" and suggest this may be a consequence of receiving credentials that are not fully recognized and/or valued by the Canadian labor market (Buhr, 2010). Buhr stresses the importance of these findings, stating that there is a possibility that nurses educated outside of Canada may not be able to gain employment, which may inhibit labor shortages to be filled adequately and with efficiency. Important to note as a significant empirical work, Buhr assumes variables like marital status, presence of children, province of residence, and native language affect earnings; she also groups immigrants into five general groups: United States, Australia and Western Europe, Eastern and Southern Europe, Central and South America, Africa and the Caribbean, and Asia.

Another study by Massey and Gentsch attempts to explain how real wages of Mexican immigrant workers in the United States have declined in the past decades (Gentsch et. al., 2014). Their paper, "Undocumented Migration to the United States and the Wages of Mexican Immigrants," determines that increasing the share of undocumented workers in the United States labor market lowers wages of Mexican immigrants because they lack documents and labor rights in the United States (Gentsch et. al., 2017). As for the wage penalty, they find that it increased by 10-percentage points, from 8 percent to 18 percent, as "the percentage undocumented rose from its observed minimum to maximum" (Gentsch et. al., 2017). Important to note, the authors share,

too, that during the time of their study (1990 through 2009), the United States enacted several policies into federal law which may have made the population of Mexican migrants more vulnerable to exploitation is various forms including lower wages.

Contrary to the findings of the studies above, one paper "Why Are Migrants Paid More?" by Bryson, Rossi, and Simmons identifies a wage penalty to domestic workers in firms in a single industry (professional football), rather than to migrants (Bryson et. al., 2012). Through their analysis, they determine that this result "persists within firms and is only partially accounted for by individual labour productivity" (Bryson et. al, 2012). Though they hypothesized there would be a penalty to migrants, their results did not support their initial belief. Because this paper offers a different result to those above, it presents a valuable perspective to consider as a possibility in further research.

Studies on comparative wage penalties to immigrant employees in the United States and Canada

Overall, the existing literature focuses very closely on specific immigrant groups and particular industries or labor markets. There is less research on the general significance and correlation of foreign status on whole country labor markets, regardless of specific industry groups. There is also limited literature comparing wage penalties to immigrant employees in the United States and Canada. In fact, it seems nothing like this exists that compares the two countries and offers estimates about the size of the wage penalty facing immigrants over time. My study adds to this body of literature in economics and hopes to provide perspective on foreign and domestic-born wage penalties, in the United States and Canadian labor markets, for the years 1990, 1991, 2000, and 2001.

III. Data and Methodology

The data

This study uses data collected from the Integrated Public Use Microdata Series (IPUMS) (IPUMS, 2020). Because this study covers the wage penalties in both the United States and Canada, the data was taken directly from the IPUMS International site, which provides census microdata for over 100 countries, provided by participating national statistical offices. Through

the IPUMS International site, the samples for the years 1990 and 2000 were selected for the United States and the years 1991 and 2001 were selected for Canada. Following this sample selection, I identified relevant variables that would be important for the study and selected those in the years indicated. After extracting this sample in October 2022, the data went through a thorough organization and sorting process to prepare it for economic analysis. Important to note, while the data was obtained in 2022, it was first recorded in the years specified in my analysis by the countries themselves and was then published on the IPUMS database for research use. Additionally, it was not necessary to combine data sets as a further step because the IPUMS site does so for you in the extraction process.

The data used is cross-sectional as it has no regard for differences in time, rather it simply observes many subjects at one specific year; cross-sections of the years 1990, 1991, 2000, and 2001 are used to evaluate observations for varying participants. Further in the analysis of the model that will be presented below, comparisons across years are made between the two countries. While the year groupings, 1990 and 1991, and 2000 and 2001 are not the same, they differ by only one year and for this analysis, they will be considered relatively the same for comparison purposes, drawing conclusions based on foreign status and wage and salary income for two periods of time, one decade apart.

Several of the variables required additional work to sort as many of them returned coded results through the extraction process, meaning that instead of numerical values, the IPUMS database returned codes corresponding to specific traits the individual had for each variable. While the codes were informative, they were not sufficient for this numerical analysis and required recoding with indicator variables. Using the provided codes, I defined new variables to specify whether an observation had a certain trait or not.

Additionally, through the sorting process, it was necessary to drop several observations because data was not specified and/or included for variables and/or samples. When the extraction was completed originally, the set comprised of over 30 million observations for the United States and Canada combined. Following the sorting process, 12,895,339 observations were left, with 12,240,939 observations for the United States and 654,400 observations for Canada. The number of observations for Canada is much lower than that of the United States. This is most likely due to a larger United States population compared to that of Canada. In both countries, because the long form census (containing detailed microdata included in this study) is distributed to nearly

one in six households (in the United States) and 25-percent of households (in Canada), and only a 5-percent selection of those forms completed is shared by national statistical offices, it can be expected that for a country with a larger population, the United States, there would be a greater subset of surveys and therefore observations, than for a country with a smaller population, like Canada. Since this study only compares the percentages that wage penalties have across and within countries, this difference in observation totals is not considered an issue.

Some may also suggest volunteer and non-response selection bias in this study because the census microdata relies only upon individuals who chose to participate and therefore share their characteristics with the national statistical offices. This means that those who chose to respond may have different characteristics than those who chose not to respond. However, the probability of this bias was minimized to its greatest extent through randomization, in that all data collected from the IPUMS data base was selected through the selection of variables in this study. Also, the statistical agencies in the United States and Canada go through an extensive effort to ensure respondent confidentiality and follow-up with initial nonrespondents, further decreasing the probability of this bias.

It is assumed that individuals whose birthplace is not the United States or Canada, respectively, are foreign and are represented as such in indicator variables in the model. Individuals from places other than these countries are anticipated to see lower wages compared to those born in the United States and Canada. For these cases, it is expected that language may act as a barrier for individuals where English is commonly spoken in these countries. Differences in education in various countries may also be a contribution to this suspected negative effect on wages. In addition to these variables, the visible minority status may also potentially impact the wages received by these populations. These additional expectations can be determined through the tables presented below, but for the purpose of this analysis, a focus is placed closely on foreign-born status.

The model

For studies involving wage and discrimination in economic literature, it is common to use a multiple-linear regression model to study the effects of different variables on the wages received by employees. The following equation (1) is used for empirical estimation of the wage penalties received by foreign-born employees. It is run separately, one time for the United States'

sample and a second time for the Canadian sample. Differences in data availability between the United States and Canada necessitated several small differences in how equation (1) was estimated for each of the two countries, as explained in detail below.

$$
\begin{aligned}
\log incwage_i \\
= \beta_0 + \beta_1 foreignborn_i + \beta_2 age_i + \beta_3 agesquared_i + \beta_4 male_i \\
+ \beta_5 married_i + \beta_6 collegegraduate_i + \beta_7 somecollegecompleted_i + \beta_8 highschoolgraduate_i \\
+ \beta_9 englishspeaking_i + \beta_{10} metroarea_i + \beta_{11} wageandsalaryworker_i + \beta_{12} industry_i \\
+ \beta_{13} occupation_i + \beta_{14} race_i + \beta_{15} geographicregion_i + u_i
\end{aligned}
$$

$$(1)$$

Here, each variable is subscripted with an i because this study examines individual level data. In the equation, $incwage_i$ is, for example, a measure of the wage and salary income received by individual i, an employee. Examining the coefficient for this variable in the respective country regression results will provide insight on the impact foreign status has on the wages and salaries received by employees in the country that the regression is run for. This specific variable and its coefficient are very important to this study and will determine an answer to the research question.

Some variables were also unnecessary to include in the regression model but were important in the data extraction process. This was often because data was identical for each observation. For example, it was important to include employment status in the original data extract to identify those employed individuals, but because every individual was employed, it was therefore unnecessary to include employment status in the regression model. Further, it was essential to remove observations with employees who were no longer participating members of the labor force as this study specifically examines the wages and salaries received by employed individuals.

Nearly all of the variables in equation (1) are indicator variables except for age_i and $agesquared_i$. There are a select few, including $industry_i$, $occupation_i$, $race_i$, and $geographicregion_i$, which contain an extensive list of these state fixed effect indicators. To clarify, in the United States' data, there are 14 indicator variables for $industry_i$, and in Canada's data, there are 12 indicator variables for $industry_i$. For $occupation_i$, in both the United States'

and Canada's data there are 9 indicators. For $race_i$, in the United States' data there are 5 indicators (Black, Asian and Asian Pacific Islander, Native American, multiple races, and other, with White as the reference group). In Canada's data, there are 3 indicators for race (Black, Asian and Asian Pacific Islander, and other, with White as the reference group). Finally, for $geographicregion_i$, in the United States' data there are 50 indicators (representing all the states), and in Canada's data there are 10 (representing all the provinces). The variable $race_i$ will be included in the summary statistics tables but not in the regression tables because of the number of indicator variables, however regression results can be reviewed upon request for these variables and their coefficients. The variables $industry_i$, $occupation_i$, and $geographicregion_i$, will not be included in either the summary statistic tables or regression tables because of the large number of indicator variables but can reviewed upon request.

For all the indicator variables in this model, a reference group has been assigned. The reference group for $foreignborn_i$ is anyone born in the United States or Canada, dependent on which country is being examined at that time. Educational attainment is measured through three indicator variables, $collegegraduate_i$, $somecollegecompleted_i$, and $highschoolgraduate_i$. The reference group for all of these includes individuals who have not completed any form of education. The variable $englishspeaking_i$, includes individuals who do not speak English as a reference group, and the variable $metroarea_i$, uses anyone living in a nonidentifiable region (rural area) as its reference group. Finally, $wageandsalaryworker_i$, examines the status of employment by looking at the employment type of individuals (wage and salary worker), with anyone self-employed as the reference group.

An individual's age is also considered in this equation, through two variables, age_i and $agesquared_i$. Age may have a non-linear relationship with $log\ incwage_i$; consequently, it was necessary to include the age-squared variable as a potentially more accurate measure of the impact age has on the wages received by employees.

The variables

The dependent variable for this study is the natural logarithm of wage and salary income, expressed in contemporary nominal dollars specific to those of the respective country. The explanatory variables, explained briefly above, are foreign status (determined by the birthplace of each individual), age, age squared, sex, marital status, educational attainment, English

speaking status, metropolitan area, employment class status, industry, occupation, race, and geographic location in each country. These include 1990 United States' geographical area, 2000 United States' geographical area, 1991 Canadian geographical area, and 2001 Canadian geographical area.

As noted, the wage and salary income of each individual is measured in contemporary nominal dollars, relevant to each country during the time specified. This infers that across the years, inflation has not been accounted for, however, because this study examines the percentage impact that foreign status has on employees, it was not considered necessary to factor inflation in for these variables as any inflation in nominal wages or the cost of consuming goods would presumably affect domestic and foreign-born workers equally in all years.

Finally, while it was mentioned prior, many of the individuals were omitted from the samples. Those who reported not being participating members of the labor force were dropped from the data set, as well as those who were unpaid or chose to withhold their wage and salary income, or any number of the other variables, from their survey. Resultingly, the data set decreased by nearly fifty percent, however, valuable predictions in the form of null hypotheses are still made based on the data available, which are explained in detail below.

Hypotheses

For this set of variables, it is expected that foreign status will have a negative correlation with the wages and salaries of employees. This implies that if an employee identifies themselves as not being born in either the United States or Canada, respectively, they will receive a wage penalty, meaning that their wages will be of a lesser percentage than those who are domestic to the country they are working in. It is also expected that having a higher level of education will positively correlate to a percentage increase in the wages received by employees, as it is typically seen that those who have higher educational attainment secure higher-paying jobs than those with an elementary level of education. For variables that contain information regarding geographic and metropolitan location, it is expected that individuals in less rural areas will receive higher wages, meaning that the metropolitan area will positively correlate to wage and salary income. It is also expected that English speaking status will positively correlate to higher wages as the language primarily spoken in both the United States and Canada is English. Finally,

it is expected that being male will correlate to a higher wage, as gender wage gaps still remain present in several industries and occupations.

    For all race indicator variables, with white as a reference group, it is expected that there will be a negative correlation to wage and salary income of individuals. For industry and occupation variables, because of their extensiveness, it is difficult to determine which will have a positive correlation to the wage and salary individuals receive. However, it might generally be assumed that occupations and industries involving extensive training and education may positively correlate to the wages and salaries received. For age and age squared and variables, it is difficult to suggest a correlation prediction but individuals who are middle aged are most likely in a peak-working period, and therefore, there may be a positive correlation to the wages they receive. Alternatively, those who are younger and with minimal education, and those who are older with potential health effects, may receive lower wages.

IV. Summary Statistics and Regression Results

Summary statistics

    The summary statistics for the United States and Canada, respectively, can be found in Tables 1 and 2 for the dependent variables. In Table 3, summary statistics for the dependent variable, wage and salary income, can be found, with differences between the two countries over time, without adjusting for the covariates. First, examining Table 1, the values for all variables seem reasonable compared to the general trends over time in the United States.

Table 1: Average Values for the United States, 1990 and 2000		
Variable Names	1990	2000
Foreign-born (percentage of all employees)	**0.09** (0.29)	**0.12** (0.33)
Age	**37.94** (12.88)	**39.69** (13.01)
Age squared (percentage of all employees)	**1605.66** (1077.45)	**1744.55** (1101.24)
Male (percentage of all employees)	**0.54** (0.50)	**0.53** (0.50)
Married (percentage of all employees)	**0.62** (0.49)	**0.59** (0.49)

Black (percentage of all employees)	**0.09**	**0.09**
	(0.28)	(0.29)
Asian and Asian Pacific Islander (percentage of all employees)	**0.03**	**0.03**
	(0.16)	(0.18)
Native American (percentage of all employees)	**0.01**	**0.01**
	(0.08)	(0.09)
Multiple races (percentage of all employees)	-	**0.02**
		(0.14)
Other race (percentage of all employees)	**0.00**	**0.04**
	(0.02)	(0.20)
College graduate (percentage of all employees)	**0.23**	**0.27**
	(0.42)	(0.44)
Some college completed (percentage of all employees)	**0.30**	**0.32**
	(0.46)	(0.47)
High school graduate (percentage of all employees)	**0.34**	**0.31**
	(0.47)	(0.46)
English speaker (percentage of all employees)	**0.99**	**0.99**
	(0.07)	(0.09)
Lived in a non-rural urban area (percentage of all employees)	**0.67**	**0.72**
	(0.47)	(0.45)
Wage and salary worker (as opposed to self-employed) (percentage of all employees)	**0.96**	**0.96**
	(0.20)	(0.20)

Note: Bold value is the mean, and the parenthesis value is the standard deviation.

The hyphen in Multiple races in 1990, indicates that none of the individuals in 1990 characterized themselves as being multiple races.

Total number of observations: 5,154,384 (1990); 5,756,561 (2000)

We can identify some interesting and notable differences across both years. In examining foreign-born status, the mean here also appears to increase by 0.03-percentage points, which would indicate an increase in foreign-born workers in the United States over this ten-year period. For educational attainment, the means of the indicator variable groups differ; we see a 0.04-percentage point increase in the mean number of individuals who graduated from college, a 0.02-percentage point increase in the mean number of individuals who completed some education, and a 0.03-percentage point decrease in the mean number of individuals who completed high school.

The latter may be caused by the increase of individuals finishing and entering college and secondary-level education. It is also seen that English-speaking status and wage and salary income remain constant over the ten years, which is interesting regarding the potential influx of foreign individuals to the country. Finally, here we also see a 0.05-percentage point increase in the mean number of individuals living in metropolitan areas, indicating that a small number of individuals may have migrated out of rural areas into city environments.

Shifting to Canada, the summary statistics for employees in Canada are found in Table 2. The statistics here also seem reasonable, and we can see similar trends compared to the United States.

Table 2: Average Values for Canada in 1991 and 2001		
Variable Names	1991	2001
Foreign-born (percentage of all employees)	**0.18** (0.39)	**0.20** (0.40)
Age	**36.94** (12.05)	**38.74** (12.32)
Age squared	**1510.04** (961.62)	**1652.34** (985.93)
Male (percentage of all employees)	**0.53** (0.50)	**0.53** (0.50)
Married (percentage of all employees)	**0.66** (0.47)	**0.64** (0.48)
Black (percentage of all employees)	-	**0.06** (0.24)
Asian and Asian Pacific Islander (percentage of all employees)	-	**0.02** (0.14)
Other race (percentage of all employees)	**0.09** (0.28)	**0.04** (0.20)
College graduate (percentage of all employees)	**0.23** (0.42)	**0.27** (0.44)
Some college completed (percentage of all employees)	**0.33** (0.47)	**0.35** (0.48)
High school graduate (percentage of all employees)	**0.21** (0.40)	**0.19** (0.39)
English speaker (percentage of all employees)	**0.88** (0.33)	**0.88** (0.31)

Lived in a non-rural urban area (percentage of all employees)	**0.64** (0.48)	**0.65** (0.48)
Wage and salary worker (as opposed to self-employed) (percentage of all employees)	**0.94** (0.23)	**0.94** (0.24)

Note: Bold value is the mean, and the parenthesis value is the standard deviation.

The hyphens in Black and Asian and Asian Pacific Islander in 1990, indicate that none of the individuals in 1990 characterized themselves as either being Black or Asian and/or Asian Pacific Islander.

Total number of observations: 314,735 (1991); 339,665 (2001)

Like the United States, Canada also sees an influx of foreign-born employees. While one point lower than the increase in the United States, here we observe that Canada's population of foreign-born employees increases by 0.02-percentage points. Additionally, Canada's trends continue to follow those in the United States when it comes to educational attainment. The mean number of individuals who graduated from college and the mean number of individuals who completed some college have identical increases to the United States, at 0.04-percentage points and 0.02-percentage points, respectively. For those who completed high school, the mean for this variable also decreased as it did in the United States, but to a lesser value by 0.02-percentage points. It is also seen that English speaking status and wage and salary income remain constant over the ten years, identical to the United States statistics. Here, we also notice an increase in the mean number of individuals living in a metropolitan area.

In Table 3 below, summary statistics for the dependent variable, logarithm of wage and salary income, can be seen. Additionally, this table also focusses on the differences in the logarithm wage and salary income in each country, without adjusting for the covariates mentioned in Tables 1 and 2 above. This difference between the logarithm of wage and salary income for employees (based on foreign status) has been verified with a t-test statistic, which indicates whether the difference is statistically significant. These statistics are different than those identified further in this paper in the Summary Statistics and Regression Results (IV), since those have controlled for the independent variables mentioned in Tables 1 and 2.

Table 3: Average Values for the Logarithm of Wage and Salary Income in the United States (1990, 2000) and Canada (1991, 2001)				
	The United States		Canada	
	1990	2000	1991	2001
Wage and salary income (natural logarithm)	**9.63** (1.04)	**10.01** (1.03)	**9.78** (1.11)	**9.98** (1.18)
Wage and salary income (natural logarithm) for foreign-born employees	**9.58** (1.00)	**9.94** (1.00)	**9.87** (1.08)	**10.01** (1.17)
Wage and salary income (natural logarithm) for domestic-born employees	**9.64** (1.04)	**10.02** (1.03)	**9.76** (1.11)	**9.98** (1.18)
Difference	0.05	0.08	-0.10	-0.04
T-Statistic	33.85***	61.39***	-20.42***	-8.35***
Note: Bold value is the mean, and the parenthesis value is the standard deviation. Significance indicated by ***for 1 percent. Total number of observations: The United States - 5,154,384 (1990); 5,756,561 (2000); Canada - 314,735 (1991); 339,665 (2001)				

In the table, the natural logarithm of wage and salary income can be found for both countries, but for the context of understanding these values, I will explain them here in contemporary nominal dollars. In the United States, the mean of wage and salary income increased by 11,078.37 dollars over the years. This increase is interesting and motivates this study's research questions. While this number does increase by a certain value, the model will indicate whom this increase benefits and whom it does not, hopefully providing insight on the type of individuals who are favored in their employment positions. Looking more specifically, the mean of wage and salary income for foreign-employees increases by 10,194.47 dollars over time, and the mean of wage and salary income for domestic-employees increases by 11,246.13 dollars over time. The t-statistics here, without adjusting for the covariates, indicate that there are statistically significant differences between the logarithm of wage and salary income of domestic and foreign-born employees for

both 1990 and 2000, showing a higher wage and salary income for domestic-born employees, on average, in both years.

In Canada, the mean of wage and salary income increased by 6,907.47 dollars over the years. This increase is more than half of the increase identified in the United States which is interesting to consider seeing that the time between the years measured is identical. This statistic rises a similar question to that of the United States: whom does this increase in wage and salary income benefit? Looking more specifically, the mean of wage and salary income for foreign-born employees increases by 5,947.00 dollars over time, and the mean of wage and salary income for domestic-employees increases by 7,114.85 dollars over time. Unlike in the United States, the t-statistics here, without adjusting for the covariates, indicate that there are statistically significant differences between the logarithm of wage and salary income of domestic and foreign-born employees for both 1991 and 2001, showing a higher wage and salary income for foreign-born employees, on average, in both years.

Regression results

In Tables 4 and 5, regression results for the United States and Canada, respectively, can be found. Before examining them, it is critical to explain the issues and limitations that have been adjusted for, as these are the results that are currently presented in the tables. The primary issue that was presented when first examining the regression outputs for both countries was heteroskedasticity. This challenge means that the variance of the standard errors was not constant, regardless of the value of the dependent variable, the logarithm of wage and salary income. To verify the presence of heteroskedastic results, the Breusch-Pagan test was used for each regression, which calculates a chi-squared value for each regression output. Through this test, heteroskedasticity was verified and was necessary to correct for through robust (White-corrected) standard error regressions for all years in both the United States and Canada. The regression outputs in Tables 3 and 4 contain the robust results, corrected for heteroskedasticity, verifying that the variance of the error is constant. Another issue that is common while using cross-sectional data is multicollinearity, which was something the regression output corrected for itself by dropping variables that contained data already explained by other variables in the regression.

Results for the United States

       With these corrected issues in consideration, the regression results for the United States can be found in Table 4 below.

Table 4: Regression Results for the United States		
Variable Names	1990	2000
R-Squared Value	0.4168	0.4106
Foreign-born	**-0.06*****	**-0.05*****
	(0.001)	(0.001)
Age	**0.13*****	**0.12*****
	(0.000)	(0.001)
Age squared	**-0.00*****	**-0.00*****
	(0.000)	(0.002)
Male	**0.46*****	**0.39*****
	(0.001)	(0.001)
Married	**0.10*****	**0.10*****
	(0.001)	(0.001)
College graduate	**0.69*****	**0.76*****
	(0.001)	(0.002)
Some college completed	**0.40*****	**0.43*****
	(0.061)	(0.001)
High school graduate	**0.31*****	**0.32*****
	(0.001)	(0.001)
English speaker	**0.23*****	**0.16*****
	(0.005)	(0.004)
Lived in a non-rural urban area	**0.15*****	**(0.14)*****
	(0.001)	(0.001)
Wage and salary worker (as opposed to self-employed)	**0.11*****	**0.07*****
	(0.03)	(0.002)
Note: Bold value is the coefficient. and the parenthesis value is the standard error.		
All regressions also include other stated fixed effect variables not explicitly stated here, for race, occupation, industry, and geographic location; coefficients and standard errors for these values can be seen upon request.		
Significance indicated by ***for 1 percent.		
Total number of observations: 5,154,384 (1990); 5,756,561 (2000)		

Here, we see the coefficients for all variables considered in this study for both years, 1990 and 2000. For each year, a separate regression was run; in 1990, 42-percent of the variance in the

dependent variable was explained by the variance of the independent variables and in 2000, 41-percent of the variance in the dependent variable was explained by the variance in the independent variables. Additionally, all variables examined in the model were significant according to their t-statistics at a 0.05 significance level.

Examining the coefficient for foreign-born (highlighted in yellow in the coefficient table) on the logarithm of wage and salary income, we see, relative to domestic-born employees, a 6-percent decrease in the wages received by employees with foreign-born status in 1990 and a 5-percent decrease in the wages received by employees with foreign-born status in 2000. This supports the hypothesis that foreign-born employees receive a wage penalty. For these two years, this percentage value decreases, which implies that there has potentially been a small improvement in how employees of this status are getting paid. However, this value is so small that it is unclear how statistically different these percentages really are; a test that will be explained further on will provide more context onto this change. As was mentioned, other variables were significant and show an increase in the logarithm of wage and salary income received by employees, but since the focus on this study is on foreign-born employees, the discussion here will focus on the foreign-domestic wage gap.

Results for Canada

Next, examining Canada, regression results can be seen in Table 5 below.

Table 5: Regression Results for Canada		
Variable Names	1991	2001
R-Squared Value	0.3664	0.3494
Foreign-born	-0.06*** (0.005)	-0.09*** (0.005)
Age	0.15*** (0.001)	0.15*** (0.001)
Age squared	-0.00*** (0.000)	-0.00*** (0.000)
Male	0.47*** (0.004)	0.36*** (0.004)
Married	0.15*** (0.004)	0.14*** (0.004)
College graduate	0.40***	0.41***

	(0.006)	(0.006)
Some college completed	**0.24***	**0.25***
	(0.005)	(0.005)
High school graduate	**0.20***	**0.18***
	(0.005)	(0.006)
English speaker	**0.06***	**0.09***
	(0.006)	(0.007)
Lived in a non-rural urban area	**0.15***	**0.14***
	(0.004)	(0.004)
Wage and salary worker (as opposed to self-employed)	**0.21***	**0.37***
	(0.009)	(0.009)

Note: Bold value is the coefficient. and the parenthesis value is the standard error.

All regressions also include other stated fixed effect variables not explicitly stated here, for race, occupation, industry, and geographic location; coefficients and standard errors for these values can be seen upon request.

Significance indicated by ***for 1 percent.

Total number of observations: 314,735 (1991); 339,665 (2001)

In this table, the coefficients for all variables considered in this study are outlined for years 1991 and 2001. For each year, a separate regression was run; in 1991, 37-percent of the variance in the dependent variable was explained by the variance of the independent variables and in 2001, 35-percent of the variance in the dependent variable was explained by the variance in the independent variables. In addition to the foreign-born variable, all other variables in the model were significant according to their t-statistics at a 0.05 significance level.

Examining the coefficient for foreign-born (highlighted in yellow in the coefficient table) on the logarithm of wage and salary income, we see a 6-percent decrease in the wages received by employees with foreign-born status in 1991, and a 9-percent decrease in the wages received by employees with foreign-born status in 2001. Like in the United States, these results support the hypothesis that foreign employees receive a wage penalty. For these two years, this percentage value increases, which implies that foreign-born employees are getting increasingly more penalized for their foreign status, as time increases. This will be explored further below. While the other variables were significant and positively correlate to an increase in the logarithm of wage and salary income received by employees, the discussion here will remain centered on the foreign-domestic wage gap.

Comparing the regression results for the United States and Canada

When comparing the regression results for the two countries, we begin with Canada in 1990 and the United States in 1991. The regression outputs for both the United States and Canada show an identical negative correlation, between being foreign-born and the logarithm of wage and salary income, of nearly 6-percent. This would indicate that in both countries, if an individual identifies as foreign-born, their wage and salary income, compared to that of domestic-born identification, will be lower. Further, when comparing Canada in 2000 and the United States and 2001, a negative correlation between foreign status and the logarithm of wage and salary income persists. In the United States, we see a 5-percent negative correlation with foreign status and the logarithm of wage and salary income, whereas in Canada, we see a 9-percent negative correlation. Between the United States and Canada in this time, there is a 4-percentage point difference, suggesting that Canadian employment positions may be harsher to individuals who identify as foreign than employment positions in the United States. According to the results presented above, this negative correlation in Canada (2001), is the greatest out of all years, and interestingly, it is one of the most recent years in this study.

Confirming statistical difference and change over time

To support these findings and confirm their statistical difference and change over time, I also conducted a t-test of statistical difference for the regressions. Using equation 2 below, I was able to test a null hypothesis stating that the coefficients for foreign-born in the United States and Canada were identical for all comparisons, where $\hat{\beta}_x$ and $\hat{\beta}_y$ equal the coefficients for foreign-born for the regressions compared, and se equals the standard error for the respective coefficient. This test was completed to compare the foreign-born coefficients in the United States in 1990 and 2000, Canada in 1991 and 2001, the United States and Canada in 1990 and 1991, and the United States and Canada in 2000 and 2001.

$$t = \frac{\hat{\beta}_x - \hat{\beta}_y}{\sqrt{se(\hat{\beta}_x)^2 + se(\hat{\beta}_y)^2}}$$

(2)

For the null to be rejected, the value of t (the t-statistic) must be greater than +2.0 or less than -2.0. First, when comparing the United States in 1990 and 2000, the t-statistic is -3.97; for this

case, the null is rejected as there is statistical difference between the coefficients for foreign-born across these years. This suggests that over this period, the negative correlation between foreign status and wage and salary income decreases by 1-percentage point, meaning that individuals with foreign-born status face a wage penalty 1-percentage point lower in 2000 than they did in 1990. Next, when comparing Canada in 1991 and 2001, the t-statistic is 3.81, meaning that the null can be rejected due to statistical difference between the two coefficients. This suggests that over this period, the negative correlation between foreign status and wage and salary income increases by 3-percentage points, meaning that individuals with foreign-born status face a wage penalty 3-percentage points higher in 2001 than they did in 1991.

When comparing across countries, beginning with the United States and Canada in 1990 and 1991, the t-statistic is 0.27. Here, the null is not rejected as there is no statistically significant difference between the coefficients. Again, there is still a negative correlation between being foreign-born and wage and salary in both countries during this time, however, there is no statistical difference in the coefficients. This makes sense given the percentage value for these coefficients is identical in both regressions. Finally, when comparing the United States and Canada in 2000 and 2001, the t-statistic is 6.7; the null is rejected in this case due to a large statistical difference between the coefficients. Calling back on the regression, this suggests that there is in fact a 4-percent difference between the wage and salary income for individuals correlating to foreign status during these times in the United States and Canada.

V. Conclusion

The results of this study support the hypothesis that foreign-born employees suffer wage penalties in the United States and Canada. Using four multiple linear regression modes, the dependent variable, logarithm of wage and salary income, has been analyzed against several independent variables including foreign-born status, age, gender, marital status, educational attainment, metropolitan area, type of employment, industry, occupation, race, and geographic region. These regressions yield results identifying the correlation of foreign-born status on the logarithm of wage and salary income in the United States in 1990 and 2000 and Canada in 1991 and 2001. After an intensive extraction and sorting process, the results were corrected for heteroskedasticity, and outlined in the Data and Methodology (III) and Summary Statistics and Regression Results (IV) sections.

To briefly overview, the following results were found. Regarding the United States alone, there is a negative correlation between foreign-born status and the logarithm of wage and salary income. According to the additional t-statistics, there is a statistically significant difference between these coefficients for years 1990 and 2000. This suggests that the wage penalty faced by foreign-born employees decreases by a statistically significant amount over time. Regarding Canada, there is also a negative correlation between foreign-born status and the logarithm of wage and salary income. Like the United States, through the additional t-statistic evaluation, there is a significant difference over time, indicating a larger wage penalty to foreign-born employees in Canada in 2001 than in 1991.

When examining across the countries, in 1990 (in the United States) and in 1991 (in Canada), there is a negative correlation between foreign-born status and the logarithm of wage and salary income. However, there is no statistical difference between their coefficients. Comparatively, in 2000 (in the United States) and in 2001 (in Canada), there is a significant difference indicating a greater wage penalty for foreign-born employees in Canada than in the United States during these years.

These results are important to consider when examining how individuals are paid in both countries. While these percentages are low, they do suggest the reality of penalties to foreign-born employees on their wage and salary incomes. Any economic research specifically comparing the effects of foreign status on wages was not present for the United States and Canada; the hope is that this study will begin to fill the gap and provide insight on an important subject that needs addressing. In both the United States and Canada, there were statistically significant differences in the correlation of foreign-born status on wage and salary income over time. In the United States, there is a significant decrease in wage penalties to foreign-born employees over time. While this could infer an adjusted, more fair system of compensation for foreign-born employees, another potential explanation in the decreased wage penalty could be due to efforts by the United States to decrease illegal immigration inflows to the country. In 1996, the United States passed the Illegal Immigration Reform and Immigrant Responsibility Act, with the intention of "increasing enforcement at the border and in the interior," further "priotitiz[ing] enforcement of laws on hiring immigrants" (Cohn, "How U.S. immigration laws and rules have changed through history"). Research by the Federal Reserve Bank of Dallas and IZA Institute of Labor Economics suggests "low-skilled immigrants may have been discouraged

from settling in states that set wage floors substantially above the federal minimum" (Orrenius, Zavodny, "The Effect of Minimum Wages on Immigrants' Employment and Earnings"). These two pieces of research may suggest increases in the wages of foreign-born employees who decided to stay in states where the wages were raised initially as a tactic to deter them. This reasoning could potentially support the decrease in wage penalties to foreign-born employees (since they experienced an increase in their wages) during this time in the United States.

In Canada, there is a significant increase in wage penalties to foreign-born employees over time. One potential reason for the increase in the foreign-domestic wage gap in Canada during this time might be due to Canada's substantial increase of immigrants to their population. In 2001, they established the Immigration and Refugee Protection Act, which "stresses education, language, and adaptability" (Challinor, "Canada's Immigration Policy: a Focus on Human Capital"). Resultingly, their immigration flows were influenced, making it "one of the top three refugee resettlement countries in the world" (Challinor, "Canada's Immigration Policy: a Focus on Human Capital"). According to data from the World Bank, Canada also experienced a 13.3-percent increase in international migrant stock in 2000 from 1995, indicating an increasing trend in the number of immigrants present in the country ("Canada Immigration Statistics 1960-2022"). The increase in the flow of immigrants could have impacted certain industries examined here if those industries were particularly concentrated with immigrant workers. Consequently, this wage penalty could have decreased in certain industries primarily composed of foreign-born workers, whereas, other industries, primarily composed of domestic-born workers might have remained unaffected by this increased immigration. Further, with this higher immigration flow depressing foreign-born wages, immigrant welfare and happiness could have been improved by letting many more immigrants come into and work in Canada where they could earn much higher wages than elsewhere.

The wage penalties found here could also represent a human capital compatibility issue. This infers that as the regressions control for age (as a proxy for experience) and education, perhaps a year of experience and/or education obtained abroad, could not translate perfectly to a year of experience and/or education obtained in the host country. This could be another potential reason for the penalties present in this study.

This study provides context on the wage penalty condition affecting foreign-born employees in the United States and Canada and may provide an entry into understanding how

these employees are treated. The hope is that this discussion can establish background information that can be brought to deliberations on wages and salaries in various occupations, industries, and countries. As is seen with both countries, it is hard to determine if the wage penalties we see are a direct result of an employee with foreign-born status or rather of immigration trends. This makes it difficult to identify specific future policy directions. However, this limitation could guide further research on the topic.

To support the overall understanding of wage penalties to foreign-born employees, it could be beneficial to analyze specific industries and occupations individually to see specifically how the immigrant population has changed over time. It could then be inferred whether wage penalties are present and how they differ in extremity for foreign and domestic employees, while controlling for variables specific to the industry or occupation analyzed. Additional studies on this topic could analyze specific industries and occupations. Finally, comparing this data across consecutive years and over larger time periods could be beneficial and potentially aid in the projection of future trends in wage penalties to foreign-born employees.

The results here apply to multiple industries and fields of work. The data indicates that foreign-born employees face wage penalties and future policies could be implemented to decrease this effect substantially for current employees and those who continue to seek work opportunities in the countries they immigrate to, whether it be the United States, Canada, or elsewhere.

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