The Impact Of COVID-19 On Pay Gap Between Native- And Foreign-Born Medical Workers In The US

Presented to the faculty of Lycoming College in partial fulfillment of the requirements for Departmental Honors in Economics

by
Harshita Devi Bandhu
Lycoming College
May 5th 2023

Approved by:

Moorhouse
(Signature)

(KURTZ)
(Signature)

MEHRDAD MADRESEHEE
(Signature)

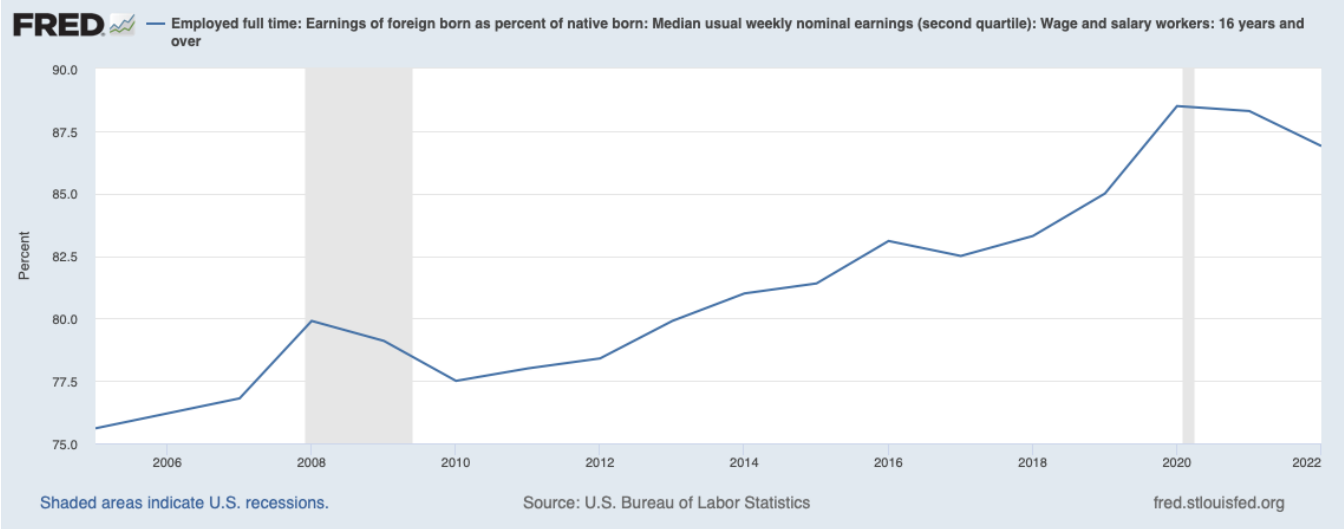
Ben Kantack
(Signature)

ABSTRACT

This paper will focus on how the COVID-19 pandemic has affected the pay gap between foreign- and native-born medical workers in the United States. Previous research has attributed the wage differences between native- and foreign-born workers to human capital as well as to different forms of discrimination. Using data from the Current Population Survey and difference in difference method, the goal of the paper is to explore how the pandemic has changed this difference in pay in the medical field; a sector in which labor was highly demanded during the spreading of the virus. It is hypothesized that the pandemic being a time of crisis will have decreased the pay gap between native- and foreign-born workers in the US. The difference in difference regressions show that the hypothesis can be accepted to some extent. Although workers find an increase in their pay after the pandemic, the increase differs by nationality and occupation.

INTRODUCTION

While some papers argue that immigration can be harmful to the economy (Borjas 2003), immigration in the US has proven to create more employment and has caused an increase in the levels of wages (PPI 2018). Having immigrants brings out more variety of skills and hence better productivity and better performance for economic growth. According to Sherman et al (2019), "Immigrant workers help support the aging native-born population, increasing the number of workers as compared to retirees and bolstering the Social Security and Medicare trust funds. And children born to immigrant families are upwardly mobile, promising future benefits not only to their families but to the U.S. economy overall." Despite these economic advantages associated with immigration, a pay gap between foreign and native workers is still prevalent. Research has shown that foreign-born workers earn lower wages than native-born workers in many developed countries (BLS 2022; Banerjee & Lee 2012). The graph below shows how the median weekly earnings of foreign-born workers vary as a percent of native born workers over the years.



Graph 1: U.S. Bureau of Labor Statistics, employed full time: Earnings of foreign born as percent of native born: Median usual weekly nominal earnings (second quartile): Wage and salary workers: 16 years and over (2023).

As seen from Graph 1, it can be noted that with time, on average, the percentage of foreign-born workers' earnings compared to those of native-born ones also increases with the years. It leads us to believe that although not reaching a 100% level, the gap between foreign born and native-born workers decreases with time. This gap however varies between occupations and for some, it does not seem to close entirely (Donahue 2021).

This disparity in earnings may arise due to several factors including differences in educational attainment, work experience, travel restrictions, or even possible discrimination. Indeed, the change in this wage gap varies over time and tend to get affected by drastic changes in the labor market.

From Gary Walton and Hugh Rockoff (2010), it is noted that through urgent times, there is an urge to employ minority groups to keep businesses running. During World War I, for instance, despite all prior beliefs and restrictions, women, and children, who are deemed as being minority groups, were employed to substitute for the men lost on the field. By 1920, 20 percent of the labor force was composed of women (Walton & Rockoff 2010). The same notion has been analyzed for black men in war-related industries by Collins in 2001. Black men, considered as a minority group as well, earn more than men of the same race employed in other industries (Collins, 2001). It will be interesting to see if such changes have occurred to foreign born workers during recent drastic events.

One such recent example is the impact of COVID-19, declared a Public Health Emergency of International Concern on January 30th, 2020. Like world wars, the waves of COVID-19 brought along a time of crisis. It deeply impacted the labor market, causing the highest rate of unemployment since the Great Depression about 14.4% in April 2020 (Kochhar 2022). An article from Congressional Research Service also compared the pandemic to the Great Depression and it

seemed that the decline in the employment rate has been at its peak between April 2020 and August 2020 (Falk et al, 2021). While COVID-19 has taken a toll on the growing economy, its adverse effects on foreign-born workers did not go unseen. Foreign born faced a higher unemployment rate than native-born (Kochhar & Bennett 2021).

To limit the risks of contamination, several economies including the US limited mobility of people all around the world. The Department of State had suspended routine visa services all around the globe (Covid-19 restrictions on U.S. visas and entry 2022). Such restrictions have made the intake of foreign-born workers more difficult. As reported by CBS News, as of 2022, the current US labor workforce has 2 million fewer immigrants than it would have had if immigration had remained at pre-pandemic levels (Ivanova 2022). All labor markets faced drastic changes with the varying numbers of available workers. While lack of labor caused some businesses to close, there were some sectors that were considered as urgent service providers and had to keep running. One example is the medical sector.

The impact of COVID-19 could also be clearly seen in the market of medical workers: one of the urgent service providers. Doctors, nurses, and all the medical staff were the frontliners in this time of medical crisis. The pandemic in fact worsened the already existing shortages of workers (Dill, 2021). It is theorized that during such medical emergencies, foreign-born workers, being a minority group, will be more prone to be employed due to prevalent workers shortages. In fact, according to CNN (Chen, 2020), the pandemic led to a reduction in the restrictions on foreign born medical workers. “For example, international medical graduates in New York are now allowed to practice medicine after one year of residency – on par with American medical graduates – instead of the three years that most states require” (Chen, 2020).

As such, it is hypothesized that foreign workers will have higher pay than pre-pandemic. It will be interesting to see if the pandemic has indeed caused the earning gaps between foreign- and native-born healthcare workers to close. Regression analyses will be carried out to compare the pay gap between native- and foreign-born workers, both before and after the pandemic, whilst controlling for any other variations. The comparison will allow us to understand the earnings changes among health care workers and will reflect how the gap that exists after controlling for certain factors, might have been affected after the first hit of the COVID-19 pandemic.

LITERATURE REVIEW

This literature review has as its primary motive to explore the fluctuations in pay gaps between native- and foreign-born workers in the US. Several studies have been conducted in the past to study the pay gaps between foreign- and native-born workers.

Barry Chiswick (1982) attributed the differences in earnings to the country of origin, the number of years spent residing in the US, and the reason behind migrating. Chiswick studied the influx of foreign-born workers and the variations between these workers in terms of country of origin. He demonstrated that upon gaining more years of residency, foreign-born workers' earnings increase and reach the same amount as the native-born people after 11 to 15 years. The author used data from the 1970 Census of Population to compare the productivity, occupational status, and earnings of foreign-born workers to those of native-born ones. He also explored the effect of race on earnings. Although there may be variations in the backgrounds of the foreign-born and native-born workers, eventually foreign-born workers are very adaptable to the system and eventually catch up as the years spent in the US increase.

Nonetheless, more recently, Anderson and Huang (2019), using assimilation patterns in the US, had a slightly different conclusion. They described assimilation in the labor market as the wages, employment, and occupational selection of immigrant and native workers becoming more similar over time. Their study included immigrants who entered the US between 1960 and 1969 and between 1980 and 1994. Assimilation patterns of these immigrants are looked at through census surveys and longitudinal data. The paper also looks at over 15 OECD countries and uses different categories such as gender, and country of origin to compare the assimilation patterns and earnings. They found out that the wage gaps decrease over time, but never reach parity. It is noted that assimilation varies by ethnicity and gender as well. The disparity in wage is explained mainly by the human capital theory and segmented labor market theory. The human capital theory links productivity with wages. As such, the higher the productivity which can be determined by the work experience, level of education attained, fluency in communication, and other characteristics, the higher the wages. The segmented labor market theory focuses on how labor markets can never be entirely open to immigrants. There exist several legal restrictions that increase the barrier to entry for a foreign worker. Some countries also impose strict credentialing requirements. The legal policies and high prerequisites thus, according to Anderson and Huang (2019) make wage assimilation more difficult. The opportunities for foreign-born workers are lower compared to native-born ones. As a result, there is a wage gap between native- and foreign-born workers.

Another paper supporting such findings is by Gwyneth Donahue. The wage differences have once again been mostly explained by factors such as "differentials in human capital, occupational segregation, differentials in work experience and discrimination" (Donahue 2021). The paper separates factors in the several categories including immigrant status, educational attainment, and job choices. Demographics which consisted of age, gender, race, marital status,

and health status are also controlled for. Using the Blinder-Oaxaca decomposition, the research concludes that only 68% of the wage gap was explained by the named factors. It is also pointed out that regardless of the education level, job choices or other contributing differences factored in, immigrants would still face a wage gap of about $1016 less than nonimmigrants. Consequently, Donahue attributes the possibility of discrimination to explaining the remaining portion. The author also focused on how the occupation itself plays a great role in determining the wage gaps. Less skilled workers tend to face a higher gap than more skilled ones. For workers who arrived at the US more than 25 years ago, the wage gap for skilled ones was estimated to be $720 while that of unskilled workers was around $6000 (Donahue 2021).

Since pay gaps are impacted by occupational differences, a paper that related to the medical sector, the concentration of my own research paper, was found. This paper by Amin and Uyar (2020) is also very closely related to my research work. The paper takes factors such as race, gender, and location into consideration to study wage gaps between foreign- and native-born dentists, optometrists, and physicians. Amin and Uyar (2020) also noted that previously, no other papers focusing on the wage disparity between foreign-born and native-born doctors have been marked. The years used for this study are 2006-2017. Data for this paper are collected from the American Community Survey from the Integrated Public Use Microdata Series. They conclude through the Mincer model that "after 10 years of stay, foreign-born male doctors (which include dentists, optometrists, and physicians) start to earn about 17% more than their native-born counterparts which are significant at 5% level" (Amin & Uyar 2020). The findings explain that for foreign-born female doctors, on the other hand, the wage differences diminish within 5-10 years.

In addition to doctors and other highly specialized medical workers, research have also explored pay gaps between other health care workers. One of great focus has been nursing. Edward

Schumacher (2011) did such a study using data from the CPS and National Sample Survey of Registered Nurses (NSSRN). He demonstrates how upon controlling for factors such as race, education, union membership, and location of employment, there still exists an overall difference of about 7.6% in the wage gaps between native- and foreign-born registered nurses. These nurses quickly eliminate the gap that existed upon their entry into the workforce once they start building more experience. Schumacher (2011) found out that after 4 years of residing in the US, foreign-born registered nurses receive a wage about 10% lower than native-born ones. This gap however gets narrower and eventually insignificant by the completion of 6 years of residency.

This difference in pay between foreign- and native-born workers fluctuate overtime. One such event leading to drastic changes in the medical labor market is the COVID-19 pandemic. According to Cantor et al (2022), who used industry- and county-level data from the US Bureau of Labor Statistics Quarterly Census of Employment and Wages, employment levels in the healthcare sector also declined suddenly, from 22.2 million in 2019 to 21.1 million in 2020 and increased to 21.8 million in the second quarter of 2021. They also conducted two different analyses to look at the changes in both employment and wages for six different medical occupations. They found out that the largest employment decline was in dentistry during the second quarter of 2020 while skilled nursing facilities had the highest increase in average wages at the same time. Some other papers also found nearly similar results. According to Wager et al (2022), the average weekly earnings of healthcare workers increased by 15.4% in the US, compared to 13.1% for other jobs from April 2020 to April 2022. Nursing home care and elder care employees' weekly earnings have seen the highest increase in wages by 20.9%, while for the physicians it increased by 10.3%.

Nonetheless, no papers that have compared the pay gaps between native- and foreign-born medical workers in the US before and after COVID-19, have however been found.

Following all the paper analyses, this paper therefore aims to focus on the differences in pay between native- and foreign-born workers before and after the pandemic, after controlling for factors such as variations in human capital.

FRAMEWORK

The differences in pay between native- and foreign-born workers can be decomposed into two different components. One component pertains to the productivity differences affecting the pay gap. Another one is the remaining aspect after the productivity differences are controlled for. Productivity differences majorly include disparities in human capital. Human capital as per the World Bank "consists of the knowledge, skills, and health that people invest in and accumulate throughout their lives, enabling them to realize their potential as productive members of society" (World Bank Group 2019). The upbringing of native US workers and foreign-born workers is certainly different in terms of the educational system and standards of living amongst other ways. Differences in human capital often give US native-born workers a head start and hence an upper hand compared to foreign-born workers, explaining a significant portion of the pay gap.

One of the biggest barriers that foreign-born must usually get through is language. Efficient communication in the workplace is important to understand assigned duties. A lower proficiency in the language can create challenges for foreign-born workers to adapt to the system, build connections, and thus complete tasks successfully. Such imperfections are less of a problem for native-born workers, since most if not all of them have been exposed to the language for a long time. They have also been around the local labor market itself for so long enough that they are quicker to comprehend how it works. Consequently, their power to negotiate is greatly increased (Smith & Fernandez 2017).

Another reason behind the pay gap in the labor market is the differences in work experience between native and foreign-born workers. Similarly, to education work experience acquired in the US has higher returns than work experience acquired by foreigners in their country of origin (Coulombe et al 2014). Longer exposure to the system aids in comprehending it better. Therefore, workers who arrive at an older age tend to have a larger pay gap compared to workers their own age who arrive at an earlier time. It is also noted that foreign-born workers from developing countries tend to have lower productivity than those from developed ones (Banerjee & Lee 2012). The qualifications obtained by the foreign-born workers of a less developed or developing economy usually do not match the level of qualifications in the more developed country. Once again, different education levels lead to different levels of pays between native and foreign-born workers. Those from developing countries are more likely to have a higher pay gap when compared to those from developed economies such as Western Europe (Borjas 2015; Duleep & Dowhan 2008). Several analyses also recommend providing educational credentials or implementing policies to reduce the gaps between skills, education levels, and hence pay gaps. (Banerjee & Lee 2012; Smith & Fernandez 2017).

The other component of the pay gap that remains after controlling for the different factors affecting labor productivity is usually attributed to market discrimination. It can justify most of the remaining aspect of pay gap. The two main forms of discrimination, as described by Tushaar Agrawal (2013), are “taste-based” and “statistical.” In the first category, employers, employees, and customers' discrimination are a cycle. This model has been explained by Gary Becker in 1971. As explained by Becker (1971), an example is when selecting between two individuals of the same level of productivity. Some employers or customers will tend to pick the one they closely relate to, in terms of race, gender, or even nationality. The choice is more dependent on

the taste of the employers or customers. Such preferences often play a huge role in determining whether foreign-born workers will acquire the job or whether they deserve to be paid the same level. This kind of discrimination is tautological, which means that they are the way they are because people like them to be that way.

In statistical discrimination, employers or customers use what they see around them to hire or choose people. It arises largely because of a lack of information. Employers choose to believe more in the statistics of people being hired rather than trying to pick the best choice. For instance, female workers are offered lower wages since they are deemed to be less productive, on average, than male workers (Dickenson & Oaxaca, 2004). Statistical discrimination reinforces stereotypes, by favoring one category. It reduces the incentives for disadvantaged groups to develop skills and experience. Once again, these types of discrimination are reflected not only in differences in pays, but also the employment category.

These differences contribute hugely to the pay gap, which can be shown by the model in Figure 1.

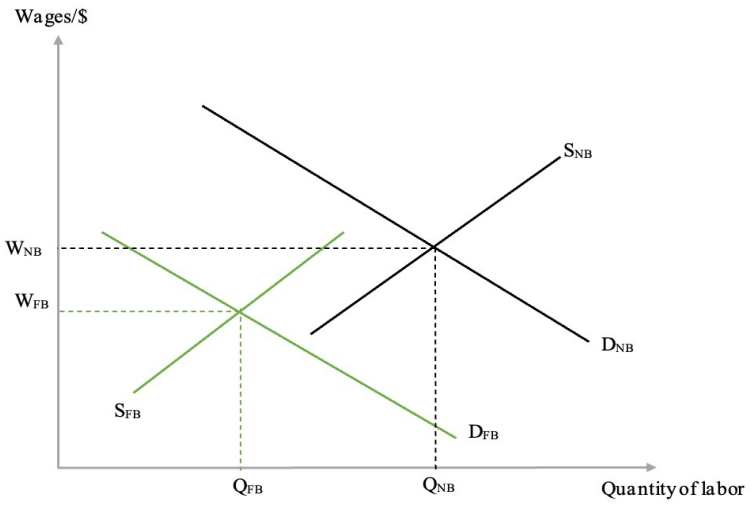


FIGURE 1: Demand and Supply To Show Pay Differences Between Native And Foreign Born Workers.

The diagram above, Figure 1, illustrates the hypothetical pay differentials model, with the demand for native born being higher than that of the foreign-born workers. Differences in human capital explain the greater demand of the native-born workers. The supply of native-born workers is also likely to be higher since the ratio of native-born workers to foreign born workers is usually higher. For instance, in 2019, the share of the U.S. civilian labor force that is foreign born was at 17.4 percent (Labor Force Characteristics of Foreign-Born Workers Summary – 2021, 2022). The market of native-born workers will thus clear at a higher pay rate, W_{NB}, than of the foreign born. The pay differential shown by W_{NB}-W_{FB} is partly accounted for partly by the difference in human capital, which include productivity difference and partly by discrimination.

The pay gap between native- and foreign-born workers and the factors affecting it may vary overtime. Since the COVID-19 pandemic has caused several major economic changes worldwide, the labor market was also deeply impacted. Not only were unemployment rates affected but payments to workers also changed. In 2020, the unemployment rate of the foreign born increased to 15.3% compared to 12.4% for the native born (Kochhar 2021). The decline in employment rate can be attributed to the closing down of businesses, "work from home" situations or reduction in employment hours. With high mortality rates and easy transmission of the virus, people were reluctant to step outside and were being more cautious. Employers have been desperate to retain workers on the demand side. During the pandemic, the virus was easily transmitted, and sick people had to be quarantined for a long time. Travel restrictions were also prevalent. As such, supply of workers was getting lower. In the aftermath of lockdown, demand for workers was increasing further to keep businesses productive and running, and shortages of workers were recorded. As a result, these events seem to result in an increase in wage rates; 12.5% for foreign born and 13.0% for native born, as shown:

Median wages increased sharply at the start of the pandemic and then fell, reflecting the impact on lower-wage jobs

Median hourly earnings, by year and quarter, in 2021 second-quarter dollars

	2019:2	2020:2	2021:2	Change 2019-20	Change 2020-21
All					
U.S.-born	$20.29	$22.83	$21.50	12.5%	-5.8%
Foreign-born	18.61	21.03	20.00	13.0	-4.9
Women					
U.S.-born	18.86	20.88	19.64	10.7	-5.9
Foreign-born	15.71	18.79	17.78	19.6	-5.4
Men					
U.S.-born	22.16	25.05	23.75	13.0	-5.2
Foreign-born	20.15	23.07	21.63	14.5	-6.2

Note: The median divides each group into halves, one half earning more than the median and the other half earning less than the median. Estimates refer to employed workers ages 16 and older, working full time or part time, and are not seasonally adjusted. The changes shown are from the second quarter of one year to the second quarter of the next year.
Source: Pew Research Center analysis of 2019, 2020 and 2021 Current Population Survey monthly files (IPUMS).

PEW RESEARCH CENTER

Table 1: Changes In Median Wages (Source: Pew Resource Center (Kochhar & Bennett 2021))

The table clearly demonstrates that the foreign-born workers, regardless of the gender made gains over native born workers. On average, their hourly earnings increased more than native born workers. It can thus be hypothesized that the COVID pandemic brought a state of urgency that most probably assigned a greater workload to foreign born workers. It seemed like both employers and customers would tend not to differ between the backgrounds of the employees. This would especially occur in some fields such as medical, in which the treatment must be accepted under any case.

The medical field has been one of the urgent care services that were greatly required during the tough pandemic times. The turmoil in the labor market seemed to have been significant for the health care sector. The demand for health care workers increased greatly since they were part of the first responders. Meanwhile, shortages of workers were a big issue. It has

been reported that health care workers had to face “increased health care worker burnout, exhaustion, and trauma” (Sexton et al 2022). Alongside, the high risk of contamination is also prevalent. Workers were not prepared to indulge in a workplace and were prompted to rather stop working and stay at a safer place for their own safety and those in close contact.

In addition, the medical sector is one whereby working from home is not a huge possibility. As such, there has been an increase in the pay rates of the medical care workers, irrespective of their origin. This can once again be shown through the changes in a demand and supply model. Throughout, for a simpler model, it has assumed that the elasticities of demand and supply for both native- and foreign-born workers remained constant.

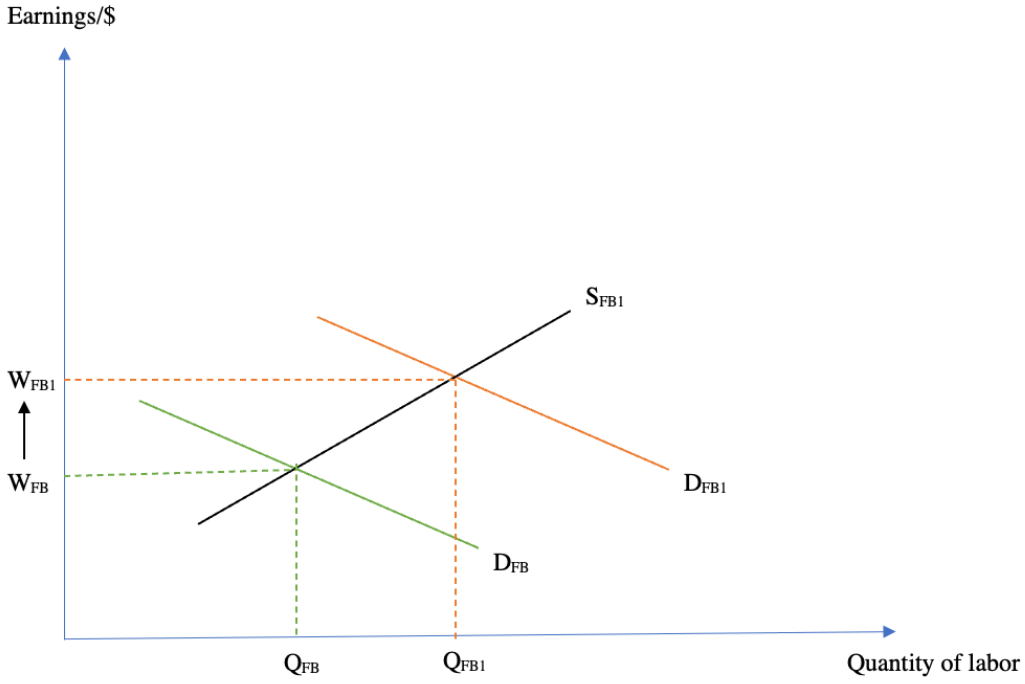


FIGURE 2: Demand And Supply For Foreign Born Labor Before And After Pandemic

Figure 2 represents the changes in the market of foreign-born workers only. The demand for foreign born labor shifts outwards to D_{FB1}. The increase in demand can be explained by the urgency caused the virus. According to the New York Times, “medical staff providers are also

trying to speed up the import of qualified foreign health care workers, many of whom have been waiting years for permission to enter the United States" (Jordan & Correal, 2020). In addition, several states have reduced the visa restrictions imposed on the foreign-born workers (Jordan & Correal, 2020).

It should also be noted that both native- and foreign-born workers have faced the increase in pay. However, we hypothesize that this increase was proportionately more for foreign born workers than that for native born workers. As a result, this would result in the closing of the pay gap between both types of workers.

The pandemic led to employed health care workers, irrespective of their background, having access to more workload due to the escalating daily intake of patients. The increase in number of working hours for foreign born workers is likely to increase the workers' experience with the system during the challenging times. More exposure to the tasks leads to quicker development of skills. The knowledge that was supposed to be acquired in the long run is gained under a shorter time, approaching closer to the level of experience a native born may have. Therefore, the difference in human capital between foreign- and native-born workers is expected to close. With less variations in human capital, part of the pay gap will also close. The closing of the gap is also reflected in Table 1; whereby as years go by, the difference in human capital decreases and so, the wage gap between native- and foreign-born workers become smaller.

It is also hypothesized that the remaining part of the pay gap that exists after controlling for the main factors diminished due to the pandemic. As Donahue (2021) contemplates, part of this remaining gap can be attributed to discrimination. Prior to the availability of vaccination, the population was, to a great extent, exposed to the virus. Medical institutions had to take in a lot of patients. Indeed, such overwhelming situations would have required the presence of a greater

number of medical staff. In times of crisis, as shown during world wars (Walton & Rockoff, 2010), it is thought that traditional practices were largely disrupted. These disruptions to the status likely benefited marginalized groups more than the more privileged groups. The chances that both employers and patients would look at races, genders before agreeing on going through procedures is reduced.

The turmoil in the labor market will be significant for the health care sector as the demand for health care workers increased during the pandemic in the USA while the supply of workers to the health care sector could not increase due to lockdown. It is hypothesized that the pay gap between foreign- and native-born medical workers will be smaller. For this study, I plan to compare the pay gap before and after the COVID-19 pandemic and will attempt to establish whether the urgency of medical science had any impact on the pay gap.

DATA AND METHODOLOGY

Data will be collected from CPS (Current Population Survey) Annual Social and Economic Survey Supplement (ASEC). This survey contains data collected from more than 75000 US households. It involves details about the social and economic characteristics of everyone interviewed. The sample to be studied contains data values from the years 2017, 2018, 2019, 2021 and 2022. The sample does not contain data from March 2020. The pandemic was first introduced as a global pandemic by the World Health Organization in March 2020 (Northwestern Medicine). March 2020 is thus the time when the pandemic was at one of its peaks. Including data for 2020 can increase inaccuracy in the dataset. The sample is also restricted to only include post-secondary teachers, registered nurses and physicians and surgeons in the labor force working full-time and aged between 18 and 75 only.

To conduct this research, the Amin and Uyar (2020)'s paper is largely followed. The following six empirical models are used:

1. $\log(earnings_{it}) = \beta_0 + \beta_1\, FORBORN_{it} + \alpha_{it}X_{it} + \gamma_{it}\theta_{it} + u_{it}$

2. $\log(earnings_{it}) = \beta_0 + \beta_1\, FORBORN_{it} + \beta_2\, YR_{POST\,it} + \alpha_{it}X_{it} + \gamma_{it}\theta_{it} + u_{it}$

3. $\log(earnings_{it}) = \beta_0 + \beta_1\, FORBORN_{it} + \beta_3\, PHY\_SURG_{it} + \beta_4\, RNS_{it} + \alpha_{it}X_{it} + \gamma_{it}\theta_{it} + u_{it}$

4. $\log(earnings_{it}) = \beta_0 + \beta_1\, FORBORN_{it} + \beta_2\, YR\_POST_{it} + \beta_3\, PHY\_SURG_{it} + \beta_4\, RNS_{it} + \alpha_{it}X_{it} + \gamma_{it}\theta_{it} + u_{it}$

5. $\log(earnings_{it}) = \beta_0 + \beta_1\, FORBORN_{it} + \beta_2\, YR\_POST_{it} + \beta_3\, PHY\_SURG_{it} + \beta_4\, RNS_{it} + \beta_7\, (FORBORN_{it} * YR\_POST_{it}) + \alpha_{it}X_{it} + \gamma_{it}\theta_{it} + u_{it}$

6. $\log(earnings_{it}) = \beta_0 + \beta_1\, FORBORN_{it} + \beta_2\, YR\_POST_{it} + \beta_3\, PHY\_SURG_{it} + \beta_4\, RNS_{it} + \beta_5\, (FORBORN_{it} * YR\_POST_{it}) + \beta_6\, (FORBORN_{it} * YR\_POST_{it} * PHY\_SURG_{it})) + \beta_7\, (FORBORN_{it} * YR\_POST_{it} * RNS_{it}) + \alpha_{it}X_{it} + \gamma_{it}\theta_{it} + u_{it}$

where X_i is the vector of the variables that measures the various characteristics of each medical worker, θ_i is a control for the region each worker works.

X_i includes the workers' background, human capital variables amongst other factors which can impact our regression. The characteristics included in this model are citizenship of each worker, the number of years since entry in the US, educational attainment, and socio-economic disparities. These differences are noted to prevent disparities and thus controlling for variations between the two groups. For instance, to prevent human capital differences, the highest educational level of each worker is considered and separated into categorical variables. Socio economic differences such as gender, race, age, marital status, whether the person is a union member is also considered. Race is classified as categorical variable, whilst marital status, gender will be regarded as dummy variables. The option that the worker is a union member is also considered since being in a union can give a worker more bargaining power. As such, the latter will have a better ability to fight for a higher earnings rate.

To avoid any geographical disparities and partly account for the different living standards, θ_i is used. The workers are classified in accordance with the metropolitan status of the areas in which they reside. The metropolitan status is treated as dummy variable with a value of one being given if it is a metropolitan area.

Table 2 below summarizes the means earnings of some important variables and Table 3 provides a breakdown of the different categories of variables which have been considered.

Table 2: Mean Earnings For Each Variable (*N=11830*)

Occupation	Number Of Workers	Mean	Standard Deviation
Physicians And Surgeons	2358	234540.32	199977.89
Registered nurses	6854	71678.34	53506.53
Post Secondary Educators	2618	88425.18	79991.43

Table 3: CPS Annual Social and Economic Survey Supplement: Sample Data Descriptive Statistics (*N=11830*)			
Variable Name	Variable Abbrievation	How Is It Measured?	Mean/Proportion
Dependent Variable:			
log(Earnings)	LNEARNS	Numerical Value	11.26
Key Independent Variables:			
Foreign Born	FORBORN	1: Foreign born	20.60%
		0: Native born (Reference Group)	79.40%
Post COVID-19	YR_POST	1:Post the pandemic effects (2021, 2022)	36.86%
		0: Years Before the effects pandemic (2017 to 2019) (Reference Group)	63.14%
Control Variables			
Human Capital Variables			
Educational Attainment	BACH	Bachelor's Degree	40.35%
	MS	Masters' Degree	17.34%
	PROFCERTIF	Professional Certificate	16.78%
	PHD	PhD (Reference Group)	25.53%
Demographic Variables			
Gender	SEX	1: Female	68.77%
		0: Male (Reference Group)	31.23%
Marital Status	MARI_STATUS	1: Married	68.93%
		0: Single/Divorced/Widowed (Reference Group)	31.07%
Age	AGE	Numerical Value (18,75)	44.26
Union	UNION	1:Union Member	2.49%
		0: Not a union member (Reference Group)	97.51%
Race	BLACK_R	Black	10.48%
	ASIAN_R	Asian	12.69%
	OTHER_R	Other	1.95%
	WHITE_R	White (Reference Group)	74.88%
Years Since Entry To The US	TEN_YRS	Less than 10 years	4.18%
	MORE_TEN_YRS	Above 10 years	10.89%
	ZERO_YRS	If in the US since birth (Reference Group)	79.40%
Class Of Worker	FED_CLASS	Federal	3.24%
	STATE_CLASS	State	14.55%
	OTHER_CLASS	Other	5.89%
	PRIVATE_CLASS	Private (Reference Group)	76.31%
Occupation	PHY_SURG	Physicians And Surgeons	19.93%
	RNS	Registered nurses	57.93%
	PS_EDUC	Post Secondary Educators (Reference Group)	22.13%
Geographic Variables			
Area of Residence: Metropolitan Status	METRO_STATUS	1:Metropolitan	85.07%
		0: Non-Metropolitan (Reference Group)	14.93%

A difference in difference is carried out through the R software. The regressions are estimated multiple times to study the effects of the pandemic and the effects of being a foreign-born medical worker. To analyze whether this difference in earnings is solely due to the pandemic, the education sector is picked as a treatment variable for occupations.

Based on the parallel trends' assumption, the difference in how the market of post-secondary teachers and that of health care workers responded allows for a difference in difference comparison. It is expected that both fields previously behaved nearly similarly, in terms of fluctuations of the earnings. Nonetheless, during the pandemic, the services of the education sector were not urgently needed during the pandemic when compared to the medical sector. Post-secondary educators in this study act as the untreated variable and comparing this occupation to health care explains whether the changes in earnings are solely due to the pandemic.

This specific occupation will act as a control in the models. Post- secondary teachers are also very closely related to the health care workers in terms of the level of education. Most of both health care workers and post-secondary teachers require either a professional degree or a PhD to qualify for employment. The similarities between both noble professions will reduce variations between the data.

The sample data along with medical workers thus also includes post-secondary educators. In addition, the standard errors are clustered according to the individuals' geographical variable. These regression models do not only compare the coefficients on our dependent, independent variables, but they also provide additional information from the use of the dummy variables.

The purpose of this paper is to explore the changes in earnings before and after the pandemic. Based on previous studies, β_1 is expected to be negative. For medical workers with similar backgrounds living and working in same regions of country, the working hours of foreign-born workers is estimated to be less, accounting for the pay disparity that exists after controlling for all variations. It is also expected that being a foreign-born worker is associated

with an increase in the level of earnings after the pandemic. Consequently, $\beta_5, \beta_6, \beta_7$ are expected to have positive values. The possible reduction in discrimination will cause a larger increase in earnings for the foreign-born workers compared to native born workers. A closing in the pay gap between native- and foreign-born workers is expected to be seen.

FINDINGS AND DISCUSSION

Using the software R, the regressions were carried out. [1]Table 4 below reflects a summary of the results:

Table 4: Regression Results

Regression Model:	1	2	3	4	5	6
Variables:						
FORBORN	-0.126***	-0.134***	-0.089***	-0.098***	-0.085***	-0.085
	(0.030)	(0.030)	(0.028)	(0.028)	(0.031)	(0.042)
YR_POST		0.111***		0.126***	0.132***	0.114***
		(0.013)		(0.012)	(0.014)	(0.030)
PHY_SURG			0.844***	0.847***	0.847***	0.855***
			(0.022)	(0.022)	(0.022)	(0.029)
RNS			0.027	0.02	0.02	0.029
			(0.019)	(0.019)	(0.019)	(0.024)
FORBORN*YR_POST					-0.03	0.064
					(0.030)	(0.059)
PHY_SURG*YR_POST						0.054
						(0.044)
RNS*YR_POST						0.014
						(0.035)
Difference In Difference Coefficients						
PHY_SURG*FORBORN*YR_POST						-0.127
						(0.085)
RNS*FORBORN*YR_POST						-0.133*
						(0.073)
R^2	0.232	0.236	0.331	0.337	0.337	0.338
CONTROLS	YES	YES	YES	YES	YES	YES

Note: The dependent variable is the log of earnings. Standard Errors in parentheses have been clustered by geographic variable.

Significance Levels are denoted by * p ≤ .10; ** p ≤ .05; *** p ≤ .01

[1] See Table 4a in Appendix for more details.

In Model (1), an analysis using all the control variables was carried out to identify the relationship between the log of earnings and being a foreign-born worker. In this regression, the different occupations of the workers were not controlled for. Like our predicted hypothesis, it turns out that on average for the occupations chosen, being a foreign worker has a negative impact on the amount of earnings. Being a foreign-born worker is in fact associated with a 12.6% decrease in the earnings when compared to being a native-born worker. The results coincide with our theories of human capital differences as well as market discrimination.

A similar regression was carried out in Model (2). In this analysis, however a dummy variable for the post COVID period was also added. It can be deduced that the years post COVID-19 pandemic brought along an increase in the earnings of workers in the sample, irrespective of their occupation and country of origin. As predicted by the demand and supply model, all workers experience an increase in the pay after COVID pandemic. Working in post the pandemic period is associated with an increase in earnings by 11.1% compared to when working during the period before the pandemic.

In Model (3) the occupation of the workers is categorized, and it can be concluded that β_1 is -0.089 significant at 1% level. Once again, the negative β_1 is in line with the findings from previous studies. It can also be deducted that being in the health care sector is associated with a positive impact on the earnings than being in the education field. While part of the differences in occupational pay gap can be explained by the different factors of demand and supply, according to Bublitz and Regner (2022), the difference in occupational earnings, can also be attributed to the social pay gap. It can also be highlighted that the value of R-squared in this model is greater than the previous two ones.

Model (4), like Model (2) indicates the positive impact on earnings associated with the effects of pandemic. With the variations in occupations now controlled, being a worker in any year post the COVID pandemic (2021, 2022) is associated with a 12.6% increase in earnings compared to prior to the pandemic. Like Model (2), the effect can be explained by the differences in demand and supply of the labor market during the pandemic.

As for Model (5), an interaction term is introduced. Model (5) studies the earnings' gap between being a foreign born after the pandemic and a native-born worker after the pandemic. Being a foreign-born worker post the pandemic is associated with a negative impact of 3 percentage points on the level of earnings when compared to a native-born worker after the pandemic. In this case, while both native- and foreign-born workers witnessed an increase in earnings, this increase is larger for native workers. The earnings gap, which exists after controlling for all listed human capital differences, can account for an unexplained factor, which can be attributed to market discrimination.

Model (6) looks at the effect of being a foreign-born worker after the pandemic in each health care occupation on the earnings compared to the control group. It may be concluded from Model (6) that after the pandemic, there has been a general 11.4%, significant at 1% level, increase in the earnings. Nonetheless, using the same model, it can be denoted that the value of this increase is affected by both the occupation and origin of the worker. For instance, Model (6) shows that being a foreign-born worker after the pandemic is associated with a positive impact in the level of earnings compared to being in the pre-pandemic period. However, it is also denoted that being a foreign-born physician and surgeon after pandemic is associated with a negative impact of 12.7% in the additional level of earnings compared to reference group. A negative

impact on the earnings of about 13.3% can also be associated with being a foreign-born registered nurse after the pandemic when compared to the reference group.

Through the regression models, it is found that all workers experienced an increase in their nominal earnings after COVID. However, this increase is impacted by the occupation as well as by the citizenship of the worker.

It can also be concluded that the initial hypothesis cannot be fully accepted. The increase in earnings between native- and foreign-born workers vary when occupations are controlled for.

The negative impact of being a foreign-born physician and surgeon, and registered nurse after the pandemic can possibly be explained by the limitations of visas. While some states were in the process of reducing the regulations imposed on foreign born workers, most foreign-born health care workers were not eligible to move around the country due to the restrictions on their visas. They had to practice only where they matched their residencies (Chen, 2020).

To confirm the results, the regression models were run again using R with more restrictions on the dataset. In this sample, data from the year 2022 was omitted. Only March 2021 was considered in the post-COVID period. The sample was thus reduced to 9711 values. From a survey by the University of Minnesota, it is shown that most of the respondents were returning to their life as it was before the pandemic in March 2022 (Soucheray, 2022). If the pandemic was a minor bump that did not persist for long time, to improve the accuracy of the data, March 2022 was omitted from the sample data. [2]Table 5 shows the regression results.

[2] See Table 5a in Appendix for more details.

Table 5: Regression Results						
Regression Model:	1	2	3	4	5	6
Variables:						
FORBORN	-0.175***	-0.179***	-0.137***	-0.142***	-0.134***	-0.108**
	(0.034)	(0.034)	(0.032)	(0.032)	(0.033)	(0.044)
YR_POST		0.085***		0.107***	0.113***	0.125***
		(0.013)		(0.016)	(0.017)	(0.039)
PHY_SURG			0.837***	0.841***	0.841***	0.851***
			(0.025)	(0.025)	(0.025)	(0.030)
RNS			0.021	0.017	0.017	0.033
			(0.021)	(0.021)	(0.021)	(0.025)
FORBORN*YR_POST					-0.029	0.007
					(0.038)	(0.075)
PHY_SURG*YR_POST						0.063
						(0.057)
RNS*YR_POST						-0.036
						(0.045)
Difference In Difference Coefficients						
PHY_SURG*FORBORN*YR_POST						-0.104
						(0.110)
RNS*FORBORN*YR_POST						-0.046*
						(0.092)
R^2	0.237	0.239	0.334	0.337	0.337	0.338
CONTROLS	YES	YES	YES	YES	YES	YES
Note: The dependent variable is the log of earnings. Standard Errors in parentheses have been clustered by geographic variable.						
Significance Levels are denoted by * $p \leq .10$; ** $p \leq .05$; *** $p \leq .01$						

As observed from Table 5, all six models show the negative β_1, irrespective of the occupations chosen. It is derived that being a foreign-born worker is associated with a negative impact on the earnings. Despite having one year omitted, the results for β_1 are significant at 1% level. Models 2, 4, 5, and 6 also confirm the initial hypothesis and demonstrate how the impact of COVID-19 is correlated with a general increase in the level of earnings irrespective of the occupations of the workers. For instance, in Model 2, working in a post-pandemic time is associated with an 8.5% general increase in the level of earnings. In fact, like Table 4, these new regressions also show that being a health care worker is related to a positive impact on the

earnings when compared to the reference group: post- secondary teachers. From Model 6 of Table 5, it can still be noted that the general increase in the post-pandemic period differs from one occupation to the other and the nationality of the workers also plays a great role.
For instance, the results show that being a foreign-born registered nurse after pandemic is associated with a negative impact of 4.6% in the additional level of earnings compared to post-secondary educators. Nonetheless, being a foreign-born worker, itself is related with a positive impact on the increase in the earnings.

Once again, part of the hypothesis can be accepted; all foreign-born workers have seen a general increase in their level of earnings. However, this increase once again varies according to the occupation.

LIMITATIONS

This study certainly has some other limitations as well. Firstly, the data in the sample is limited to only one month of each year. With a larger sample, not only are results more accurate but standard errors are more likely to be minimized. Moreover, the occupations included do not necessarily pick up the changes in the pandemic. Health care workers such as practitioners, laboratorians, or physician assistants, were more exposed to the day-to-day responses (Dennon. 2023). More occupations in the health care sector could have been added in.

The sample data also keeps on changing on a yearly basis due to different individuals being surveyed. To reduce such variations across the samples, the earnings of the same individuals could have been studied over time. Another way to diminish the variations and thus, standard errors is to choose a weighted sample data. Assigning weights to the values in the data account for possibility of biasness and other statistical differences between the sample and actual population.

This dataset also uses nominal values for the earnings earned without accounting for any change in inflation. In fact, according to Economic Commission for Latin America and the Caribbean (2022), US has witnessed inflation ever since the impact of the pandemic. This data does not capture the changes in purchasing power. The increase in earnings do not fully reflect the returns to the workers.

CONCLUSION AND FUTURE WORKS

This paper has aimed to study how the earnings gap between native- and foreign-born medical workers have been affected due to the COVID-19 pandemic. The earnings difference can be attributed mainly to productivity differences as well as market discrimination.

Our hypothesis predicts that initially, there is a negative relationship between being a foreign-born worker and the earnings. However, for the medical field, the coefficient associated with both variables is expected to be less negative. The more positive value represents a probable decrease the difference in earnings gap between foreign- and native-born workers after the pandemic. The reasons behind can be explained by the changing forces of demand and supply due to the urgency of the pandemic.

To carry out the analysis, data is collected from the yearly CPS (Current Population Survey) Annual Social and Economic Survey Supplement. A difference in difference regression is carried out to study i) the effect of the pandemic ii) the effect of being a foreign-born worker and iii) the effect of being a health care worker. Through the parallel trends ample data for post-secondary teachers is also collected to be used as a treatment variable.

As per the regression results, it may be concluded that our initial hypothesis can be accepted to some extent. The initial negative β_1 coefficient related to being a foreign-born

worker can be clearly analyzed in all the regression models, even when controlling for the effect of the pandemic. After the pandemic, it is studied that there has been an increase in the earnings irrespective of the origin of the worker. Nonetheless, this increase has been more for native born workers than for foreign born ones. A more restricted dataset was run, and it can be deduced that most of the results still stand valid.

Therefore, we fail to accept the second part of the hypothesis for the studied occupations in health care. It seemed as if for the pandemic, foreign born workers in the health care sector did not see a closing gap in their earnings amount compared to native born ones.

For future works, it will be interesting to see how the differences in earnings keep changing throughout more years after the pandemic. The duration of the effect of the pandemic can also be studied. While the medical field has been a good focus, more occupations in this specific area can be looked at. Are the variations in earnings significant within the medical field itself due to the pandemic? A further analysis of several medical occupations over a longer time will indeed provide more accurate results.

ACKNOWLEDGEMENTS

I extend my sincere gratitude to the Economics Department at Lycoming College for all the valuable insights as well as to Joanne, and Arthur Haberberger for providing the fellowship that has aided me in conducting my research.

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APPENDIX

Table 4a

Table 4a: Regression Results						
Regression Model:	1	2	3	4	5	6
Intercept	10.616***	10.82***	10.342***	10.306***	10.303***	10.616***
	(0.034)	(0.034)	(0.034)	(0.034)	(0.034)	(0.036)
Variables:						
FORBORN	-0.126***	-0.134***	-0.089***	-0.098***	-0.085***	-0.085
	(0.030)	(0.030)	(0.028)	(0.028)	(0.031)	(0.042)
YR_POST		0.111***		0.126***	0.132***	0.114***
		(0.017)		(0.012)	(0.014)	(0.030)
BACH	-0.140***	-0.141***	0.020	-0.021*	0.021	-0.140****
	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
MS	-0.084***	-0.083***	0.034*	0.036*	0.035*	0.042**
	(0.021)	(0.021)	(0.019)	(0.019)	(0.020)	(0.023)
PROFCERTIF	0.542***	0.538***	0.078***	0.070***	0.070***	0.072***
	(0.021)	(0.021)	(0.023)	(0.023)	(0.023)	(0.023)
SEX	-0.283***	-0.285***	-0.175***	-0.174***	-0.174***	-0.174***
	(0.015)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
MARI_STATUS	0.176***	0.175***	0.151***	0.150***	0.150***	0.150***
	(0.014)	(0.014)	(0.013)	(0.013)	(0.013)	(0.013)
AGE	0.013***	0.013***	0.014***	0.014***	0.014***	0.014***
	(0.0006)	(0.0006)	(0.0005)	(0.0005)	(0.0005)	(0.0005)
UNION	-0.030	-0.025	0.017	0.023	0.023	0.023
	(0.041)	(0.040)	(0.038)	(0.038)	(0.038)	(0.038)
BLACK_R	-0.068***	-0.183***	-0.105***	-0.123***	-0.120***	-0.124***
	(0.021)	(0.021)	(0.020)	(0.020)	(0.020)	(0.020)
ASIAN_R	0.091***	0.091***	0.040*	0.039*	0.039*	0.039*
	(0.022)	(0.022)	(0.021)	(0.021)	(0.021)	(0.021)
OTHER_R	0.076*	0.066	0.079*	0.068	0.068	0.068
	(0.046)	(0.046)	(0.043)	(0.042)	(0.042)	(0.042)
TEN_YRS	-0.168***	-0.183**	-0.105***	-0.123***	-0.120***	-0.124***
	(0.042)	(0.042)	(0.039)	(0.039)	(0.039)	(0.039)
MORE_TEN_YRS	-0.149***	-0.156***	-0.114***	-0.122***	-0.121***	-0.125***
	(0.033)	(0.033)	(0.031)	(0.031)	(0.031)	(0.031)
FED_CLASS	0.162***	0.159***	0.108***	0.105***	0.105***	0.104***
	(0.036)	(0.036)	(0.033)	(0.033)	(0.033)	(0.033)
STATE_CLASS	-0.137***	-0.136***	-0.009	-0.009	-0.009	-0.010
	(0.019)	(0.018)	(0.019)	(0.019)	(0.019)	(0.019)
OTHER_CLASS	0.033	0.034	-0.054**	-0.054**	-0.054**	-0.053**
	(0.027)	(0.027)	(0.026)	(0.025)	(0.025)	(0.025)
PHY_SURG			0.844***	0.847***	0.847***	0.855***
			(0.022)	(0.022)	(0.022)	(0.029)
RNS			0.027	0.02	0.02	0.029
			(0.019)	(0.019)	(0.019)	(0.024)
Interaction Terms:						
FORBORN*YR_POST					-0.03	0.064
					(0.030)	(0.059)
PHY_SURG*YR_POST						0.054
						(0.044)
RNS*YR_POST						0.014
						(0.035)
PHY_SURG*FORBORN*YR_POST						-0.127
						(0.085)
RNS*FORBORN*YR_POST						-0.133*
						(0.073)
R^2	0.232	0.236	0.331	0.337	0.337	0.338
Note: The dependent variable is the log of earnings. Standard Errors in parentheses have been clustered by geographic variable.						
Significance Levels are denoted by * $p \leq .10$; ** $p \leq .05$; *** $p \leq .01$						

Table 5a

Table 5a: Regression Results						
Regression Model:	1	2	3	4	5	6
Intercept	10.576***	10.561***	10.296***	10.279***	10.277***	10.265***
	(0.038)	(0.038)	(0.038)	(0.038)	(0.038)	(0.040)
Variables:						
FORBORN	-0.175***	-0.179***	-0.137***	-0.142***	-0.134***	-0.108**
	(0.034)	(0.034)	(0.032)	(0.032)	(0.033)	(0.044)
YR_POST		0.085***		0.107***	0.113***	0.125***
		(0.017)		(0.016)	(0.017)	(0.039)
BACH	-0.127***	-0.127***	0.027	0.029*	0.029*	0.031*
	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)
MS	-0.056**	-0.055**	0.047**	0.049**	0.049**	0.054**
	(0.023)	(0.023)	(0.022)	(0.022)	(0.022)	(0.022)
PROFCERTIF	0.558***	0.556***	0.096***	0.090***	0.090***	0.090***
	(0.024)	(0.024)	(0.025)	(0.025)	(0.025)	(0.025)
SEX	-0.295***	-0.296***	-0.176***	-0.175***	-0.175***	-0.176***
	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)	(0.016)
MARI_STATUS	0.178***	0.177***	0.156***	0.154***	0.154***	0.154***
	(0.016)	(0.016)	(0.015)	(0.015)	(0.015)	(0.015)
AGE	0.014***	0.014***	0.015***	0.015***	0.015***	0.015***
	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)	(0.0006)
UNION	-0.036	-0.034	0.011	0.014	0.014	0.015
	(0.044)	(0.044)	(0.041)	(0.041)	(0.041)	(0.041)
BLACK_R	-0.061**	-0.061**	-0.043*	-0.043*	-0.042*	-0.043**
	(0.024)	(0.024)	(0.022)	(0.022)	(0.022)	(0.022)
ASIAN_R	0.117***	0.116***	0.061***	0.060***	0.060***	0.059**
	(0.024)	(0.024)	(0.022)	(0.022)	(0.022)	(0.022)
OTHER_R	0.059	0.054	0.066	0.06	0.06	0.06
	(0.053)	(0.053)	(0.049)	(0.049)	(0.049)	(0.049)
TEN_YRS	-0.236***	-0.245**	-0.169***	-0.179***	-0.177***	-0.182***
	(0.025)	(0.025)	(0.023)	(0.023)	(0.023)	(0.023)
MORE_TEN_YRS	-0.197***	-0.201***	-0.164***	-0.168***	-0.167***	-0.169***
	(0.037)	(0.037)	(0.035)	(0.035)	(0.035)	(0.035)
FED_CLASS	0.157**	0.155***	0.111***	0.108***	0.108***	0.107***
	(0.040)	(0.040)	(0.037)	(0.037)	(0.037)	(0.037)
STATE_CLASS	-0.134***	-0.133***	-0.004	-0.004	-0.004	-0.005
	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)
OTHER_CLASS	0.045	0.045	-0.052*	-0.052*	-0.052*	-0.052*
	(0.030)	(0.030)	(0.028)	(0.028)	(0.028)	(0.028)
PHY_SURG			0.837***	0.841***	0.841***	0.851***
			(0.025)	(0.025)	(0.025)	(0.030)
RNS			0.021	0.017	0.017	0.033
			(0.021)	(0.021)	(0.021)	(0.025)
Interaction Terms:						
FORBORN*YR_POST					-0.029	0.007
					(0.038)	(0.075)
PHY_SURG*YR_POST						0.063
						(0.057)
RNS*YR_POST						-0.036
						(0.045)
PHY_SURG*FORBORN*YR_POST						-0.104
						(0.110)
RNS*FORBORN*YR_POST						-0.046*
						(0.092)
R^2	0.237	0.239	0.334	0.337	0.337	0.338
Note: The dependent variable is the log of earnings. Standard Errors in parentheses have been clustered by geographic variable.						
Significance Levels are denoted by * p ≤ .10; ** p ≤ .05; *** p ≤ .01						