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Keep America Great: The Effect of the H-1B Visa on the STEM Sector

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By

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Abstract

How foreign-born workers affect the domestic labor market has been a long-standing debate in the history of the United States. Occupations in the fields of Science, Technology, Engineering and Mathematics are a fast-growing segment of the U.S. labor market. The purpose of this thesis is to answer three questions: (1) Do foreign born workers with H-1B visas workers impact native employment within the STEM sectors? (2) Does the prevailing average wage of an H-1B visa worker have an impact on the wages of native born employees? (3) How is international student enrollment affected by employer's demand for the H-1B visa. After analyzing the available data, my findings suggest that H-1B workers are used as a complement to native workers and there is no significant impact on the wages of native workers, however international enrollment is negatively affected by an increase in demand for the H-1B visa.

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1. Introduction

On April 18, 2017, President Trump signed the *Buy American, Hire American* Executive Order, which attempts to create higher wages and employment rates for US workers and to protect their economic interests by rigorously enforcing and administering [their] immigration laws (United States Citizenship and Immigration Services, 2017). At the heart of this debate lies the “Specialty Occupation and Fashion Models” visa, more commonly known as the H-1B visa. The order directed the Department of Homeland Security to co-ordinate with other government agencies to advance policies to help ensure H-1B visas are awarded to only the most-skilled or highest-paid beneficiaries (USCIS, 2017).

After the President signed the executive order, the U.S. Citizenship and Immigration Services (USCIS) has increased its scrutiny of H-1B applicants. In 2017, the USCIS sent out 40% more requests for additional information (Kasperkevic, 2018). Two additional strains were also imposed on employers. First, the process of applying for the visa has become more complex and time consuming, and second, if the USCIS believes that the employer does not need the H-1B recipient for the entire three-year period, the USCIS will issue a visa for a shorter time (Kasperkevic, 2018). Many employers believe that America has not and continues to not produce enough graduates that are appropriately skilled to fill these jobs. Therefore, they need to bring in foreign-born workers to fill the gaps (Kasperkevic, 2018). Others believe that the reform of the H-1B visa could be beneficial because it would highlight any potential misuses of the program since it will identify any loopholes and exploitations of the program (Kasperkevic, 2018).

These new restrictions and additional information requests have already impacted the labor market. Due to the Administration’s new policies, skilled workers from countries such as India appear to be turning away from the United States (US) and to countries like Canada instead

(Smith, 2018). Canada is a country where racial anxieties appear to be notably less prevalent, and it admits much greater numbers of high-skilled immigrants relative to its population (Smith, 2018). In 2017 alone, Canada increased its intake of skilled workers by 7.5% and announced a new program to approve visas for these workers in 2 weeks in contrast to the 6 or 7 months it takes in the US (Smith, 2018). Losing foreign-born workers can potentially be a huge problem for the United States, as skilled immigrants are a key part of the US economy (Smith, 2018). Between 1995 and 2005, immigrants have started more than half of the new businesses in Silicon Valley and as of 2011 more than 40% of the Fortune 500 companies were started by immigrants or their children (Smith, 2018).

However, there is another school of thought which believes that non-immigrant workers on H-1B visas are being hired over qualified American workers because the H-1B visa allows employers to pay those workers less. There is research that suggests that this concern may be overblown (Smith, 2018). There is evidence which suggests that companies that have the chance to hire more H-1B workers' pay lower wages, but there is also evidence that shows that H-1B workers are not paid less than native-born Americans, after accounting for their age and skill levels (Smith, 2018). In turn, these diffuse companies and allow businesses to innovate faster and hire more workers as well as pay higher wages (Smith, 2018). Skilled foreigners help keep new ideas flowing in technology clusters like Silicon Valley; Austin, Texas; and Raleigh, North Carolina (Smith, 2018). A study by economists Giovanni Peri, Kevin Shih, and Chad Sparber found that increases in [foreign] Science, Technology, Engineering and Mathematical (STEM) workers are associated with significant wage gains for college-educated native workers. Their results imply that foreign STEM [workers] increase total factor productivity growth in US cities (Smith, 2018). Therefore, if the new immigration policies break the wage growth cycle, the tech industry may decide to relocate to countries where policies are more immigrant friendly like Canada, or even emerging economies like China or India (Smith, 2018). The move of the tech industry would have very significant impacts on the labor force, resulting in fewer desired jobs and lower wages for American workers, skilled and unskilled (Smith, 2018).

The H-1B policy does not only affect existing native workers and foreign-born workers but also the future foreign-born labor force, i.e. international students. The number of F-1 visas (which allows international students to enroll in United States colleges and universities), had decreased by 17% in the year that ended in September of 2017 (Kavilanz, 2018). The 'America First' mantra seems to be causing [international students] some anxiety and concern. It appears to be negatively affecting schools who rely heavily on the enrollment of international students. The biggest decline in visa approvals in 2017 were seen among students from Asian countries, particularly those from China and India who usually account for the largest number of F-1 visas (Kavilanz, 2018). Instead, students are choosing to go to countries like Canada, Germany, and Australia. These countries are making it easier for international students to stay in the country after they graduate and become part of the workforce (Kavilanz, 2018). The Administration's tougher stance on the H-1B foreign work visa makes it harder for new graduates to remain in the country and it could be deterring overseas students from applying to American colleges (Kavilanz, 2018).

In my analysis I focused on three research questions: (1) Does having H-1B visa workers affect native employment within the STEM sector? (2) Does the prevailing average wage of an H-1B visa worker have an impact on native employees' annual average wages? (3) How is international student enrollment affected by the demand for the H-1B visa? The first two questions focus primarily on how holders of the visa impact native (United States Citizens) proportional employment and their wages in the US STEM sectors. The third question may allow policy makers to see how changing policy regarding a work visa could affect college and university enrollment in the US in the following years.

My findings regarding my first question suggest that there is a positive relationship between the employment of H-1B workers and native workers within the STEM sector. The relationship varies across different states in the US. The interesting states to consider are the ones that hold the highest H-1B holders such as California, Texas, New York and Michigan which showed no significance at any level which implies that H-1B visa workers are not used as substitutes but as complements. On the second question, I found that H-1B prevailing wages in the STEM sector have no impact on native average wages. This result varies between the states, again with an emphasis on California, Texas, New York and Michigan which showed no significance among the coefficients. On the third question regarding enrollment of international students, I show that enrollment is impacted by the demand/competitiveness for the H-1B visa. These results hold strong implications for future policy because they indicate that any decrease in the cap for the visa will likely have a negative effect on enrollment in US colleges and universities with down the road impacts on the US labor market within the STEM sector. As well, since the policy affects international enrollment it means that tuitions in colleges and universities will be impacted and may need to change based on the number of foreign students who are still willing to attend universities and colleges in the United States.

In my study, I analyzed how the caps on the H-1B visa effected the STEM labor market in terms of proportions of foreign and native workers and their average wages. I am contributing support to the existing literature because my results show similar results. My study differs from the ones above because I could not examine individual level data but analyzed aggregate impacts at the state level. I am also adding support to the literature previously published on international student enrollment and the effect the H-1B cap policy has on their decision to attend university or college in the US. I am contributing to future literature by combining the current effects of the H-1B visa on the STEM sector and creating an OLS regression to estimate how the international student enrollment over the past 16 years has been affected by the decrease in the cap of the H-1B visa. I am also attempting to contribute more recent analysis to the literature since there have not been any studies published about the implications of President Trump's current visa policy decisions.

This paper is divided into nine sections. In the first section, I provide background on the H-1B visa, as well as on the F1 and Optional Practical Training (OPT) status. The second section contains literature review, divided into subsections. My third and fourth sections will discuss where I obtained my data from, the variables used and a subsection for the limitations of the data. Sections five through seven will discuss my methodology, results, discussion and a subsection for policy implications. Section eight contains my concluding remarks.

1.1 H-1B, F1 and OPT Background

The H-1B visa was created by the Immigration Act of 1990 and is a class of visa that allows employers to hire foreigners to work on a temporary basis in jobs that require highly specialized knowledge (Pew Research Center, 2017). In order for a job to qualify as a specialty occupation it must meet one of the criteria outlined by the USCIS. The job must require at least a bachelor's degree or higher and this must be common practice for the job industry. Essentially, the employer has to prove that the occupation is so complex or unique that it can only be performed by an individual with a degree (USCIS, 2017). Furthermore, the nature of the specific duties is so specialized and complex that the knowledge required to perform the duties is usually associated with the attainment of a bachelor's or higher degree (USCIS, 2017).

When the visa was introduced in 1990, the United States government capped it at 65,000. In 1999, the cap was raised to 115,000 visas and then again in 2001, to 195,000. Due to the economic slowdown and backlog in 2002, fiscal year 2003 was the only year that the cap was not fully utilized (Salmon and Sherk, 2008). Since then, the cap was lowered back to 65,000 and employers have used every authorized visa. The visas run out very fast in the lottery: in 2007, employers used up the entire quota in less than a day after the USCIS started to accept applications. It is important to note that there are an extra 20,000 visas issued to foreign-born workers with a master's degree or higher and due to trade deals, alternative visas for countries such as Canada, Chile, Mexico and Singapore (Shih, 2016).

STEM occupations play a critical role in the United States economy. According to American Immigration Council, STEM workers are responsible for many of the new and innovative ideas and technologies that create jobs and raise the living standards of U.S. households (American Immigration Council, 2017). Foreign-born workers make up a growing share of the US STEM workforce. In fact, foreign-born STEM workers are more likely than native born STEM workers to obtain a patent in computing, electronics, medical devices and pharmaceuticals (American Immigration Council, 2017).

In the US, the total number of STEM workers has almost doubled since 1990. Currently, STEM workers plus health and social science professionals make up about 12.6% of the workforce (American Immigration Council, 2017). As well, since 1990 the share of foreign-born workers in the STEM workforce has also almost doubled. In 2015, there were 3.9 million foreign-born workers in the STEM field, almost 19.3% of the workforce (American Immigration Council, 2017).

The F1 visa is a class of visa that is issued to international students who are attending an academic program or English Language Program at a university or college in the United States (F1 Student, no year). F1 students are required to keep a certain minimum course load in order to be considered full time students. They can remain in the United States 60 days beyond the length of time that it takes for them to complete their academic program, unless they have applied for a stay and work visa under the Optional Practical Training (OPT) program (F1 Student, no year).

The United States has more foreign students enrolled in their colleges and universities than any other country in the world. Much of the growth in the enrollment of international students has happened since the start of the Great Recession (Pew Global Center, 2017). Students come from all over the world, but 54% of the students come from China, India and South Korea (Pew Global Center, 2017).

Once an international student has graduated, they are eligible for a different status— the OPT status, which allows students to work in the United States for a year. The job they seek must be directly related to their major field of study in order to qualify for OPT (H1Base, 2000). Generally, after the OPT year runs out, the student changes their visa status to the H-1B visa upon finding a sponsoring employer. There is a one-time extension for students who qualify under STEM degrees for 17 extra months (H1Base, 2000). Part of their decision is based on how the H-1B visa policy is implemented under each administration and the ease and expense of obtaining one. In my analysis, I looked at how the change in demand affected whether or not students chose to enroll in United States universities and colleges.

1.2 Why STEM?

Due to our reliance on technology, the STEM fields are growing. There are more opportunities for students to gain a job in the field especially with the Silicon Valley booming and many states becoming homes for new technologies.

The H-1B visa goes to applicants with a specialty occupation and those are ones with a bachelor's or higher degree. Over 99% of the STEM employment was in an occupation that typically require some type of postsecondary education for entry, compared with 36% of overall employment (Fayer, S., Lacey, A., & Watson, A. 2017). Between May 2009 and May 2015, there were over 800,000 net STEM jobs that were added to the U.S. economy (Fayer, S., Lacey, A., & Watson, A. 2017). Since the STEM sector is a fast paced, fast growing industry I decided to focus my analyses on the sector that has the highest recipients for the H-1B visa.

2. Literature Review

2.1 Diversity within the workplace

Diversity within the workplace has become a common focus of almost every firm. Firms are trying to showcase their inclusivity by hiring people of different genders, races, nationalities and religions. This leads to the question of *does diversity have an impact on the workforce or is it just nice to include everyone?* Herring (2009) published a study to analyze how race and gender diversity in the workplace can affect firms' outcomes, such as their sales revenue, their number of customers, and whether with diversity their market share and profits increase. He developed seven hypotheses each looking at how one specific variable, such as a business organization's sales revenue or its number of customers, changes as race and gender diversity in the workplace increases. Herring used data from the National Organizations Survey from 1996 to

1997 to gauge business performance and track racial diversity. To gauge business performance, he used the variables: sales revenue, number of customers, relative market share, and relative profitability. To track racial diversity, he used two different indexes: Racial Index of Diversity, and Asymmetrical Index of Diversity.

He found that racial diversity was associated with increased sales revenue, more customers, greater market share, and greater relative profits, and that gender diversity was associated with increased sales revenue, more customers and greater profits. This study is important to note because it gives support to the idea that diversity can help a company do better in the marketplace, and to the idea that H-1B visas/foreign born workers can strengthen the U.S. economy.

Another paper that looks at general diversity in the workplace is a study done by Hunt (2011). In this paper, she analyzed immigrants from different visa categories to see how they performed in the labor market, and whether their contributions made a significant impact on the labor market. She addressed the research question of immigrants in the workplace by measuring their wages and their success in creating, disseminating and commercializing knowledge as well as activities with public benefits that are likely to increase U.S. total factor productivity. Hunt (2011) specifically measured success as patenting, commercializing, and licensing patents; publishing books and papers; writing papers for major conferences; and starting successful companies.

Hunt's study used the 2003 National Survey of College Graduates to quantify the study. The data emphasized the importance of the entry visa, not the visa that the person currently holds. Hunt found that immigrants who entered the US on a student/trainee visa, or on a temporary work visa (H-1B, etc.) had a large advantage over native workers in wages, in patenting, and in publishing. She also found that immigrants who entered with legal permanent residence did not out-perform native workers. Lastly, she showed that immigrants were more likely to start companies than native workers who had similar attributes.

Hunt's study is an important addition to my analysis because it shows how the H-1B visa holder does not get paid less, contrary to the media and popular belief. In contrast, Herring's (2009) study showed much broader effects of race and gender diversification in the workplace, and supports the idea that diversity does in fact have a positive benefit on the economy. Hunt's (2011) study showed how accepting applications with different entry visas can further economic development and provide more diversity in the workplace while creating more innovation. Herring's study provided a solid background on the positive effects of diversity on the U.S. economy, while Hunt's study shows the importance of bringing people in on a work visa or a student visa to the US economy and how it can boost the economy. Ultimately, both studies establish that there are benefits to having workers that are not necessarily from the same country. The outcome relates to my study because it helps support the question of how the H-1B visa has affected the United States' labor force and if the program worth continuing. Both these studies help support the notion that continuing this program will benefit consumers and producers.

2.2 H-1B Visa Cap Trends

Mayda et al. (2017) studied the effects of the H-1B quota reduction using a triple difference strategy. The strategy determined the inner workings and effectiveness of the H-1B program to determine if the legislative negatively impacted the US economy. They compared the hiring of new and established H-1B workers in both non-profit and for-profit sectors before and after 2004. The authors wanted to see if the difference between the demand for the visa and the cap would affect the employment of the person. The authors noted that the fiscal years 2008 and 2009 were notable as aggregate demand for H-1B visas spiked and more than 150,000 applications were received within the first filing week of each year. To keep up with the demand, the US government responded by distributing all cap-subject permits with a lottery for these years. Therefore, the authors examined whether the heightened intensity of rationing during the lottery years had stronger impacts on employment and other outcomes.

The authors' analysis exploited a dataset on approved H-1B applications that was acquired through a Freedom of Information Act (FOIA) request. The individual-level information allowed them to establish the education, experience, and occupation of each approved H-1B worker, which then allowed them to filter by the variables they wanted to study.

The triple indifference model used helped the authors quantify the decline in new H-1B employment in for-profit firms relative to what would have occurred in the absence of hiring restrictions. The authors found that the cap-subject skill groups experienced an approximate 20-50% decline in H-1B employment relative to what it would have been if hiring outcomes were determined by firm demand, not legislation limit. H-1B employment fell by an additional 3-8% relative to the demand-driven level during the fiscal years 2008 and 2009.

The triple difference model that the authors designed removed the differential pre-trends between for-profit and non-profit sectors as well as between new and existing hires for each skill-specific labor market. The results remained stable, so the authors added more controls and added coexistent shocks to the visa, to see if the impact would change based off of the control variables.

It is important to note that with the cap reduction, H-1B employment fell without generating any offsetting rise in native employment. Thus, Mayda et al (2017) found the results provided no evidence for short-run native and H-1B labor substitutability. The conclusion is useful for my study because it supports my hypothesis that H-1B workers are compliments to native workers and not substitutes. The result also suggested that innovation waned as native employment remained stable while specifically H-1B employment fell.

The authors also assessed whether the quota affected the selection of new H-1B employees and the types of firms that participate in the H-1B program. They established that the policy change also redistributed H-1B labor toward firms that employed 50 or more H-1B workers each year and away from employers that used the program less; ultimately the policy led to an increase in the concentration of H-1B workers in fewer firms.

In the end, the authors found that 80% of for-profit firms accounted for 40% of new H-1B hires. The concentration then grew after the fall in cap, where 80% of the firms accounted for only 20% of new hires. The H-1B restrictions also led to a compositional shift in the new H-1B employment favoring Indian-born workers, computer-related occupations, and firms that used the H-1B program heavily. Their concluding interpretation of the results was that acute visa restrictions increased the importance of labor networks, economies of scale in hiring foreign-labor, and skill in navigating the H-1B program. The work the authors did indicated that further reducing the H-1B cap was likely to further skew the characteristics of the H-1B program. Mayda et al.'s (2017) study highlights the limitations and vulnerabilities of the cap on the H-1B program and if taken further could possibly show the long-term consequences for cap reduction such as lost innovation or the tech sector moving out from the United States.

Watts (2001) argued that the debate over increasing the H-1B visa obscured fundamental flaws in the visa program such as compliance with the program. The debate was centered on the lack of IT workers: companies were rallying to increase the cap for the H-1B visa so that they were able to hire foreign-born workers who had the satisfying qualifications. Opponents of the visa argued that companies should hire American workers and retrain them instead of raising the cap. Watts's paper showed that the hiring of visa holders created a more open labor market, but it also restricted the worker to the specific employer that the visa was issued to. In turn, the binding of the employee to the employer affected the market in a different way – it created less labor market mobility for the foreign worker and more preference for cheap labor. Watts concluded by saying that loopholes in the H-1B program, combined with limitations on the Department of Labor's ability to enforce H-1B requirements, gave employers an advantage over H-1B holders. These loopholes needed to be reduced so that H-1B workers were not being exploited. This study offered an alternative position from the other articles' that I have analyzed because it claimed that employers were able to easily exploit the H-1B workers' salaries, while other articles claimed that H-1B holders had a significant advantage in negotiating their salaries (Watts, 2001). This paper effectively pointed out what can be improved with the current visa policy to minimize loopholes and how policy makers can make the H-1B visa stronger for the future. Nonetheless, it did not provide enough evidence to explain how the loopholes are negatively affecting the program in the beginning, and it did not examine how changing the flaws of the H-1B program could equalize the playing field between H-1B holders and non H-1B holders.

Like Mayda et al (2017), Watt's paper looked at the effects of the H-1B visa on the economy. It used a broader analysis and found loopholes in the policy that can motivate employers to shortchange workers. Mayda et al (2017) in contrast, provided a more in-depth analysis of how different firms (for profit and nonprofit) reacted to the shortage or influx of H-1B workers.

Despite the limitations of both analyses, the results should still be considered in future research. For the purpose of my study, I used Mayda et al's (2017) general conclusion that lowering H-1B employment does not affect native employment and hypothesize that the H-1B workers affect native workers in positively because it has been proven that the decrease in H-1B workers does not necessarily lead to an increase of native workers.

2.3 Effects on salaries of Native and H-1B holders

Hayes and Lofstorm (2011) addressed the issue that H-1B workers were paid less than native workers and that firms actually profited from using a foreign-born worker rather than hiring a native worker. This study combined unique individual level H-1B data from USCIS and data from the 2009 American Community Survey to outline how certain variables impact earnings. Hayes and Lofstorm (2011) analyzed earning differences between H-1B visa holders and US born workers in STEM occupations. They found that the H-1B workers were younger and more skilled (measured by education) than US born workers in the same occupations. They did not find support for the notion that H-1Bs were paid less than similar native-born workers. Their evidence suggested that H-1B workers in some key STEM occupations were being paid more. I used this study to model my second regression of native workers' wages within the STEM sector being affected by H-1B workers prevailing average wages. I modified the regression by using natural logs.

The study used individual level data for people who received the H-1B visa from 2000 to 2010. The authors focused their analysis on the year 2009 to obtain the results as current as possible given their dataset. For their analysis, the authors restricted their attention to those individuals between the ages of 22 and 64, with at least a Bachelor’s degree. They further restricted their analysis to those working in the five major STEM occupation groups detailed below which constituted 74% of the 2009 H-1B holders.

The Hayes and Lofstorm (2011) used an estimated ordinary least squares (OLS) regression of annual earnings first for the pooled sample of the included STEM occupations and then separately by occupational group. The OLS regression is similar to the model that I will build for my study because the model looks at the salary changes in the STEM sector controlling for education, experience and age. In my OLS model I will not be controlling for education, experience and age because I did not have access to that data. The authors also included a dummy variable for new H-1B visa holders and a separate variable for continuation. They also included a variable for naturalized immigrants in order to provide another benchmark for the earnings of H-1B workers. The coefficients on the naturalized immigrant indicator variable represented the log earnings difference between US born workers and naturalized immigrants.

The data showed that H-1B workers on average were younger and more highly educated than both naturalized immigrant and US born workers. H-1B workers were also more than twice as likely to possess a non-professional doctoral degree as a US born worker.

The average annual earnings of H-1B workers was about 10% higher than the average annual earnings of the sample of US born workers (Lofstorm and Hayes 2011). Overall, the data analysis pointed towards H-1B workers having both higher earnings and skill levels than US born workers.

When the authors added in and controlled for the variables age and education, the estimates revealed significantly higher earnings among both new and continuing H-1Bs by more than 20%. Compared to the US workers, the estimates showed that the conditional earnings difference between H-1B and US born workers was about 10% in favor of the temporary high skilled foreign workers. The authors switched to looking at H-1B holders who renewed their visas to see if that had any implications on the results. The analysis showed that the renewed visas received a 16% salary bump, pointing toward an earnings advantage for H-1B IT workers overall.

Once age was controlled, earnings disadvantage turned to an H-1B salary premium of nearly 18% for new H-1B workers followed by an increase of close to 5% for those renewing their visas. The earnings advantage was to some extent driven by the higher schooling levels of H-1Bs compared to US born workers. When the authors controlled for education the overall H-1B earnings declined. The last controls that the authors added were for occupation and fixed effects. The results suggested that the newly arrived H-1B workers earned close to 7% more than US born workers of the same age, education and specific IT occupation, with an additional increase of about 5% for those renewing their visas.

The results changed based on occupation. In the unadjusted model specification newly, arrived engineers using the H-1B appeared to earn more than their US counterparts. The results were counteracted upon renewal of the visa. The same relationship was found for math and science occupations: there was an initial decrease in earnings for new H-1B holders but a raise upon visa renewal. When the authors controlled for education and age, the results failed to show an earnings difference between H-1Bs and their observed similar US counterparts. In healthcare occupations, H-1B workers appeared to earn more than their US born workers. However, the results declined once education was controlled for, and then the model moved in favor of the new H-1Bs holders.

In post-secondary education occupations, new H-1B workers earned more than US workers and received a boost when their visa was renewed. This advantage was overstated because of the proportion of H-1B workers with doctorate degrees. The estimates with controlled education revealed a smaller advantage for new H-1B workers than their US counterparts. Industry and detailed occupational fixed effects did not affect the results. Overall, the results showed that H-1B holders had an earnings advantage over their US counterparts as well as a higher skill set. The major shortcoming of the experiment was that the authors did not control for gender and geographical location. This means that their data could have been disproportionately male and in high-income areas, such as Silicon Valley.

Overall, this paper helps elucidate why a foreign-born worker has a higher salary in the STEM fields, and how controlling for age and education does have an effect in the employer's choice of giving the H-1B worker a higher salary. The study clearly shows that there is a difference between the wages paid to a native and a non-native born person. It disagrees with the argument that H-1B workers are hired because companies can pay them less and introduces the idea that foreign born workers may be more qualified due to their educational background than native born workers, which is a possible reason for their salary increase.

Mithas and Lucas (2010) examined how visa and immigration policies were related to the salaries of American and foreign IT professionals employed in the United States. This paper used 50,000 foreign and American IT professionals in the United States to study the wages of foreign and US citizen IT professionals.

Mithas and Lucas (2010) tested four hypothesizes to discern how a non-native IT professional's salary changes based on their educational qualifications, work experience, and whether the H-1B visa cap was fully utilized.

The authors found support for the first hypothesis: IT professionals without U.S. citizenship earned 8.9% more than those with U.S. citizenship and this difference was statistically significant. The authors also found support for the second hypothesis: IT professionals on H-1B or other work visas earned 6.8% more than those with U.S. citizenship and the relationship was also statistically significant. They also found support for the third hypothesis as IT professionals with a green card earned 12.9% more than those with a U.S. citizenship and the difference was also statistically significant. Moreover, they tested whether green card holders had a salary premium compared to those with an H-1B visa or a different work visa. An IT professional holding a green card earned 6.1% more than one with a work visa and the difference in coefficients of a green card holder against a work visa was positive as well as statistically significant.

When looking for the effects of hypothesis four, the authors created an indicator variable to designate if the visa cap was fully utilized that year. As well, they included interaction terms involving the dummy variable that indicates citizenship or visa status. The authors found support for hypothesis, and these finding suggested that lower and fully utilized visa caps increased the salary premium for H-1B professionals. Interestingly, the coefficient of the interaction term involving visa cap utilizations and green card was determined to be statistically insignificant, suggesting visa caps had no effect on salary premiums of green card holders.

Mithas and Lucas (2010) furthered their study using year-wise regressions and found that non-US citizens earned statistically significant salary premiums from 2000 to 2005, when controlling for education, experience, demographic and other institutional variables. During 2000 to 2003, the number of actual H-1B visas issued was lower than the maximum limit of 195,000 but the authors observed salary premiums for non-US citizen IT professionals during those years. During 2004, maximum quotas came down to pre-1999 levels of 65,000 and perhaps as a result, the premium rose significantly that year. During 2005, Congress allowed an additional 20,000 H-

1B work visas for foreign professionals graduating from US universities and some impact in the form of lower salary premiums was observed in 2005.

Both papers, Lofstorm and Hayes' (2011) and Mithas and Lucas' (2010), analyzed how H-1B workers' salaries changed compared to native workers' salaries. The papers used different data sets, but both found that H-1B visa holders had an advantage when it came to earnings because they tended to be higher skilled workers. Hayes and Lofstorm (2011) conducted a more detailed study, having broken down the estimates to the occupational level. Mithas and Lucas (2010) kept a broader analysis and looked at earnings each year as well as the cap fluctuations from 2000 to 2005. Of these studies, Lofstorm and Hayes' (2011) is more relevant to my analysis because it conducts a similar experiment, except instead of breaking down the H-1B holders into their individual job occupations. I looked the STEM sector as a whole broken down by state, and not as individual level data compared to the native worker's wages in the STEM sector. To help further both studies, Lofstorm and Hayes (2011) and Mithas and Lucas (2010) could have used a variable for gender, and analyzed if there was a wage gap within the H-1B salary since the STEM sector is predominately male.

2.4 Productivity

Choudhury, Ruiz, and Wilson (2012) analyzed the geography of H-1B visa requests focusing on the metropolitan areas with the highest demand between the years 2001 and 2011. Choudhury et al. (2012) saw that the demand for H-1B workers fluctuated with economic and political cycles over the ten-year time period. They found that the fluctuation reflected the employers' need for high-skilled temporary workers. The authors also found that 106 metropolitan areas had at least 250 requests for the H-1B workers in the 2010-2011 period. On average, there were about 2.2 requests for H-1Bs per 1,000 workers in the 106 metro areas, compared to 2.4 for the nation as a whole.

The metropolitan areas varied by the number of employers using the H-1B program and the cap status of the employers. The high demand in the corporate metro areas came primarily from private employers subjected to the annual visa cap. Whereas research metro areas' demand was driven by universities and other research institutions that were exempted from the cap. In the mixed metro areas, a variety of employers demanded temporary high-skilled foreign workers.

In particular, STEM employers accounted for more than half the requests in 92 of the 106 metropolitan areas. The most popular profession requesting H-1B workers was computer occupations in all but 11 of the 106 metro areas, where engineers, healthcare practitioners, and postsecondary teachers were more requested.

Lastly, the study found that H-1B visa fees that were designated for skills training and STEM education had not been distributed proportionately to metropolitan areas requesting the highest number of H-1B workers. The study showed that metropolitan areas with a high demand for H-1B workers were receiving on average only $3.09 per working age person (16 years and older) of the technical skills training grant compared to $15.26 for metropolitan areas that had a lower demand for H-1Bs from 2001-2011. STEM education funds were distributed similarly, with high H-1B demand metros receiving only $1.00 per working age person compared to $14.10 in the low H-1B demand metros. The lack of funds may be reasons why the metro areas differed in their demands for H-1B visas. Areas that did not receive much funding for technical training or STEM education had a higher demand for these visas.

Similarly, Peri, Shih, & Sparber (2015) detailed the spread of H-1B workers in each state. The authors wanted to quantify the long-run effects of increased city-level STEM employment on labor market outcomes for STEM, college, and non-college educated native-born workers. The authors exploited the introduction of the H-1B visa program in 1990 and the differential effect that the visas had on bringing foreign-born college-educated workers to 219 US cities from 1990 to 2010. For their empirical analysis, the authors used a variation in foreign-born STEM workers across US cities and time periods to estimate their impact on native wages and employment (Peri, Shih, & Sparber, 2015). The authors found that a 1% point increase in the foreign STEM share of a city's total employment increased wage growth of native college-educated labor by about 7% to 8% points and the wage growth of non-college educated natives by 3% to 4% points. The analysis showed that there was an insignificant effect on the relative employment of those two groups. Results indicated that STEM workers spurred economic growth by increasing productivity, especially of those college-educated workers.

Choudhury et al (2012) did not address the effect that the H-1B visa had on native-born salaries or employment. My study differs in that I attempted to show how the H-1B visa affects native-born employment. Choudhury et al.'s (2012) study is good background on the breakdown of where the H-1B STEM workers are aggregating and will be used as a reference for when I discuss my results at the state level to see if they are consistent with the metropolitan areas.

Peri, Shih, and Sparber (2015) conducted a similar study to the one I will conduct: they looked at the productivity in the cities, as well as compared the quantity of H-1B holders to the quantity of native workers. My study employs a different dataset, and thus may yield different results based on the initial distribution of foreign STEM occupations across the states. H-1B holders might have been driven towards certain cities due to certain amenities and lifestyle choices.

2.5 Policy Implications on International Students

Changes to the H-1B visa policy do not only affect current workers on the H-1B visa. The policy changes can also influence the decision international students make when applying to study in the United States or deciding to stay after their four years of studying. Admissions and retention rates of the students may be negatively affected when the cap is decreased, or enrollment may be positively affected when the cap is increased.

A study conducted by Alberts and Hazen (2006) examined the incentives and disincentives that influence international students to stay in the US or return to their home country. The authors found 64% of respondents believe that the United States had better career opportunities than their home country. Another factor that impacted the students desire to stay was better standard of living (Hazen and Alberts, 2006). Finally, and most surprising, 8% of the respondents said that the current political situation was an advantage to stay in the United States.

Alberts and Hazen (2006) reported the disadvantages of international students returning to their home countries, the top being that half their respondents saying that there is poor job opportunities back home. Another reason was concerns about restrictive or hierarchical career structures in the home country. The last factors were poor economic standard of living, the political situation and poorer quality of life.

Alberts and Hazen (2006) did ask the respondents about their home country's benefits. The most common answer as to why students would return home was to be with their friends and family. Some students reported that in their home country there was a better quality of life and the last factor was some students felt the responsibility to return skills to their home country.

The most common response for international student's decision to leave the US was feeling alienated from US culture (Hazen and Alberts, 2006). The second reason was another cultural and personal issue of students feeling different understanding of friendship and career. Racism was also found as a disadvantage to the students but surprisingly the authors did not find a significant relationship between the home region and students citing 'racism'. The last factor was poor working conditions and quality of life in the US.

I included this study in my literature because it is important to note that there are other factors that encourage international students and discouragement other students when deciding staying the United States after their undergraduate degree is completed. This study was conducted as six focus groups and informal conversations with international students from a variety of disciplines and countries at the University of Minnesota. Therefore, there are limitations of this study in that the questionnaire that Alberts and Hazen (2006) created was distributed to many non-native-English speakers and the study was focusing student decision making as the key factor of student migration but it is one of many factors that help explain migration patterns (Hazen and Alberts, 2006). The last limitation of this study is that it was conducted more than 10 years ago when the political climate was very different than it is now. I hypothesize if the study was done now, majority of the responses rank political climate and racism higher on their scale of disadvantages to the United States.

Shih (2016) examined the relationship between international enrollment and the openness of the United States' skilled labor market, which is regulated by the H-1B program. He used gravity regressions that showed that H-1B visa issuances to a country were positively and significantly related to the number of international students from that country. His causal estimates of the impact of labor market openness were achieved by exploiting the dramatic fall in the H-1B visa cap when it fell in October of 2003. The triple indifference estimates showed that the decrease lowered the foreign enrollment by 10%.

This study is worth noting because it shows how expansive immigrant visa policy is, and how changes in the program affect other parts of the United States economy. The study is supportive background on how the H-1B policy affects future enrolment of international students. International students do not just affect the US economy when they obtain an OPT or an H-1B visa but also their consumption when they are studying for the 4 years helps smaller town economies grow, as discussed in a paper by Feerasta et al. (2011). I used Shih (2016) to model my fourth regression and created a demand variable to show the competitiveness of the H-1B visa and the affect on enrolled international students.

Feerasta et al. (2011) looked specifically at how international students could be used as a possible state stimulus. Their belief was international students have the unique ability to enrich the experiences of domestic students, as well as impact the economy with direct expenditures. Moreover, the data showed many international students stay in the United States after graduation because of programs like the H-1B, which add to existing firms or establish new companies. Feerasta et al. (2011) pointed out that many rust belt states were looking to transform themselves from being dependent on manufacturing and agriculture to more diverse knowledge-based economies. International students can be used as a catalyst to further economic growth at the state level. The results in the study conducted by Feerasta et al. (2011) showed that domestic students were concerned about their state's economic future and had a positive perception of the economic benefits of international students. They also supported policy to increase international enrollment. In turn, international students have had a more positive view of globalization and the positive economic impact of internationalization of education.

As important as it is, this study has limitations. For example, Feerasta et al.'s (2011) sample responses were drawn only from one university in Ohio. Therefore, it cannot be concluded that these sentiments are felt at other state schools that offer four-year programs. The study was also based on the author's convenience and not on a random sample. This means that the results may be exposed to self-selection bias as individuals who have an interest in Ohio's economy and international students may have chosen to complete the survey over others without an interest in the topic.

A study done by Kato and Sparber (2013), discusses how restrictive H-1B policy has affected the average quality of prospective international students who face reduced U.S. employment opportunity after graduation. The authors used a difference-in-difference estimation to identify the effect of current policy on the selection of foreign students interested in U.S. education, because of their five control countries: Australia, Canada, Chile, Mexico and Singapore. The authors chose these countries as their control because international students from the five countries are less bound by the H-1B restrictions because they are able to obtain a work permit that is a substitute for an H-1B visa.

Kato and Sparber used College Board dataset that measured the SAT scores of international students and found that visa restrictions have reduced SAT scores of prospective students by 10 to 20 points. Their paper provided support that restrictive immigration policies has an effect on the quality of international students that are interested in US education. Kato and Sparber (2013) had a unique way of measuring prospective international students by using the SAT scores but there are limitations of the data. For example, not all international students who take the SATs apply to US schools and there is no way of identifying which students do and do not. As well, it omitted students who took the ACT exam. Another limitation of their dataset is that admission offices weight applications differently. Some institutes find that GPA is more important than the SAT scores and others place SAT scores higher than other factors. For the purpose of their study, it was a unique feature but it would not allow Kato and Sparber to further their analysis to see how the pool of international applicants weakened.

Kato and Sparber (2013), Feerasta et al. (2011), and Shih (2016) all provide support to the notion that international students are considering the H-1B visa when applying to the US and evaluating their chances of staying in the country after four years.

In my study, I analyzed how the H-1B visa effected the STEM labor market in terms of proportions of foreign and native workers and their average wages. I am contributing support to the existing literature because my results show similar results. My study differs from the ones above because I did not look at individual level data but analyzed aggregate impacts at the state level. I am also adding support to the literature previously published on international student enrollment and the effect the H-1B policy has on their decision to attend university or college in the US. I am contributing to future literature by combining the current effects of the H-1B visa on the STEM sector and creating an OLS regression to estimate how the international student enrollment over the past 16 years has been affected by the decrease in the cap of the H-1B visa. I am also attempting to contribute more recent analysis to the literature since there have not been any studies published about the implications of President Trump's current policy decisions.

3. Data Collection

I obtained the historical prevailing wage data for H-1B visa workers from the United States Department of Labor website, specifically the Office of Foreign Labor Certification (OFLC). I used the Historical Case Disclosure Data for the Labor Certification Application (LCA) Programs that had historical data for the H-1B, H-1B1, E-3 wages and the number of applications from employers broken down by state. The number of applications accepted was used as the number of H-1B workers.

For native wages, I obtained data from the Bureau of Labor Statistics Occupational Employment Statistics (OES). OES provides employment and wage estimates annually for over 800 occupations. Estimates were available for the entire nation, individual states, metropolitan, and nonmetropolitan areas. OES published the number of native workers in each occupation which I added together for the total for the STEM sector in each year. For the purpose of my study, I used the OES data broken down into States from 2008 to 2016. As well, OES published the definition of STEM occupations and that list was used to clean the dataset for H-1B and native wages.

STEM occupations are broken down into these groups: life and physical science, engineering, mathematics, information technology occupations, social science occupations, architecture occupations and health occupations.

Further, each STEM occupation can be categorized into one of the five types of STEM occupations:

1. Research, development, design or practitioner occupations
2. Technologist and technician occupation
3. Postsecondary teaching occupations
4. Managerial occupations
5. Sales occupations

The OFLC datasets are publicly available and can be used to fit any study. For my study, I cleaned and filtered the datasets in the following ways.

The 2015 LCA Disclosure Data had a column for “Willful Violator” Employer. “Willful violator” or “willful violator employer” means an employer that meets all the following standard:

The agency finds that the employer has committed either a willful failure or a misrepresentation of a material fact (two of the Labor Condition Application (LCA).

This category is for employers and is not specified in other datasets, so I decided to remove the column since it was not specified in the other datasets. The definition was taken from the United States Department of Labor Fact Sheet #62S.

For the number of enrolled international students, I obtained data from the Institute of International Education Inc. The Institute published data on international enrollment across the United States, how many of those students continued to Optional Practical Training (OPT), and the total enrollment from 1948 to 2017. For my study, I used the institutional data on enrolled international students, and Optional Practical Training (OPT) between the years 2001 to 2016.

The cap number and H1B petitions accepted data was collected by the USCIS Yearbook of Immigration Statistics from 2001 to 2016.

My GDP data was obtained from the Bureau of Economic Analysis. This dataset was already sorted by state and gave the option for All Industry Total.

Table 1 shows my summary statistics for my models 1 through 8. My dependent variables, number of native employees, average wage for native STEM had means of 168, 207, and 2.285e+06, respectively. The maximum is 7,290, and 44,400, respectively. My independent variables, number of H-1B STEM employees, average prevailing wage for H-1B STEM, and GDP all industry total, have minimums of 7, 4,779, and 8.472 respectively. The maximums are 168,207, 431,270, and 13.33 respectively.

Table 1: Summary Statistics for Model 1-8

VARIABLES	(1) N	(2) mean	(3) sd	(4) min	(5) max
Number of H1b STEM Employees	459	10,074	19,625	7	168,207
Average Prevailing Wage for H1B	459	61,796	27,737	4,779	616,352
Number of Native STEM Employees	459	222,317	306,560	7,290	2.285e+06
Average Wage for Native STEM	459	72,792	18,485	44,400	431,270
GDP All Industry Total	459	316,863	393,441	25,467	2.623e+06

Table 2 shows my summary statistics for model 9. My dependent variable, enrolled international students has a minimum of 526,670 and maximum of 903,127. My independent variables, Lag Optional Practical Training, Demand, and GDP all industry total have minimums of 22, 745, 1.013 and 1.056e+07 respectively. The maximums of 175,695, 5.356, and 1.851e+07 respectively.

Table 2: Summary Statistics for Model 9

VARIABLES	(1) N	(2) mean	(3) sd	(4) min	(5) max
Year	16	2,008	4.761	2,001	2,016
Enrolled International Students	16	658,914	133,449	526,670	903,127
Lag Optional Practical Training	16	74,337	45,194	22,745	175,695
Demand	16	3.651	1.301	1.013	5.356
GDP all industry total	16	1.450e+07	2.447e+06	1.056e+07	1.851e+07

4. Variables Used:

For the purpose of my study, I used the total weighted average of prevailing wages for H-1B workers from the years 2008 to 2016. In each dataset LCA required the employer to indicate how many workers were requested to be working at that specific site (Town, County, and State) and what the prevailing wage was for the occupation, which was determined by the Department of Labor & Industries. If this wage was lower than the agreed upon wage when signing the contract, the worker was to be paid a different wage. However, for my study I decided to use the prevailing wage because not all wages were listed, and the wage depended on if the prevailing was higher or lower than the intended salary. For native workers, I used the weighted average of the average mean salary that was documented by the Bureau of Labor Statistics.

For both native and nonimmigrant workers, I used the total number of workers in the STEM sector for the years 2008 to 2016 in order to examine growth in the STEM sector and to evaluate if the influx of H-1B workers into the STEM sector had an impact on native wage growth.

The ninth regression looks at the demand for the visa as a proxy for its competitiveness and the impact that this demand has on the enrollment of international students. I created a demand variable by dividing the number of petitions accepted by the USCIS by the cap for the period of 2001 to 2016. This demand variable is used as a proxy for competitiveness of the H-1B visa. Furthermore, I used the number of enrolled international students, and the OPT variable from the dataset spanning the years 2001 to 2016. These variables were modelled from the regression that Shih's (2016) paper mentioned earlier.

All regressions used GDP All Industry total as a control variable.

4.1 Limitations of the data

One limitation was the public nature of the information. I was not able to obtain individual level data due to time constraints: the Freedom of Information Act (FOIA) would have taken months if I had tried to access individual level data. The only published historical years available for the H-1B LCA were from 2008 to 2017. I omitted the 2017 data, as it had just come out and I wanted to look at a duration of 8 years for my study.

The types of data published by the Department of Labor Statistics differed from year to year. In the 2008 dataset for the H-1B visa, the occupations were worded differently from those in the datasets from 2009 onwards. For the 2008 dataset, I had to manually sort through and find the occupations that fell within the STEM sector. However, not all labels were very specific; therefore, some occupations that were not considered STEM could still have been present in the dataset. From 2009 onwards, I was able to use VLOOKUP in Excel to match the exact wording of the STEM occupation to the H-1B dataset.

Another limitation of the data related to the H-1B cap, this data came from the H-1B report from the USCIS which reports annually. These numbers show the total applicants who applied and were accepted but do not specify if the employer used an exception policy since the approved petitions for every year were significantly greater than the cap. The original cap for the H-1B visa was 65,000 with 20,000 extra visas allocated for workers with a master's or doctorate degree. However, because many exemptions were used by employers to get approvals, more visas were issued than the cap limit. As well, the data published before 2001 did not appear to be very accurate so I decided to omit those years and look at the relationship between the years 2001 and 2016.

5. Methodology

For this study, I have created nine standard OLS regressions to answer the three questions that I posed at the outset. Eight of the regressions used panel data to address my first two questions, i.e. *does having H-1B visa workers affect native employment within the STEM sector* and *does the prevailing average wage of an H-1B visa worker have an impact on native* *employees' annual average wages.* The ninth regression used times series data. For the eight panel data regressions I used the Haussmann test to see if I needed to use Fixed Effects or Random Effects for my robustness check. My p-value was very close to 0 for both of the regressions and therefore I used the Fixed Effects model to correct for any correlation between my independent and dependent variables.

My first four regressions (models 1-4) attempt to answer the question *does having H-1B visa workers affect native employment in the STEM sector in the US?*

Model 1

$$nativeemployees_{it} = \beta_0 + \beta_1 h1bemployees_{it} + \beta_2 GDP_{it} + \delta_i + \varepsilon_{it}$$

The first regression was set up to find whether there were any contemporaneous effects of H-1B visa hires on the hiring of native employees. Therefore, I used the number of native STEM employees for the dependent variable and the number of H-1B STEM employees as the independent variable. I also used the GDP all industry total for all individual US states as the control variable in the model.

Model 2

$$nativeemployees_{it} = \beta_0 + \beta_1 laggedh1bemployees_{it} + \beta_2 GDP_{it} + \delta_i + \varepsilon_{it}$$

The second regression also used the number of native STEM employees as the dependent variable, but I lagged the number of H-1B STEM employees by a year to investigate whether their employment in the previous year impacted native employees in the current year. I kept the GDP all industry total for all individual US states as the control variable in the model.

Model 3

$$nativeemployees_{it} = \beta_0 + \beta_1 h1bemployees_{it} + \beta_2 laggedh1bemployees_{it} + \beta_3 GDP_{it} + \delta_i + \varepsilon_{it}$$

My third regression was designed to investigate whether native employment was impacted by employment of H-1B visa workers over multiple years. I decided to investigate the impact of the hiring in the current and previous years by using both the lagged and unlagged number of H-1B visa workers as the independent variable. I kept my dependent variable unchanged as the number of native employees. And again, kept the GDP all industry total for all individual US states as the control variable in the model.

Model 4

$$nativeemployees_{it} = \beta_0 + \beta_1 h1bemployees_{it} + \beta_2 h1bemployees * state_{it} + \beta_3 GDP_{it} + \delta_i + \varepsilon_{it}$$

The fourth regression was set up to show the differential impact of H-1B visa hires on native employment across each of the states. I created interaction terms between the number of H-1B employees in each state and the state code that STATA provided. These terms show the differential impact across the states of H-1B workers employment on native employment. The GDP all industry total for all individual US states remained as the control variable in the model.

My next four regressions (models 5-8) attempt to answer the question *does the prevailing average wage of an H-1B visa worker have an impact on native employees' annual average wages?*

Model 5

$$lnnativewage_{it} = \beta_0 + \beta_1 lnh1bwage_{it} + \beta_2 lnGDP_{it} + \delta_i + \varepsilon_{it}$$

Regression number 5 used the natural log of the native wage as the dependent variable and the natural log of the H-1B average prevailing wage and the natural log of GDP as the independent variables. This regression should yield the impact of H-1B wages on native wages in contemporaneous periods, while controlling for changes in economic activity proxied by GDP, as in my previous regressions.

Model 6

$$lnnativewage_{it} = \beta_0 + \beta_1 lnh1bwagelag_{it} + \beta_2 lnGDP_{it} + \delta_i + \varepsilon_{it}$$

The sixth regression also has the natural log of native wages as the dependent variable, however, I used the natural log of H-1B wages lagged by a year. The independent variable natural log of GDP remained as before. The lagged variable attempts to assess whether there is a lagged effect of H-1B visa workers' wages on the wages of native employees.

Model 7

$$lnnativewage_{it} = \beta_0 + \beta_1 lnh1bwage_{it} + \beta_2 lnh1bwagelag_{it} + \beta_3 lnGDP_{it} + \delta_i + \varepsilon_{it}$$

As I had done with my regressions on employment, with my seventh regression I tried to assess whether there was a multi period impact on the wages of native employees. Specifically, keeping the natural log of native wages as my dependent variable, I increased the number of independent variables by adding the natural log of H-1B wages in the current year to Model 6. Thus, this regression was set up to show the impact of current and previous years' H-1B wages on native wages in the current year.

Model 8

$$lnnativewage_{it} = \beta_0 + \beta_1 lnh1bwage_{it} + \beta_2 lnh1bwage * state_{it} + \beta_3 lnGDP_{it} + \delta_i + \varepsilon_{it}$$

The eight regression includes the natural log of H-1B wage unlagged as well as the interaction terms of the natural log of H-1B wages in each state multiplied by the state code to analyze the differential impact across the States. The natural log of GDP is kept in as a control variable.

My ninth regression differs as it was designed to answer the question *how does the demand for the H-1B visa affect international enrollment?*

Model 9

$$lnenrolledinternationalstudents_t = \beta_0 + \beta_1 demand_i + \beta_2 OptionalPracticalTraininglag_i + \beta_3 GDP_i + \varepsilon_i$$

For this regression, I used times series data. A common problem with time series data is that it needs to be corrected for autocorrelation among the error terms. Therefore, I used the newey regression in order to correct any standard errors and make sure that my regression was robust. This regression is similar to Shih (2016) who also analyzed the impact of the H-1B visa on international enrollment. We both used the same variables but in different ways. I used the natural log of enrolled international students as my dependent variable. My independent variables are demand, work visas issued under the OPT program, and state total GDP. Demand is defined as demand for the H-1B visa created by dividing the number of accepted applicants by the cap number for each year between 2001 and 2016. Shih (2016) decided to lag demand for the H-1B variable while I decided to lag the number of visas issued under OPT.

6. Results

The results of all of my different models are shown in tables 3 through 5 and provide interesting insights into the questions that I had previously posed.

The first four regressions (models 1-4) answer the question *does having H-1B visa workers affect native employment within the STEM sector?*

With the first model which examines contemporaneous impact on native employment I expected a positive relationship between the coefficients. The coefficient for the number of H-1B STEM employees was 7.145 which was significant at the 1% level. This signifies that for every 1 H-1B worker, there are 7 native workers. The positive coefficient implies that H-1B workers are not substitutes for native employees but instead are complementary. And with significance being at the 1% level this complementary relationship appears to be very strong.

With my second model with the lagged H-1B workers variable, I expected that there would be a positive relationship, given the first regression. However, the coefficient positive was not significant at any level. This implies that the previous year's employment of H-1B visa workers did not impact the employment of native workers.

Given the earlier results for my third model, I expected to see a positive relationship for both variables. The coefficient for the unlagged number of H-1B employees was 7.5, which is similar to the first regression with a coefficient of 7. Essentially signifying that for every 1 H-1B worker, there are approximately 7 native employees. This supported my expectations. However, the coefficient for the lagged H-1B variable turned negative but was still not significant. This reversal of signs may indicate multi-collinearity, which may invalidate the results of this model.

For my fourth model which showed the differential impact across the states, I expected to see positive coefficients in states such as California, New York, Michigan and Texas as they have high numbers of foreign workers in the STEM sector. Alabama was excluded from the regression results due to collinearity. However, not many states had a significant coefficient and the ones that did had negative coefficients. These states were: Arkansas, Delaware, Hawaii, Idaho, Maine, Nebraska, New Hampshire, New Mexico, North Dakota, Rhode Island, South Dakota, and Vermont. These results are not in line with my expectations and will be considered further in the discussion section of this paper.

The next four regressions (models 5-8) answer the question *do the wages of H-1B visa workers affect the wages of native employees within the STEM sector?*

The fifth model used the natural log of the native wage as the dependent variable and the natural log of the H-1B average prevailing wage and the natural log of GDP for the same year as the independent variables. I expected there to be a negative contemporaneous relationship between the coefficients. The coefficient indicated a negative relationship between the native wages and the H-1B wages, however it was not significant at any level.

For the sixth model, I attempted to assess whether there were any lagged effects of the wages of H-1B workers on the wages of native employees. Thus, the independent variable, the natural log of the wages of H-1B visa workers is lagged by one year. The independent variable GDP stayed as before. Given the results of the first regression, I expected there to be a small, negative relationship in this regression. I found this negative relationship but it was not significant at any level.

The seventh model examined the impact of the wages of H-1B workers over multiple years on the current wages of native employees. To do this, I used the independent variables regarding H-1B visa worker wages from both models 5 and 6, along with GDP as the control variable. Given the results of models 5 & 6, I expected to see small negative relationships with both variables in model 7. And this exactly how it worked out. The coefficients for each variable changed somewhat, but they remained negative and insignificant.

The eighth model shows the differential impact of H-1B worker wages on native wages across the states. Due to collinearity, Alabama was omitted from the results. The only state that had a significant and positive coefficient was Arizona with a coefficient of 0.180. Idaho, Indiana, Kentucky, Maine, Maryland, Michigan, Nevada, Pennsylvania, Rhode Island, South Carolina, Vermont, West Virginia and Wisconsin all had small but negative and significant coefficients.

The ninth model attempted to answer the question *how does the demand for the H-1B visa affect international student enrollment?* My dependent variable is the natural log of enrollment of international students and my independent variables is the demand for the H-1B visa and one year lagged issuance of the Optional Practical Training (OPT) status. I lagged the OPT variable because students choose to obtain this visa after their four years at a college or university. The coefficient for demand was -0.032. This indicates that as the demand for the visa increases, fewer international students choose to enroll in universities and colleges. I will explain this result further below.

7. Discussion

7.1. Does having H-1B visa workers affect native employment within the STEM sector?

Table 3 presents the results of models 1 through 4, in each of which I have tried to assess the impact of employing workers with H-1B visas on the employment of native workers.

Model 1 tried to assess the contemporaneous relationship between the dependent and independent variables. It showed that the ratio for the current year was 1 H-1B worker to approximately 7 native workers. The ratio being positive indicates that H-1B workers are not being used as substitutes for native workers. This is an important, as one argument says that H-1B workers are taking jobs away from native workers. My results, in fact, show the opposite and in a very significant sense.

Model 2 tried to assess whether there was a lagged relationship between the employment of the two types of workers. The coefficient was negative was not significant at any level. This implies that previous hiring of H-1B visa workers did not have a substantial impact on current native employment. Thus, it may also imply that the prior year's public policy regarding H-1B visa issuance did not have a major impact on native employment in the STEM sector. This is surprising and did not fit my expectations.

Model 3 in table 3 shows the combined effect of current and previous year hiring of H-1B visa workers and potentially also the combined effect of current and lagged public policy with respect to the H-1B program. Again, the current year coefficient was 7.5, changing slightly from the first regression which showed 7.1. The lagged variable had no significance but indicated a negative relationship from previously being positive in model 2. This may indicate multi-collinearity, and thus require a different specification of this model.

Model 4 showed the differential impact of H-1B worker hiring on native employment across each of the States. As stated in the results section, Arkansas, Delaware, Hawaii, Idaho, Maine, Nebraska, New Hampshire, New Mexico, North Dakota, Rhode Island, South Dakota, and Vermont were the only states that were significant at the 1%, 5% or 10% level as well as negative. There were no positive, significant coefficients. The negative coefficients for the States indicate that H-1B workers are being used as a substitute for native workers. However, looking at the list of States, it is obvious that these are States that do not organically have a high level of STEM workers. For example, it is predicted that in Arkansas in 2018 STEM jobs will make up only 3% of all employment (Carnevale, Smith, Melton, 2017). Similarly, Delaware is predicted to have only

6% of all jobs in the STEM field (Carnevale, Smith, Melton, 2017). Hawaii, and North Dakota STEM sector will grow to 4% of all jobs while in Idaho, Nebraska, New Hampshire, New Mexico, Rhode Island, and Vermont the STEM sector is predicted to be 5% of all jobs (Carnevale, Smith, Melton, 2017). Maine and South Dakota have a predicted growth of 3% in the STEM sector for 2018. These percentages do not distinguish workers in the STEM fields by native and foreign born. The STEM sector in these states is small to begin with, which could account for employers attempting to bring in the highest qualified workers in order to meet their needs and ultimately help grow the sector.

Interestingly, a few states that were not significant were California, Michigan, New York and Texas. According to a report issued by the Bureau of Labor Statistics, these states have had had a huge boost in number of STEM jobs added since 2015. As well, according to Choudhury, Ruiz and Wilson (2012) New York, California, District of Columbia, Illinois, Massachusetts and Texas had a high demand for H-1B workers between 2010-2011. The positive coefficients for all the states lead me to believe that H-1B workers are not being used as a substitute for native workers, but instead are complementary. However, since the coefficients are not significant at the 1%, 5% or 10% level, I cannot conclude that that is what is going on. Reasons for the insignificance could be other influences such as the relatively larger size of STEM occupations in these states and the larger domestic populations.

7.2. Do the wages of H-1B visa workers affect the wages of native employees within the STEM sector?

Table 4 shows the results of models 5 through 8. These four models try to answer the question *does the prevailing wage for the H-1B worker have an impact on native employees'* *annual average wages?* In each model I used the natural logs of the average wages of both H-1B and native workers as my independent and dependent variables respectively. And again State GDP was used an independent control variable in each model as well.

Model 5 looked at this question in a contemporaneous sense. I used the natural log of the average prevailing wages as the independent variable to show the effects of the H-1B wages. Its coefficient was negative but was not significant at the 1%, 5% or 10% level. This is important to note because the regression is saying that there is no significant impact on native wages given the H-1B wages which supports the argument that the hiring of H-1B workers is not impacting the competitive situation of native workers.

In model 6, I lagged the H-1B wage by one year in order to show the impact of previous year's hiring and potentially H-1B visa policy on native wages. The lagged variable had a coefficient of -0.339 but it was not significant at any level. This implies that last year's wages have a negative impact on native wages, but it is very small and is not meaningful.

Model 7 in table 4 combines the lagged and unlagged H-1B worker wages variable. Both variables were insignificant, however when they are combined in the same regression they both change signs. The unlagged H-1B variable was now negative while the lagged variable is positive. This changing of signs could be an indication of multicollinearity. Which likely indicates that while the overall model result is okay, that the coefficients for each variable are unstable and not to be relied upon.

Model 8 showed the differential impact of H-1B visa workers' wages on native wages across each of the states. There was only one positive and significant state, Arizona, which had a coefficient of 0.180. The coefficient implies that for every 1% in wages that an H-1B worker makes, the native worker makes 0.18% more in wages. This is noteworthy because it shows in a state that is not traditionally a STEM state, they are paying the native workers much more. However, this result was found in only one state, and it warrants further investigation to ensure that it is not a data issue. The states that were significant and negative were: Idaho, Indiana, Kentucky, Maine, Maryland, Michigan, Nevada, Pennsylvania, Rhode Island, South Carolina, Vermont, West Virginia, and Wisconsin. However, in all these states the negative coefficients were small. This implies a small gap between H-1B visa workers and native wages. This is very noteworthy because it evidences that the Office of Foreign Labor Certification's (OFLC) condition of paying an H-1B visa worker the average prevailing wage is working. Furthermore, the OFLC wants to make sure that H-1B wages do not adversely affect the wages or working conditions of similarly employed U.S. workers. For this reason, it would make sense why many of the States including California, Michigan, New York and Texas do not show as significant because if those employers are paying the average prevailing wage (which was recorded in the dataset published by the OFLC) then H-1B wages should not be affecting native wages.

7.3. How does the demand for the H-1B visa affect international student enrollment?

The last regression, model 9, used in my study analyzes the question *how does the demand of the H-1B visa effect international enrollment?* This regression is found in table 5. My dependent variable is the natural log of the enrolled international students and my independent variables were the demand for the visa, created by dividing the number of applications accepted by the cap number for each year from 2001 to 2016, as well as the one year lagged variable of OPT. The demand variable had a coefficient -0.032 which was significant at the 10% level. The lagged variable of OPT was 3.98e-06 which was significant at the 5% level. Both of these results are noteworthy. The demand coefficient indicates that as demand for the visa increased, international enrollment decreased. The result might seem counterintuitive but in fact, it is not. International students consider many factors when applying and ultimately choosing to attend school in the United States as Hazens and Alberts (2006) analyzed in their study. The H-1B visa policy does play a part in a student's choice to enroll in a four-year university or college if they intend on finding a US job after graduation. Shih's (2016) study also pointed out that students use the H-1B visa policy as a benchmark for the openness of the United States labor market, post-graduation. However, it is important to note that the entire decision of an international student attending school in the United States does not rely on the H-1B visa policy. There are many other factors such as standard of living, political and social tensions, lack of family, friends and support systems as well as language barriers, which all impact a student's decision to come to the US and to stay on. As for the OPT variable, it makes sense that it would have a positive coefficient because the OPT status is available for any student who chooses to pursue the visa after graduation.

7.4 Policy Implications

There are many policy implications for the changing of the H-1B visa regulations for the STEM sector. H-1B workers are required to have a high level of education and skill and employers have to petition the USCIS to be able to retain these workers for an additional three years, every time their existing term is up. Reforming the policy and making it stricter will strongly impact the STEM sector which brings in talented foreign-workers from abroad and from US universities and colleges when they cannot find native workers. In Watts (2009) study, she found that the IT industry had a huge lack of workers, yet Americans were not able to fill the jobs because there simply weren't enough who were qualified. Employers have lobbied the government to increase the cap for H-1B workers so that their companies could retain more foreign workers. Reducing the cap, or causing more backlog in the system will therefore heavily impact the STEM sector who need these workers. As seen from my first four regressions in table 3, the states with the highest growth in STEM workers are using the H-1B workers as complements to native workers and not terminating native workers based on the hiring of the H-1B workers. The substitution of workers is only found in States where the STEM sector is small, and not as prominent or as extensive as in states such as California.

Regarding the wage debate, there is evidence in my study that there is a gap between native and foreign-born workers' wages. However, states with negative coefficients such as Idaho, Indiana, Kentucky, Maine, Maryland, Michigan, Nevada, Pennsylvania, Rhode Island, South Carolina, Vermont, West Virginia, and Wisconsin are not known for booming STEM sectors. As well, it is important to note that the coefficients were very small and did not indicate that there is a huge gap between native worker's average wages and H-1B workers prevailing average wage. There also could be other explanations for the gap, such as skill and experience gaps between the two sets of workers.

Lastly, reducing the H-1B visa has strong implications for foreign students. My results indicate that as the H-1B visa becomes more in demand by applicants less foreign students are willing to attend university or college in the United States. This has big implications for policy makers who want to reduce the visa. Already with the 65,000 cap and the 20,000 for Masters/PhD, the applicant pool is still big. Currently, the fiscal year of 2019 (not included in this study) had 94,213 petitions eligible for the cap, meaning that these did not include petitions that cited an exemption. 94,213 applications are much larger than the 65,000 visas that are available (H-1B Fiscal Year (FY) 2019 Cap Season, no date). Potential students could see this as a deterrent to continuing their higher education in the United States because they might believe that the visa would be too hard for prospective employers to obtain. Any potential changes in policy could steer foreign students to look at countries with more friendly work and immigration policies such as Canada, Australia and Germany.

8. Conclusion

In this paper, I used data from the LCA, OES, BEA, USCIS, and International Student Inc in order to answer my three research questions: (1) Does having H-1B visa workers affect native US employment within the STEM sector? (2) Do H-1B visa workers’ wages have an impact on native employees' wages? (3) How is international student enrolment affected by the demand for the H-1B visa?

I found that there is a positive relationship between the number of H-1B visa workers and native workers. However, the relationship varies among states, with different states either using the workers as substitutes or compliments. In states where there is a big STEM program and many companies such as California, it is noted that the coefficient is insignificant indicating that the H-1B workers and the native workers are being used as compliments to each other and not substitutes.

For my second question, I found that there is a small wage gap between native workers and H-1B workers that favor the native worker. The gap, which is very small does not fit my expectations. However, it exists in states that do not have a large STEM program and potentially could have a hard time attracting high-skilled foreign labor to their state.

The last question, I found that there was a negative relationship between the demand for the H-1B visa and the enrollment of international students, signaling that as the demand/competitiveness increases for the H-1B visa, the enrollment of international students does decrease.

All three questions that I have discussed are important to consider when creating a new policy for the H-1B visa because it has an impact on the STEM sector and the future of universities and colleges in the United States, some of which rely on the higher tuitions paid by foreign students.

8.1 Limitations and Future Research

There are limitations to my study, such as the state level data only gives an overview of the effect that H-1B worker employment and wages have on native employment and wages within the STEM sector. Another limitation of the results in regard to the third question is that there are many other factors that could explain why international enrolment may decrease such as social and political tension, standard of living, and lack of family and friends in the United States. Currently, with the political conditions in the United States I would expect factors such as social tensions and the standard of life to be heavy contributing factors.

Looking ahead, my paper opens up different avenues for future research. The first being, the use of more individual level data to get more conclusive results on how the changes in employment of H-1B workers affects employment of native United States workers in the STEM sector as well on their wages. With the individual level data, to the analysis could be conducted at the occupational level to see if there are any disruptions or disparities within the different occupations within the STEM sector. Research could also be expanded to analyze demand by city or state to enhance our understanding of the effects in more local economics. The city level analyses could be conducted regarding international students as well, to examine how the higher tuition benefits the university and the economy of the town the institution is in. Another way to accurately measure the effect of the H-1B on the STEM labor market would be to create an interaction term with unemployment in the sector and the national unemployment rate. Lastly, my study creates the possibility of combining the countries of origin of enrolled international students and the countries that are receiving the most H-1B visas to see how US visa policy affects them and their decision making. Hopefully, future research will be able to show the impacts of the current United States administration's policy on the STEM sector, as well as the demand for the H-1B visa and the enrollment of international students.

Appendix

Table 3: Does having an H-1B visa workers affect native employment within the STEM sector?

VARIABLES	(1) Number of Native STEM Employees	(2) Number of Native STEM Employees	(3) Number of Native STEM Employees	(4) Number of Native STEM Employees
Number of H-1B Employees	7.145***		7.519**	1.693
	(1.556)		(3.064)	(9.243)
GDP All Industry Total	0.0251	0.673	0.121	-0.991
	(0.469)	(0.467)	(0.481)	(0.635)
Number of H-1B Employees Lagged		2.536	-2.052	
		(1.723)	(2.851)	
Alaska Interaction				-370.7
				(315.5)
Arizona Interaction				3.550
				(9.546)
Arkansas Interaction				-20.56**
				(9.504)
California Interaction				9.026
				(9.686)
Colorado Interaction				11.95
				(9.603)
Connecticut Interaction				-3.126
				(8.809)
District of Columbia Interaction				-8.048
				(16.10)
Delaware interaction				-24.39***
				(9.367)
Florida Interaction				13.03
				(10.96)
Georgia Interaction				5.750
				(9.655)

Hawaii Interaction	-155.7** (70.77)
Idaho Interaction	-127.4** (55.89)
Illinois Interaction	6.075 (9.753)
Indiana Interaction	8.702 (10.58)
Iowa Interaction	-1.931 (9.162)
Kansas Interaction	-18.62* (9.578)
Kentucky Interaction	-8.127 (10.41)
Louisiana Interaction	-29.02* (15.80)
Maine Interaction	-134.2*** (24.53)
Maryland Interaction	17.98 (11.40)
Massachusetts Interaction	7.635 (9.767)
Michigan Interaction	10.82 (10.10)
Minnesota Interaction	6.951 (9.462)
Mississippi Interaction	-166.7 (107.5)
Montana Interaction	-78.79 (81.00)
Nebraska Interaction	-24.72**

	(11.17)
Nevada interaction	-47.54
	(29.92)
New Hampshire Interaction	-36.08***
	(11.62)
New Jersey Interaction	1.990
	(9.327)
New Mexico Interaction	-59.17**
	(25.63)
New York Interaction	13.93
	(11.23)
North Carolina Interaction	4.123
	(10.16)
North Dakota Interaction	-172.1***
	(64.94)
Ohio Interaction	10.11
	(9.978)
Oklahoma Interaction	-1.821
	(17.77)
Oregon Interaction	-2.025
	(8.970)
Pennsylvania Interaction	4.335
	(9.827)
Rhode Island Interaction	-40.16***
	(9.596)
South Carolina Interaction	-3.187
	(11.79)
South Dakota Interaction	-119.7***
	(37.62)
Tennessee Interaction	2.522
	(9.615)

Texas Interaction				12.09
				(11.61)
Utah interaction				-4.110
				(11.99)
Vermont Interaction				-259.1**
				(121.0)
Virginia Interaction				13.23
				(10.16)
Washington interaction				6.336
				(9.779)
West Virginia Interaction				-119.4
				(130.7)
Wisconsin Interaction				3.976
				(9.445)
Wyoming Interaction				-787.7
				(1,314)
Dummy Variables				
2009	4,268			-3,560
	(16,260)			(11,761)
2010	15,783	38,603*	6,558	28,324**
	(14,516)	(20,287)	(20,166)	(13,529)
2011	140,715***	159,887***	138,640***	166,615***
	(20,553)	(21,479)	(19,763)	(22,613)
2012	130,446***	177,713***	129,132***	167,375***
	(19,949)	(24,594)	(22,773)	(23,015)
2013	123,132***	157,958***	132,186***	170,407***
	(22,799)	(28,289)	(25,105)	(27,091)
2014	136,987***	159,754***	147,220***	195,265***
	(25,470)	(31,432)	(28,161)	(30,856)
2015	109,293***	160,970***	116,378***	188,272***
	(30,190)	(34,684)	(30,276)	(36,114)
2016	-34,028	-15,404	-15,945	38,132
	(22,866)	(31,460)	(27,704)	(29,995)
Alaska	-97,365	-23,912	-93,414	-178,999*
	(64,185)	(67,576)	(66,704)	(93,918)

Arizona	50,265	28,834	44,675	144,128**
	(36,964)	(40,254)	(36,319)	(58,646)
Arkansas	-91,595**	-37,736	-88,243**	-93,481*
	(42,735)	(44,289)	(44,741)	(51,441)
California	728,178	-53,561	695,537	2.443e+06**
	(830,941)	(907,358)	(850,481)	(1.152e+06)
Colorado	83,636*	61,335	89,390**	126,923***
	(43,274)	(46,623)	(44,042)	(48,466)
Connecticut	-64,099**	-52,384	-62,468**	82,566*
	(29,617)	(32,653)	(30,088)	(43,046)
District of Columbia	-49,701	2,876	-43,319	-104,495*
	(38,730)	(40,078)	(39,966)	(55,153)
Delaware	-114,348*	-29,285	-107,863	-142,449*
	(64,525)	(64,953)	(67,229)	(77,689)
Florida	251,474	-42,503	230,154	740,131**
	(277,504)	(286,048)	(283,248)	(339,650)
Georgia	26,937	-45,303	26,124	285,525**
	(113,925)	(124,654)	(115,893)	(141,211)
Hawaii	-91,704	-28,750	-88,577	-160,724**
	(56,161)	(58,999)	(58,084)	(78,657)
Idaho	-79,452	-5,328	-74,278	-127,561
	(62,122)	(64,625)	(64,382)	(78,324)
Illinois	76,027	-106,066	67,030	582,551**
	(227,384)	(244,399)	(232,284)	(289,830)
Indiana	21,965	-33,662	16,967	120,069**
	(53,538)	(56,477)	(55,028)	(59,539)
Iowa	-111,928**	-63,051*	-105,845*	-77,949**
	(45,904)	(34,996)	(60,328)	(37,046)
Kansas	-48,379*	-13,565	-45,583	-37,849
	(28,502)	(30,715)	(29,668)	(37,656)
Kentucky	-51,642***	-37,354*	-50,378***	-22,258
	(16,746)	(20,649)	(17,998)	(27,571)
Louisiana	-37,067	-69,240**	-44,426	53,391
	(26,489)	(30,381)	(27,306)	(39,147)
Maine	-94,852	-16,849	-89,701	-130,545
	(65,564)	(68,029)	(67,957)	(80,988)
Maryland	136,711**	97,060	145,558**	162,113**
	(59,002)	(65,546)	(62,769)	(80,054)
Massachusetts	134,038	70,902	142,089	342,803**
	(108,526)	(119,959)	(111,446)	(133,407)
Michigan	159,020	78,521	160,094	322,386***
	(104,466)	(111,641)	(106,888)	(122,187)
Minnesota	44,940	27,595	50,717	134,454**
	(46,988)	(53,121)	(48,509)	(56,081)
Mississippi	-82,954***	-132,282***	-96,375**	35,729
	(30,428)	(49,952)	(38,477)	(79,124)

Missouri	25,138	97,292***	40,657	7,215
	(29,303)	(36,619)	(38,160)	(56,809)
Montana	-91,189	-7,857	-85,227	-224,473**
	(70,076)	(72,586)	(72,462)	(98,656)
Nebraska	-75,119*	-21,093	-70,931	-107,922*
	(44,174)	(45,850)	(45,431)	(60,097)
Nevada	-78,027**	-46,342	-78,463**	-84,472*
	(32,393)	(36,034)	(34,040)	(47,582)
New Hampshire	-87,656	-12,039	-81,775	-128,928*
	(59,820)	(61,501)	(62,112)	(74,672)
New Jersey	-59,007	-85,051	-49,451	405,508**
	(141,615)	(159,529)	(142,999)	(192,750)
New Mexico	-63,351	-6,913	-59,657	-117,799*
	(48,522)	(51,347)	(50,408)	(69,165)
New York	246,594	-304,557	199,362	1.109e+06*
	(500,683)	(522,695)	(518,700)	(592,708)
North Carolina	30,021	-68,613	21,338	313,601**
	(122,596)	(131,540)	(126,531)	(145,616)
North Dakota	-105,024	-26,087	-100,354	-192,216**
	(68,571)	(71,091)	(70,451)	(93,340)
Ohio	137,144	-1,896	134,372	418,099**
	(160,580)	(171,202)	(165,150)	(196,060)
Oklahoma	-35,319**	-26,023	-35,833**	-44,790
	(16,592)	(21,921)	(17,006)	(30,587)
Oregon	-21,201	-9,232	-18,386	27,202
	(15,659)	(18,360)	(16,420)	(18,459)
Pennsylvania	114,412	-35,345	104,785	601,605**
	(202,168)	(214,794)	(206,059)	(258,529)
Rhode Island	-107,142	-21,253	-100,519	-149,155*
	(67,928)	(69,208)	(70,624)	(83,564)
South Carolina	-23,133	-12,714	-23,000	-12,013
	(14,375)	(17,951)	(14,733)	(24,738)
South Dakota	-107,087	-24,350	-102,074	-194,163*
	(70,764)	(73,334)	(73,148)	(99,457)
Tennessee	-19,051	-49,297	-20,987	93,580*
	(42,431)	(46,827)	(43,910)	(48,934)
Texas	504,698	-25,549	477,712	1.450e+06**
	(551,503)	(594,195)	(577,792)	(626,235)
Utah	-28,777	10,896	-24,026	-69,341
	(30,483)	(31,676)	(31,305)	(44,882)
Vermont	-107,048	-15,408	-100,708	-190,806*
	(76,923)	(79,499)	(79,653)	(98,622)
Virginia	213,614*	137,941	226,946*	358,021**
	(118,641)	(126,408)	(120,848)	(152,022)
Washington	103,244	65,793	111,391	297,182***
	(91,941)	(102,875)	(94,135)	(110,253)

West Virginia	-91,499	-25,940	-88,143	-171,164**
	(57,770)	(60,643)	(59,761)	(81,218)
Wisconsin	21,248	7,429	24,775	119,048**
	(40,603)	(45,206)	(42,857)	(48,646)
Wyoming	-107,864	-25,502	-103,482	-223,545**
	(71,528)	(74,812)	(74,379)	(105,185)
Constant	55,369	-86,834	36,096	213,854*
	(80,535)	(80,469)	(84,657)	(113,495)
Fixed Effects?	Yes	Yes	Yes	Yes
Observations	459	408	408	459
R-squared	0.916	0.911	0.924	0.934

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4: Does the prevailing average wage of an H-1B visa worker have an impact on native employees' annual average wages?

VARIABLES	(5) Natural Log Average Wage for Native STEM Worker	(6) Natural Log Average Wage for Native STEM Worker	(7) Natural Log Average Wage for Native STEM Worker	(8) Natural Log Average Wage for Native STEM Worker
Natural Log Average Prevailing Wage for H-1B STEM Worker	-0.0362 (0.0465)		-0.421 (0.410)	0.0187 (0.191)
H-1B Prevailing Wage		-0.339 (0.466)	4.139 (4.008)	
Natural Log GDP all industry total	-0.0110 (0.0158)	-0.0110 (0.0158)	-0.0102 (0.0156)	-0.0144 (0.0198)
Alaska Wage Interaction				-0.100 (0.130)
Arizona Wage Interaction				0.180* (0.108)
Arkansas Wage Interaction				-0.353 (0.260)
California Wage Interaction				-0.0585 (0.0992)
Colorado Wage Interaction				-0.116 (0.112)
Connecticut Wage Interaction				-0.0369 (0.108)
District of Columbia Wage Interaction				-0.0861 (0.108)
Delaware Wage Interaction				-0.0519 (0.139)

Florida Wage Interaction	-0.0751 (0.108)
Georgia Wage Interaction	-0.0631 (0.103)
Hawaii Wage Interaction	-0.119 (0.130)
Idaho Wage Interaction	-0.328** (0.139)
Illinois Wage Interaction	0.000577 (0.213)
Indiana Wage Interaction	-0.273** (0.135)
Iowa Wage Interaction	-0.0164 (0.193)
Kansas Wage Interaction	-0.220 (0.141)
Kentucky Wage Interaction	-0.601*** (0.213)
Louisiana Wage Interaction	-0.149 (0.126)
Maine Wage Interaction	-0.223** (0.100)
Maryland Wage Interaction	-0.158* (0.0944)
Massachusetts Wage Interaction	-0.311*** (0.0950)
Michigan Wage Interaction	-0.517*** (0.179)
Minnesota Wage Interaction	-0.115 (0.104)
Mississippi Wage	-0.173

Interaction	(0.109)
Montana Wage Interaction	-0.238 (0.327)
Nebraska Wage Interaction	-0.0318 (0.100)
Nevada Wage Interaction	-0.418*** (0.133)
New Hampshire Wage Interaction	-0.0417 (0.124)
New Jersey Wage Interaction	-0.201 (0.135)
New Mexico Wage Interaction	-0.166 (0.122)
New York Wage Interaction	-0.0174 (0.0942)
North Carolina Wage Interaction	-0.0987 (0.163)
North Dakota Wage Interaction	0.0102 (0.104)
Ohio Wage Interaction	-0.134 (0.0952)
Oklahoma Wage Interaction	-0.0569 (0.105)
Oregon Wage Interaction	-0.0404 (0.120)
Pennsylvania Wage Interaction	-0.271** (0.125)
Rhode Island Wage Interaction	-0.180* (0.104)
South Carolina Wage Interaction	-0.281** (0.127)

South Dakota Wage Interaction				-0.0896
				(0.125)
Tennessee Wage Interaction				-0.126
				(0.0933)
Texas Wage Interaction				-0.0507
				(0.109)
Utah Wage Interaction				-0.142
				(0.102)
Vermont Wage Interaction				-0.255**
				(0.114)
Virginia Wage Interaction				-0.125
				(0.103)
Washington Wage Interaction				-0.0192
				(0.0971)
West Virginia Wage Interaction				-0.401*
				(0.225)
Wisconsin Wage Interaction				-0.337***
				(0.109)
Wyoming Wage Interaction				-0.0908
				(0.115)
Dummy Variables				
2009	0.0318***	0.0318***	0.0315***	0.0365***
	(0.00778)	(0.00770)	(0.00810)	(0.0107)
2010	0.0648***	0.0646***	0.0645***	0.0705***
	(0.00774)	(0.00764)	(0.00797)	(0.0141)
2011	0.0604***	0.0597***	0.0624***	0.0715***
	(0.00860)	(0.00822)	(0.00972)	(0.0223)
2012	0.0647***	0.0640***	0.0650***	0.0775***
	(0.0111)	(0.0108)	(0.0111)	(0.0288)
2013	0.123***	0.122***	0.124***	0.139**
	(0.0401)	(0.0395)	(0.0402)	(0.0625)
2014	0.102***	0.101***	0.103***	0.120***
	(0.0116)	(0.0111)	(0.0115)	(0.0353)
2015	0.118***	0.117***	0.120***	0.138***
	(0.0115)	(0.0109)	(0.0127)	(0.0391)

2016	0.168***	0.167***	0.170***	0.190***
	(0.0136)	(0.0129)	(0.0136)	(0.0440)
Alaska	0.107***	0.106***	0.110***	1.211
	(0.0218)	(0.0218)	(0.0209)	(1.406)
Arizona	-0.0110	-0.0117	-0.0103	-2.010*
	(0.0167)	(0.0163)	(0.0165)	(1.195)
Arkansas	-0.111***	-0.111***	-0.111***	3.726
	(0.0344)	(0.0344)	(0.0345)	(2.848)
California	0.220***	0.218***	0.222***	0.869
	(0.0475)	(0.0464)	(0.0482)	(1.086)
Colorado	0.0936***	0.0926***	0.0948***	1.369
	(0.0159)	(0.0154)	(0.0159)	(1.238)
Connecticut	0.107***	0.106***	0.109***	0.509
	(0.0146)	(0.0141)	(0.0146)	(1.199)
District of Columbia	0.264***	0.263***	0.267***	1.209
	(0.0155)	(0.0152)	(0.0150)	(1.171)
Delaware	0.0569***	0.0561***	0.0589***	0.619
	(0.0207)	(0.0208)	(0.0201)	(1.514)
Florida	-0.0145	-0.0147	-0.0154	0.811
	(0.0257)	(0.0257)	(0.0254)	(1.191)
Georgia	0.00847	0.00795	0.00850	0.701
	(0.0192)	(0.0189)	(0.0190)	(1.132)
Hawaii	-0.00157	-0.00199	-0.000348	1.300
	(0.0179)	(0.0180)	(0.0174)	(1.420)
Idaho	-0.0695***	-0.0701***	-0.0678***	3.543**
	(0.0207)	(0.0208)	(0.0202)	(1.528)
Illinois	0.0555*	0.0541*	0.0582*	0.0409
	(0.0291)	(0.0282)	(0.0307)	(2.333)
Indiana	-0.0511***	-0.0512***	-0.0514***	2.935**
	(0.0134)	(0.0133)	(0.0131)	(1.481)
Iowa	-0.0762***	-0.0758***	-0.0641***	0.113
	(0.0200)	(0.0198)	(0.0138)	(2.107)
Kansas	-0.0360***	-0.0362***	-0.0356***	2.367
	(0.0127)	(0.0127)	(0.0124)	(1.535)
Kentucky	-0.106***	-0.106***	-0.106***	6.449***
	(0.0161)	(0.0161)	(0.0162)	(2.325)
Louisiana	-0.0271**	-0.0270**	-0.0276**	1.595
	(0.0111)	(0.0111)	(0.0108)	(1.378)
Maine	-0.0783***	-0.0784***	-0.0772***	2.360**
	(0.0218)	(0.0219)	(0.0215)	(1.082)
Maryland	0.163***	0.163***	0.164***	1.904*
	(0.0146)	(0.0143)	(0.0145)	(1.029)
Massachusetts	0.161***	0.160***	0.162***	3.612***
	(0.0223)	(0.0217)	(0.0224)	(1.048)
Michigan	0.0176	0.0170	0.0176	5.710***
	(0.0198)	(0.0195)	(0.0196)	(1.987)

Minnesota	0.0317**	0.0311**	0.0324**	1.293
	(0.0149)	(0.0145)	(0.0148)	(1.141)
Mississippi	-0.108***	-0.108***	-0.109***	1.772
	(0.0127)	(0.0125)	(0.0124)	(1.185)
Missouri	-0.0567***	-0.0571***	-0.0560***	-0.0613**
	(0.0160)	(0.0160)	(0.0158)	(0.0237)
Montana	-0.240***	-0.240***	-0.239***	2.345
	(0.0587)	(0.0586)	(0.0585)	(3.519)
Nebraska	-0.0907***	-0.0907***	-0.0901***	0.255
	(0.0144)	(0.0144)	(0.0141)	(1.095)
Nevada	0.00176	0.00113	0.00291	4.608***
	(0.0142)	(0.0141)	(0.0139)	(1.462)
New Hampshire	0.0291	0.0284	0.0309	0.480
	(0.0195)	(0.0195)	(0.0189)	(1.353)
New Jersey	0.161***	0.160***	0.162***	2.384
	(0.0225)	(0.0220)	(0.0225)	(1.523)
New Mexico	0.0302*	0.0299*	0.0311**	1.843
	(0.0156)	(0.0157)	(0.0153)	(1.321)
New York	0.122***	0.121***	0.122***	0.311
	(0.0365)	(0.0359)	(0.0365)	(1.042)
North Carolina	0.235	0.233	0.247	1.333
	(0.215)	(0.212)	(0.226)	(1.748)
North Dakota	-0.134***	-0.134***	-0.133***	-0.245
	(0.0268)	(0.0266)	(0.0264)	(1.132)
Ohio	-0.000434	-0.000778	-0.000827	1.467
	(0.0208)	(0.0207)	(0.0205)	(1.047)
Oklahoma	-0.0786***	-0.0784***	-0.0788***	0.543
	(0.0108)	(0.0108)	(0.0106)	(1.144)
Oregon	0.0266*	0.0253*	0.0286*	0.464
	(0.0148)	(0.0141)	(0.0148)	(1.342)
Pennsylvania	0.0632**	0.0626**	0.0631**	3.056**
	(0.0247)	(0.0244)	(0.0246)	(1.368)
Rhode Island	0.0729***	0.0724***	0.0747***	2.041*
	(0.0229)	(0.0230)	(0.0223)	(1.126)
South Carolina	-0.0815***	-0.0816***	-0.0814***	2.988**
	(0.0113)	(0.0113)	(0.0112)	(1.383)
South Dakota	-0.214***	-0.214***	-0.213***	0.756
	(0.0272)	(0.0270)	(0.0268)	(1.348)
Tennessee	-0.0487***	-0.0488***	-0.0489***	1.332
	(0.0118)	(0.0118)	(0.0117)	(1.018)
Texas	0.107***	0.107***	0.107***	0.668
	(0.0365)	(0.0361)	(0.0363)	(1.222)
Utah	-0.0416***	-0.0420***	-0.0409***	1.510
	(0.0123)	(0.0123)	(0.0121)	(1.104)
Vermont	-0.0745**	-0.0750**	-0.0724**	2.723**
	(0.0311)	(0.0313)	(0.0305)	(1.232)

Virginia	0.113***	0.113***	0.114***	1.495
	(0.0205)	(0.0200)	(0.0205)	(1.147)
Washington	0.108***	0.106***	0.110***	0.310
	(0.0229)	(0.0218)	(0.0235)	(1.049)
West Virginia	-0.114***	-0.114***	-0.114***	4.248*
	(0.0205)	(0.0204)	(0.0204)	(2.437)
Wisconsin	-0.0387***	-0.0389***	-0.0387***	3.654***
	(0.0137)	(0.0137)	(0.0136)	(1.196)
Wyoming	-0.113***	-0.113***	-0.112***	0.872
	(0.0268)	(0.0268)	(0.0264)	(1.235)
Constant	11.63***	12.04***	5.923	11.06***
	(0.589)	(1.178)	(5.047)	(2.078)
Observations	459	459	459	459
Fixed Effects	Yes	Yes	Yes	Yes
R-squared	0.636	0.636	0.639	0.644

Table 5: How is international student enrollment affected by the demand of the H-1B visa?

VARIABLES	(1) Enrolled International Students
Demand	-0.0320*
	(0.0177)
OPT lag	3.98e-06**
	(1.46e-06)
GDP All Industry Total	2.91e-08
	(2.82e-08)
Constant	12.81***
	(0.268)
Observations	15

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

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