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Abstract

There are a significant number of H-1B immigrants who are employed through specific outsourcing companies upon which United States' companies then contract with for contract labor. According to Thibodeau & Machlis (2012), the top United States companies that employ H-1B immigrants are "offshore outsourcing companies", including Cognizant and Infosys, which each employ approximately 5000 H-1B immigrants who are then contracted out to other United States companies for specific jobs. The fact that most H-1B immigrants are not employed directly by the United States companies for which they are working, implies that there will be some discrepancy between the temporary immigrant workers and the native workers in terms of: types of jobs, wage rate, and job security. Therefore, this paper aims to study how the recession of 2008 affected the market for workers in the IT industry, specifically focusing on the number of jobs lost or retained by temporary immigrant workers compared with those of native workers.

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I. INTRODUCTION

Outsourcing is typically viewed as the process of shipping jobs overseas to another country so the job can be done by workers for a lower cost. However, there are many types of corporate restructuring that can fall under the broad scope of outsourcing. Wooster and Paul (2010) define outsourcing as sending in-house production to another company, which can achieve the same results at a cheaper price, whether domestic or overseas. This paper asserts that the immigration of temporary labor, such as the H-1B visa program, is yet another type of outsourcing.

This study specifically examines the Information Technology (IT) industry because the majority of the H-1B immigrants work in the IT industry (Kerr & Lincoln, 2010). The H-1B program was developed in 1990 and was a refinement of the H-1 immigration program. The H-1 program was created to allow individuals who show special merit or ability to perform temporary services to immigrate for a period of time. The H-1B program specified the requirements of these types of visas more definitely. This program places a cap on the number of immigrants allowed into the country each year, and specifies a six-year limit on the length an H-1B visa can be in effect. Many companies, specifically in the IT industry, have lobbied the government to expand the quota of H-1B visas every year since the cap was put into effect (Watts, 2001).

There are a significant number of H-1B immigrants who are employed through specific outsourcing companies upon which United States' companies then contract with for contract labor. According to Thibodeau & Machlis (2012), the top United States companies that employ H-1B immigrants are "offshore outsourcing companies", including Cognizant and Infosys, which each employ approximately 5000 H-1B immigrants who are then contracted out to other

United States companies for specific jobs. The fact that most H-1B immigrants are not employed directly by the United States companies for which they are working, implies that there will be some discrepancy between the temporary immigrant workers and the native workers in terms of: types of jobs, wage rate, and job security. Therefore, this paper aims to study how the recession of 2008 affected the market for workers in the IT industry, specifically focusing on the number of jobs lost or retained by temporary immigrant workers compared with those of native workers.

II. LITERATURE REVIEW

The H-1B program was developed in the 1990s, and little research has been done on the program or its effects on either the temporary immigrant workers or the native workers in specific industries. The literature reviewed for the purpose of this paper varies in many different ways. Some of the articles, such as Das et al. (2012), look specifically at a comparison of immigrant labor and outsourcing of jobs. Other papers, such as Zavodny (2003), focus more on the problem this paper aims to analyze. This paper focuses on the idea of using immigrant labor compared to outsourcing, while taking into account the view that temporary immigration is an aspect of outsourcing.

It is important to examine why firms decide to outsource production to another firm, either domestically or offshore. Paul and Wooster (2010) investigate this specific decision. Typically, firms find a way to produce the same products either at a cheaper price or more efficiently. However, recently with the addition of the H-1B visa program, businesses are finding a niche where they can produce at cheaper prices while keeping jobs in the United States. Thibodeau and Machlis (2012) argue that offshore outsourcing companies employ the majority of H-1B users in the United States. The source they cite is the United States Citizenship and

Immigration Service (2012), which is the government organization that controls the application process for these companies to employ H-1B visa to immigrants. The niche these outsourcing companies are now able to fill with the H-1B visa program is allowing them to become the "major beneficiary of the H-1B program" (Thibodeau & Machlis, 2012, p. 1).

Paul and Wooster (2010) assert that because the IT industry is so competitive and operates in an "environment where continuous innovation is crucial," (p. 300) the need to outsource is greater than in other industries. According to Thibodeau (2010), Congress increased the scope of the H-1 program in 1990 "in response to warnings of an emerging 'skills gap' or 'skills mismatch' among United States engineering and technology professionals" (p. 1). Kerr and Lincoln found that "science and engineering and computer-related occupations account for approximately 60 percent of H-1B admissions" (2010, p. 474). This paper focuses on the IT industry to analyze the effects the H-1B program has on both the temporary immigrants and the native workers because IT was one of the industries that this program was aiming to benefit.

Much of the literature that specifically studies the H-1B program focuses on what the H-1B program is as a whole and to articulate the reasoning behind the need for temporary immigrant workers. Julie Watts (2010) states that, "because the IT industry accounts for nearly one-third of the growth of the United States economy, and because IT has penetrated almost all sectors, a shortage of skilled IT labor threatens the global competitiveness of the entire United States economy" (p. 145). Kerr and Lincoln (2010) look at how the H-1B program has affected innovation on behalf of the native workers and the temporary immigrants. The authors assert that "total invention increased with higher admissions primarily through the direct contributions of immigrant inventors" (p. 504). The purpose of this paper most resembles Zavodny's study, *The H-1B Program and Its Effects on Information Technology Workers*. Zavodny (2003) examines the effect the temporary immigrants have on wages as a whole in the IT industry. However, her results do not support her hypothesis that an influx of H-1B workers will cause downward pressure on wages and ultimately lower wages in the entire IT industry.

The H-1B visa program and other similar programs, have both proponents and opponents. The primary argument against the H-1B program is that the

immigration of temporary workers will take jobs away from United States workers. While on the other hand, the primary argument in favor of the H-1B program argues that the temporary immigrants are helping fill a void or shortage in skilled laborers specific to the IT industry. The majority of the literature on this topic explains the reasons for temporary immigrant labor or provides policy implications to either reduce or increase the number of temporary immigrant workers allowed in the country. The paper aims to contribute to this body of research by specifically looking at the effect that the business cycle has on both temporary immigrants and native workers in the IT market, after the temporary immigrants have entered the IT industry.

III. THEORY

Zavodny's (2003) paper looks specifically into the topic of what effects an increase in H-1B immigrants (due to an increase in the cap of H-1B Visas) have on wages. Zavodny's study assumes that there is one labor market that includes the temporary immigrants, as well as the native workers. The main hypothesis of this study is that the influx of temporary immigrants who are willing to work at a lower wage will cause pressure on the entire labor market in the IT industry, ultimately lowering all wages. The study finds that the results do not support this hypothesis; wages did not in fact decrease during this time period (2003).

Zavodny's paper, in conjunction with the fact that the majority of H-1B visa immigrants are hired by outsourcing companies rather than directly by United States companies, as well as the temporary status of the immigrant workers, all lead to the conclusion that there seems to be a segmentation of the labor market between the temporary immigrants and the native workers. Therefore, the theory of a dual labor market in this situation seems to be the underlying theory that needs to be taken into account. A dual labor market means that there are two labor markets separated by some barrier (Reich et al., 1973). In this case, the temporary immigrants are in their own labor market, which is segmented from the labor market of the natives in the IT industry. These two labor markets have a barrier between them, which prevents mobility of labor. Specifically, the temporary immigrant workers are hired by different companies (outsourcing companies) rather than those of the natives. This allows for a different equilibrium for wages and quantity of labor in each of the labor markets.

This theory assumes that if there is a change in

one of these labor markets, there will be no effect on the other labor market. In the native workers' market, we assume that supply and demand are derived based on the economy and available workers in the field. In the temporary immigrant workers market, we assume that demand is derived from the number of jobs needed, but that supply is only derived up until the point of the quota for the H-1B visas. Reich et al. identifies this as a dual labor market, where one market is the primary market with more stability and higher wages, and the other market is the secondary market with less stable working environments lower wages generally. According to Das et al., "the host country workers and migrant workers are imperfect substitutes" (2012, p. 111). The idea of imperfect substitutes suggests that the native workers are in the primary market because they live in the country and can be employed for an unlimited amount of time. The secondary market consists of the temporary immigrant workers who are only allowed to work in the country for a short period of time (1973).

The figures in the appendix graphically represent the situation of a dual labor market- where Figure 1 represents one labor market, the temporary immigrant workers- and Figure 2 represents the other labor market, the native workers. The line drawn between the two graphs represents the barrier where no worker can cross from one market to the other. As is shown by W^* and Q^* in both graphs, it is clear that in the secondary market, Figure 1, the temporary workers have a lower wage than that of the native workers in Figure 2. The graphs also represent how the equilibrium is derived. In Figure 1, the Q^* is forced because there is a quota of the number of H-1B visas allowed in the country each year, and therefore, there is a maximum number of temporary workers that can be accounted for. In figure 2, the native workers equilibrium is derived from the market where supply of native workers equals the demand of native workers. When taking into account the segmented labor market theory, we can hypothesize that the temporary immigrant workers will be more subject to fluctuations in the business cycle than the native workers. Thus, we would expect a decrease in the temporary immigrants' quantity of labor during tough economic times. It is expected that since the temporary immigrant workers are in the secondary labor market, they are the most expendable and hence, will be the first to be let go during times of economic struggle. While the native workers are seen as more permanent workers, there is less of a chance they will be let go before the immigrants, regardless of the fact that native workers have higher wages than

their temporary immigrant counterparts. Therefore, this study hypothesizes that during the 2008 recession, there was a decrease in temporary immigrant workers in the IT industry relative to the amount of workers in the native market, which I hypothesize will stay about equal, or will at least decrease less than the temporary immigrant market does

IV. DATA

The primary database used in this study is iPums-USA American Community Survey. The data that specifically look at the effect on H-1B immigrants is not available, however, through the ACS, it can be controlled for specific variables, such as immigration status, year naturalized, country of birth, and so on, to get the data of a specific group of immigrants who meet the requirements of the H-1B visa. There is no certain way to ensure that all members of the sample of temporary workers in my study have the H-1B visa, but it is known that the immigrants in this study meet the qualifications. So it is assumed that the data received will be similar to that which it would be if there was a database of H-1B immigrants.

Second, this study will be looking at a native group of individuals who are similar to the temporary immigrant group in terms of age, education status and occupation. The individuals in this group will be citizens of the United States and born in the United States. The third group of individuals in this study will be called all other immigrants. This group will include individuals who are immigrants, thus not born in the United States, but do not have temporary status, which means that these individuals have been naturalized or are working towards naturalization and likely to have a green card which assures permanent residency. The theoretical assumption of this analysis suggests that there are two markets, the native market and the temporary immigrant market. For this reason, the group labeled all other immigrants will be counted in the native group because if they have become citizens, it is reasonable to assume they have mostly assimilated into the United States.

In this dataset, the only extracted data is of individuals within the age parameter of 25 to 65 years. In addition, more data was extracted from working age adults to demonstrate the IT type occupations defined by the 1990 occupation code as: computer systems analysts and computer scientists, operations and systems researchers and analysts, computer software developers, programmers of numerically controlled

machine tools, and computer and peripheral equipment operators. The reason for looking at these types of jobs is to attain data of workers in IT type occupations.

Furthermore, in this study, temporary immigrant workers and native workers are analyzed in three specific years. The first year is during relatively good economic times in 2006. The second year, 2008, is during the recession, with relatively bad economic times. The third year is during the recovery of the recession, 2010, where the economy is thought to have recovered some, but was by no means completely recovered.

V. EMPIRICAL MODEL

The empirical model in this study uses descriptive statistics that summarizes the numbers of employees in each group through the three years to test the hypothesis that temporary immigrant employment in IT employment decreases relative to employment of natives in IT. The empirical model will also consist of an OLS regression, with the purpose to confirm the results found through descriptive statistics. Table 5 gives definitions of all of the variables included in the regression model along with the expected signs. The dependent variable in this case will be usual hours worked per week to determine if employees during the recession had to cut back their hours worked per week. There will be multiple independent variables to control for human capital and demographic determinants of hours worked including a dummy variable indicating temporary status immigrants (TEMPSTAT); dummy variables for educational, and control variables for age (AGE); and gender (GENDER). This regression will be run three different times for each of the three years, a boom year, in 2006, the recession in 2008, and the slow recovery in 2010. The results of the three years will be compared to determine if the dependent variables, and specifically TEMPSTAT, have a significant effect on the IT sector hours worked. The equation below is what is being estimated.

$$\begin{aligned} \text{Usual hours worked per week} = & \alpha \\ & + \beta_1(\text{TEMPSTAT}) + \beta_2(\text{NATIVES}) + \beta_3(\text{EDUCHS}) + \\ & \beta_4(\text{EDUCCOLG}) + \beta_5(\text{EDUCGRAD}) + \beta_6(\text{GENDER}) \\ & + \beta_7(\text{AGE}) \end{aligned}$$

This regression will be run to allow for comparison between the two groups, temporary immigrants and the native workers. When this regression is run, the expected sign that will prove my hypothesis would be for β_1 to be negative all three years. This means that having temporary status would cause a negative

effect on the usual hours worked per week. It is also expected that β_1 decreases each year to support my hypothesis that temporary immigrants are being hurt more than the native workers by the recession. The other independent variables in this regression should be interesting to determine if they affect usual hours worked per week, but they are not the prime focus of this regression.

VI. RESULTS

The results from both the descriptive statistics and the OLS regression are presented in tables in the appendix at the end of this paper. The results will be examined in two sections. The first will discuss the descriptive statistics used to determine the quantity of individuals employed throughout the three years. The second section will discuss the regression results.

A. Descriptive Statistics

Descriptive Statistics were run on the data for each year separately to determine how the IT employment numbers changed from year to year. Table 1 represents the breakdown of the data collected to determine the dispersion throughout the five IT sector jobs through the three years. This table includes only workers who would be deemed full time, meaning they work at least 35 hours per week for at least 48 weeks the prior year. As is represented in the table, the total number of workers in each job type from 2006 to 2008 has increased. Then looking from 2008 to 2010, the total number in the sample has decreased from these two years; this is also what we would have expected to occur because of the recession in 2008. It is particularly interesting to note that in one of the jobs the number of workers actually increased from 2008 to 2010, which means that there is growth in that part of the IT sector regardless of the recession.

Table 2 represents a complete breakdown of the sample each year by employment status. This allows us to look at the changes in employment, as well as changes in unemployment, and people who have dropped out of the labor force but whose last job would have been in the IT sector. From 2006 to 2008, it appears that unemployment and individuals not in the labor force decreased, while those employed increased. From 2008 to 2010, we expect unemployment and individuals not in the labor force to increase quite significantly and employment to decrease. The data does show this, which suggests that the IT sector did in fact have to let individuals go during the slow recovery after the recession.

Table 3 represents the percent distribution for IT workers of the three groups, (native workers, temporary immigrant workers, and all other immigrants) over the three years. This table includes only those who are working full time, which is denoted earlier. According to Table 3, employment in the native group actually decreased significantly from 2008 to 2010, with a 4.2 percent decrease in employment. Surprisingly, while employment of natives decreased, there was an unexpected increase in the employment in the temporary immigrant group from 2008 to 2010. The third group, which includes all other immigrants, appeared to increase but only by less than 1 percent. These results are extremely surprising and suggest that employers are reducing employment of the native employees rather than the temporary immigrant workers. One reason employers could decide to let go of the native workers instead of the temporary workers is because typically the native workers are paid more, and thus the employers would save more money as a result of reducing their employment.

Table 4 shows the percent of workers in the IT sector in each group mentioned above: natives, temporary immigrants, and all other immigrants. As this table makes clear, it appears that employers are decreasing the jobs of native workers relative to the jobs of temporary immigrants, as well as all other immigrants. This suggests that employers are turning more towards temporary immigrant workers instead of retaining or creating more native jobs in the IT sector.

B. OLS Regression

Table 5 defines each of the variables used in the regression. The dependent variable is number of hours worked. The results of the regression, which was run for each year, 2006, 2008, and 2010, are presented in Table 6. The results for all three years have extremely low adjusted R-squares, which suggests that less than 5 percent of the variance in the dependent variable each year can be explained by the independent variables in the regression.

The coefficients of the regression all appear to be significant at the .01 level except NATIVES in the first year, 2006 with a significant level at the .05. In the results, the TEMPSTAT variable, which is the most important for the purposes of this research study, appears to be negative in all three years, similar with the expectation. Also, it appears to be increasing each year, which is also what my hypothesis predicted. The fact that the TEMPSTAT variable is increasing suggests

that the temporary status of an individual is becoming more important in the prediction of the number of hours worked each week. This reflects the hypothesis that temporary status is important when companies decide how many hours' employees work. However, when taking into account the descriptive statistics, it appears TEMPSTAT is important, but that employers are deciding to increase temporary immigrant's hours rather than maintaining or increasing the native workers' hours.

VII. CONCLUSIONS

In conclusion, the results of this study appear not to support my hypothesis that during a recession, temporary immigrant workers will be affected by the recession more adversely than native workers. In fact, it appears that the native workers were affected more than the temporary immigrant workers. This is surprising given my hypothesis, but also suggests two things: first, that employers could be saving more money through letting go the more expensive workers, and second, some of the decrease in native workers could be explained by people deciding to retire or being forced into retirement.

The first explanation would make sense when looking back at the previous literature. Specifically, the article suggests that many United States companies are hiring more temporary immigrant workers because, according to Thibodeau (2010), there is "an emerging 'skills gap' or 'skills mismatch' among United States engineering and technology professionals" (p. 1). Perhaps this is correct and the temporary immigrant workers still employed during the recession have some skills that the native workers do not.

The second explanation of why natives were let go more than the temporary immigrant workers could represent the natives choosing to retire or being forced into retirement. This is an interesting hypothesis and one that could be considered for further research. The data used for this paper did not take into account retirement specifically. However, it could be that it was accounted for in the variable employment status under 'not in labor force'.

The assertion in the introduction of this paper suggesting that the influx of temporary immigrant workers is just another type of outsourcing, just domestically, appears to be the case. This is true if, as the results provide, the temporary immigrants were not let go because the cost of these workers is cheaper

than the cost of keeping the native workers employed. Overall, it appears that the IT sector is putting more emphasis on temporary immigrant labor instead of native labor as is shown through the results of both the descriptive statistics as well as the OLS regression.

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IX. APPENDIX

Table 1: Number Employed in IT Occupations				
	Census Year			
Occupation, 1990 basis	2006	2008	2010	Total
Computer systems analysts and computer scientists	14235	16140	15562	45937
Operations and systems researchers and analysts	1463	1592	1787	4842
Computer software developers	10976	11692	11329	33997
Programmers of numerically controlled machine tools	544	643	524	1711
Computer and peripheral equipment operators	1169	1062	991	3222
Total	28387	31129	30193	89709

Table 2: Distribution of Sample by Employment Status and Survey Year						
Employment Status	2006		2008		2010	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Employed	31948	90.40%	34225	91.80%	33543	88.80%
Unemployed	887	2.50%	913	2.40%	1951	5.20%
Not in the Labor Force	2529	7.20%	2143	5.70%	2270	6%
Total	35354	100%	37281	100%	37764	100%

Table 3: Number of Individuals Employed in IT						
Number of:	2006	% Change	2008	% Change	2010	
Natives	22404	8.6%	24328	-4.2%	23297	
Temporary Workers	1026	6.8%	1096	5.1%	1152	
All other Immigrants	4957	15.1%	5705	0.7%	5744	

Table 4: Percent Distribution of Individuals Employed in IT by Immigration Status			
% Employed	2006	2008	2010
Natives	79%	78%	77%
Temporary Workers	3.6%	3.5%	3.8%
All other Immigrants	17.4%	18.3%	19%

Table 5: Variables and Descriptions		
Variable Name	Description	Expected Sign
Dependent		
Usual hours worked per week	Numerical number of hours worked per week	
Independent		
NATIVES	0=immigrant, 1=native	Unknown
TEMPSTAT	0=citizen, 1=temporary status	-
Education Attainment		
EDUCHS	0=no high school diploma, 1=has high school diploma	Omitted
EDUCCOLG	0=no college diploma, 1=has college diploma	+
EDUCRGRAD	0=no education beyond college, 1=attended some graduate school	+
GENDER	0=male, 1=female	Unknown
Age	Number 25 through 65	Unknown

Table 6: Regression Results Predicting Hours Worked			
	2006	2008	2010
Constant	46.539***	47.385***	45.479***
TEMPSTAT	-2.834***	-2.931***	-3.459***
NATIVES	.410**	.434***	.558***
EDUCCOLG	.743***	.751***	1.543***
EDUCGRAD	1.362***	1.398***	2.118***
GENDER	-3.914***	-3.963***	-3.587***
Age	-.147***	-.161***	-.155***
Adjusted R-Squared	.039	.046	.038
Sample Size	35354	37281	37764
*Significance at the .10 level			
**Significance at the .05 level			
***Significance at the .01 level			