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Offshoring, Immigration, and the Native Wage Distribution

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Abstract

While workers in developed countries have become increasingly concerned about the impact offshoring and immigration have on their wages, the available evidence remains mixed. This paper presents a simple model that examines the impact of offshoring and immigration on wages and tests these predictions using U.S. state-industry level data. According to the model, the productivity effect causes offshoring to have a more positive impact on low-skilled wages than immigration, but this gap decreases with the workers' skill level. The empirical results confirm these predictions and thus provide the first evidence of the productivity effect. Furthermore, the impact of offshoring and immigration on wages differs depending on the income level of the foreign country, which may explain the mixed results in the literature.

Keywords: offshoring, outsourcing, immigration, productivity effect, native wages

JEL Codes: F16, F22, J3

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1 Introduction

Workers in developed countries are becoming increasingly concerned about the impact of offshoring and immigration on their domestic labor markets.[2] Offshoring and immigration are the two factors that are of most concern to American workers: 77% of Americans think that offshoring has hurt them (13% believe it has helped) and 55% of Americans believe immigration has hurt them (28% believe it has helped).[3] While many American workers blame their stagnant wages on the increased prevalence of offshoring and immigration, the available evidence on the link between offshoring, immigration, and wages remains mixed. In order to investigate the validity of these fears and clarify these relationships, this paper presents a simple model that highlights the impact of offshoring and immigration on wages and then tests these predictions using a comprehensive dataset.

The offshoring of domestic jobs and the immigration of foreign workers are mechanisms that increase the effective labor force available to domestic firms. However, their impact on wages differs if the benefits of offshoring and immigration accrue to different factors of production. A simple model is constructed that clarifies the relationship between the offshoring of low-skilled tasks, low-skilled immigration, and wages. Both offshoring and immigration generate a labor-supply effect which depresses the wages of low-skilled workers but increases the wages of high-skilled workers. Offshoring also generates a productivity effect which refers to the costs savings that firms enjoy after relocating some tasks abroad. The productivity effect increases the wages of low-skilled workers but has no effect on the wages of high-skilled workers. Immigration does not generate a productivity effect since domestic firms must pay native and immigrant workers similar wages. Unlike offshoring, the benefits of coun-

[2] Offshoring refers to the relocation of domestic jobs to foreign countries.

[3] "Public Says American Work Life is Worsening, But Most Workers Remain Satisfied with Their Jobs," Pew Research Center, 2006.

try wage differences are captured by the immigrants rather than the domestic firms. Thus, comparing the impact of offshoring and immigration on the wages of native workers offers a unique opportunity to test for the presence of the productivity effect. Specifically, due to the productivity effect, offshoring has a more positive impact on low-skilled wages than immigration (Proposition 1), but this gap decreases with the workers' skill level (Proposition 2).

The predicted impact of immigration and offshoring on the wages of different types of native workers is then tested using a comprehensive U.S. state-industry level dataset. Using state-industry level data is appealing because it introduces a substantial amount of variation, it mitigates many of the mobility concerns associated with city or county level analyses, and it controls for compositional industry adjustments. The results confirm both predictions of the model. Offshoring has a positive effect on the wages of low-skilled workers while immigration has a slight negative effect on these wages. However, the impact of offshoring and immigration on wages converges as the workers' skill level increases.

Offshoring and immigration are then grouped according to the income level of the foreign country. This focuses attention on the types of offshoring and immigration that are best captured by the model, specifically the offshoring of low-skilled tasks to less-developed countries and the immigration of less-skilled workers from less-developed countries. The results again confirm both predictions of the model and provide even stronger empirical support for the productivity effect. Again, due to the productivity effect, offshoring has a more positive effect on the wages of low-skilled workers than immigration, but as the workers' skill level increases, the effect of offshoring and immigration on native wages becomes more similar.

While not the focal point of the model, offshoring to developed countries and immigration from developed countries are also included in the empirical analysis for comparison purposes. Interestingly, offshoring to developed countries decreases and immigration from developed countries increases the wages of most native workers. Thus, the two types of offshoring and the two types of immigration have very different impacts on the wages of native workers. Controlling for the income level of the foreign country proves crucial in understanding the implications of offshoring and immigration on native wages. This shifts our focus from whether offshoring and immigration help or hurt native workers to how specific components of offshoring and immigration affect particular types of native workers.

Some authors have recently examined the impact of offshoring and immigration on native wages (Jones 2005, Grossman and Rossi-Hansberg 2008). These papers show how offshoring can lead to an increase in domestic wages and discuss the similarities and differences of immigration. This paper builds upon this literature by constructing a model that combines immigration and offshoring into a single, unified framework. In particular, a model is developed that incorporates immigration into a variation of the Grossman and Rossi-Hansberg's (2008) trade in task model. This produces specific predictions about how offshoring and immigration affect different types of native workers. Combining offshoring and immigration into a single framework also generates two testable predictions for the presence of the productivity effect. This is an important contribution since it has been difficult for researchers to test for the productivity effect due to the lack of adequate trade data. The empirical results that follow support both propositions of the model and thus provide the first empirical evidence of the productivity effect.

While the links between offshoring and wages (Feenstra and Hanson 1999, Slaughter 2000) and immigration and wages (Card 1990, Card 2001, Borjas 2003) have been studied extensively with results varying substantially, to the best of my knowledge no one has combined offshoring and immigration into a comprehensive empirical analysis. Not only does this provide a unique opportunity to test for the productivity effect, it also allows for specific components of offshoring and immigration to be compared. Conflicting results in the literature typically arise from papers using different estimation strategies, unit of analyses, or data. However, this paper shows that offshoring and immigration have very different impacts on native wages depending on the income level of the foreign country. This improves our understanding of how these global forces affect the wages of native workers and may reconcile some of the mixed results in the literature.

Recent studies have provided highly publicized estimates of the number of U.S. jobs that may be offshored in the coming years (Blinder 2007, Jensen and Kletzer 2005, McKinsey Global Institute 2005). While these papers offer a rough estimate of the scope of offshoring, they do not address the implications of offshoring for native workers. Between 22% - 29% of all U.S. jobs are potentially offshorable (Blinder 2007), but without a clear idea of how offshoring impacts domestic labor markets, interpreting these results is difficult. This paper fills this void by identifying how different components of offshoring affect particular types of native workers. The results that follow suggest that certain types of offshoring are beneficial for particular types of native workers.

The remainder of the paper is organized as follows. A simple model is constructed in the next section which highlights the impact of offshoring and immigration on domestic wages. Section 3 presents the estimation strategy while Section 4 describes the data used in this analysis and presents descriptive statistics. The results are discussed in Section 5, and endogeneity concerns and additional robustness checks are pursued in Section 6. Finally, Section 7 concludes.

2 Model

The goal of this section is to construct a simple model that clarifies the relationship between offshoring, immigration, and native wages. Following Grossman and Rossi-

Hansberg (2008), I model offshoring as trade in tasks. The productivity effect arises in an environment in which there are heterogeneous costs of offshoring tasks, while the labor-supply effect arises in an environment in which there are more factors of production than goods. Thus, in order to simply and clearly illustrate these competing effects, the model focuses on a small economy that produces a single good using two factors and that faces increasing costs of offshoring tasks.[4] In addition, immigration, which leads to changes in the domestic labor supply, is added to the model. While other authors have discussed the similarities and differences of offshoring and immigration (Jones 2005, Grossman and Rossi-Hansberg 2008), this is the first paper that incorporates immigration into a trade in task framework. Combining offshoring and immigration in a unified model generates clear, testable predictions for the productivity effect.

Consider a small economy, such as a state, that takes the price and the foreign wage as given and specializes in the production of a particular good Y. The production of good Y requires L-workers, who are relatively less skilled, and H-workers, who are relatively more skilled. There is a continuum of L-tasks and a continuum of H-tasks performed by each type of worker. The tasks are defined such that each task must be performed once in order to produce a unit of good Y. Each L-task requires a_L units of domestic low-skilled labor, and each H-task requires a_H units of domestic high-skilled labor. Substitution between H-tasks and L-tasks is possible, and thus both unit requirements are chosen by the firm in order to minimize costs. Without loss of generality, the number of L and H tasks is normalized to one. Therefore, a_L and a_H also indicate the amount of domestic L-labor and H-labor necessary to produce a unit of good Y.

[4] Including a second good in the model would generate a "relative-price effect" caused by offshoring which would put downward pressure on the low-skilled wage and upward pressure on the high-skilled wage via the Stolper Samuelson Theorem (Grossman and Rossi-Hansberg 2008). While this is an interesting extension, the relative price effect is not crucial for this analysis, and thus I try to keep the model as simple as possible. If anything, the relative price effect would work against the propositions of the model and the empirical results that follow.

Offshoring L-tasks to the foreign country and immigration of L-workers to the home state are possible, while the offshoring of H-tasks and the immigration of H-workers are negligible.[5] The L-tasks are ordered such that the costs of offshoring are increasing. Let w and w^* be the wages of the L-workers in the home state and foreign country respectively (with $w > w^*$). A firm can produce task j domestically at a cost of wa_L, or it can produce task j abroad at a cost of $w^* a_L \beta g(j)$, where β is a shift parameter that captures changes in the cost of offshoring and $g(j)$ is a continuously differentiable function with $g'(j) > 0$ due to the ordering of the tasks. Firms offshore tasks in order to take advantage of lower foreign wages but face increasing costs of offshoring, $\beta g(j) \geq 1$. Thus, there exists a task J such that the wage savings is exactly equal to the costs of offshoring, or

$$w = \beta g(J) w^*. \tag{1}$$

If $w < \beta g(j) w^*$, then task j is performed at home, and if $w > \beta g(j) w^*$, then task j is performed abroad. Therefore, due to the ordering of tasks, tasks $j \in [0, J]$ are offshored, and tasks $j \in (J, 1]$ are carried out at home. A reduction in the cost of offshoring ($d\beta < 0$) leads to an increase in the share of low-skilled tasks that are offshored ($dJ < 0$).

If firms optimally choose a_L, a_H, and the tasks to offshore, then profit maximization implies that price equals marginal cost

$$P = wa_L(.)(1 - J) + w^* a_L(.) \int_0^J \beta g(j) dj + s a_H(.), \tag{2}$$

[5] While these assumptions are consistent with the findings that offshoring of high-skilled jobs and high-skilled immigration are relatively small, these restrictions will be relaxed in the empirical analysis that follows.

where s represents the high-skilled wage and a_L and a_H are functions of the relative average costs of the two sets of tasks. The first term on the right-hand side represents the costs paid to domestic low-skilled workers since $(1-J)$ tasks are performed at home with a_L low-skilled labor needed for each task. The second term on the right-hand side represents the costs of hiring foreign low-skilled workers. Since the costs vary across each task, I integrate from 0 to J. The third term is the costs of hiring native high-skilled workers.

Substituting (1) into (2) yields the following zero-profit condition:

$$P = \Omega(J) w a_L(\Omega w/s) + s a_H(\Omega w/s), \tag{3}$$

where

$$\Omega(J) = 1 - J + \left(\int_0^J g(j)dj \right) / g(J).$$

Here the dependence of the factor intensities a_L and a_H on the relative average costs is explicitly stated. If $J = 0$, then no tasks are offshored, $\Omega(J) = 1$, and the zero-profit condition is of the standard form. Since $g'(j) > 0$, by the ordering of tasks, it can be shown that $\Omega(J) < 1$ as long as $J > 0$. Therefore, the costs to the firm after offshoring some tasks are less than if they chose to perform all L-tasks domestically. Finally, an increase in the share of low-skilled tasks that are offshored $(dJ > 0)$ leads to a decrease in firms' costs $(d\Omega(J) < 0)$.[6] Offshoring leads to a reduction in firms' costs through the extensive margin because more tasks are offshored and through the intensive margin because it is now cheaper to offshore the tasks already produced abroad.

[6] $\frac{\partial \Omega}{\partial J} = \frac{\int_0^J g(j)dj}{g(J)^2} g'(J)$ which is negative when $J > 0$.

Domestic firms reduce their costs by optimally choosing the tasks to offshore. Since offshoring is a deliberate action on the part of the firm, offshoring features prominently in the firms' profit maximizing decision in (3). In contrast, immigration is determined by factors largely exogenous to the firm, such as changes in immigration policies or foreign economic conditions. Furthermore, since domestic firms are not allowed to discriminate against immigrants by paying them lower wages, an increase in immigration does not directly reduce firms' costs.[7] Thus, immigration does not affect the profit maximizing decision facing the firm in (3). Unlike offshoring, the benefits associated with country wage differences are captured by the immigrants rather than the domestic firm. However, both offshoring and immigration will have important implications for the market-clearing conditions that follow.

Each firm performs $(1 - J)$ L-tasks at home and all H-tasks at home. Domestic firms hire native low-skilled workers and low-skilled immigrants to perform the $(1-J)$ L-tasks. Therefore, the market-clearing conditions are

$$(1 - J)a_L(\Omega w/s)Y = (1 + I)L \tag{4}$$

and

$$a_H(\Omega w/s)Y = H, \tag{5}$$

where $I \in [0, 1]$ is the ratio of immigrant low-skilled workers to native low-skilled workers. Thus, the right-hand side of (4) represents the domestic low-skilled labor

[7] As long as employers cannot fully discriminate against immigrants by paying them the prevailing wage in their source country, the cost savings under offshoring will exceed that under immigration. Furthermore, if employers can fully discriminate, then there would be no difference between offshoring and immigration which would work against the empirical findings of this paper.

supply which consists of native and immigrant workers.

Using the zero profit condition and the market clearing conditions, we can examine how an increase in offshoring or an increase in immigration affects domestic wages. Totally differentiating equation (3), assuming that P is the numeraire, yields[8]

$$\theta_L(\hat{w} + \hat{\Omega}) + (1 - \theta_L)\hat{s} = 0, \tag{6}$$

where θ_L is low-skilled labor's share of total costs. Differentiating the ratio of (4) to (5) gives

$$\sigma(\hat{s} - \hat{w} - \hat{\Omega}) = \frac{dJ}{(1 - J)} + \frac{dI}{(1 + I)}, \tag{7}$$

where σ is the elasticity of substitution between the set of L-tasks and the set of H-tasks.

Combining (6) and (7) yields the percent change in the wage of low-skilled workers as a function of changes in offshoring and immigration:

$$\hat{w} = -\hat{\Omega} - \frac{(1 - \theta_L)}{\sigma}\frac{dJ}{(1 - J)} - \frac{(1 - \theta_L)}{\sigma}\frac{dI}{(1 + I)}. \tag{8}$$

The first term on the right-hand side of (8) is the productivity effect. As the cost of offshoring decreases ($d\beta < 0$), more tasks are offshored ($dJ > 0$), and thus the cost of performing the L-tasks declines ($\hat{\Omega} < 0$). Lower costs are equivalent to higher productivity for low-skilled labor. Higher productivity increases the demand for low-skilled workers and raises their wage. The second term on the right-hand

[8] See Model Appendix for derivations.

side of (8) is the labor-supply effect of offshoring. As the cost of offshoring decreases ($d\beta < 0$), more L-tasks are offshored ($dJ > 0$), and thus some low-skilled workers become unemployed. Due to excess supply, the wage of low-skilled workers declines. Together the first and second terms of equation (8) represent the impact of offshoring on the wages of low-skilled workers in this model. The third term on the right-hand side of (8) is the labor-supply effect of immigration. The excess supply of low-skilled workers due to immigration reduces the low-skilled wage. From equation (8), the following proposition is immediate:

Proposition 1 *Due to the productivity effect, offshoring has a more positive impact on the wages of low-skilled workers than immigration.*

While both offshoring and immigration generate a labor-supply effect, offshoring also generates a productivity effect that increases the wages of low-skilled workers. If the productivity effect exceeds the labor-supply effect, then offshoring will increase the wages of low-skilled workers. Thus, this model generates the seemingly counterintuitive result that offshoring can benefit the factor whose tasks are being sent abroad. Immigration, on the other hand, unambiguously decreases the wages of low-skilled labor in this model. Immigration does not generate a productivity effect because the benefits of country wage differences are captured by the immigrants rather than the domestic firm. Unlike offshoring, immigration does not generate any direct costs savings for domestic firms since they pay immigrants and native workers the same market wage.

Using (6) and (7), it is also possible to derive the percent change in the wage of high-skilled workers as a function of changes in offshoring and immigration:

$$\hat{s} = \frac{\theta_L}{\sigma}\frac{dJ}{(1-J)} + \frac{\theta_L}{\sigma}\frac{dI}{(1+I)}. \tag{9}$$

Here the labor-supply effect of offshoring and immigration increases the wages of high-skilled workers. As is common in a two factor model, an increase in the effective supply of low-skilled labor increases the marginal product and wages of high-skilled workers. Offshoring does not generate a productivity effect for high-skilled workers because a decrease in the costs of offshoring ($d\beta < 0$) reduces the firms' costs of performing L-tasks with no direct effect on the costs of performing H-tasks. Thus, offshoring does not directly impact the productivity of high-skilled workers. Comparing equations (8) and (9) establishes the following proposition:

Proposition 2 *Due to the productivity effect, the impact of offshoring and immigration on wages becomes more similar as the workers' skill level increases.*

The labor-supply effects generated by offshoring and immigration have a negative impact on low-skilled wages and a positive impact on high-skilled wages. However, the productivity effect generated by offshoring only impacts low-skilled wages since offshoring affects the costs of performing L-tasks but not H-tasks. Thus, offshoring and immigration differ in their impact on low-skilled wages but have a similar impact on high-skilled wages.

3 Estimation Strategy

The propositions generated by the model offer two unique, testable predictions for the productivity effect. Offshoring will have a more positive impact on low-skilled wages than immigration (Proposition 1), but this gap decreases with the workers' skill level (Proposition 2). The empirical analysis that follows will test these predictions by estimating the impact of offshoring and immigration on different wage deciles of native workers. This estimation strategy identifies how offshoring and immigration affect the wages of native workers with a variety of different skill levels. This offers greater insight into the relationship between offshoring, immigration, and wages than simply estimating the impact on high-skilled and low-skilled wages and it is especially useful in testing Proposition 2. Thus, the following equation will be estimated:

$$W_{sitd} = \alpha_0 + \alpha_1 Off_{sit} + \alpha_2 \operatorname{Im} g_{sit} + \alpha_3^{'} X_{sit} + \delta_s + \eta_i + \gamma_t + \epsilon_{sitd}, \tag{10}$$

where s indexes states, i indexes industries, t indexes years, and d indexes different native wage deciles; W is the natural log of the native workers' wage; Off is offshoring; Img is immigration; X is a vector of control variables; δ_s are state fixed effects; η_i are industry fixed effects; and γ_t are year fixed effects. The model predicts that $\alpha_1 > \alpha_2$ for low wage deciles but that the difference between α_1 and α_2 decreases as the native wage deciles increase. The productivity effect generates a difference in coefficients at the low end of the wage distribution, but as the native wage increases the productivity effect diminishes and thus the gap between the coefficients decreases.

The inclusion of state, industry, and year fixed effects means that any factor that is common to a state, industry, or year will be controlled for in this analysis. Thus, the impact of offshoring and immigration on native wages is identified by state-industry level changes over time. For instance, if General Motors, Ford, or Chrysler decides to relocate more automotive production activities abroad, then offshoring in the manufacturing industry in Michigan will increase. If builders in Texas decide to hire more foreign-born workers, then immigration in the construction industry in Texas will increase. This analysis will take advantage of these changes in offshoring and immigration to identify how these forms of globalization affect native wages.

Estimating (10) will provide insight into the overall impact of offshoring and immigration on different wage deciles of native workers. However, it would be appealing to decompose the offshoring and immigration variables into components that more closely correspond to the type of offshoring (L-tasks) and the type of immigration (L-workers) that are envisioned in the model. Focusing on offshoring to less-developed countries (i.e. L-tasks) and immigration from less-developed countries (i.e. L-workers) provides a good proxy for these components of interest. Thus, the following equation will be estimated:

$$
\begin{aligned}
(11)\quad W_{sitd} = \alpha_0 + \alpha_1 Off\_lessdev_{sit} + \alpha_2 Off\_dev_{sit} + \alpha_3 \operatorname{Im} g\_lessdev_{sit} \\
+ \alpha_4 \operatorname{Im} g\_dev_{sit} + \alpha_5^{'} X_{sit} + \delta_s + \eta_i + \gamma_t + \epsilon_{sitd}.
\end{aligned}
$$

Again the model predicts that $\alpha_1 > \alpha_3$ for low wage deciles but that the difference between α_1 and α_3 decreases as the native wage deciles increase.

Offshoring to less-developed countries takes advantage of low foreign wages by relocating particular low-skilled tasks abroad. This is the type of offshoring that is envisioned in the model and entails different tasks being performed by domestic and foreign low-skilled workers. Since native and foreign workers are complements in the production process, it is more likely that the productivity effect exceeds the labor-supply effect, and thus the impact on low-skilled native wages will be positive. On the other hand, offshoring to other developed countries tends to be motivated by the desire to access foreign markets by replicating the production process abroad rather than exporting. While this is not the type of offshoring that is discussed in the model, the concepts of the productivity and labor-supply effects are still relevant. This type of offshoring consists of similar tasks being performed by domestic and foreign workers. Since foreign workers are substituting for domestic workers, the labor-supply effect likely exceeds the productivity effect, and thus the impact on low-skilled native wages will be negative.[9]

[9] This is consistent with Harrison and McMillan's (2006) findings that vertical foreign affiliate employment complements domestic employment whereas horizontal foreign affiliate employment substitutes for domestic employment.

Consistent with previous results (Borjas 1995), I find that the skill level of immigrants is strongly correlated with the income level of the foreign source country.[10] Since immigrants from less-developed countries are relatively less skilled, they will compete with less-skilled native workers for jobs. Thus, according to the model, immigration from less-developed countries generates a labor-supply effect that depresses low-skilled wages and increases high-skilled wages. Although the model focuses on less-skilled immigrants, the effects of skilled immigrants from developed countries will be included in the empirical analysis for comparison purposes. If these skilled immigrants bring knowledge and expertise that is not readily available in the domestic labor market, they may raise the wages of all types of native workers.

4 Data

The data set utilized in this analysis spans the 48 contiguous U.S. states, 14 NAICS industries, and 6 years (2000-2005). Census data on employed individuals who earn a positive wage, are not in school, and are between the ages of 18 and 65 is obtained from the Integrated Public Use Microdata Series (IPUMS). From these 2.9 million individual observations, native wage deciles are constructed for each state-industry-year observation. Immigration is calculated as the share of employed individuals who are foreign born which is consistent with I from the model. In addition, the following control variables are calculated for each observation: the share of native employees that are male, the share of native employees that are of a particular race and marital status, and the average age and average educational attainment of native workers.[11]

Data on offshoring, defined as the number of employees at majority-owned for-

[10] In order to be consistent with the offshoring measure, immigrants are grouped according to the income level of the foreign source country. The results that follow are not sensitive to whether this proxy or the educational attainment of the immigrants is used.

[11] See Data Appendix for additional details.

eign affiliates of U.S. firms, is obtained from the U.S. Bureau of Economic Analysis (BEA).[12] Given the trade in task model, focusing on foreign affiliate employment is preferable to other measures of foreign direct investment such as affiliate sales. The BEA provides foreign affiliate employment data by year and industry of the foreign affiliate. Since offshoring data is not available by state, foreign affiliate employment is distributed across states based on the share of state GDP to national GDP in that industry. Finally, the share of foreign affiliate employment to total employment, including both domestic and foreign employment, is calculated by state, industry, and year. Thus, offshoring is defined as the following share

$$offshoring_{sit} = \frac{\left[\frac{GDP_{sit}}{\sum_s GDP_{sit}} * Foreign\_Affiliate\_Empl_{it}\right]}{Domestic\_Empl_{sit} + \left[\frac{GDP_{sit}}{\sum_s GDP_{sit}} * Foreign\_Affiliate\_Empl_{it}\right]} * 100,$$

where s indexes states, i indicates industries, and t references years. This measure of offshoring is consistent with J from the model which captures the share of tasks that are offshored. Comparing this offshoring variable to data from the Trade Adjustment Assistance (TAA) program indicates that this method of distributing foreign affiliate employment across states is accurate.[13] Offshoring to developed and less-developed countries was constructed in an analogous manner. Inshoring, defined as the number of employees at majority-owned U.S. affiliates of foreign firms, was also constructed in the same way. This will be an important control in the regressions that follow.

This dataset has a number of appealing features. First, using U.S. state level data

[12] While the model does not draw a distinction between offshoring tasks to foreign affiliates or foreign arms length suppliers, the empirical section of this paper will focus on the offshoring of jobs to foreign affiliates due to data constraints. Since offshoring to arms length suppliers is difficult to measure, and given that offshoring to foreign affiliates is relatively less labor intensive (Antras 2003), this definition represents a lower bound on the total amount of offshoring.

[13] The TAA program has data on the number of domestic workers who are displaced due to import competition. While these variables measure slightly different things, the correlation coefficient between these two variables is 0.8.

is preferable to a cross country analysis where it is difficult to control for unobserved factors. Since U.S. states share similar laws, institutions, and cultural characteristics, using states as the unit of analysis limits these confounding factors. Together with the variation in offshoring and immigration across states (Table 1), this means that the link between these forms of globalization and wages is more easily identified. In addition, state level data mitigates many of the mobility concerns associated with a city or county level study. Thus, states more closely resemble a closed labor market while still offering a substantial amount of variation.

Second, this analysis incorporates 14 2-digit NAICS industries which range from manufacturing to professional services to finance (Table 2). Due to data constraints, many previous studies focus just on manufacturing industries (Feenstra and Hanson 1999, Harrison and McMillan 2006, Amiti and Wei 2009). However, manufacturing represents only 13% of total U.S. GDP in 2008.[14] Unlike these previous studies which focus on a small component of the U.S. economy, this analysis examines how offshoring and immigration affect wages in a wide variety of industries. Furthermore, by focusing on highly aggregated NAICS industries, mobility across industries is less problematic.

Incorporating 14 industries into this analysis not only provides an additional source of variation but it also controls for the compositional mix of industries within states. It is possible that an influx of immigrants or an increase in offshoring could lead to a change in industry composition within a state. Specifically, a labor supply shock can be fully absorbed through a change in industry mix without any change in factor returns. By using a state-industry-year unit of observation, this analysis controls for the changing compositional mix of industries within states. Finally, the years included in this analysis span exogenous shocks to both offshoring and immigration caused by China joining the World Trade Organization in 2001 and changes

[14] Gross Domestic Product by Industry Accounts (BEA).

to immigration policy following 9/11.

Table 1 presents the median wage, immigration, and offshoring by state. While the state fixed effects will capture much of this variation, Table 1 provides insight into the states that are most susceptible to offshoring and immigration. There is substantial variation across states, with the median wage ranging from $23,721 in Montana to $41,595 in Connecticut, immigration fluctuating from 1.6% in West Virginia to 34.3% in California, and offshoring varying from 3.2% in Montana to 9.0% in Indiana. Figure 1 plots average immigration and offshoring by state. Not surprisingly, the urban coastal states of California, New York, and New Jersey have high shares of offshoring and immigration while the rural isolated states such as Montana and North Dakota have low shares of both. Florida and Nevada have high shares of immigration but relatively low shares of offshoring. Finally, midwestern rust-belt states such as Michigan and Indiana have a relatively high share of offshoring but relatively little immigration.

There is similar variation across industries (Table 2), with the median wage fluctuating from $15,433 in accommodations and food services to $48,742 in utilities, immigration ranging from 5.4% in utilities to 22.7% in accommodations and food services, and offshoring varying from 0.1% in health care and social assistance to 21.2% in manufacturing. The substantial variation evident in Tables 1 and 2 indicates that there has been little wage convergence across states and industries and supports the assertion that a state-industry labor market is reasonably closed. Although the state, industry, and year fixed effects will capture much of the variation in Tables 1 and 2, these figures provide insight into the dimensions and nature of the dataset used in this analysis.

To gain a sense of the variation exploited in this analysis, I need to eliminate the variation that will be captured by the state, industry, and year fixed effects. This is done by first regressing the median native wage, offshoring, and immigration variables on state, industry, and year fixed effects. The residuals from these regressions will be the variation left after accounting for the fixed effects. The median wage residuals and offshoring residuals are plotted in Figure 2 while the median wage residuals and immigration residuals are plotted in Figure 3. These scatter plots do not include factors that are constant within states, industries, and years and thus focus on the variation in wages, offshoring, and immigration exploited in this paper. It is evident in Figure 2 that offshoring is associated with higher median native wages. However, there is little relationship between immigration and median native wages in Figure 3. These basic scatter plots suggest that there is an important difference between the impact of offshoring and immigration on native wages. However, to more accurately test the propositions of the model, it is crucial to examine how offshoring and immigration impact the wages of different types of native workers, and it is important to control for characteristics of the native population.

5 Results

This section presents the empirical results. I am interested in how different components of offshoring and immigration affect specific types of native workers. However, before tackling these important questions, I first examine how globalization, defined as the sum of offshoring, immigration, and inshoring, impacts the wages of different types of workers. Given the fears associated with an increasingly integrated global economy, it is worthwhile to investigate whether globalization benefits or hurts American workers. Table 3 reports the results from estimating the impact of globalization on eight different wages deciles.[15] All regressions are weighted by the sample size, include state, industry, and year fixed effects, and have robust standard errors in

[15] Unfortunately, the Census replaces wage values above $200,000 with the state average of these wage values regardless of industry. While it is important to include these 'top coded' observations in order to maintain an accurate wage distribution, regressions using the 90th wage decile as the independent variable are biased and are therefore not reported.

brackets. We see that globalization leads to an increase in wages of all types of native workers, thus contradicting many of the fears of American workers. A protectionist policy that limited offshoring, immigration, and inshoring would unambiguously decrease the wages of native workers. While Table 3 demonstrates that these forms of globalization, on the whole, benefit native workers, the model predicts that offshoring and immigration should differ in their impact on the wages of native workers. Next, the aggregate effect of offshoring and immigration on native wages is examined, while the subsequent section focuses on the types of offshoring and immigration that are most similar to those considered in the model.

5.1 Immigration and Offshoring

Table 4 reports the results from estimating equation (10). We see that offshoring increases the wages of most native workers while immigration has little impact on native wages. Specifically, a one percentage point increase in the share of foreign affiliate employment increases the median wage of native workers by 0.3 percent, while a one percentage point increase in the share of foreign born workers does not have a significant impact on the median native wage. Offshoring has the strongest impact on low wage native workers, with this positive effect diminishing as the wage deciles increase. Not surprisingly, inshoring, or the hiring of domestic workers by foreign firms, increases the wages of all types of native workers. The control variables are significant and of the expected sign; however, the coefficients on offshoring and immigration are similar if these controls are omitted.

The results reported in Table 4 support the predictions of the model. The offshoring coefficients are more positive than the immigration coefficients at the low end of the wage distribution, but this gap decreases as the native wage deciles increase. These results are consistent with both Proposition 1 and 2 outlined in the model, and they provide preliminary evidence of the productivity effect. However, these aggregate measures combine different types of offshoring and immigration which may have very different implications for native workers.

5.2 Income Level of Foreign Country

While Table 4 provides preliminary evidence on the relationship between offshoring, immigration, and native wages, it is informative to decompose offshoring and immigration according to the income level of the foreign country. This is an effective way to identify the types of offshoring and immigration that are best captured by the model, specifically the offshoring of low-skilled tasks and the immigration of low-skilled workers. The results of estimating equation (11) are presented in Table 5 and demonstrate that the relationship between offshoring, immigration, and native wages is sensitive to the income level of the foreign host and source countries. A one percentage point increase in offshoring to less-developed countries increases the median native wage 1.4%, while a one percentage point increase in offshoring to developed countries decreases the median native wage 0.7%. A one percentage point increase in immigration from less-developed countries decreases the median native wage 0.1%, while a one percentage point increase in immigration from developed countries increases the median native wage 0.9%.

In contrast to the aggregate results presented in Table 4, the results in Table 5 differ in two important dimensions. First, the two types of offshoring and the two types of immigration work in opposite directions, with one component increasing and the other decreasing the wages of most native workers. These contrasting results indicate that the measures of offshoring and immigration are capturing important variation in wages. Second, the impact of the less-developed and developed components on native wages are different for offshoring and immigration. For instance, native workers benefit from offshoring to less-developed countries but they see their wages decrease due to immigration from less-developed countries. These contrasting results highlight the importance of controlling for the income level of the foreign country.

In addition to differences between the independent variables, there are also important differences in how offshoring and immigration impact various types of native workers. An appealing aspect of using native wage deciles is the ability to examine how offshoring and immigration affect wage inequality. The results in Table 5 indicate that offshoring to less-developed countries decreases wage inequality since the wages at the low end of the distribution increase by relatively more than the wages at the high end. However, offshoring to developed countries increases wage inequality. In contrast, immigration does not have a significant effect on wage inequality. Table 5 indicates that both types of immigration have a relatively constant effect on the wages of different types of native workers.

Figure 4 plots the *Offshoring (Less Dev)* and *Immigration (Less Dev)* coefficients and their 95% confidence intervals from Table 5. The vertical difference between these two lines captures the productivity effect. These results provide strong support for Proposition 1 and Proposition 2 of the model. Offshoring has a more positive impact on the wages of low-skilled native workers than immigration, but this difference decreases as the wage deciles increase. Offshoring to less-developed countries generates a productivity effect that more than compensates for the labor-supply effect at the low end of the wage distribution. However, as the wage deciles increase, the productivity effect diminishes, and thus the impact that offshoring and immigration have on native wages converges. According to the model, immigration from less-developed countries generates only a labor-supply effect that depresses the wages of low-skilled workers and increases the wages of high-skilled workers. The *Immigration (Less Dev)* coefficients suggest that the labor-supply effect is relatively small in comparison to the productivity effect. When focusing on the types of offshoring and immigration that are most consistent with the model, the results are larger in magnitude, more significant, and conform more closely to the predictions of the model than the aggregate results in Table 4.

While the model focuses on the offshoring of low-skilled tasks and the immigration of low-skilled workers, I include offshoring to developed countries and immigration from developed countries in the regressions in Table 5 for comparison purposes. Offshoring to other developed countries entails replicating the production process abroad in order to access foreign markets and avoid transport costs. This results in foreign workers substituting for domestic labor and explains the negative coefficients on *Offshoring (Dev)*. Meanwhile, the positive coefficients on *Immigration (Dev)* indicate that these high-skilled immigrants bring with them skills and expertise that benefit native workers. Overall, the results in Table 5 emphasize the importance of controlling for the income of the foreign country, are consistent with the model's predictions, and provide strong empirical evidence of the productivity effect.

6 Robustness Analysis

In principle, it is possible that offshoring and immigration may respond to changes in native wages. However, it is unlikely that this type of endogeneity is biasing the results in Table 5. First, based on its construction, it is doubtful that offshoring could respond to the native wage profile in a particular state, industry, and year. The foreign affiliate employment data is gathered at the national industry level and then distributed across states using state GDP shares. It is unlikely that local wages in a state could substantially influence national offshoring in a particular industry. However, it is possible that local wages are correlated with local GDP. To address this concern, Table 6 uses the pre-sample 1999 state GDP shares to distribute industry offshoring for all years. While reducing the possibility of endogeneity, this method does not allow the allocation of national industry offshoring across states to reflect changes in the state's share of that industry over time. Despite these differences, the results in Table 6 are consistent in sign, magnitude, and significance level to those reported in the baseline results in Table 5.

Second, local wages are unlikely to be a driving force in the state location decision of immigrants. Non-economic factors such as family and friends, distance from home country, and weather are typically found to be important determinants of immigrant location decisions.[16] The migration of residents in response to wages is more problematic at a more finely disaggregated geographic level (i.e. cities or counties) or across more finely disaggregated industries (i.e. 6-digit NAICS). However, for the sake of argument, suppose immigrants did choose states and industries solely based on which paid a relatively higher wage. Then there would be a spurious positive correlation between immigration and wages. The fact that the *Immigration (Less Dev)* coefficients in Table 5 are significantly negative implies that either this positive bias is negligible or the impact of immigration on domestic wages is even more negative than these estimates suggest. Neither case is problematic for the conclusions of this paper. As an additional robustness check, the regressions in Table 7 exclude anyone who moved across state lines in the past year for any reason, including those that were responding to state wage differences.[17] The results using this restricted sample are similar in sign, magnitude, and significance level to the baseline results in Table 5.[18]

An alternate hypothesis to the one presented in this paper is that the offshoring of low-skilled tasks and low-skilled immigration simply displaces the least skilled, lowest wage decile native workers. As these low-skilled native workers become unemployed, one would observe an increase in the wages of the remaining employed native workers. Thus, increases in native wages may indicate a compositional shift in employment

[16] Bartel (1989), Hansen et al. (2002), and Cragg and Kahn (1997).

[17] Since the 2000 1% Census does not include a question about where the resident lived a year ago, the year 2000 was excluded from this analysis.

[18] As a further robustness check, instrumenting for the independent variables of interest would be appealing. However, it is difficult to find instruments for *Offshoring (Less Dev)*, *Offshoring (Dev)*, *Immigration (Less Dev)*, and *Immigration (Dev)* that vary by state, industry, and year.

rather than a productivity effect as this paper proposes.

To address these concerns, I include the average educational attainment of the native population as a control in all the regressions presented in this paper. This will capture changes in the average skill level of native employees and thus any compositional shifts in employment will be controlled. The results indicate that native educational attainment is an important control variable. However, there is still an important relationship between offshoring, immigration, and wages which is not driven by these compositional changes.

As an additional thought experiment, it is useful to consider what the observed change in native wage deciles would be if the compositional shift in employment was driving these results. Suppose an increase in the offshoring of low-skilled tasks or the immigration of low-skilled workers displaced a low-skilled native worker in a particular state-industry-year. As this native worker becomes unemployed, each wage decile would then capture a slightly more educated, higher paid native worker. Thus, *all* native wage deciles would increase due to offshoring and immigration.[19] However, the fact that neither the *Offshoring (Less Dev)* nor the *Immigration (Less Dev)* coefficients in Table 6 exhibit these patterns indicates that there is little empirical support for this hypothesis. In contrast, the empirical results in Table 5 conform closely to both propositions of the model presented in this paper.

Finally, the baseline results in Table 5 are not sensitive to using total income instead of wages, excluding particular states (i.e. California), or excluding particular industries (i.e. manufacturing). The results are even stronger when state*year and industry*year fixed effects are included. However, given the short panel data set (6 years), there is not enough annual variation to include state*year, industry*year, and state*industry fixed effects. [20]

[19] Given the exponential distribution of wages, it is likely that the higher wage deciles would increase by more than the lower wage deciles.

[20] All of these results are available upon request.

7 Conclusion

Americans have become increasingly concerned about the impact offshoring and immigration have on domestic wages. Despite extensive research, which generally focuses on one or the other of these phenomena, the available evidence on the link between offshoring, immigration, and wages remains mixed. This paper presents a simple model that identifies the ways in which offshoring and immigration can affect wages. Both offshoring and immigration generate a labor-supply effect, while offshoring also generates a productivity effect that benefits low-skilled native workers only. Thus, comparing the impact of offshoring and immigration on native wages offers a unique opportunity to test for the productivity effect.

The empirical results provide two key contributions that improve our understanding of how offshoring and immigration affect native wages. First, the difference between the impact of offshoring and immigration on native wages highlights the empirical importance of the productivity effect. Consistent with the propositions of the model, offshoring has a more positive impact on low-skilled native wages than immigration, but this difference decreases as the wage deciles increase. These results provide the first empirical evidence that offshoring generates a productivity effect that benefits the factor whose jobs are sent abroad. Second, in order to identify the impact of offshoring and immigration on native wages, it is crucial to account for the income level of the foreign country. The less-developed and developed components of offshoring and immigration have dramatically different effects on the wages of native workers. This moves us past simply thinking about whether offshoring and immigration are good or bad for the domestic economy, and instead identifies how specific components of offshoring and immigration affect particular types of native workers.

On the whole this paper shows that globalization, defined as the sum of offshoring, immigration, and inshoring, increases the wages of all types of workers, thus contradicting many of the fears of American workers. However, there is evidence that certain components of offshoring and immigration can depress the wages of specific types of native workers. Policy makers, whose goal is to increase the wages of native workers, should encourage offshoring to less-developed countries, immigration from developed countries, and inshoring. Obviously the impact of offshoring and immigration on other dimensions of the home and foreign economies are important and warrant further research.

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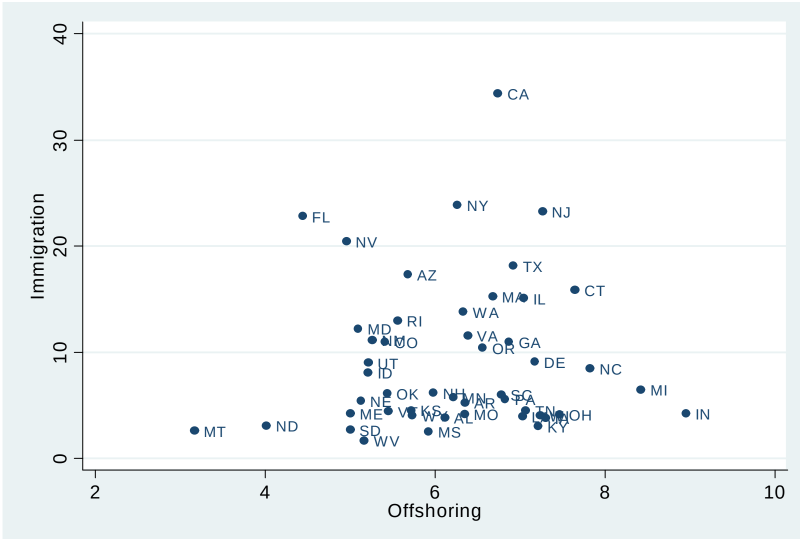
TABLE 1
STATE AVERAGES

State	Median Wage	Immigration	Offshoring
Alabama	$28,132	3.8	6.1
Arizona	$33,271	17.3	5.7
Arkansas	$25,677	5.2	6.4
California	$40,294	34.3	6.7
Colorado	$35,735	10.9	5.4
Connecticut	$41,595	15.8	7.7
Delaware	$35,913	9.1	7.2
Florida	$30,612	22.8	4.5
Georgia	$32,466	10.9	6.9
Idaho	$25,610	8.0	5.2
Illinois	$36,171	15.1	7.1
Indiana	$30,365	4.2	9.0
Iowa	$27,402	3.7	7.3
Kansas	$28,654	4.5	5.7
Kentucky	$26,910	3.0	7.2
Louisiana	$28,166	3.9	7.0
Maine	$28,310	4.1	5.0
Maryland	$36,340	12.2	5.1
Massachusetts	$41,142	15.2	6.7
Michigan	$34,293	6.4	8.4
Minnesota	$33,848	5.7	6.2
Mississippi	$24,589	2.5	5.9
Missouri	$30,204	4.1	6.4
Montana	$23,721	2.5	3.2
Nebraska	$27,818	5.4	5.1
Nevada	$33,170	20.4	5.0
New Hampshire	$32,960	6.1	6.0
New Jersey	$41,582	23.2	7.3
New Mexico	$27,807	11.1	5.3
New York	$37,894	23.8	6.3
North Carolina	$30,015	8.4	7.8
North Dakota	$25,761	3.0	4.0
Ohio	$31,268	4.1	7.5
Oklahoma	$27,707	6.1	5.4
Oregon	$31,148	10.4	6.6
Pennsylvania	$30,981	5.5	6.8
Rhode island	$34,166	12.9	5.6
South Carolina	$28,808	6.0	6.8
South Dakota	$25,438	2.6	5.0
Tennessee	$28,863	4.5	7.1
Texas	$33,063	18.1	6.9
Utah	$29,936	9.0	5.2
Vermont	$28,905	4.4	5.5
Virginia	$34,526	11.5	6.4
Washington	$36,060	13.7	6.3
West Virginia	$24,750	1.6	5.2
Wisconsin	$30,481	4.0	7.2
Wyoming	$30,362	4.0	5.7

State average of the median native wage, the share of employees that are foreign born, and the share of employees that work abroad weighted by the sample size.

FIGURE 1

IMMIGRATION AND OFFSHORING BY STATE



State average of the share of employees that are foreign born and the share of employees that work abroad weighted by the sample size.

TABLE 2

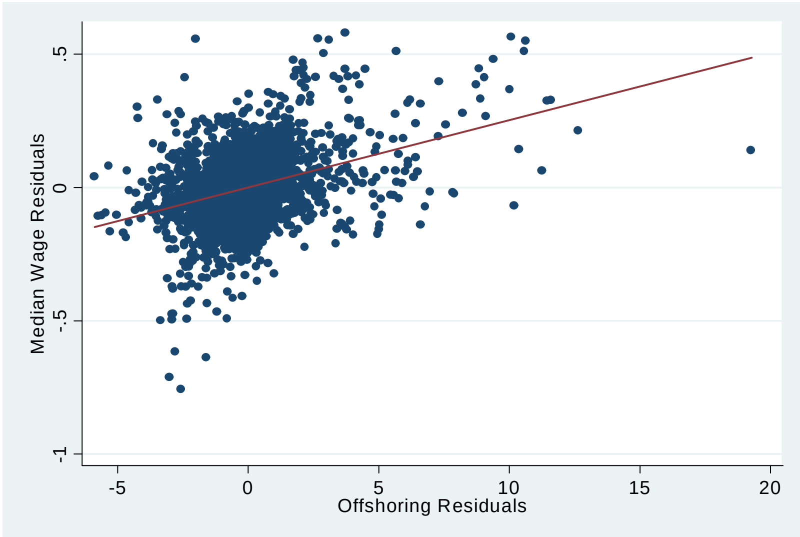
INDUSTRY AVERAGES

Industry	Median Wage	Immigration	Offshoring
Agriculture, Forestry, Fishing, Hunting, and Mining	$31,256	16.5	4.7
Utilities	$48,742	5.4	9.4
Construction	$33,957	14.9	0.3
Manufacturing	$38,097	14.2	21.2
Wholesale Trade	$36,740	12.6	10.6
Retail Trade	$24,030	10.7	3.4
Transportation and Warehousing	$37,735	11.4	2.6
Information	$41,728	10.2	7.9
Finance and Insurance	$38,889	9.6	3.5
Real Estate, Rental, and Leasing	$31,663	12.6	0.9
Professional, Scientific, Techinical Services and Management	$46,766	12.8	3.6
Administration and Waste Services	$24,730	18.4	4.9
Health Care and Social Assistance	$28,324	11.6	0.1
Accomodations and Food Services	$15,433	22.7	3.8

Industry average of the median native wage, the share of employees that are foreign born, and the share of employees that work abroad weighted by the sample size.

FIGURE 2

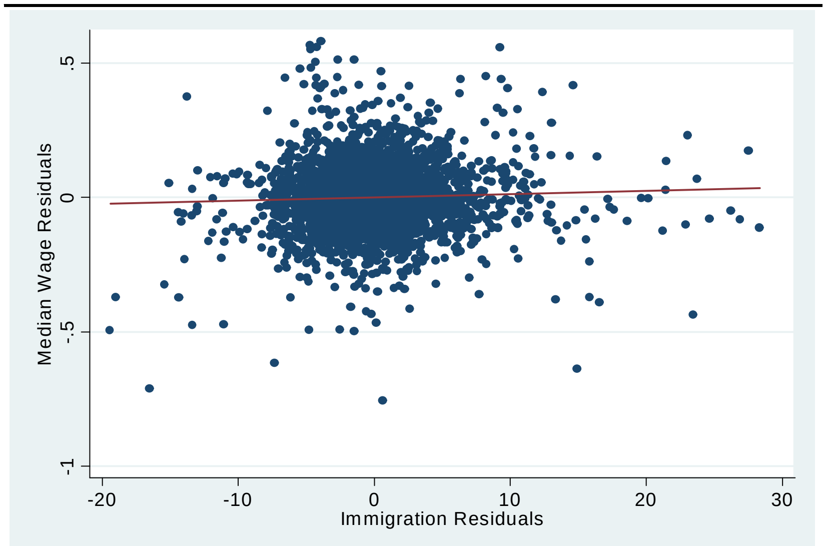
MEDIAN WAGE AND OFFSHORING



The residuals from regressing the ln native median wage on state, industry, and year fixed effects are plotted against the residuals from regressing offshoring on state, industry, and year fixed effects.

FIGURE 3

MEDIAN WAGE AND IMMIGRATION



The residuals from regressing the ln median native wage on state, industry, and year fixed effects are plotted against the residuals from regressing immigration on state, industry, and year fixed effects.

TABLE 3

IMPACT OF GLOBALIZATION (DEFINED AS OFFSHORING+IMMIGRATION+INSHORING) ON NATIVE WAGES

	ln(Wage 10th%)	ln(Wage 20th%)	ln(Wage 30th%)	ln(Wage 40th%)	ln(Wage 50th%)	ln(Wage 60th%)	ln(Wage 70th%)	ln(Wage 80th%)
Globalization	0.002***	0.002***	0.001***	0.001***	0.002***	0.002***	0.002***	0.002***
	[0.001]	[0.001]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Age	0.004	0.004	0.004	0.003	0.002	0.002	0.003	0.003
	[0.004]	[0.003]	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]
Education	0.166***	0.170***	0.180***	0.187***	0.198***	0.207***	0.216***	0.237***
	[0.013]	[0.009]	[0.008]	[0.007]	[0.007]	[0.007]	[0.007]	[0.011]
Male	0.010***	0.010***	0.009***	0.010***	0.010***	0.010***	0.010***	0.010***
	[0.001]	[0.001]	[0.000]	[0.000]	[0.000]	[0.000]	[0.001]	[0.001]
Black	0.000	0.001*	0.002***	0.002***	0.002***	0.002***	0.001**	0.000
	[0.001]	[0.001]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Asian	0.014**	0.022***	0.017***	0.017***	0.016***	0.019***	0.020***	0.021***
	[0.006]	[0.004]	[0.004]	[0.004]	[0.004]	[0.004]	[0.004]	[0.005]
Hispanic	-0.006***	-0.005***	-0.004***	-0.004***	-0.004***	-0.004***	-0.004***	-0.003***
	[0.002]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Married	0.000	0.000	0.000	0.001	0.001**	0.002**	0.002***	0.002**
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Single	-0.007***	-0.006***	-0.005***	-0.005***	-0.004***	-0.004***	-0.003***	-0.002**
	[0.002]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Observations	4032	4032	4032	4032	4032	4032	4032	4032
R-squared	0.91	0.95	0.96	0.96	0.96	0.96	0.96	0.95

Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. All regressions are weighted by the sample size and include year, state, and industry fixed effects.

TABLE 4

IMPACT OF TOTAL OFFSHORING AND TOTAL IMMIGRATION ON NATIVE WAGES

	ln(Wage 10th%)	ln(Wage 20th%)	ln(Wage 30th%)	ln(Wage 40th%)	ln(Wage 50th%)	ln(Wage 60th%)	ln(Wage 70th%)	ln(Wage 80th%)
Offshoring	0.008**	0.006***	0.004**	0.003**	0.003**	0.004**	0.003*	0.001
	[0.003]	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]
Immigration	-0.001	0.000	-0.001**	-0.001**	-0.001	0.000	0.000	0.000
	[0.001]	[0.001]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Inshoring	0.023***	0.019***	0.019***	0.018***	0.019***	0.019***	0.022***	0.024***
	[0.006]	[0.004]	[0.003]	[0.003]	[0.003]	[0.003]	[0.003]	[0.003]
Age	0.008**	0.007***	0.007***	0.006***	0.005***	0.004**	0.005***	0.006***
	[0.004]	[0.003]	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]
Education	0.163***	0.167***	0.177***	0.185***	0.196***	0.204***	0.213***	0.235***
	[0.013]	[0.009]	[0.008]	[0.007]	[0.007]	[0.007]	[0.007]	[0.011]
Male	0.009***	0.009***	0.009***	0.009***	0.009***	0.010***	0.009***	0.009***
	[0.001]	[0.001]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.001]
Black	0.000	0.001*	0.002***	0.002***	0.002***	0.002***	0.001**	0.000
	[0.001]	[0.001]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Asian	0.012**	0.021***	0.016***	0.015***	0.014***	0.018***	0.019***	0.019***
	[0.006]	[0.004]	[0.004]	[0.004]	[0.004]	[0.004]	[0.004]	[0.005]
Hispanic	-0.002	-0.002*	-0.001	-0.002*	-0.002*	-0.001*	-0.002*	0.000
	[0.002]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Married	-0.001	0.000	0.000	0.001	0.001	0.001**	0.002**	0.001**
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Single	-0.007***	-0.006***	-0.005***	-0.005***	-0.004***	-0.004***	-0.003***	-0.002**
	[0.002]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Observations	4032	4032	4032	4032	4032	4032	4032	4032
R-squared	0.92	0.95	0.96	0.96	0.96	0.96	0.96	0.95

Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. All regressions are weighted by the sample size and include year, state, and industry fixed effects.

TABLE 5

IMPACT OF OFFSHORING AND IMMIGRATION TO LESS DEVELOPED AND DEVELOPED COUNTRIES ON NATIVE WAGES

	ln(Wage 10th%)	ln(Wage 20th%)	ln(Wage 30th%)	ln(Wage 40th%)	ln(Wage 50th%)	ln(Wage 60th%)	ln(Wage 70th%)	ln(Wage 80th%)
Offshoring (Less Dev)	0.034***	0.028***	0.021***	0.015***	0.014***	0.011***	0.006	0.001
	[0.007]	[0.006]	[0.005]	[0.004]	[0.004]	[0.004]	[0.004]	[0.005]
Offshoring (Dev)	-0.019***	-0.015***	-0.012***	-0.008**	-0.007**	-0.004	-0.001	0.001
	[0.006]	[0.005]	[0.004]	[0.003]	[0.003]	[0.003]	[0.003]	[0.003]
Immigration (Less Dev)	-0.001*	-0.001	-0.001***	-0.001**	-0.001**	-0.001	0.000	0.000
	[0.001]	[0.001]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Immigration (Dev)	0.015***	0.008***	0.008***	0.008***	0.009***	0.011***	0.011***	0.014***
	[0.004]	[0.003]	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]	[0.003]
Inshoring	0.026***	0.021***	0.020***	0.020***	0.020***	0.020***	0.022***	0.023***
	[0.006]	[0.004]	[0.003]	[0.003]	[0.003]	[0.003]	[0.003]	[0.003]
Age	0.008**	0.007***	0.007***	0.005***	0.005***	0.004**	0.005***	0.006***
	[0.004]	[0.003]	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]
Education	0.158***	0.165***	0.174***	0.182***	0.193***	0.201***	0.210***	0.230***
	[0.013]	[0.009]	[0.008]	[0.007]	[0.007]	[0.007]	[0.007]	[0.010]
Male	0.009***	0.009***	0.009***	0.009***	0.009***	0.010***	0.009***	0.009***
	[0.001]	[0.001]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.001]
Black	0.000	0.001*	0.002***	0.002***	0.002***	0.002***	0.001**	0.000
	[0.001]	[0.001]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Asian	0.009	0.019***	0.014***	0.014***	0.012***	0.015***	0.016***	0.016***
	[0.006]	[0.004]	[0.004]	[0.004]	[0.004]	[0.004]	[0.004]	[0.005]
Hispanic	-0.001	-0.002	0.000	-0.001	-0.001	-0.001	-0.001	0.001
	[0.002]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Married	-0.001	-0.001	0.000	0.000	0.001	0.001**	0.002**	0.001**
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Single	-0.007***	-0.006***	-0.005***	-0.005***	-0.004***	-0.004***	-0.003***	-0.002**
	[0.002]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Observations	4032	4032	4032	4032	4032	4032	4032	4032
R-squared	0.92	0.95	0.96	0.96	0.96	0.96	0.96	0.95

Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. All regressions are weighted by the sample size and include year, state, and industry fixed effects.

FIGURE 4
Impact of Offshoring and Immigration on Native Wages
(Coefficients and 95% Confidence Intervals from Table 6)

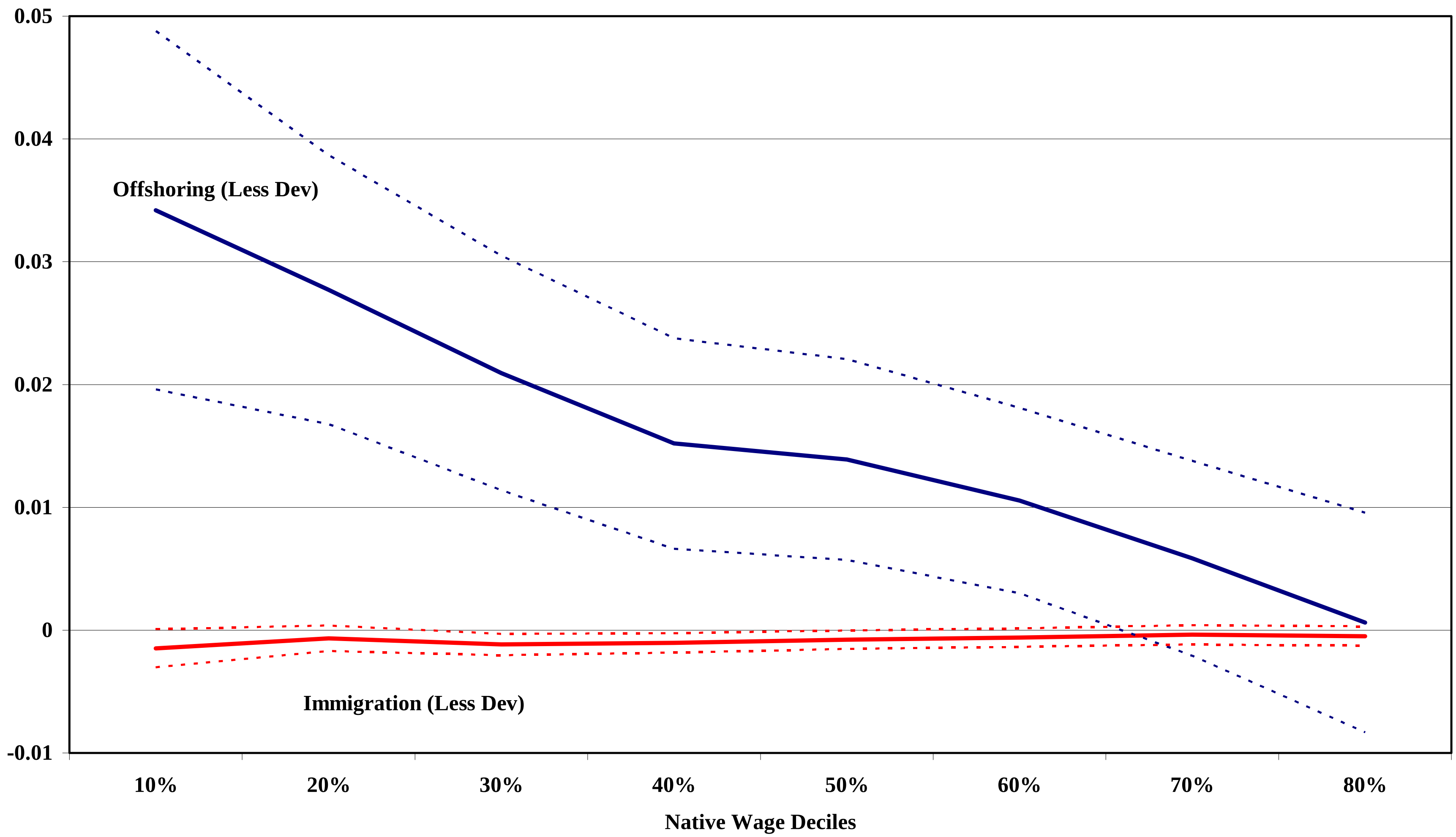


TABLE 6
OFFSHORING CONSTRUCTED USING 1999 STATE GDP SHARES

	ln(Wage 10th%)	ln(Wage 20th%)	ln(Wage 30th%)	ln(Wage 40th%)	ln(Wage 50th%)	ln(Wage 60th%)	ln(Wage 70th%)	ln(Wage 80th%)
Offshoring (Less Dev)	0.041***	0.033***	0.025***	0.019***	0.017***	0.014***	0.009**	0.002
	[0.007]	[0.005]	[0.004]	[0.004]	[0.004]	[0.004]	[0.004]	[0.005]
Offshoring (Dev)	-0.025***	-0.019***	-0.015***	-0.010***	-0.009***	-0.005*	-0.001	0.003
	[0.006]	[0.004]	[0.003]	[0.003]	[0.003]	[0.003]	[0.003]	[0.004]
Immigration (Less Dev)	-0.002**	-0.001	-0.001***	-0.001***	-0.001**	-0.001*	0.000	0.000
	[0.001]	[0.001]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Immigration (Dev)	0.015***	0.008***	0.007***	0.007***	0.008***	0.010***	0.010***	0.013***
	[0.004]	[0.003]	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]	[0.003]
Inshoring	0.026***	0.021***	0.020***	0.020***	0.020***	0.020***	0.022***	0.024***
	[0.005]	[0.003]	[0.003]	[0.003]	[0.003]	[0.003]	[0.003]	[0.003]
Age	0.008**	0.007**	0.006***	0.005***	0.005***	0.004**	0.005***	0.006***
	[0.004]	[0.003]	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]
Education	0.157***	0.164***	0.173***	0.180***	0.190***	0.198***	0.206***	0.225***
	[0.013]	[0.009]	[0.008]	[0.007]	[0.007]	[0.006]	[0.007]	[0.009]
Male	0.009***	0.009***	0.009***	0.009***	0.010***	0.010***	0.009***	0.009***
	[0.001]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.001]
Black	0	0.001*	0.002***	0.002***	0.002***	0.002***	0.001*	0
	[0.001]	[0.001]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Asian	0.007	0.018***	0.012***	0.012***	0.010***	0.013***	0.014***	0.014***
	[0.006]	[0.004]	[0.004]	[0.004]	[0.004]	[0.004]	[0.004]	[0.004]
Hispanic	-0.001	-0.002	-0.001	-0.001	-0.001	-0.001	-0.001	0
	[0.002]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Married	-0.001	0	0	0	0.001	0.001**	0.002**	0.001**
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Single	-0.006***	-0.006***	-0.005***	-0.004***	-0.004***	-0.004***	-0.003***	-0.002**
	[0.002]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Observations	4032	4032	4032	4032	4032	4032	4032	4032
R-squared	0.92	0.95	0.96	0.96	0.96	0.96	0.96	0.95

Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. All regressions are weighted by the sample size, include the full set of control variables, and include year, state, and industry fixed effects.

TABLE 7

SAMPLE RESTRICTED TO THOSE THAT DID NOT MIGRATE IN LAST YEAR (2000 EXCLUDED)

	ln(Wage 10th%)	ln(Wage 20th%)	ln(Wage 30th%)	ln(Wage 40th%)	ln(Wage 50th%)	ln(Wage 60th%)	ln(Wage 70th%)	ln(Wage 80th%)
Offshoring (Less Dev)	0.039***	0.032***	0.027***	0.021***	0.017***	0.016***	0.007	0.006
	[0.009]	[0.007]	[0.006]	[0.005]	[0.005]	[0.005]	[0.005]	[0.005]
Offshoring (Dev)	-0.022***	-0.020***	-0.015***	-0.011***	-0.007*	-0.006	0.000	-0.001
	[0.008]	[0.006]	[0.005]	[0.004]	[0.004]	[0.004]	[0.004]	[0.004]
Immigration (Less Dev)	-0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	[0.001]	[0.001]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Immigration (Dev)	0.014***	0.008***	0.006***	0.005***	0.006***	0.007***	0.007***	0.007***
	[0.004]	[0.003]	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]
Inshoring	0.029***	0.026***	0.021***	0.022***	0.020***	0.019***	0.022***	0.023***
	[0.006]	[0.004]	[0.003]	[0.003]	[0.003]	[0.003]	[0.003]	[0.003]
Age	0.005	0.002	0.003	0.003	0.003	0.004**	0.005**	0.007***
	[0.004]	[0.003]	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]	[0.002]
Education	0.144***	0.160***	0.167***	0.176***	0.187***	0.191***	0.199***	0.206***
	[0.014]	[0.010]	[0.008]	[0.008]	[0.008]	[0.008]	[0.007]	[0.008]
Male	0.009***	0.009***	0.008***	0.008***	0.009***	0.009***	0.008***	0.007***
	[0.001]	[0.001]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Black	-0.001	0.001	0.001***	0.002***	0.002***	0.001**	0	0
	[0.001]	[0.001]	[0.001]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Asian	0.004	0.013***	0.013***	0.008*	0.008**	0.012***	0.012***	0.010**
	[0.007]	[0.004]	[0.004]	[0.004]	[0.004]	[0.004]	[0.004]	[0.004]
Hispanic	-0.002	-0.002	-0.001	-0.001	-0.002*	-0.001	-0.001	0
	[0.002]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Married	-0.001	-0.001	0	0.001	0.002**	0.001**	0.002***	0.002***
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Single	-0.007***	-0.007***	-0.006***	-0.005***	-0.003***	-0.003***	-0.003***	-0.002*
	[0.002]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Observations	3360	3360	3360	3360	3360	3360	3360	3360
R-squared	0.9	0.94	0.95	0.96	0.96	0.96	0.95	0.95

Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. All regressions are weighted by the sample size, include the full set of control variables, and include year, state, and industry fixed effects.

A Model Appendix

A.1 Deriving Equation (6):

Total differentiating equation (3), assuming that P is the numeraire, yields:

$$0 = d\Omega w a_L + dw\Omega a_L + da_L \Omega w + ds a_H + da_H s$$

or:

$$0 = \hat{\Omega}\theta_L + \hat{w}\theta_L + \hat{a}_L\theta_L + \hat{s}\theta_H + \hat{a}_H\theta_H$$

where θ_L and θ_H are the cost shares of low-skilled and high-skilled labor (and $\theta_L + \theta_H = 1$). Since profit maximizing firms have minimized costs, $\hat{a} = 0$ by the envelope theorem. Thus:

$$(6)\ 0 = \theta_L(\hat{\Omega} + \hat{w}) + (1 - \theta_L)\hat{s}$$

A.2 Deriving Equation (7):

Totally differentiating the ratio of (4) to (5) gives:

$$\frac{da_L}{a_H}\left(\frac{dw\Omega}{s} + \frac{d\Omega w}{s} - \frac{dsw\Omega}{s^2}\right) - \frac{a_L da_H}{a_H^2}\left(\frac{dw\Omega}{s} + \frac{d\Omega w}{s} - \frac{dsw\Omega}{s^2}\right) = \frac{dL(1+I)}{H(1-J)} + \frac{dIL}{H(1-J)} - \frac{L(1+I)dH}{H^2(1-J)} + \frac{L(1+I)dJ}{H(1-J)^2}$$

or:

$$\frac{a_L}{a_H}\left(\hat{a}_L - \hat{a}_H\right)\left(\frac{w\Omega}{s}\right)\left(\hat{w} + \hat{\Omega} - \hat{s}\right) = \frac{L(1+I)}{H(1-J)}\left(\hat{L} + \frac{dI}{(1+I)} - \hat{H} + \frac{dJ}{(1-J)}\right)$$

The first terms on each side cancel following from the ratio of (4) to (5) and since the native factor supplies are fixed then $\hat{L} = \hat{H} = 0$. Therefore:

$$\left(\hat{a}_H - \hat{a}_L\right)\left(\frac{w\Omega}{s}\right)\left(\hat{s} - \hat{w} - \hat{\Omega}\right) = \frac{dI}{(1+I)} + \frac{dJ}{(1-J)}$$

or:

$$(7)\ \sigma\left(\hat{s} - \hat{w} - \hat{\Omega}\right) = \frac{dI}{(1+I)} + \frac{dJ}{(1-J)}$$

where the elasticity of substitution is defined as:

$$\sigma = \frac{d\left(\frac{a_H}{a_L}\right)/\left(\frac{a_H}{a_L}\right)}{d\left(\frac{w\Omega}{s}\right)/\left(\frac{w\Omega}{s}\right)} = \frac{(\hat{a}_H - \hat{a}_L)(w\Omega/s)(\hat{w} + \hat{\Omega} - \hat{s})}{(\hat{w} + \hat{\Omega} - \hat{s})} = (\hat{a}_H - \hat{a}_L)(w\Omega/s)$$

A.3 Deriving Equation (8):

Rearranging equation (7) as follows:

$$\hat{s} = \frac{dJ}{\sigma(1-J)} + \frac{dI}{\sigma(1+I)} + \hat{w} + \hat{\Omega}$$

and plugging this into equation (6) yields:

$$\theta_L(\hat{w} + \hat{\Omega}) + (1 - \theta_L)\left[\frac{dJ}{\sigma(1-J)} + \frac{dI}{\sigma(1+I)} + \hat{w} + \hat{\Omega}\right] = 0$$

or:

$$(8)\ \hat{w} = -\hat{\Omega} - \frac{(1-\theta_L)}{\sigma}\frac{dJ}{(1-J)} - \frac{(1-\theta_L)}{\sigma}\frac{dI}{(1+I)}$$

A.4 Deriving Equation (9):

Rearranging equation (7) as follows:

$$\hat{w} = -\frac{dJ}{\sigma(1-J)} - \frac{dI}{\sigma(1+I)} + \hat{s} - \hat{\Omega}$$

and plugging this into equation (6) yields:

$$\theta_L\left[-\frac{dJ}{\sigma(1-J)} - \frac{dI}{\sigma(1+I)} + \hat{s}\right] + (1 - \theta_L)\hat{s} = 0$$

or:

$$(9)\ \hat{s} = \frac{\theta_L}{\sigma}\frac{dJ}{(1-J)} + \frac{\theta_L}{\sigma}\frac{dI}{(1+I)}$$

B Data Appendix

B.1 Data Sources

Individual level data was obtained from the 2000 1% Census sample and the 2001-2005 American Community Survey (ACS) via IPUMS. The 2000 1% sample was preferable to the 2000 ACS because it was approximately seven times the size (the 2000 sample was by far the smallest ACS). The variables (and their IPUMS code) used in this analysis were state of employment (PWSTATE2), industry of employment (INDNAICS), year (YEAR), wage and salary income (INCWAGE), total personal income (INCTOT), birthplace (BPLD), employment status (EMPSTAT), school attendance (SCHOOL), age (AGE), gender (SEX), marital status (MARST), race (RACED), Hispanic origin (HISPAND), educational attainment (EDUC99), and state or country of residence 1 year ago (MIGPLAC1). Offshoring data was obtained from the "U.S. Direct Investment Abroad" tables produced by the BEA. Inshoring data was obtained from the "Foreign Direct Investment in the U.S." tables also produced by the BEA. GDP and domestic employment by state, industry, and year was obtained from the "Regional Economic Accounts" tables provided by the BEA.

B.2 Sample

The sample was restricted to the contiguous 48 states because Alaska, Hawaii, and Washington D.C. were substantial outliers in many dimensions and they had limited census observations for particular industries. Of the 20 2-Digit NAICS industries, the BEA does not provide foreign affiliate employment data for "Education Services", "Arts, Entertainment and Recreation", "Other Services", and "Public Administration." Of the remaining 16 industries, "Agriculture, Forestry, Fishing, and Hunting" and "Mining" were combined and "Professional, Scientific and Technical Services" and "Management of Companies and Enterprises" were combined due to a lack of census observations by state in these industries. Thus, the analysis includes 14 NAICS industries. Finally, available Census and BEA data restricts the sample to the years 2000-2005.

B.3 Definition of Developed

The countries with the highest 2006 GDP per capita according to the World Development Indicators database (World Bank, April 11, 2008) were Canada, Denmark, Finland, Iceland, Norway, Sweden, UK, Ireland, Belgium, France, Luxembourg, Netherlands, Switzerland, Italy, Austria, Germany, Japan, and Australia (not including San Marino or the U.S.). Immigrants that were born in these 18 countries were assigned to the Developed group, while those immigrants born in the remaining countries were assigned to the Less-Developed group. Offshoring to developed countries includes foreign affiliate employment in Europe, Canada, Australia, and Japan, while offshoring to less-developed countries consists of the remaining foreign affiliate employment. Unfortunately data limitations do not allow "Europe" to be broken into individual countries that correspond to those included in the immigrant definition. However, of the total foreign affiliate employment in Europe, 85% is going to the 14 European countries included in the immigrant Developed group.

B.4 Missing Values

Due to confidentiality concerns, the BEA withholds some industry-country specific foreign affiliate employment numbers. There are no missing values for total foreign affiliate employment, but when constructing offshoring to developed and less-developed countries, this issue needs to be addressed. Data for these 18 missing values are filled with the industry-country average across years. The majority of the time this average falls within the employment range indicated by the BEA for that employment cell; when it does not, I replace the missing value with the midpoint of this range instead.

It is unlikely that this significantly alters the results since country data is summed to create Developed and Less-Developed groups and it is rare that there are multiple countries missing the same industry-year observation. Domestic employment data by state, industry, and year also have 18 missing observations over this sample period. These missing values are filled with state-industry averages across years. The results are not sensitive to whether these values are left missing or are replaced with the industry-state averages.