

## **What Can State Administrative Data Tell Us About the Undocumented Worker Labor Market?**

Julie L. Hotchkiss <sup>\*^</sup>

and

Myriam Quispe-Agnoli<sup>\*</sup>

October 2007

### Abstract

This paper makes use of state administrative data to identify undocumented workers in the state of Georgia and to investigate the impact of their presence on the labor market outcomes of documented workers. A greater share of undocumented workers in an industry is found to have a statistically significant negative impact on the wages of documented workers in all industries and on the growth of wages of documented workers in the construction industry only. While statistically significant, these results have very little practical significance, given the size of the undocumented workforce. In addition, as one potential explanation for why undocumented workers are paid less than documented workers, it was determined that undocumented workers have a significantly lower labor supply elasticity, likely as a result of their limited employment or grievance opportunities.

---

<sup>\*</sup>Federal Reserve Bank of Atlanta. <sup>^</sup>Georgia State University. Contact: Myriam Quispe-Agnoli, Research Department, Federal Reserve Bank of Atlanta, 1000 Peachtree St., NE, Atlanta, GA 30309, 404-498-8930, Myriam.Quispe-Agnoli@atl.frb.org. The opinions expressed in this paper do not necessarily reflect those of the Federal Reserve Bank of Atlanta nor the Federal Reserve System. The research assistance of M. Laurel Graefe and Gustavo Uceda is much appreciated.

## **What Can State Administrative Data Tell Us About the Undocumented Worker Labor Market?**

### I. Introduction and Background

The United States has a long history of immigration debate. Through the last century and into this one, immigration policy has been subjected to changing economic needs and fears and to political whims. Positive contributions of immigration have been identified by Neal and Uselding (1972) who estimate that the flow of immigrants into the United States between 1790 and 1912 resulted in a 13 to 42 percent higher level of capital stock than would have prevailed in the absence of immigration during these years (also see Barro and Sala-i-Martin 1995 and Chiswick et al. 1997).<sup>1</sup> Immigration has also been more recently explored in various countries as a mechanism for replacing retiring baby-boom workers (e.g., Koichi and Hiromi 2007, Hotchkiss 2005, Denton and Spencer 1997).

The concerns surrounding immigration are rooted in an expectation that the arrival of new workers into a labor market would displace native workers and/or put downward pressure on wages. The literature presents a wide range of estimates of the wage effects of immigration on wages and employment of native workers. The consensus, however, settles on a one to four percent decrease in native wages resulting from a 10 percent increase in the population share of immigrants (for example, see Friedberg and Hunt 1995 and Borjas et al. 2006).

While firmly rooted in the empirical literature measuring the impact of immigration on native wages, this paper deviates slightly by exploring the impact of undocumented workers (assumed to be immigrants) on wages of documented workers, some of which are likely immigrants themselves. The analysis makes use of administrative data from the state of Georgia

---

<sup>1</sup> In contrast, Morley (2006) finds empirical evidence of economic growth leading to increased immigration, but not vice versa.

to investigate how the proportion of undocumented workers affects the wages of documented workers and what role different labor supply elasticities might play in the observed wage gap between the two groups of workers. The results presented in this paper are of particular relevance as the immigration debate has recently narrowed its focus on illegal, or undocumented, immigrants. One might speculate that the number of undocumented workers is so small as to be irrelevant to the determination of documented worker wages. However, it is also likely that the experience with undocumented workers varies considerably across different industries.

#### *A. Measuring the Impact of Immigration*

The impact of immigration on native worker wages essentially comes down to how complementary or how substitutable the immigrants are with native workers, and how responsive native migration patterns are to the influx of additional workers. Goldin (1994) documents significant wage effects of the large European migration to the United States in the early 20th century. Measured effects of more recent waves of immigrants have been more modest.<sup>2</sup> Friedberg and Hunt's (1995) review of the literature through the mid-1990s summarizes the consensus view that, at most, a 10 percent increase in the fraction of immigrants reduces native wages by (at most) one percent, and that immigration has no effect of economic significance on native employment.<sup>3</sup> Friedberg and Hunt also point out, however, that the measured effect varies across skill groups. For example, Borjas et al. (1997) conclude that while immigration of less-skilled workers (and trade influences) between 1980-1995 might account for half of the relative wage declines of high school dropouts over the period, the effect did not contribute significantly to the widening wage gap between skilled and low-skilled workers.

---

<sup>2</sup> For example, Goldin's (1994) wage effect estimate is about 10 times larger than that of Altonji and Card (1991).

<sup>3</sup> Deviations from this consensus are nicely summarized in Fix and Passel (1994).

Even more recent estimates put the negative impact of immigration on native wages, at most, at a four percent loss per 10 percent increase in immigrant share (see Borjas 2003, 2005 and Borjas et al. 2006). In addition, Borjas (2005) estimates that the measured wage effect is mitigated by out-migration of natives from areas experiencing significant immigrant in-flows. On the other end of the spectrum is the paper by Ottaviano and Peri (2006) who estimate an overall *positive* influence of immigration on native wages. This result is achieved by allowing immigrants and natives to be less than perfect substitutes and by allowing yearly adjustment of physical capital in response to immigration flows. Ottaviano and Peri, however, do find that wages of earlier immigrants do suffer significantly with the arrival of more recent immigrants.<sup>4</sup>

To a certain extent, the impact of undocumented workers can be expected to be similar to that of immigrants as a whole, however there are some important difference between the two groups of workers. First of all, the number of undocumented workers in any labor market is only a fraction of the total number of immigrants. Second, undocumented workers are likely even much more limited in their opportunities and therefore have much lower elasticities of labor supply. This would tend to make them a much less expensive factor substitute for native labor of similar skill. This lower elasticity of labor supply will also have implications for wage differentials between documented and undocumented workers. The more concentrated undocumented workers are in an industry the greater is the opportunity for firms to exercise monopsony power and keep wages of undocumented workers low.

### *B. Measuring Illegal Immigration*

The common method to estimate the number of unauthorized immigrants is the residual approach, or the difference between the total measured foreign-born population and the legal

---

<sup>4</sup> This finding is consistent with earlier evidence provided in Lalonde and Topel (1991).

immigrant population. According to the U.S. Census of Population and Housing and the U.S. Current Population Survey the number of foreign-born individuals exceeds the number of legal immigrants in the U.S.<sup>5</sup>

Table 1 shows the estimates from various sources of the number of unauthorized immigrants in the U.S. using the residual approach. The legal immigrant population includes lawful permanent residents (LPR), asylees, refugees, and non-immigrants whose information is obtained from the office of Immigration Statistics of the Department of Homeland Security (DHS). The foreign-born population is estimated from the American Community Survey (ACS) of the U.S. Census Bureau. According to the latest figures, there are 11.6 million unauthorized immigrants living in the U.S. as of January 2006. It is also estimated that about four percent of the total (490,000 persons) are located in Georgia (Hoefer et al. 2007). Between 2000 and 2006, the greatest percentage increase of unauthorized immigrants in the U.S. occurred in Georgia--a 123 percent increase, equivalent to an average annual increase of 45 thousand unauthorized immigrants.

[Table 1 here]

Estimates using this residual approach suggest that stocks of illegal immigrants have risen sharply over time. However, there is considerable variability in the estimates, associated with differing assumptions about the magnitude of errors in enumerating legal and unauthorized immigrants in official data sources. One of the primary sources of error in these estimates is the variability of sample sizes in the ACS across years which leads to difficulties in assessing the degree to which the foreign-born population may be undercounted or may have emigrated (Hoefer et al. 2007). In addition, the ACS estimates assume that the current residence of a legal immigrant is the same one when they obtained LPR status; the estimates do not take into account

---

<sup>5</sup> See Hanson (2006) for a review of different sources and estimates of undocumented immigrants.

internal migration. Other concerns exist regarding the validity and reliability of Census survey data on the year of entry. Further, errors on admission counts, length of visit, and changes in status might result in double counting of non-immigrants and persons adjusting to LPR status.

A second data source on unauthorized migration is information on border apprehensions from the U.S. Border Patrol. Estimating the level of unauthorized immigration using apprehension data is problematic, primarily because it is not only a function of the number of attempts to cross the border, but also a function of the enforcement efforts of border patrol and a function of the number of attempts, which have been shown to vary with expected relative U.S./Mexico economic conditions (Hanson and Spilimbergo 1999; also see GAO 2006). Evaluating apprehension data between 1977 and 1988, Espenshade (1995) estimates that unauthorized immigration exceeds the level of apprehensions by an order of 2.2. Even if that factor were cut in half (as a result of greater resources being devoted to border patrol efforts since 1988), the 1.1 million apprehensions along the Southwest border of the U.S. in 2004 would mean that over a million undocumented migrants made it across the border.<sup>6</sup>

According to DHS estimates for January 2006, 57 percent of unauthorized immigrants come from Mexico, not a considerable change from 55 percent in January 2000. Therefore it is not surprising that surveys from Mexico constitute a third source of data on unauthorized immigrants. The Mexican Migration Project (MMP) is a household survey conducted in 1982 and over the period 1987 and 1997, during the winter months when seasonal migrants return to Mexico. The Legalized Persons Survey (LPS) is another survey including illegal immigrants who were granted permanent legal residence in the U.S. under the amnesty provision of IRCA. The LPS consisted of an initial survey in 1989 and a follow-up in 1992 (Hanson 2006: 884). In

---

<sup>6</sup> Hanson (2006) estimates that number is closer to 300,000 per year since 2000.

general, the MMP and LPS have been found to be more useful in characterizing undocumented immigrants than actually counting them.

In general, data sources on unauthorized immigrants are subject to sample-selection problems. Official sources are likely to underestimate unauthorized immigrants for lack of information. For example, the MMP survey includes seasonal migrants, mostly in agriculture, and the LPS specifically excludes migrant workers.

This paper differs from others in the way in which unauthorized individuals are identified. Most importantly, it does not rely on survey results. State administrative data is used to identify invalid social security numbers used by employers in reporting earnings. It is a common misconception that undocumented workers are all working "off the books." There is considerable evidence that employers do report, either knowingly or unknowingly, and pay taxes on the wages paid to undocumented workers. Unlike most other studies, the measure used here does not capture the supply of undocumented workers, but, rather, the demand, as the workers are identified through employment records. The advantage of this data source is that it is not subject to sample selection issues plaguing survey results. The disadvantage is that it does not capture undocumented workers that are not reported on employer's payrolls.

### *C. Immigration Policy in the U.S.*

Immigration legislation dates from the founding of the nation.<sup>7</sup> In 1790, Congress enacted a uniform rule for naturalization of two years of residence. In 1875, the first federal regulation was established by limiting immigration qualitatively, prohibiting the entry of criminals and prostitutes. In 1891, the Bureau of Immigration was established, and the federal

---

<sup>7</sup> Much of the information contained in this section was obtained from CBO (2006) and FAIR (2007).

government assumed responsibility for processing all immigrants seeking admission to the U.S. After World War I, the number of immigrants increased and Congress passed the first quantitative immigration quota law based on national origins. In 1942, legislation allowed the border crossing of agricultural workers from Mexico and Central America; the Emergency Farm Labor Program, or informally known as the Bracero Program, lasted until 1964. In 1965, the Immigration and Nationality Act Amendments ended the quota system and established preferences for skilled workers and relatives of U.S. citizens and permanent residents. In the most recent decades, there have been two comprehensive efforts to address the growing concerns of undocumented immigration. These efforts resulted in the Immigration and Control Act (IRCA) of 1986, and the Illegal Immigration Reform and Immigrant Responsibility Act (IIRIRA) of 1996.

The IRCA responded to the growing population of undocumented immigrants by creating two amnesty programs for unauthorized immigrants and a new classification for seasonal agricultural workers. The Seasonal Agricultural Worker amnesty program allowed immigrants who had worked for at least 90 days in certain agricultural jobs to apply for permanent residence. The Legally Authorized Workers amnesty program allowed current undocumented immigrants who could prove residence in the U.S. since January 1, 1982 to legalize their status. Under the two amnesty programs, roughly 2.7 million undocumented people residing in the United States became lawfully permanent residents. At the same time, this reform established sanctions to employers who knowingly would hire or recruit undocumented workers.<sup>8</sup> In addition, the legislation mandates that states use the Systematic Alien Verification for Entitlement system, an automated verification system to track the immigration status of applicants for welfare.

---

<sup>8</sup> CBO (2006) p.2.

According to Fix and Passel (1994), the amnesty programs were very successful; however employer sanctions have "largely failed to control illegal immigration in the 1990s. Employer sanctions have proven difficult to enforce because of the increased prevalence of fraudulent documents and the limited resources thus far dedicated to enforcement by the Immigration and Naturalization Services (INS)" (p.16).

Addressing the concerns of a growing population of unauthorized immigrants, the 1996 Illegal Immigration Reform and Immigrant Responsibility Act (IIRIRA) set new guidelines for border enforcement and eligibility verification for work or social services. The IIRIRA increased the number of border patrol agents and introduced new border control measures. In addition, it reduced government benefits available to immigrants, and established a pilot program in which employers and social service agencies could check the eligibility of applicants. The employment verification program is voluntary and the Government Accounting Office (GAO) has found that document fraud (use of counterfeit documents) and identity fraud (fraudulent use of valid documents belonging to others) made it very difficult for employers to comply with this verification process (GAO 2005).

According to the GAO study, between 1999 and 2003, the number of man hours ICE agents devoted to worksite inspections declined from 480,000 inspections (9 percent of total INS agent hours) to 180,000 hours (or 4 percent of total ICE agent hours). Therefore, this low worksite enforcement implies that fewer employers hiring undocumented workers are detected or prosecuted. Since September 11, 2001, ICE concentrated efforts on sites that could represent national security vulnerability, consistent with its mission to combat terrorism. Finally, the 2005

GAO study concludes that “under the former INS and now under ICE, worksite enforcement has been a relatively low priority.”<sup>9</sup>

## II. Data

The primary data used for the analyses in this paper are the Employer File and the Individual Wage File, which are compiled by the Georgia Department of Labor for the purposes of administering the state's Unemployment Insurance (UI) program. These data are highly confidential and strictly limited in their distribution. The Employer File provides an almost complete census of firms in non-farm sectors, covering approximately 97 percent of non-farm workers. The establishment level information includes the number of employees, the total wage bill and the NAICS classification of each establishment.<sup>10</sup> The Individual Wage File contains quarterly earnings information for all workers employed by these establishments.<sup>11</sup> Regrettably, the data set contains no information about the worker's demographics (e.g., education, gender, race, etc.). There is no specific information about the worker's job (e.g., hours of work, weeks of work, or occupation). Because of the lack of individual characteristics of workers (besides earnings), all analyses are performed at the 3-digit NAICS level.<sup>12</sup> Workers are more

---

<sup>9</sup> The Homeland Security Act of 2002 created the Department of Homeland Security (DHS). The Immigration and Naturalization Service (INS), in charged of immigration services, border enforcement and border inspections, was restructured in three bureaus within DHS. Immigration and naturalization services are provided by the Bureau of Citizenship and Immigration Services; border enforcement functions are performed by two bureaus, the Bureau of Customs and Border Enforcement (ICE), and the Bureau of Customs and Border Protection.

<sup>10</sup> White et al. (1990) provide an extensive discussion about the use of these employment data, commonly referred to as the Quarterly Census of Employment and Wages (QCEW), or ES-202 data.

<sup>11</sup> Included in earnings are pay for vacation and other paid leave, bonuses, stock options, tips, the cash value of meals and lodging, and in some states, contributions to deferred compensation plans (such as 401(k) plans). Covered employer contributions for old-age, survivors, and disability insurance (OASDI), health insurance, unemployment insurance, workers' compensation, and private pension and welfare funds are not reported as wages. Employee contributions for the same purposes, however, as well as money withheld for income taxes, union dues, and so forth, are reported even though they are deducted from the worker's gross pay.

<sup>12</sup> Because the Individual Wage file contains a firm rather than establishment identifier, a choice of which NAICS code to assign to each worker who was employed by a multi-establishment firm is required. Following the

homogeneous in skill level in some industries, such as construction, than in others, such as professional and business services. Another disadvantage to using UI records data to identify undocumented workers is the lack of coverage in the agriculture industry where one might expect to find a significant number of undocumented workers. However, Hanson (2006) finds from his survey of the literature, all surveys that include undocumented immigrants from Mexico, that the workers are overwhelmingly employed outside of agriculture.

The data are available from the first quarter of 1990 through the fourth quarter of 2006. In each quarter, and within each 3-digit industry, the total number of workers, the total number of firms, the number of undocumented workers, and the average quarterly earnings of documented and undocumented workers are calculated. There is no identifier for whether a worker is an immigrant or not. Therefore, it is very likely that immigrants are included among the documented workers.

In addition to the data from the Department of Labor, we also make use of data available from the Bureau of Economic Analysis (BEA). Gross State Product (GSP) is available on an annual basis and is used as a measure of overall economic activity in the state of Georgia. The BEA also makes available estimates of industry-level gross output. However, since the measure is only available through 2005, is positively correlated with other industry size measures, such as total employment and number of firms, and rarely contributes significantly to the regressions, it is not included as a regressor.<sup>13</sup>

---

Department of Labor convention, a 6-digit NAICS code is assigned based on the largest share of the firm's total employment.

<sup>13</sup> Conclusions from estimations including industry output through 2005 do not differ from those presented here.

### *A. Identifying Undocumented Workers using Invalid Social Security Numbers*

Every quarter employers must file a report with their state's Department of Labor detailing all wages paid to workers who are covered under the Fair Labor Standards Act (FLSA).<sup>14</sup> Each worker on this report is identified by his/her social security number (SSN). There are a number of ways in which one can establish that the reported social security number as invalid. The Social Security Administration provides a service by which an employer can upload a file of SSNs, but one must register as an employer to obtain this service.<sup>15</sup> Alternatively, there are several known limitations on what can be considered a valid social security number and so we employ an algorithm to check each number to make sure it conforms to the valid parameters.

There are three pieces to the SSN.<sup>16</sup> The first three numbers are referred to as the Area Number. This number is assigned based on the mailing address (the state) stated on the SSN application; it does not necessarily reflect the state of residence. The lowest Area Number possible is 001 and the highest Area Number ever issued is 772. Area Numbers between 700 and 728 were originally assigned to railroad workers and discontinued as of 1963. Any SSN with an Area Number equal to 000 or greater than 699 will be considered invalid.

The second piece of the SSN consists of the two-digit Group Number. The lowest group number is 01 and they are assigned in non-consecutive order based on whether the Area Number is odd or even. The Social Security Administration publishes the maximum Group Number issued for every Area Number as of certain dates. We checked for the presence of these invalid

---

<sup>14</sup> Information about which workers are covered, see United States Department of Labor (2007). Approximately 97 percent of all non-farm workers are covered.

<sup>15</sup> See <<http://www.ssa.gov/employer/ssnv.htm>> (accessed 20 September 2007).

<sup>16</sup> Historical information and information about valid SSNs can be found at the Social Security Administration's web sites: <<http://www.ssa.gov/history/ssn/geocard.html>> <<http://www.socialsecurity.gov/employer/stateweb.htm>> (accessed 20 September 2007).

Group Numbers for one quarter of our data (several million observations) and found no hits. Given the time consuming nature of this particular search, we did not check all 18 years of data for this type of invalid SSN. Any SSN with a Group Number equal to 00 will be considered invalid.

The last four digits of the SSN are referred to as the Serial Number. These are assigned consecutively from 0001 to 9999. Any SSN with a Serial Number equal to 0000 will be considered invalid.

There were a series of SSNs that were de-commissioned by the Social Security Administration because they had been put on fake Social Security Cards used as props to sell wallets.<sup>17</sup> Apparently, some people who purchased the wallets thought the fake Social Security Cards were real and started using them as their own. If any of these 21 "pocketbook" SSNs appear in the data, they are considered invalid. In addition, there are a number of SSNs that are exactly equal to the employer identification number. These are considered invalid. In any case where a SSN is used for more than one person on a firm's UI wage report, that SSN will be considered invalid. Lastly, a SSN that does not have the required number of digits (including zeros) will also be considered invalid. Table 2 lists all of the reasons why a SSN is classified as invalid for the purposes of this paper.

[Table 2 here]

The means in Table 3, which reports the incidence of invalid SSNs over the entire time period, mask an important dynamic that will show up in the next section. That is, we will see that the incidence of some of these reasons for being invalid have a very strong cyclical component and some have grown remarkably over the time period in some industries. In addition, these reasons for being invalid are not mutually exclusive. For example, a SSN may be

---

<sup>17</sup> See U.S. Department of Housing and Urban Development (1990).

invalid because it has a high area number, but it also may be duplicated within the firm. Nonetheless, over the period the single largest reason a SSN is considered invalid is because of duplication on a UI report. 1.53 percent of all records over this time period are duplicates within a firm in the same quarter. The next largest reasons are zeros in any of the pieces and a SSN that is equal to the employer ID; each of these reasons appears for about 0.3% of the sample. The incidence of pocketbook SSNs is very small. SSNs with an Area Number that is too high shows up in 0.07% of the observations. Overall, about 0.39% of observations have an invalid SSN for any one of the reasons listed in Table 3. This amounts to just over one million of the workers in the full sample.

[Table 3 here]

### *B. Growth in Undocumented Workers in Georgia 1990-2006*

The means in Table 3 average the incidence of invalid SSNs across the whole time period and across all industries. There is reason to expect that invalid SSNs are more likely to be concentrated in certain industries and to have been growing over time. Fortuny et al. (2007) estimate that 72 percent of unauthorized immigrants in Georgia arrived in the last 10 years. They also estimate that 4.5 percent of Georgia's workforce is undocumented. This is a considerably larger percentage than we calculate using invalid SSNs, which is not surprising since our methodology does not capture workers who are not reported on UI wage reports. Fortuny et al. also estimate that 52 percent of undocumented workers are employed in leisure and hospitality, construction, and manufacturing.

Figure 1 plots the percent of workers in each 1-digit NAICS industry for which we find an invalid SSN. Consistent with expectations, the industries in which the largest percent of

workers with invalid SSNs are construction and leisure and hospitality. Manufacturing is in the middle of the pack at the bottom of the Figure. We also see a significant trend change with a significant growth in invalid SSNs in the construction industry beginning in about the year 2000. In addition, there appears to be a strong cyclical component to the presence of invalid SSNs. The peaks occur in the third quarter of every year and may have something to do with the timing of firm's record keeping.

[Figure 1 here]

To explore the nature of the cyclicity of the occurrence of invalid SSNs, Figure 2 plots the percent of workers with invalid SSNs in the construction industry only, by reason of invalid classification (excluding the pocketbook reason since it was so small). The striking story of this figure is that the third quarter cyclicity is unique to SSNs with all zeros in one of the pieces and those that are equal to the employer ID. Duplicate SSNs appear to have their own irregular cyclicity with spikes happening often in the first quarter. Notably, the incidence of invalid SSNs for these three reasons (as a percent of all workers) seems to be on the decline. Remarkably, however, the incidence of SSNs with larger than valid Area Numbers exhibits no cyclical behavior, and it has seen a fairly significant growth in the construction industry since the late 1990s.

[Figure 2 here]

Given the apparent administrative cyclicity for all but the High Area Number invalid SSN reason, we only use this reason as a conservative measure of the percent of undocumented workers in an industry. This will clearly undercount the actual number of undocumented workers, so that any effect that we pick up will also likely under-estimate the true effect of the presence of undocumented workers on documented worker outcomes. To get a better idea of

whether there is any pattern to which Area Number is used most often to create an invalid SSN, Figure 3 plots the full distribution of Area Numbers starting with 773 (there are no Area Numbers between 700 and 773). Figure 3 shows that the overwhelming favorite invalid Area Number is 999, with 9 being the favorite first digit. However, there is a good representation of all invalid Area Numbers between 773 and 899, as well.

[Figure 3 here]

Figure 4 plots the incidence of High Area Number by all one-digit NAICS industry. The growth of the percent of workers with this type of invalid SSN in construction is striking. In contrast to Figure 1, most industries see a growth in undocumented workers over this time period, when only looking at the Area Number. And it is here where we see the concentration of undocumented workers identified by Fortuny et al. (2007) more clearly: construction, leisure and hospitality, professional and business services, wholesale and retail trade, and manufacturing.

[Figure 4 here]

In order to quantify the concentration of undocumented workers in certain industries, or, rather, to compare the distribution of documented and undocumented workers across industries, Figure 5 presents Welch's (1999) index of congruence for each quarter in the sample:

$$G = \frac{\sum_i (q_i^u - \bar{q}_i)(q_i^d - \bar{q}_i) / \bar{q}_i}{\sqrt{\left(\sum_i (q_i^u - \bar{q}_i)^2 / \bar{q}_i\right) \left(\sum_i (q_i^d - \bar{q}_i)^2 / \bar{q}_i\right)}} \quad (1)$$

where  $q_i^u$  and  $q_i^d$  are the fractions of undocumented ( $u$ ) and documented ( $d$ ) workers employed in industry  $i$ ;  $\bar{q}_i$  is the fraction of the entire workforce employed in that industry. The index,  $G$ , equals one if the two groups are equally distributed across industries and minus one if the two groups are concentrated in completely different industries.

[Figure 5 here]

The first thing to notice from Figure 5 is that the index values are closer to -1 than to 1. The implication is that the distribution of undocumented workers across industries is more unequal than it is equal to the distribution of documented workers. Some of the difference in distribution of documented and undocumented workers across industries may be a function of individual characteristics, such as education levels, that can not be identified in these data. For example, Borjas (2003), being able to group workers based on education and labor market experience, reports occupation (not industry) index values that are mostly positive. It may also be the case that undocumented immigrants are truly much more concentrated than immigrants as a whole. The second thing to notice from Figure 5 is that, while still highly unequal, the distributions move closer together through the sample period (the index becomes less negative). This reflects, as seen in Figure 4, the slight growth in incidence of undocumented workers in industries other than construction and leisure and hospitality.

### **III. Empirical Analysis**

#### *A. The Wage Impact of Undocumented Workers*

A number of different approaches have been taken to quantify the impact of immigration on native worker wages and employment. The most common strategy is used by Altonji and Card (1991) and in a number of papers by George Borjas (alone and with co-authors; 2003, 2005, 2006). The procedure makes use of decennial census data and standard linear regression to identify a relationship between difference in the density of immigrants and wages or employment across geographic areas (usually metropolitan statistical areas, MSAs). Various techniques (e.g., instrumental variables and fixed-effects through differencing) are employed to

control for the endogeneity problem of immigrants selecting their geographic destination based on observed wages in those locations. Following Borjas, the basic estimating equation used in the analysis here is:

$$\ln w_{j,t}^d = \theta p_{j,t-1} + \gamma x_{j,t-1} + \tau_{j,t} \quad (2)$$

where  $\ln w_{j,t}^d$  is the log of the average quarterly earnings of documented workers in industry  $j$  and time  $t$ ;  $p_{i,t-1}$  is the share of undocumented workers in the previous year;<sup>18</sup>  $x_{j,t-1}$  are other (lagged) regressors expected to influence the observed base wage level; and  $\tau_{j,t}$  is the random error. Lagged values of the share of undocumented workers and other regressors are used in order to address potential issues of endogeneity. In addition, the base model will include a series of quarter and industry dummies, as well as a measure of annual gross state product (GSP) for Georgia, which will capture underlying quarterly cyclical variation and output-influenced time trends in the movement of wages and any industry-specific, time-invariant influences on wages. Variants of the model include: (1) the estimate of the determination of the share of undocumented workers on the undocumented worker wage, and (2) a growth version of the base model to determine whether the proportion of undocumented workers affects wage growth.

Results from all three model estimations are presented in Table 4 for samples including all industries, the construction industries, and the leisure and hospitality industries. The first set of results corresponds to the base model which estimates the impact of the share of undocumented workers on documented worker wages. The impact across all three samples is statistically different from zero and is largest in the leisure and hospitality sector. The coefficient on  $p_{t-1}$  indicates that a one percentage point increase in the share of undocumented workers can

---

<sup>18</sup>  $p_{i,t-1} = 100 * [N_{i,t-1}^u / (N_{i,t-1}^u + N_{i,t-1}^d)]$ , where N is the number of undocumented ( $u$ ) and documented ( $d$ ) workers.

be expected to reduce quarterly earnings of documented workers by 0.6 percent. While very precisely estimated, these results may not translate into a very large practical impact on documented worker wages. Between the first quarter of 1996 and the fourth quarter of 2006, the proportion of undocumented workers in Georgia grew by 0.63 of a percentage point in construction and by 0.14 of a percentage point in leisure and hospitality. The parameter estimates in Table 4 suggest that this growth resulted in a 0.16 percent, or \$17, decline in quarterly earnings among documented workers in the construction sector and a 0.08 percent, or \$5, decline in the leisure and hospitality sector.<sup>19</sup> However, as mentioned earlier, it is likely that our measure severely undercounts the presence of undocumented workers in Georgia. But even applying the parameter estimate in Table 4 to the two percentage point growth of undocumented immigrants in the U.S. between 1990 and 2000 estimated by Passel (2007), suggests a wage impact of only \$53 over this time period for documented construction workers and \$66 for documented workers in leisure and hospitality.

[Table 4 here]

Except for construction workers, the other results in Table 4 indicate that there is no statistically significant impact of the share of undocumented workers in an industry on either the wages of undocumented workers themselves, or on the growth in documented worker wages. Among construction workers, the share of undocumented workers has a greater negative impact on undocumented worker wages than on documented worker wages and significantly reduces the wage growth of documented workers. Average real quarterly earnings among documented construction workers rose 61.3 percent between the first quarter of 1996 and the fourth quarter of 2006. According to the results in Table 4, the wage growth among documented construction

---

<sup>19</sup> Using average quarterly earnings in the fourth quarter of 2006 yields  
for Construction:  $(\$10,253) * (-0.257) * (0.63) / 100 = \$16.60$   
for Leisure and Hospitality:  $(\$5,853) * (-0.563) * (0.14) / 100 = \$4.61$

workers would have been seven percentage points ( $0.63 \times 11.3$ ) greater in the absence of the 0.63 percent growth in undocumented construction workers over this time period.<sup>20</sup>

Wherever the regressors are significantly different from zero, an increase in the total number of workers in the industry reduces wages, but an increase in the number of firms increases wages of documented workers. This suggests that the total number of workers is measuring movements along the demand curve and the total number of firms is measuring shifts in the demand curve for workers. Across the board, the higher the total economic activity in Georgia (GSP), the higher the wages paid to all workers.

#### *B. Labor Supply Elasticities and the Undocumented Worker Wage Penalty*

One of the ways for employers to successfully pay undocumented workers less than their documented co-workers is by exploiting a possible difference in the labor supply elasticities across the two workers. One of the most commonly accepted source of differential elasticities of labor supply across workers with different characteristics (usually gender or race) is the presence of constraints. It is argued that, historically, the employment opportunities for blacks and women are less than those for white men and that women are geographically constrained by their husband's employment choices (for example, see Raphael and Riker 1999 and Ofek and Merrill 1997).

Analogously, if undocumented workers are constrained in their employment opportunities, or at least in their grievance opportunities, their labor supply elasticity should be lower on average than that of a documented worker. We make use of a technique introduced by Ransom and Oaxaca (2006) to estimate the labor supply elasticity of documented and

---

<sup>20</sup> Both using decennial Census data, Butcher and Card (1991) find no evidence of immigration on wage growth and Enchautegui (1993) finds that higher wage growth in high immigration areas.

undocumented workers. The validity of this estimation relies on a number of assumptions. First, the technique requires that recruitment equals separation; that one employer's separation is another employer's recruitment. This means that it would not necessarily be valid in circumstances of very weak labor markets. Because of this, the separation equations will be estimated only during the period of expansion, 1993-2000. A second assumption is required as a result of how we define undocumented workers. Since we define undocumented workers as those using invalid SSNs, it is not reasonable to expect that an undocumented worker would use the same SSN when moving from one employer to another. However, we must assume that an undocumented worker uses the same SSN while employed by the same employer, so that if the undocumented worker's SSN disappears from the employer's records for a period of time, we assume that worker has separated. Of course, there is nothing keeping a different worker from using the same invalid SSN later on with the same employer.

Given these considerations, we can estimate the labor supply by type of worker as the negative of two times the separation elasticity of the worker type (see Ransom and Oaxaca 2006, 4):

$$\varepsilon_{nw} = -2\varepsilon_{sw} \quad (3)$$

The separation elasticity is estimated by first estimating the following separation equation separately for documented workers ( $j=d$ ) and for undocumented workers ( $j=u$ ):

$$s_{it}^j = \Phi \left[ \alpha_0^j + \alpha_1^j \ln(w_{it}^j) + Y_{it}^j \beta^j \right] = \Phi \left[ I_{it}^j \right], \quad (4)$$

where  $s_{it}$  is the probability that worker  $i$  separates from the employer in year  $t$ ,  $\Phi[\cdot]$  is the normal cumulative distribution function;  $w_{it}$  is the real quarterly wage observed for worker  $i$  at the beginning of year  $t$ ;  $u_i$  is equal to one if the worker is identified as an undocumented worker;

and  $Y_{it}$  are other characteristics of the worker, firm, or labor market that might affect the rate of separation. Again, the state administrative wage files provide only limited information about the workers' firms and industries and no information about the worker demographics.

Given the estimation results from equation (3), the separation elasticity for workers of type  $j$  ( $= d, u$ ) can be calculated as follows:

$$\varepsilon_{sw}^j = \hat{\alpha}_1^j \left[ \frac{\varphi(\hat{I}_i^j)}{\Phi(\hat{I}_i^j)} \right], \quad (5)$$

where  $\varphi(\cdot)$  is the standard normal density function. Table 5 reports the separation and labor supply elasticities for workers in the construction and leisure and hospitality industries.

[Table 5 here]

The first thing that the estimates in Table 5 indicate is that during this period of rapid economic expansion, all workers have fairly high labor supply elasticities; among documented workers in all industries, a one percent increase in the wage increase the quantity of labor supplied by 1.15 percent. The second point of interest from Table 5 is that the labor supply elasticities for undocumented workers are lower than that estimated for documented workers. Of course, the implication is that undocumented workers are less sensitive to wage changes than documented workers, which is what would be expected if undocumented workers are more restricted in their employment or grievance opportunities, giving employers more monopsony power over the terms of their employment.

This estimated lower labor supply elasticity among undocumented workers, and the ability of employers to identify and take advantage of the lower supply elasticity, explains why we observe them to be receiving lower pay. A competing hypothesis for observing lower pay between two groups of workers is discrimination. A main prediction from the discrimination literature is that a larger supply of the disadvantaged group leads to a larger pay differential

between the advantaged and the disadvantaged (see Becker 1971). The results in Table 4, however, indicate that the presence of a larger proportion of undocumented workers leads to significantly lower wages among the documented (advantaged) group, but does not affect the pay of undocumented workers (except in construction). Consequently, the wage gap would be more likely to *shrink*, if anything, as the proportion of undocumented workers grows. Simple fixed-effects regressions of the wage gap as a function of the proportion of undocumented workers (with the other regressors listed in Table 4) confirms this. While never significantly different from zero, the estimated coefficients indicate a weak negative correlation between the wage gap and the proportion of undocumented workers in an industry. The exception is in Construction, where the effect is estimated to be positive, but still not significantly different from zero.

#### **IV. Conclusions and Policy Implications**

The purpose of this paper was to determine whether the presence of undocumented workers affects the earnings of documented workers in the same industry. The bottom line is that a higher proportion of undocumented workers significantly reduces the wages of documented workers in the same industry, and that the impact is strongest in the leisure and hospitality and construction industries. However, the estimated size of the undocumented workforce, even in construction, is so small that the robustly estimated impact is of no practical significance. It was also found that, except in construction, the share of undocumented has no impact on the wage of undocumented workers themselves or on the wage growth of documented workers. In construction, the effect was statistically significant but only of marginal practical significance.

It was also found that undocumented workers have a lower labor supply elasticity, which is consistent with a situation in which undocumented workers face limited employment and/or grievance opportunities. This result, along with the finding that a larger share of undocumented workers *decreases* rather than increases the documented/undocumented wage gap, implies that the lower wages paid to undocumented workers is more likely the result of employers exploiting their monopsony power, rather than being the result of discriminatory behavior.

## References

- Altonji, Joseph and David Card. "The Effects of Immigration on the Labor market Outcomes of Less-skilled Natives." In J. Abowd and R. Freeman, eds. *Immigration, Trade, and the Labor Market*, 201-34. Chicago: University of Chicago Press, 1991.
- Barro, Robert and Xavier Sala-i-Martin. *Economic Growth*. New York: McGraw Hill, 1995.
- Bean, Frank D; Jennifer Van Hook; and Karen A. Woodrow-Lafield. "Estimates of Numbers of Unauthorized Migrants Residing in the United States: The Total, Mexican, and Non-Mexican Central American Unauthorized Populations in Mid-2001." Pew Hispanic Center Report (2002).
- Bean, Frank D; Rodolfo Corona; Rodolfo Tuirán; and Karen A. Woodrow-Lafield. "Circular, Invisible, and Ambiguous Migrants: Components of Difference in Estimates of the Number of Unauthorized Mexican Migrants in the United States." *Demography* 38(3) (2001): 411-22.
- Becker, Gary. *The Economics of Discrimination*, 2d ed. Chicago: University of Chicago Press, 1971.
- Borjas, George J. "Native Internal Migration and the Labor Market Impact of Immigration." *NBER Working Paper #11610* (September 2005).
- Borjas, George J. "The Labor Demand Curve Is Downward Sloping: Reexamining the Impact of Immigration on the Labor Market." *The Quarterly Journal of Economics* (November 2003): 1335-74.
- Borjas, George J.; Richard B. Freeman; and Lawrence F. Katz. "How Much do Immigration and Trade Affect Labor market Outcomes?" *Brookings Papers on Economic Activity* 1 (1997): 1-90.
- Borjas, George J.; Jeffrey Grogger; and Gordon H. Hanson. "Immigration and African-American Employment Opportunities: The Response of Wages, Employment, and Incarceration to Labor Supply Shocks." *NBER Working Paper #12518* (September 2006).
- Butcher, Kristin F. and David Card. "Immigration and Wages: Evidence from the 1980s." *American Economic Review Papers and Proceedings* 81(2) (May 1991): 292-6.
- CBO. *Immigration Policy in the United States*. Washington, D.C.: Congressional Budget Office, February 2006.
- Chiswick, Carmel U.; Barry R. Chiswick; and Georgios Karras. "The Impact of Immigrants on the Macroeconomy." *Carnegie-Rochester Conference Series on Public Policy* 37 (December 1992): 279-316.

- Costanzo, Joe; Cynthis Davis; Caribert Irazi; Daniel Goodking; and Roberto Ramirez. "Evaluating Components of International Migration: The Residual Foreign Born Population." *U.S. Bureau of the Census Working Paper no. 61* (2001).
- Denton, Frank T. and Byron G. Spencer. "Population, Labour Force and Long-term Economic Growth." McMaster University, Quantitative Studies in Economics and Population Research Reports (1997).
- Enchautegui, Maria E. "Education, Location, and labor Market Outcomes of Puerto Rican Men During the 1980s." *Eastern Economic Journal* 19(3) (Summer 1993): 295-308.
- Espenshade, Thomas J. "Using INS Border Apprehensions Data to Measure the Flow of Undocumented Migrants Crossing the U.S.-Mexico Frontier." *International Migration Review* 29(2) (Summer 1995): 545-65.
- FAIR. *U.S. Immigration History*. <[http://www.fairus.org/site/PageServer?pagename=research\\_research9c29](http://www.fairus.org/site/PageServer?pagename=research_research9c29)>. Access 26 October 2007.
- Fix, Michael and Jeffrey S. Passel. *Immigration and Immigrants: Setting the Record Straight*. Washington, D.C.: The Urban Institute, May 1994.
- Friedberg, Rachel M. and Jennifer Hunt. "The Impact of Immigrants on Host Country Wages, Employment and Growth." *Journal of Economic Perspectives* 9 (Spring 1995): 23-44.
- GAO. "Illegal Immigration: Border-Crossing Deaths Have Doubled Since 1995; Border Patrol's Efforts to Prevent Deaths Have not Been Fully Evaluated," GAO-06-770. Report to the Honorable Bill Frist, Majority Leader, U.S. Senate (August 2006).
- GAO. "Immigration Enforcement: Weaknesses Hinder Employment Verification and Worksite Enforcement Efforts," GAO-05-813. Washington, D.C.: Government Accounting Office, August 2005.
- Goldin, Claudia. "The Political Economy of Immigration Restrictions in the United States, 1890-1921." In C. Goldin and G. Libecap, eds. *The Regulated Economy*, 223-58. Chicago: University of Chicago Press, 1994.
- Hamada, Koichi and Hiromi Kato, eds. *Ageing and the Labor Market in Japan: Problems and Policies*. ESRI Studies Series on Ageing. Cheltenham, U.K. and Northampton, Mass: Elgar, 2007.
- Hanson, Gordon H. "Illegal Immigration from Mexico to the United States." *Journal of Economic Literature* 44 (December 2006): 869-924.

- Hanson, Gordon H. and Antonio Spilimbergo. "Illegal Immigration, Border Enforcement, and Relative Wages: Evidence from Apprehensions at the U.S.-Mexico Border." *The American Economic Review* 89 (Dec 1999): 1337-57.
- Hoefler, Michael; Nancy Rytina; and Christopher Campbell. "Estimates of the Unauthorized Immigrant Population Residing in the United States: January 2005." *Population Estimates*. Washington, D.C.: US Department of Homeland Security, Office of Immigration Statistics (August 2006).
- Hoefler, Michael; Nancy Rytina; and Christopher Campbell. "Estimates of the Unauthorized Immigrant Population Residing in the United States: January 2006." *Population Estimates*. Washington, D.C.: US Department of Homeland Security, Office of Immigration Statistics (August 2007).
- Hotchkiss, Julie L. "Employment Growth and Labor Force Participation: How Many Jobs are Enough?" *Federal Reserve Bank of Atlanta Economic Review* 90 (1) (Quarter 1, 2005): 1-13.
- INS (U.S. Immigration and Naturalization Service, Office of Policy and Planning). "Estimates of the Unauthorized Immigrant Population Residing in the United States: 1990 to 2000," Report 1211 (January 2003).  
<<http://www.dhs.gov/ximgtn/statistics/publications/archive.shtm>>, accessed 17 October 2007.
- Lalonde, Robert and Robert Topel. "Labor Market Adjustments to Increased Immigration." In J. Abowd and R. Freeman, eds. *Immigration, Trade, and the Labor Market*, 167-200. Chicago: University of Chicago Press, 1991.
- Morley, Bruce. "Causality Between Economic Growth and Immigration: An ARDL Bounds Testing Approach." *Economics Letters* 90 (January 2006): 72-6.
- Neal, Larry and Paul Uselding. "Immigration, a Neglected Source of American Economic Growth: 1790 to 1912." *Oxford Economic Papers*, New Series 24 (May 1972): 68-88.
- Ofek, Haim and Yesook Merrill. "Labor Immobility and the Formation of Gender Wage Gaps in Local Markets." *Economic Inquiry* 35 (January 1997): 28-47.
- Ottaviano, Gianmarco I.P. and Giovanni Peri. "Rethinking the Effects of Immigration on Wages." *NBER Working Paper #12497* (August 2006).
- Passel, Jeffrey S. "Estimates of the Size and Characteristics of the Undocumented Population." Pew Hispanic Center Report (2005).
- Raphael, Steven and David Riker. "Geographic Mobility, Race, and Wage Differentials." *Journal of Urban Economics* 45 (January 1999): 17-46.

United States Department of Labor. "Handy Reference Guide to the Fair Labor Standards Act."  
< <http://www.dol.gov/esa/regs/compliance/whd/hrg.htm>> (accessed 20 September 2007).

U.S. Department of Housing and Urban Development. "Disclosure and Verification of Social Security Numbers (SSNs) for the Section 235 Program." Mortgage Letter 90-39 (9 November 1990).  
<<http://209.85.165.104/search?q=cache:5VRIgv1oFQYJ:www.fha.gov/reference/ml1990/90-39ml.doc+pocketbook+social+security+numbers&hl=en&ct=clnk&cd=9&gl=us>> (accessed 20 September 2007).

Welch, Finis. "In Defense of Inequality." *American Economic Review* 89 (1999): 1-17.

White, Sammis B.; John F. Zipp, William F. McMahon, Peter D. Reynolds; Jeffrey D. Osterman; and Lisa S. Binkley. 1990. "ES202: *The Data Base for Local Employment Analysis.*" *Economic Development Quarterly* 4 (August): 240-53.

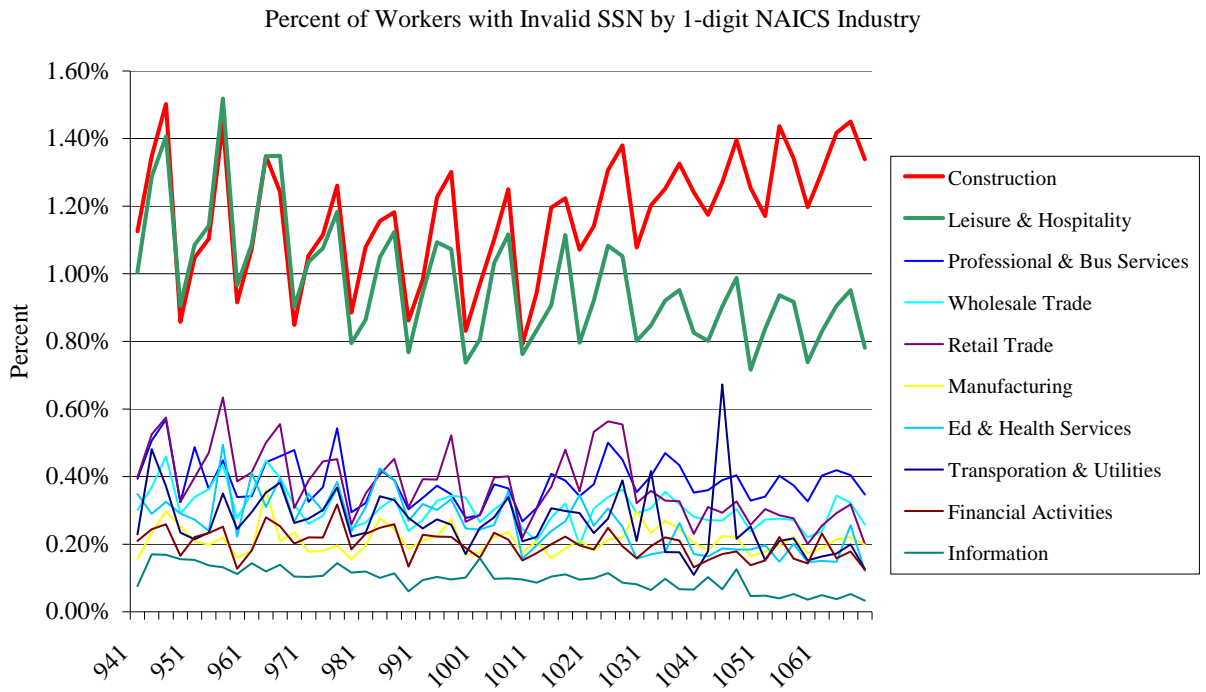


Figure 1. Percent of Workers with Invalid SSNs, by Industry, 1994:1-2006:4.

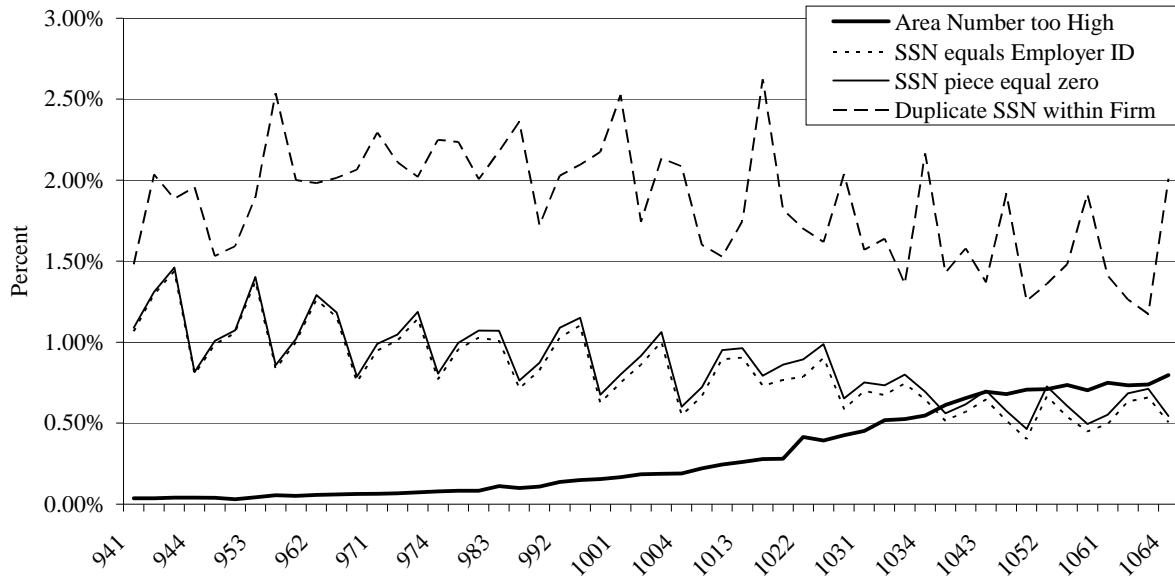


Figure 2. Percent of Workers with Invalid SSN by Reason: Construction, 1994:1-2006:4.

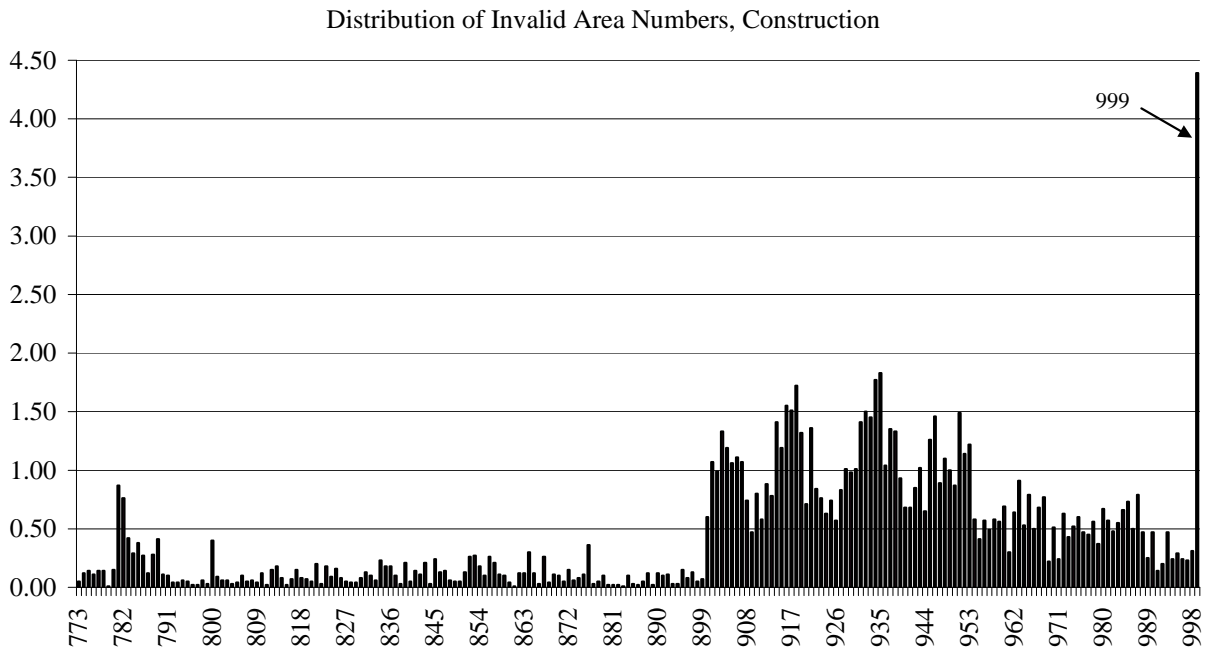


Figure 3. Distribution of Invalid Area Numbers, Construction.

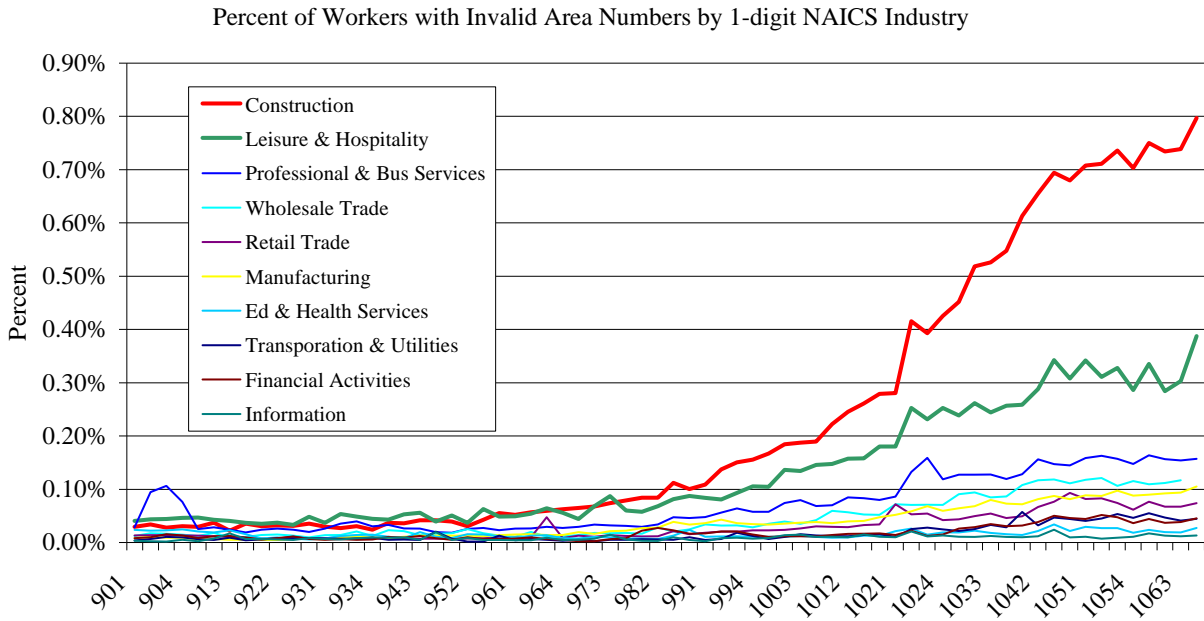


Figure 4. Percent of Workers with Invalid Area Number only by Industry, 1990:1-2006:4.

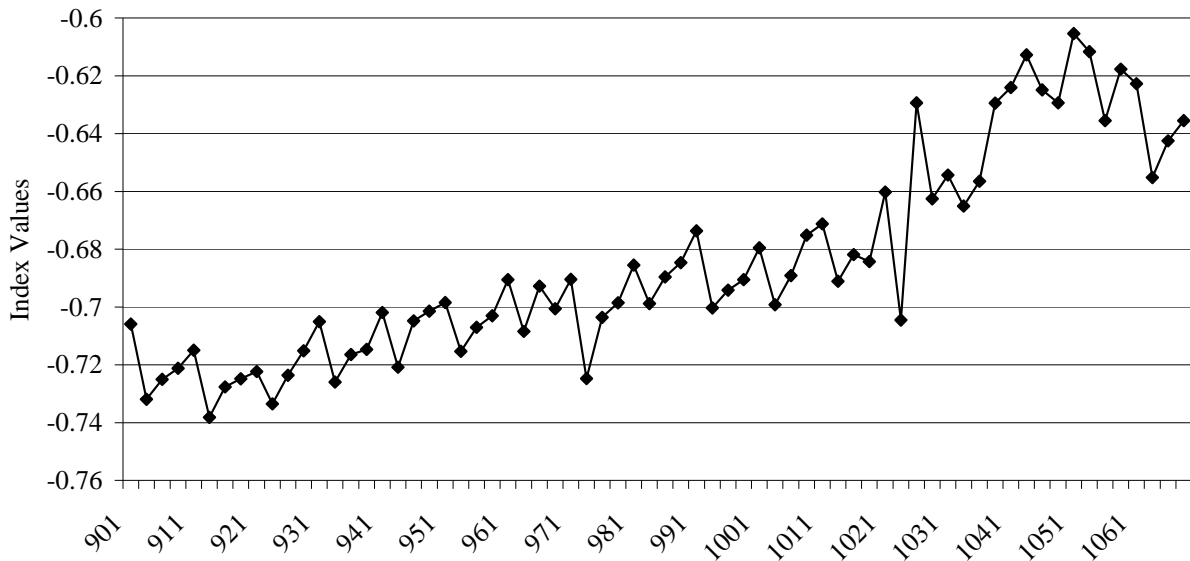


Figure 5. Welch's (1999) Index of Congruence Comparing Distribution of Documented and Undocumented Workers Across Industries.

Note: The index equals one if undocumented and documented workers are distributed equally across industries and negative one if the two groups of workers are concentrated in completely different industries.

Table 1. Estimates of the U.S. unauthorized immigrant population 1990-2006(millions).

| Year | INS (2003) | Hoefler et al.<br>(2006, 2007) | Costanzo et al.<br>(2003) | Bean et al.<br>(2002) | Passel (2007) |
|------|------------|--------------------------------|---------------------------|-----------------------|---------------|
| 1990 | 3.500      |                                |                           |                       | 3.500         |
| 1991 | 4.025      |                                |                           |                       |               |
| 1992 | 4.204      |                                |                           |                       |               |
| 1993 | 4.492      |                                |                           |                       |               |
| 1994 | 4.750      |                                |                           |                       |               |
| 1995 | 5.146      |                                |                           |                       |               |
| 1996 | 5.581      |                                |                           |                       |               |
| 1997 | 5.862      |                                |                           |                       |               |
| 1998 | 6.098      |                                |                           |                       |               |
| 1999 | 6.488      |                                |                           |                       |               |
| 2000 | 7.000      | 8.500                          | 10.242                    |                       | 8.380         |
| 2001 |            |                                |                           | 7.751                 |               |
| 2002 |            |                                |                           |                       | 9.300         |
| 2003 |            |                                |                           |                       |               |
| 2004 |            |                                |                           |                       | 10.300        |
| 2005 |            | 10.500                         |                           |                       |               |
| 2006 |            | 11.600                         |                           |                       |               |

Note: Estimates are all made using the residual method as described in the text.

Table 2. Reasons for classifying a SSN as invalid, sample means for Georgia 1990-2006.

| Invalid Reason  | Percent of Sample |
|---|-------------------|
| Area Number = 000 or Group Number = 00 or Serial Number = 0000,<br>or not enough digits | 0.32%             |
| Area Number > 699   | 0.07%             |
| Pocketbook SSN  | 0.000013%         |
| SSN equal employer ID   | 0.30%             |
| Duplicate SSN within firm   | 1.53%             |

Note: Total number of workers (number of person quarters between 1990:1 and 2006:4) is 277,183,148.

Table 3. Sample means by industry.

| Variable                            | All Industries     | Construction<br>Only | Leisure &<br>Hospitality Only |
|-------------------------------------|--------------------|----------------------|-------------------------------|
| $w_t^d$                             | \$7,881<br>(3,741) | \$7,453<br>(1,456)   | \$4,380<br>(2,532)            |
| $w_t^u$                             | \$4,728<br>(5,027) | \$4,381<br>(1,568)   | \$3,241<br>(4,578)            |
| $p_{t-1}$                           | 0.07%<br>(0.24)    | 0.18%<br>(0.21)      | 0.08%<br>(0.08)               |
| Undocumented worker<br>wage penalty | -37.9%<br>(58.54)  | -41.8%<br>(16.77)    | -21.0%<br>(76.51)             |
| Number of Workers $_{t-1}$          | 54,199<br>(68,831) | 68,767<br>(44,290)   | 93,742<br>(123,569)           |
| Number of Firms $_{t-1}$            | 1,954<br>(3,113)   | 5,470<br>(3,966)     | 2,560<br>(2,750)              |
| No. of Observations                 | 4,467              | 204                  | 294                           |

Notes: All averages are across industries. Wages are real quarterly earnings. Number of observations reflects the number of industry quarters in the sample.

Table 4. Fixed-effect regression results, impact on log wages and on wage growth.

| Variable                                 | All Industries       |                     |                         | Construction         |                      |                         | Leisure & Hospitality |                     |                         |
|--|----------------------|---------------------|-------------------------|----------------------|----------------------|-------------------------|-----------------------|---------------------|-------------------------|
|  | $\ln w_t^d$          | $\ln w_t^u$         | $\% \Delta w_{t,t-1}^d$ | $\ln w_t^d$          | $\ln w_t^u$          | $\% \Delta w_{t,t-1}^d$ | $\ln w_t^d$           | $\ln w_t^u$         | $\% \Delta w_{t,t-1}^d$ |
| $p_{t-1}$                                | -0.022***<br>(0.008) | 0.019<br>(.074)     | 0.227<br>(0.611)        | -0.257***<br>(0.032) | -0.474***<br>(0.154) | -11.3***<br>(2.09)      | -0.563**<br>(0.229)   | 0.409<br>(1.035)    | 5.470<br>(16.93)        |
| Number of<br>Wrkrs <sub>t-1</sub> /10000 | -0.006***<br>(0.001) | 0.009<br>(0.010)    | 0.169**<br>(0.079)      | -0.026***<br>(0.006) | 0.021<br>(0.027)     | -0.130<br>(0.374)       | -0.016**<br>(0.007)   | 0.036<br>(0.031)    | 0.798<br>(0.507)        |
| Number of<br>Firms <sub>t-1</sub> /1000  | 0.030***<br>(0.003)  | -0.054**<br>(0.024) | -0.040<br>(0.201)       | 0.044***<br>(0.009)  | 0.023<br>(0.041)     | 1.044*<br>(0.558)       | 0.015<br>(0.045)      | -0.130<br>(0.202)   | -3.814<br>(3.303)       |
| Georgia<br>GSP/100000                    | 0.136***<br>(0.002)  | 0.269***<br>(0.020) | -0.57***<br>(0.169)     | 0.226***<br>(0.010)  | 0.490***<br>(0.046)  | 1.68***<br>(0.620)      | 0.273***<br>(0.018)   | 0.233***<br>(0.081) | -1.423<br>(1.323)       |
| Overall R <sup>2</sup>                   | 0.09                 | 0.01                | 0.0004                  | 0.58                 | 0.54                 | 0.02                    | 0.49                  | 0.04                | 0.03                    |
| No. of<br>Observations                   | 4,227                | 4,227               | 4,227                   | 192                  | 192                  | 192                     | 278                   | 278                 | 278                     |

Notes: All regressions include quarterly dummy variables. Standard errors are in parentheses. Number of observations is lower than in Table 2 by one year's worth of observations, since regressors are lagged by one year.  $\% \Delta w_{t,t-1}^d = 100 * (w_t^d - w_{t-1}^d) / w_{t-1}^d$ .

Table 5. Separation and labor supply elasticities.

|                               | All Industries       |                      | Construction         |                      | Leisure & Hospitality |                      |
|-------------------------------|----------------------|----------------------|----------------------|----------------------|-----------------------|----------------------|
|                               | Documented           | Undocumented         | Documented           | Undocumented         | Documented            | Undocumented         |
| $\hat{\alpha}_0$              | -0.478***<br>(0.001) | -0.338***<br>(0.004) | -0.520***<br>(0.001) | -0.431***<br>(0.013) | -0.434***<br>(0.0004) | -0.436***<br>(0.010) |
| $\overline{\varphi(\hat{I})}$ | 0.2088<br>(0.0976)   | 0.3453<br>(0.0531)   | 0.2530<br>(0.0850)   | 0.3244<br>(0.0569)   | 0.2997<br>(0.0782)    | 0.3346<br>(0.0649)   |
| $\overline{\Phi(\hat{I})}$    | 0.1730<br>(0.1659)   | 0.4191<br>(0.1851)   | 0.2246<br>(0.1737)   | 0.3387<br>(0.1742)   | 0.3000<br>(0.1827)    | 0.4546<br>(0.2151)   |
| $\varepsilon_{sw}$            | -0.58                | -0.28                | -0.59                | -0.41                | -0.43                 | -0.32                |
| $\varepsilon_{mw}$            | 1.15                 | 0.56                 | 1.17                 | 0.83                 | 0.87                  | 0.64                 |
| N                             | 102,700,359          | 56,576               | 5,838,985            | 8,827                | 10,341,620            | 11,162               |

Notes: Elasticities constructed using estimates obtained via maximum likelihood probit of equation (4). Regressors other than  $\ln(w_{it})$  include the number of firms and total employment in a worker's industry, the industry average proportion of undocumented workers, quarterly dummy variables, and a measure of annual gross state product.. Based on a standard Z-test for differences in means, all estimates between documented and undocumented workers are significantly different from one another at the 99 percent confidence level.