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## Does Immigration Affect Wages? A Look at Occupation-Level Evidence \*

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**Abstract:** Previous research has reached mixed conclusions about whether higher levels of immigration reduce the wages of natives. This paper reexamines this question using data from the Current Population Survey and the Immigration and Naturalization Service and focuses on differential effects by skill level. Using occupation as a proxy for skill, we find that an increase in the fraction of workers in an occupation group who are foreign born tends to lower the wages of low-skilled natives—particularly after controlling for endogeneity—but does not have a negative effect among skilled natives. We also find that only immigrants adjusting immigration status within the U.S. impact the wages of low-skilled natives; new arrivals do not have negative wage impacts on natives. This suggests that immigrants become substitutes for natives only as they spend more time in the U.S.

**JEL classification:** J61

**Key words:** immigrants, natives, wages

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## **Does Immigration Affect Wages? A Look at Occupation-Level Evidence**

Immigration has accounted for almost one-half of the total labor force growth in the U.S. in recent years. This influx of immigrants has been disproportionately large in certain regions, such as the Northeast and the Southwest, where immigration accounted for over 90 percent of labor force growth during the period 1996 to 2000. Immigrants have also been disproportionately concentrated in certain occupations, particularly low skilled occupations such as agricultural work, in which the number of immigrants rose even as total employment fell (Mosisa, 2002). This influx of immigrants and their concentration in certain regions and occupations raises the question of how immigration affects the wages of natives, particularly low-skilled natives. This paper uses data on immigration inflows and natives' wages within occupation groups to examine this issue.

Most previous studies of the effect of immigration on wages use a cross-area approach that compares the number of immigrants in an area with wages in that area. These studies, such as Altonji and Card (1991), Butcher and Card (1991), and Schoeni (1997), typically conclude that immigration has little or no significant negative effect on wages. As noted in many papers, the cross-area approach can yield misleading results if immigrants' locational choices are endogenous, with immigrants going to areas with higher wages. For example, immigrants within a certain educational group tend to settle in areas with relatively high returns to that group (Borjas, 2001). In addition, cross-sectional results are biased if immigration causes offsetting migration by natives and previous immigrants or changes in industry mix.

In response to these potential problems, several studies use factor proportions models to estimate the effect of immigration on wages. Factor proportions models do so by making

assumptions about the elasticity of substitution between immigrants and natives (e.g., Borjas, Freeman and Katz, 1992, 1997; Jaeger, 1996; Johnson, 1998). Using reasonable elasticities, such models can yield sizable negative effects at the national level for unskilled workers. The effect of immigration on skilled workers, however, is modest at best in such studies. Moreover, results from factor content analysis tend to be sensitive to changes in the underlying assumptions of the model, such as the functional form and the number of factors (Leamer, 2000).

A few studies focus on the effect of immigration within occupations or skill groups. Using data from the 1990 Census, Card (2001) estimates the relationship between immigrant inflows and wages for six occupational groups in 175 large U.S. cities. Most of his results indicate significant negative effects, which generally increase in magnitude when instrumental variables techniques are used to control for endogeneity. Card does not discuss whether the effects differ between skilled and unskilled workers. Using a similar approach but at the national level with data from the 1991 Current Population Survey (CPS), Camarota (1997) finds a negative association between immigration and wages within low-skilled occupations. Both of these studies use cross-sectional data, creating problems if output mix or occupational choices changed in response to immigration.

There are two papers that use data consisting of multiple cross sections to look at skill or occupation groups. Friedberg (2001) uses Israeli micro data to study the impact of Russian immigration by occupation on Israeli wages and employment. Using an instrumental variables strategy, she does not find evidence of an adverse wage effect on natives whether in a pooled sample or in regressions by high and low skill level. Using several years of national-level data from the Census and the CPS, Borjas (2002) finds that higher immigrant inflows within education and experience groups—which proxy for skill—are negatively associated with wages

and employment among male natives. Borjas does not focus on differential impacts across skill groups.

This study estimates the effect of immigration inflows on wages within occupational groups using data from the Immigration and Naturalization Service (INS) and the Current Population Survey. Our approach offers several contributions to the literature. First, no study has used INS data on new recipients of legal permanent resident status to examine the effects of immigration on wages even though the data present several advantages. As discussed below, the INS data offer a novel instrumental variable for immigration inflows, contain a complete count of new legal immigrants, and allow us to distinguish between newly arriving immigrants and those who adjust status while already in the U.S. In addition, we use several years of data whereas most previous cross-area and occupation-level studies relied on a cross-sectional approach. Using multiple years of data allows us to control for unobservable local area effects, an approach not possible in cross-area studies that use only one year of data.

The next section discusses the effects of immigration on wages from a theoretical perspective. We then discuss the data used to examine the relationship between immigration and natives' wages at the occupational group level; we focus on high-, medium-, and low-skilled occupations during a five-year period, 1994-1998, at the metropolitan area level. The results indicate that, after controlling for endogeneity, higher immigration inflows lower average wages among natives working in low-skilled occupations but do not appear to have a negative effect among natives in medium- and high-skilled sectors. Immigrants who are already present in the U.S. and who adjust from nonimmigrant status have a more negative effect on natives' wages than do newly arrived immigrants, indicating that assimilation leads to increased substitutability of immigrants for native workers.

## Theoretical Framework

Immigration inflows can negatively or positively impact natives' wages, depending on the degree of substitution or complementarity between immigrant and native workers and a number of other factors. Because there is already a large theoretical literature, we do not present a formal model of the effect of immigration on natives' wages but simply review the underlying reasons why immigration might affect natives' wages and in what direction.<sup>1</sup>

The degree of substitution between immigrants and natives is a key determinant of the effect of immigration on native wages. Holding capital constant and assuming a constant returns to scale production technology, an increase in labor supply due to immigration will lower wages if immigrants and natives are substitutes and labor supply is not perfectly elastic with respect to wages.<sup>2</sup> The magnitude of the negative effect increases with the degree of substitution between immigrants and natives and with the size of the immigrant inflow. If immigrants are a complement for natives in production, in contrast, immigration will boost natives' wages.

The degree of substitution between immigrants and natives is likely to vary across skill levels. Substitution is likely to be easier in industries with less skilled workers because employees are more interchangeable and training costs are lower than in industries with skilled workers. In skilled jobs, the need for English language proficiency and institutional knowledge may make it difficult for employers to substitute immigrants for native workers. Some skilled professions, such as physicians, also involve licensing requirements, limiting the substitutability

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<sup>1</sup> For formal models, we refer readers to, among others, Borjas (1999), Greenwood and Hunt (1995), and Johnson (1998).

<sup>2</sup> These assumptions can be relaxed to accommodate changes in the relative prices of goods and in the use of capital versus labor inputs. See Chapter 4 in Smith and Edmonston (1997) for a more general model.

for natives of immigrants educated and trained abroad.<sup>3</sup> Returns to education and experience acquired abroad are generally lower than for education and experience acquired in the host country, so skilled immigrants may experience larger earnings penalties than unskilled immigrants (Friedberg, 2000; Duleep and Regets, 1999). Moreover, skill transferability, the degree to which immigrants can use human capital acquired in their home country at U.S. jobs, tends to be higher for unskilled jobs than for skilled positions (Gallo and Bailey, 1996). As immigrants assimilate over time they acquire the knowledge and language skills to better compete with natives for higher-skilled jobs. As they become more substitutable for native workers, adverse wage effects may follow.

In order to capture these differential effects by skill level, we use occupation as a proxy for skill in our empirical model below. If the elasticity of substitution is greater among unskilled workers than among skilled workers, as we hypothesize, the effect of immigration on wages should be larger in unskilled occupations than in skilled occupations. The degree of complementarity (or substitution) between immigrants in a given occupation and natives in another occupation also influences natives' wages, a topic we do not explore in this study; studies suggest that most such cross-elasticities are small (Hamermesh, 1993).

Another factor that influences the effect of immigration on wages is changes in capital. Immigrants might add to the capital stock, both initially if they bring savings when they migrate and over time (Chiswick, Chiswick, and Karras, 1992). If immigration adds to the capital stock, natives' wages might rise if capital is a complement to labor, particularly skilled labor. Unskilled labor, in contrast, appears to be a substitute for capital (Hamermesh, 1993). Capital

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<sup>3</sup> For example, among immigrants who applied to have foreign-earned qualifications (engineering, nursing, etc.) recognized in Australia, only 42 percent received approval (Chapman and Iredale, 1993).

also may move across industries and areas in response to immigration inflows.<sup>4</sup> Such movements in capital could therefore at least partially counterbalance the negative effect of an increase in labor supply on natives' wages. The empirical model we present below does not control for capital because we do not have measures of capital at the occupation and area level; since we only examine a five-year period, ignoring changes in capital may not be unrealistic. Time-invariant cross-area differences in the existing capital stock will be picked up by the city fixed effects.

The elasticity of labor supply with respect to wages also influences the impact of immigration on wages. Natives and previous immigrants might respond to immigration-induced changes in wages by altering their labor supply, moving to a different area, or upgrading or downgrading their skills.<sup>5</sup> Such changes would reduce any negative effect of immigrant inflows on wages. Studies have not reached a consensus as to whether offsetting migration occurs in response to immigrant inflows (e.g., Card, 2001; Frey, 1995; Kritiz and Gurak, 2001). Because we examine only a five-year period here, our estimates of the impact of immigration on wages are probably more negative than the long-run effect. In the long run, endogenous shifts in labor supply would likely lead to less negative estimates than any found here.

Finally, immigration inflows may lead to changes in output mix that cushion any wage impact on natives. Previous studies suggest that immigration may lead to changes in the output mix within areas, with industries intensive in low-skilled labor expanding in or moving to areas with large numbers of immigrants (Altonji and Card, 1991; Hanson and Slaughter, 2002). Such changes in production should increase the demand for labor and thereby reduce any negative

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<sup>4</sup> Quispe-Agnoli and Zavodny (2002) do not find a significant association between immigration and capital mix at the state level.

<sup>5</sup> See Chiswick (1989) for a model of how natives adjust their human capital to minimize adverse wage effects due to immigration.

effects of immigration on wages. Similarly, immigration may lead to scale effects, with demand for output increasing in response to immigration; an increase in output demand would raise demand in factor markets, putting upward pressure on wages. Such effects would also at least partially offset any negative effect of immigration on wages.

As discussed below, we instrument for changes in the labor supply as a consequence of immigration to help control for the above factors. Instrumenting, as well as including area fixed effects, also controls for endogeneity bias due to immigrants settling in areas that pay high wages or have strong wage growth, which would upward bias the estimated coefficients away from finding an adverse effect.

### Empirical Methodology

To estimate the effect of immigration on natives' wages, we regress the average earnings of natives in occupation group  $o$  on the fraction of workers in that occupation group who are foreign born and other variables, or

$$\ln w_{o,s,t} = \alpha + \beta I_{o,s,t} + \gamma X_{o,s,t} + \omega O_o + \alpha S_s + \tau T_t + \varepsilon_{o,i,t} \quad (1)$$

where  $s$  indexes areas and  $t$  indexes years. The measure of wages is the log of real average hourly wages for natives in a given occupation group, area, and year.

The variable  $I$  in Equation 1 is the number of immigrants with a given occupation group relative to total employment in that occupation group. If an area experiences an influx of immigrants within a given set of occupations, this fraction rises, reflecting the increase in the relative labor supply of immigrants. The underlying hypothesis is that occupations and areas

experiencing larger inflows of immigrants relative to the total number of workers in that occupation and area should experience larger declines in wages, and the magnitude of the decline depends on how substitutable immigrants are for other workers. As discussed below, a large number of cells have the immigrant share variable equal to zero. We therefore do not log the immigrant share variable and interpret its estimated coefficient as an elasticity; instead, the estimated coefficient of the immigrant share variable indicates the average percentage change in wages for a 1 percentage point increase in immigrants as a percentage of all workers.

The vector  $X$  controls for the average demographic characteristics of workers in that occupation. We control for the fraction of native-born workers who are female, black, married, and union members. We also control for the distribution of workers across five-year age groups and three of four education groups (less than high school, high school, some college, and college graduates).

All regressions include a full set of occupation and year fixed effects in order to control for unobservable determinants of earnings within an occupation or year. We also include area fixed effects in some specifications. Pooling five years of data allows us to control for unobserved determinants of wages that are constant within areas over time; previous studies could not control for such unobservable factors because they used cross-sectional data. We White-correct the standard errors in order to control for heteroscedasticity and weight observations by the total number of native-born workers in the occupation, area, and year.

We estimate Equation 1 by pooling observations for each of the occupation groups examined here. The immigrant share variable,  $I$ , is interacted with an indicator variable for each occupation group in order to allow the effect of immigration to differ across skill categories. Because we have only five years of data and therefore limited degrees of freedom, we constrain

the effects of the variables measuring worker characteristics and the area and year fixed effects to be the same across occupation groups.

Endogeneity bias is a concern because immigration into an area may not be independent of local wages or wage growth. We use two methods to address this problem. First, we include area fixed effects in some specifications, which controls for time-invariant factors that affect immigrants' locational choices, such as relatively high wages or wage growth. Second, we utilize an instrumental variables approach. The instrument must be correlated with the influx of immigrants into a given MSA and occupation but uncorrelated with unobserved factors driving wages and wage growth. We therefore use immigrants who are admitted to the U.S. as the spouse of a U.S. citizen and report a given occupation as an instrument for the immigrant share in that occupation group.

Immigrant spouses of U.S. citizens are an effective instrument for many reasons. First, because immigrant spouses presumably immigrate for family reunification reasons and settle where their citizen spouse lives, their location choice is largely exogenous to local wages in their reported occupation group.<sup>6</sup> Although spouses may make joint location decisions over time that depend in part on returns to the immigrant's occupation, it is probably much less likely in the year in which the immigrant spouse first receives legal status than for other immigrants. Jaeger (2000) reports that, among major admission categories, the locational choices of spouses of U.S. citizens are the least responsive to local area economic conditions; indeed, he finds a significant positive association between the spouses' locational choices and the change in the

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<sup>6</sup> Data from the CPS for 1994-1998 indicate that most citizen spouses work (88 percent of male spouses and 68 percent of female spouses) and that about two-thirds of citizen spouses earn more than their immigrant spouses. In addition, 69 percent of citizen spouses have at least as much education as their immigrant spouses. This suggests that location decisions are not necessarily driven by the earnings potential of the immigrant spouse. (The CPS sample is of citizens married to non-citizens who report arriving in the U.S. within the last 5-6 years.) Among immigrants with citizen spouses in the INS data, about 66 percent of low-skilled immigrants are male, 51 percent of high-skilled immigrants and 49 percent of medium-skilled immigrants.

unemployment rate. Spouses of U.S. citizens are also the most geographically dispersed and educationally diverse group among the categories Jaeger investigates.

In addition, the spouses of U.S. citizens are not subject to a quota or admitted on the basis of skills, so their occupation plays no direct role in whether they become immigrants. Jasso and Rosenzweig (1995) report that these “marital immigrants” are less skilled than are immigrants admitted for employment-based reasons at the time they receive LPR status. They also find that marital immigrants experience considerable occupational upgrading over time in the U.S., suggesting that they become more substitutable for natives as duration of U.S. residence increases. Moreover, during the 1990s, the simple act of filing paperwork with the INS made a person fairly immobile geographically. The INS struggled with huge backlogs and lost hundreds of thousands of files (Holmes, 2000). In this environment, few applicants risked transferring their casework from one district to another, as would be required in the case of most interstate moves. Immigrants adjusting their status therefore may not have moved across areas in response to wage differentials based on their skill level.

This empirical approach offers several advantages. Previous studies that controlled for endogeneity typically did so by using the foreign-born population share in an area at the beginning of a period as the instrument for the change in the share or by using lagged values as instruments. Because new immigrants tend to settle where previous immigrants reside, first-stage regressions using these approaches have good predictive power. However, the instruments are correlated with the error term in the second-stage earnings regressions if previous immigrants reside in certain areas for earnings-related reasons that also influence the locational choices of new immigrants. Our instrument—spouses of citizens—is more likely to be an exogenous determinant of locational choice for the reasons noted above.

## Data

We use data on employment and earnings from the outgoing rotations groups of the Current Population Survey (CPS) and immigration data from the INS. Both data sets are for the period 1994 to 1998; the CPS data are for calendar years while the INS data are for fiscal years.<sup>7</sup> We focus on three occupation groups: high skill (executives/managers and professionals, such as teachers and doctors); medium skill (clerical workers, which includes all administrative support workers; sales; and precision production, craft, and repair, which consists of skilled blue-collar jobs); and low skill (service workers, laborers, which is composed of unskilled blue collar jobs, and farm workers).<sup>8</sup> We use these relatively broad occupational groups because the groupings capture the set of occupations for which immigrants who report working in a particular occupation are likely to be substitutable for natives. For example, immigrants who report working as an agricultural laborer can also probably work in an unskilled manufacturing or service sector job but cannot work in a clerical or professional job.

The primary data set we use is the CPS, a monthly survey that focuses on labor market outcomes. Since 1994, the survey has included questions about nativity, including country of birth and year of arrival in the U.S. (in intervals). From all employed native-born individuals aged 16 and older, we constructed measures of average hourly wages and total employment within the three occupation groups. In addition, we constructed from the CPS data the ratio of all immigrants to total employment; this is the typical measure used in cross-area studies to estimate the impact of immigration. The controls for the distribution of workers across 5-year

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<sup>7</sup> The difference implicitly allows for a one-quarter lag in effects.

<sup>8</sup> We include farm workers because they often reside and work in cities during the off season. About 2.7 percent of the immigrant sample and 1.5 percent of the native-born sample are farm workers. Average hourly earnings among

age groups, four educational groups, sex, race, marital status, and union membership included in the regressions are also constructed from the CPS data.

We also constructed two alternate measures of immigrants to total employment by combining the CPS data with INS data. The INS data we use are the universe of all new legal permanent residents, also known as “green card” recipients. Our sample includes all new legal permanent residents aged 16-64 who report an occupation. The INS data list 25 occupations, which are more detailed for skilled workers (e.g., architects) than for unskilled workers (e.g., operators, fabricators, and laborers).<sup>9</sup> We drop individuals who report their occupation as homemaker, student, unemployed, or retired and collapse the remaining occupations into the three occupational groups.<sup>10</sup> The INS data do not report individuals’ earnings or educational attainment.

The INS data offer several advantages compared with other data sources that include information on nativity. The INS data are a complete count of all new legal permanent residents, and they include the preference category under which immigrants were admitted, such as spouse of legal permanent resident, spouse of U.S. citizen, priority worker with extraordinary ability, or refugee. We exploit the fact that some of these groups are exempt from immigration quotas to construct our instrumental variable. The INS data also distinguish between whether an immigrant is newly arriving in the U.S. or is already present in the U.S. and converting from another visa status, such as H1-B. The INS data report the most recent year of admission for those individuals converting from nonimmigrant status. The main disadvantages of the INS data

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sales workers are similar to those among clerical workers and significantly higher than average earnings in the low-skill occupational group, so we classify sales workers as medium skilled.

<sup>9</sup> We also tried running the regressions using the most detailed level of occupation available in the INS data, but most of the results were inconclusive because of the small cell sizes in many occupations and areas.

<sup>10</sup> About 11 percent of immigrants aged 16-64 do not report an occupation, another 13 percent report being unemployed or retired, 14 percent report being a student and about 18 percent report being a homemaker.

are that they do not include non-immigrants and illegal aliens and that they contain a limited set of personal characteristics. Greenwood, McDowell, and Trabka (1991) further describe the advantages and shortcomings of the INS data.

We separate the INS data on new immigrants into newly arriving immigrants and immigrants adjusting status and compute each as a share of total workers (based on the CPS data). We distinguish between newly-arriving immigrants and those adjusting status because the foreign born who are already present in the U.S. but only now receiving legal permanent resident status are likely to be more substitutable for natives than newly arriving immigrants. In addition, immigrants adjusting their status are already working in the U.S. in the occupation reported in the data, whereas immigrants newly arriving in the U.S. report their occupation in their home country unless they are admitted under employment-based preferences. This partially motivates our use of broad occupational categories.<sup>11</sup> We conduct the analysis at the metropolitan statistical area (MSA) level because MSAs more closely approximate labor markets than do states.<sup>12</sup> The INS data are by zip code of intended residence, which we merged with the metropolitan area codes in the CPS. The final sample consists of an unbalanced panel of 1251 observations per occupation for 283 MSAs during the period 1994-1998.

Table 1 reports the fraction of workers in each occupation group who are immigrants and natives' average wages. Column 1 shows the fraction of workers who are foreign born based on CPS data. Columns 2 and 3 show, based on the combined INS and CPS data, the number of newly arriving immigrants and immigrants adjusting status relative to all workers. The first

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<sup>11</sup> Most immigrants work in the same occupational group in the U.S. as in their home country. In the 1995-98 March CPS, which asks occupation last year as well as current occupation, over 90 percent of workers who reported not being in the U.S. last year were in the same occupation last year as during the current year.

<sup>12</sup> We note that the immigrants who settle in urban areas tend to differ from those who live in other areas. In particular, immigrants tend to initially settle in urban areas where other immigrants live and then move over time to areas with lower concentrations of immigrants

column thus measures the relative stock of immigrants while the second two are measures of the relative flow.<sup>13</sup> The foreign born make up a larger fraction of workers in low-skilled occupations, accounting for over 8 percent of low-skilled workers but less than 6 percent of high- and medium-skilled workers. However, a substantial portion of new legal permanent residents (LPRs) are in high skill occupations as well as low skill jobs. Although the U.S. granted over 650,000 persons LPR status each year during our sample period, the number of new immigrants relative to total workers in each occupation group is small, as columns 2 and 3 indicate. The total number of observations with no newly-arriving immigrants or no persons adjusting status is 506.

Columns 4 and 5 of Table 1 show the number of spouses of U.S. citizens newly receiving green cards as a fraction of total employment in each occupation. About 19 percent of legal immigrants during fiscal years 1994-1998 were admitted as the spouse of a U.S. citizen, so their numbers are small relative to total employment. These ratios of LPR spouses to total employment form our instrument for the immigrant share of total employment. When instrumenting for the foreign-born fraction of all workers based on the CPS data (column 1), we use the total number of new LPR spouses (the sum of columns 4 and 5). When instrumenting for newly-arriving LPRs as a fraction of all workers (column 2), we use the fraction of newly-arriving spouses (column 4). When instrumenting for immigrants adjusting status as a fraction of all workers (column 3), we use the fraction of adjusting spouses (column 5). The last column in the table reports average hourly wages of natives as calculated from the CPS data.

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<sup>13</sup> We note that the INS data are not a perfect count of all foreign-born workers entering an occupation for several reasons. Not all immigrants work in the U.S. in the occupation indicated to the INS at the time they received legal permanent resident status (some immigrants also may live in an area other than that reported to the INS). In addition, the data do not include illegal aliens and non-immigrants, and immigrants already present in the U.S. move between occupations. Nonetheless, the numbers should be well correlated with the inflow of immigrants into occupations and areas.

## Results

Table 2 shows OLS estimates of the relationship between natives' wages and immigrant shares by occupation group. As indicated in the table, we show specifications with and without city fixed effects; the regressions without city fixed effects are similar to the cross-sectional methods used in most previous studies. Including the city fixed effects controls for time-invariant MSA-level determinants of earnings, such as differences in the cost of living, and helps control for endogeneity. From the results in Table 2, the endogeneity bias in the cross-sectional approach is considerable. All of the coefficients for the immigrant share variable decline substantially when area fixed effects are included. Consider immigrants adjusting status as an example. Adding fixed effects (going from column 5 to 6) reduces the coefficients from 0.254 to .079, 0.284 to 0.005, and from 0.015 to -0.042 for high, medium and low-skilled shares, respectively.

As Table 2 shows, when controlling for city fixed effects, immigrant inflows have different effects on natives' wages depending on the occupation group and the type of immigrant. Higher immigrant shares are generally associated with positive wage effects on high-skilled natives. For example, average wages in executive and professional occupations are significantly positively associated with all measures of the immigrant share—the total stock, newly arriving immigrants and those adjusting status. A 1 percentage point increase in the total immigrant share is associated with an increase in native-born executives' average wages of 0.25 percent, controlling for area fixed effects (column 2). A 1 percentage point increase in the new and adjusting immigrant share meanwhile is associated with positive wage impacts of 10.9 and 7.9 percent, respectively, among natives in high-skilled occupations. It bears noting that a 1

percentage point increase in the flow measures of immigrants (new and adjusting, columns 3-6) represents much a larger increase in the immigrant share than a percentage point increase in the stock measure (all immigrants, columns 1-2). Evaluating the wage effects at the means given in Table 1 gives a more comparable measure: the effect of all, new, and adjusting immigrants, respectively, on high-skilled natives' wages is 1.41, 1.53, and 1.11 percent.

The effect on natives in low-skilled occupations tends to be negative, in contrast. For low-skilled natives (service workers, laborers, and farm workers), the respective wage impacts of all, new, and adjusting immigrants are  $-1.14$ ,  $-0.27$ , and  $-0.80$  when evaluated at the means and controlling for area fixed effects (although the coefficient is not statistically significantly different from zero for the impact of newly arriving immigrants). The interpretation of these effects would be that average wages for low-skilled natives are about 1.1 percent lower as a result of the presence of all foreign-born workers in that occupation group, 0.3 percent lower because of inflows of new legal immigrants each year, and 0.8 percent lower because of immigrants adjusting to legal permanent resident status. Natives in medium-skilled occupations (clerical and sales jobs) are less affected—either positively or negatively—by immigration than natives in more or less skilled occupations. Including area-specific linear time trends yields results similar to those shown in Table 2.

The fact that wage impacts vary by immigrant type is as interesting as the variation by skill level. Newly arriving immigrants (as compared with those adjusting status or as compared with the stock of all immigrants) have the largest positive wage impacts on natives in all three occupation groups. This is also the only group that does not cause a negative wage effect among low-skilled natives. This result could be due to the lack of substitutability of new immigrant workers for natives. Friedberg (2001) similarly argues that evidence of a positive wage impact

of newly arrived Russian immigrants on the wages of Israeli natives suggests that new immigrants are not very substitutable for native workers. In our results, the positive wage effects are smaller in magnitude (and the negative wage effects larger) for immigrant groups with more U.S. experience, suggesting that immigrant assimilation increases the substitutability of immigrant for native workers and hence the wage impacts on natives become more adverse over time.

The OLS regression results in Table 2 are biased if immigrants settle in the areas that offer relatively high wages or wage growth for their occupations and the area fixed effects do not fully control for this endogeneity. Although this is a bigger problem in the INS data on new and adjusting immigrants, it is also a concern for the CPS data if the foreign born move within the U.S. in response to higher wages or wage growth. We therefore instrumented for the immigrant share with the number of immigrants in the INS data who are spouses of U.S. citizens (relative to total employment), as discussed above.

Table 3 shows the two-stage least squares results (in the first-stage results reported in the Appendix, the instruments are jointly significantly different from zero). The results are similar to those discussed above. As expected, instrumenting for immigrant shares produces more negative effects, and the statistical significance of the positive wage effects when controlling for time-invariant area effects disappears in all groups except the newly arrived (column 4). For low-skilled natives, the immigrant stock and the number of immigrants adjusting status now have slightly more negative significant wage effects than before (columns 2 and 6). A 1 percentage point increase in the share of all immigrants reduces average wages of low-skilled natives by .34 percent, and a 1 percentage point increase in the share of immigrants adjusting status reduces native low-skilled wages by 6.3 percent (columns 2 and 6, respectively). Normalizing these

effects by evaluating them at the means given in Table 1, overall low-skilled native wages are 2.8 percent lower as a result of the immigrant stock and 1.2 percent lower as a result of immigrants adjusting status each year.

## **Conclusion**

In this paper, we take another look at how immigration affects the wages of U.S. natives. Findings in this literature are dominated by evidence of a modest but significant negative wage impact on unskilled natives, but there is little evidence on how medium and high skilled workers are impacted by immigration. We address this question in several ways. First, we use INS data on new legal immigrants together with CPS data for 1994-1998. In order to allow wage effects to vary by worker skill level, we devise three occupational categories, ranging from service workers, farm workers, and laborers at the bottom of the skill range to professionals and executives at the top of the skill range.

Using an innovative instrumental variable, new immigrants who are spouses of U.S. citizens, and area fixed effects we find two sets of interesting results. When instrumenting for immigrant shares, negative wage impacts are small in size and concentrated among low-skill occupations. We find wage effects that vary from about  $-0.1$  to  $-0.3$  percent for a 10 percent increase in the corresponding immigrant share. Although statistically significant, the effects are small relative to those commonly cited in the literature. We find no evidence of adverse wage impacts on medium- and high-skilled native workers. In fact, increases in the new immigrant share of workers within high and medium skill jobs actually have slightly positive wage effects, suggesting there may be complementarities between native workers and newly arrived immigrants in the top skill categories.

The magnitudes of the wage effects—not just the signs—also appear closely related to both the skill group and the level of U.S. experience of the immigrant group. Wage effects decrease monotonically as skill levels decrease. Wage effects also decrease as immigrants' time in the U.S. increases. Although increases in the share of newly arrived immigrants have no statistically significant negative impact on the wages of low-skilled natives, increases in the share of those who are already in the U.S. when they adjust status have a small but significant negative effect on low-skilled native wages. The biggest negative effect however, comes from the stock of all immigrants, which is also the immigrant group characterized by the most U.S. experience. Taken together, these findings suggest that the process of assimilation makes immigrants more substitutable for natives and hence increases wage competition.

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**Table 1**  
**Descriptive Statistics**

Occupation	Immigrants as % all workers			Immigrant spouses as % all workers		Average wage Natives
	All	New	Adjusting	New	Adjusting	
High skill	5.62 (5.22)	.14 (.15)	.14 (.13)	.03 (.02)	.03 (.03)	18.53 (2.28)
Medium skill	5.67 (6.39)	.09 (.12)	.05 (.08)	.02 (.02)	.02 (.02)	12.13 (1.36)
Low skill	8.15 (9.24)	.17 (.26)	.19 (.29)	.03 (.05)	.06 (.09)	9.41 (1.12)

Note: Shown are sample means (standard deviations). In column 1, immigrants as a percentage of all workers is the number of foreign-born workers in the CPS relative to all workers in the CPS. Columns 2 and 3 are, respectively, the number of newly-arriving immigrants and immigrants adjusting status in the INS data relative to all workers in the CPS. Columns 4 and 5 are the number of immigrants who are spouses of U.S. citizens in the INS data relative to all workers in the CPS. The average wage is the real average hourly wage of natives, computed as usual weekly earnings divided by usual weekly hours for salaried workers, deflated using the PCE. The data are for an unbalanced panel of 283 metropolitan areas during 1994-1998 for a total of 1251 observations per occupation.

**Table 2**  
**OLS Estimates of the Relationship between Natives' Wages and Immigration**

Occupation	All immigrants		Newly arriving		Adjusting status	
	(1)	(2)	(3)	(4)	(5)	(6)
High skill	.0083** (.0007)	.0025** (.0007)	.247** (.032)	.109** (.022)	.254** (.025)	.079** (.018)
Medium skill	.0054** (.0005)	.0006 (.0005)	.237** (.048)	.068* (.029)	.284** (.086)	.005 (.038)
Low skill	.0018** (.0003)	-.0014** (.0004)	.039** (.014)	-.016 (.012)	.015 (.014)	-.042** (.010)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Area fixed effects	No	Yes	No	Yes	No	Yes

Note: Shown are estimated coefficients from OLS regressions of average natives' wages on the share of workers who are immigrants in an occupation, area, and year. In columns 1 and 2, the immigrant share is constructed using all foreign born workers in the CPS; in columns 3-6, the immigrant share is constructed using all newly-arriving immigrants or immigrants adjusting status in the INS data. The regressions also include controls for average worker characteristics (see text for details) and fixed effects and time trends as indicated. Robust standard errors are in parentheses. Each column is from a separate regression with 3753 observations.

† p < .10; \* p < .05; \*\* p < .01

**Table 3**  
**2SLS Estimates of the Relationship between Natives' Wages and Immigration**

Occupation	All immigrants		Newly arriving		Adjusting status	
	(1)	(2)	(3)	(4)	(5)	(6)
High skill	.0089** (.0012)	.0004 (.0025)	.225** (.037)	.132** (.039)	.248** (.040)	.048 (.032)
Medium skill	.0057** (.0011)	-.0012 (.0023)	.212** (.066)	.090 <sup>†</sup> (.053)	.395** (.065)	-.012 (.057)
Low skill	.0018* (.0008)	-.0034 <sup>†</sup> (.0019)	.025 (.022)	-.008 (.019)	.029 (.018)	-.063** (.020)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Area fixed effects	No	Yes	No	Yes	No	Yes

Note: Shown are estimated coefficients from 2SLS regressions of average natives' wages on the share of workers who are immigrants in an occupation, area, and year. In columns 1 and 2, the instrument is the number of all new immigrants who are spouses of U.S. citizens in the INS data relative to all workers in the CPS; in columns 3 and 4, the number of newly-arriving immigrants who are spouses of U.S. citizens; and in columns 5 and 6, the number of immigrants adjusting status who are spouses of U.S. citizens in the INS data. The regressions also include controls for average worker characteristics (see text for details) and fixed effects and time trends as indicated. Robust standard errors are in parentheses. Each column is from a separate regression with 3753 observations.

<sup>†</sup> p < .10; \* p < .05; \*\* p < .01

**Appendix Table 1**  
**First Stage for 2SLS Estimates of the Relationship between Natives' Wages and Immigration**

Occupation	All immigrants		Newly arriving		Adjusting status	
	(1)	(2)	(3)	(4)	(5)	(6)
High skill	74.282** (5.951)	-29.994** (5.429)	5.711** (0.224)	3.998** (0.303)	4.114** (0.206)	3.596** (0.303)
Medium skill	106.250** (9.185)	-11.935* (5.455)	4.910** (0.167)	3.150** (0.366)	2.615** (0.227)	2.044** (0.359)
Low skill	45.719** (3.368)	9.852** (2.429)	4.456** (0.313)	3.851** (0.317)	2.777** (0.329)	2.580** (0.302)
F-test for joint significance	138.27 (0.00)	30.94 (0.00)	511.30 (0.00)	71.94 (0.00)	149.06 (0.00)	57.73 (0.00)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Area fixed effects	No	Yes	No	Yes	No	Yes

Note: Shown are estimated coefficients from first stage regressions of the fraction of workers who are immigrants on the fraction of workers who are new immigrants admitted as spouses of U.S. citizens in an occupation, area, and year. The regressions also include controls for average worker characteristics (see text for details) and fixed effects and time trends as indicated. Robust standard errors are in parentheses (p-value for the F-test). Each column is from a separate regression with 3753 observations.

† p < .10; \* p < .05; \*\* p < .01