The Effect of Minimum Wages on Immigrants*

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Abstract: This study compares the effects of minimum wage laws on employment and earnings among low-skilled immigrants and natives in the U.S. Conventional economic theory predicts that higher minimum wages lead to higher earnings among the employed but lower employment rates. Minimum wage increases might have larger effects among low-skilled immigrants than among natives because, on average, immigrants earn less than natives due to lower levels of education, limited English skills, and less social capital. We use data from the Current Population Survey during 1994-2005 to examine how minimum wages at the federal and state level are related to employment-to-population rates, average hours worked, and average hourly earnings among native- and foreign-born adults who do not have a high school diploma. Our results do not indicate that minimum wages have adverse employment effects among low-skilled immigrants or natives. Higher minimum wages may discourage settlement by low-skilled immigrants, however, while most low-skilled adult natives earn too much to be directly affected by minimum wage laws in recent years.

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Introduction

The switch to Democratic control of the U.S. Congress in the 2006 elections was quickly followed by House and Senate approval of an increase in the federal minimum wage, bringing new urgency to the debate over how minimum wages affect the labor market outcomes of low-skilled, low-wage workers. This urgency is compounded by the fact that an increasing number of states have taken matters into their own hands and imposed or raised state-level wage floors in recent years. As of January 2007, 29 states and the District of Columbia had minimum wages that exceeded the federal rate of $5.15, which has been in effect since 1997. Standard competitive economic models predict that higher minimum wages result in less employment. Despite this prediction, research conducted in recent years has reached disparate conclusions about the impact of minimum wage increases on employment.[1]

Most minimum wage studies of the U.S. examine the effect of the minimum wage on employment among groups that earn relatively low wages, such as teenagers and fast food workers. The fastest-growing low-wage, low-skilled group, however, is made up of immigrants (Sum et al., 2002).[2] As of 2005, about 32% of foreign-born adults (aged 25 and older) in the U.S. do not have a high school diploma or equivalent. These immigrants account for about one-third of the total adult population without a high school diploma. Almost two-thirds of adults with less than a 5th-grade education are foreign-born, as are one-half of adults who have at most an 8th grade education (Census Bureau, 2006). Because of differences in age and labor force participation rates, immigrants compose an even more disproportionate share of the low-skilled

[1] For a recent survey, see Neumark and Wascher (2006).
[2] We use the terms 'immigrant' and 'foreign-born' interchangeably in this article to refer to persons born outside the U.S. to parents who are not U.S. citizens. The data that we use do not allow us to distinguish between illegal immigrants, legal permanent residents, and temporary migrants.

labor force: almost 44% of adults in the labor force who lack a high school diploma are foreign-born.

Despite the foreign-born's increasing share of the low-skilled labor force, virtually no research has investigated the effect of minimum wages on foreign-born workers. Our study attempts to fill this gap in the literature. We compare the effect of minimum wages on employment, hours, and earnings among adult immigrants and natives in the U.S. who do not have a high school diploma. The results below suggest that labor force outcomes among low-skilled adult immigrants and natives are not adversely affected by minimum wages during the period 1994-2005.

The impact of minimum wages on immigrants is important not only because of the size and rapid growth of the low-skilled foreign-born workforce but also because the impact on the foreign-born might be greater and longer-lasting than any impact on U.S.-born workers. Many of the workers who earn near the minimum wage are teens or young adults, most of whom will experience substantial earnings growth as they age.[3] A large number of adult immigrants who have little education may be mired in low-wage jobs for their entire working lives, in contrast. The level of the minimum wage and its effect on earnings and employment therefore may play a large role in many low-skilled immigrants' standard of living, their rate of assimilation, and their settlement patterns.

Theoretical Overview

Conventional economic theory predicts that higher minimum wages lead to higher average earnings and lower employment-to-population rates. The effects should be largest

[3] See, for example, Even and Macpherson (2000, 2004).

among groups that earn near the minimum wage, groups that are likely to include youths and low-skilled adults. However, some research suggests that higher minimum wages are not necessarily associated with lower employment rates despite boosting average hourly earnings among workers (e.g., Card 1992a, 1992b; Card, Katz, and Krueger, 1994; Card and Krueger, 1994; Katz and Krueger, 1992). Potential explanations for these results include imperfectly competitive labor markets, decreases in hours per worker instead of in the number of workers, and improvements in the quality of workers and their productivity that offset the effects of higher wage mandates. For example, employers might substitute more-skilled workers for less-skilled workers as the wage floor increases, resulting in no net change in aggregate employment but changes across subgroups. Another possibility is that employment rates based on surveys of individuals remain unchanged despite minimum wage increases because some individuals work 'under the table' for wages below the legal wage floor. Individuals could be pushed into subminimum wage jobs when the wage floor rises, or they could already be working for less than the legal minimum and not be affected by increases in the minimum wage.

From a theoretical standpoint, the impact of minimum wages is likely to be larger among the foreign-born than among natives. Immigrants on the low end of the skill distribution tend to have fewer years of education, less institutional knowledge, and worse English language skills than low-skilled natives. Commensurate with these differences, foreign-born workers who do not have a high school diploma earn 14% less than natives with similarly low educational attainment, and immigrants with a high school diploma earn 18% less than high-school-graduate natives (Economic Report of the President, 2005). Low-wage immigrants, particularly those from non-English speaking countries, have considerably lower returns to education and less U.S.

labor market experience than low-wage natives (Chiswick et al., 2006).[4] If immigrants are less productive than natives within the low-skilled group, then standard economic theories predict that immigrants should experience more adverse employment effects than natives when minimum wages increase.[5]

However, there are also reasons why employment effects could be smaller for immigrants than for natives. If immigrants are more likely to work in industries with less elastic labor demand or to work off-the-books, then minimum wage increases might have *less* of an effect on employment among immigrants than among natives. In particular, the presence of a substantial number of undocumented workers among the foreign-born labor force may boost the incidence of subminimum wages in the immigrant population.[6] Employers who are already breaking the law when (knowingly) hiring undocumented workers may also be more willing to flout other labor regulations, such as minimum wage laws. Although covered by minimum wage laws, undocumented workers paid less than the minimum wage are probably unlikely to seek legal redress for fear of revealing their undocumented status.

We are not aware of any previous research that has directly examined whether the effect of the minimum wage on employment and hours is different among immigrants than among natives in the U.S. Stylized facts suggest that immigrants are more likely to be affected by minimum wages. Results in Butcher and DiNardo (2002) and Chiswick, Le, and Miller (2006) suggest that the minimum wage compresses the bottom of the wage distribution more among immigrants than among natives. A recent OECD study based on Census data for a cross-section

[4] Friedberg (2000) finds this result for immigrants to Israel. Education and work experience acquired abroad is worth significantly less than human capital acquired domestically.
[5] For formal models of the varying effects of minimum wage increases across skill levels, see, for example, Connolly (2003) and Lang and Kahn (1998).
[6] Mehta et al. (2002) indicate that about 10% of undocumented immigrants (and 3% of documented immigrants) interviewed in the Chicago area in 2001 reported being paid less than the minimum wage.

of OECD nations finds significantly more adverse effects of minimum wages and other labor market regulations on immigrants than on natives (Jean, 2006). In particular, higher minimum wages reduce female economic activity and male employment rates among the foreign-born. Also, Orrenius and Solomon (2006) find that the extent of labor market restrictions is positively related to the gap between immigrant and native unemployment rates and negatively related to the gap in employment rates across OECD countries, suggesting that labor market regulations hurt immigrants more than natives.

Data and Methods

We use annual state-level data to examine how minimum wages are related to employment-to-population rates, average weekly hours worked, and average hourly earnings among the employed during the period 1994 to 2005. Our measure of the minimum wage is the annual average of the higher of federal and state minimum wages (the "effective minimum wage") in each state. For simplicity and comparability to most previous studies, most of the analysis does not incorporate legal subminimum wages (which apply to young or recently-hired workers under the current federal law and some state laws); industry- or occupation-specific minimum wages (such as the tip credit minimum wage for some restaurant workers); city-level wage floors (which occurred in a few areas toward the end of our sample period); or "living wage" requirements.[7] The federal minimum wage increased twice early in our sample period, from $4.25 to $4.75 in October 1996 and to $5.15 in September 1997. The number of states with

[7] We also do not control for changes in the Earned Income Tax Credit (EITC) or for welfare reform, which might affect the incentive to work among low-skilled workers. The year fixed effects capture any national-level effects of changes in such factors. See Neumark and Wascher (2007) for a study that combines the effects of minimum wages and the EITC among teens and young adults.

a minimum wage above the federal level at some point during the year ranges from a low of 8 in 1998 to a high of 17 in 2005.

Our employment, hours, and earnings measures are based on data from the Current Population Survey outgoing rotation groups (CPS ORG) during 1994-2005.[8] The CPS is a monthly survey of about 55,000 nationally-representative households that focuses on labor market activity. Housing units are in the sample for four months, out for eight months, and then back in the sample for four months. When a housing unit is in the fourth and eight survey waves (the outgoing rotation), the survey asks about individuals' earnings as well as about their employment status and hours worked.

We focus on three groups: less-educated adult natives, less-educated adult immigrants, and all teens (ages 16-19). Less-educated adults here are individuals aged 20-54 who do not have a high school diploma or equivalent. Immigrants are individuals who report being born outside the U.S. and not being a U.S. citizen at birth.[9] We report results for teens to provide a benchmark for comparison with much of the minimum wage literature. We do not stratify the teen data by nativity because of the small sample sizes for foreign-born teens in many states (most immigrants arrive in the U.S. when they are adults, not as children). We present results for data stratified by sex as well as for the combined sexes because of concerns that immigrant women's labor force participation may be different from immigrant men's (e.g., Schoeni, 1998). As discussed below, examining the sexes separately yields some interesting results for teens as well as for less-educated adults. Previous research that examines changes in the federal

[8] Our approach implicitly assumes that representation of low-skilled immigrants (and natives) in the CPS does not change in response to changes in the minimum wage. If increases in the minimum wage drive the least-skilled workers into subminimum wage jobs and "into the shadows (and out of the CPS)," as hypothesized by Cortes (2004: 10), then our results probably would be biased toward not finding effects of the minimum wage. However, Cortes finds no evidence in support of that hypothesis.

[9] This approach does not count individuals born in Puerto Rico or other outlying areas of the U.S. (who are U.S. citizens at birth) as immigrants. Because such individuals are likely to differ substantially from individuals born in the U.S., we exclude them from the data entirely.

minimum wage finds evidence of adverse employment effects only among male teens (Bernstein and Schmitt, 1998; Neumark and Wascher, 2007), a result we corroborate.

We constructed annual state-level employment-to-population rates for these populations and state-level average hourly earnings among workers in these groups.[10] We also constructed average usual hours worked per week among all individuals and among only workers. The questions in the CPS ORG from which we constructed our measures are about contemporaneous employment, hours, and earnings, not about the previous year. We deflated earnings and the minimum wage using the annual average of the consumer price index for urban wage earners (CPI-W).

As Table 1 shows, 2.3% of workers paid hourly earn exactly the effective minimum wage.[11] An additional 3.3% earn less than the minimum wage while an additional 12% earn above the wage floor but within 125% of the minimum wage. The fractions of workers earning exactly, less than, and slightly above the minimum wage are all higher among immigrants than among natives, higher among teens than among low-skilled adults, and higher among women than among men within age/education and nativity groups. For example, the shares of low-skilled adult immigrants who earn exactly, less than, and slightly more than the minimum wage are 5.9%, 4.9%, and 21.8%, respectively, versus 2.8%, 3.8% and 16.8% for natives. Increases in minimum wages therefore should have a larger impact among low-skilled immigrants than

[10] We used the survey population weights to construct the employment rates and average hours and the outgoing rotation group weights to construct average earnings. The earnings sample (except for the descriptive statistics in Tables 1 and 2) included both workers paid hourly and workers paid at other frequencies; we calculated average hourly earnings for the latter as usual weekly earnings divided by usual weekly hours. We used the labor force status recode to determine employment status.

[11] Tables 1 and 2 are based on individual-level data that include only workers who are paid hourly in order to reduce measurement error issues for workers paid at other frequencies. The regression results are based on state-level averages among workers paid hourly and at other intervals (e.g., weekly). The question about hourly wages in the CPS asks respondents to exclude tips, overtime pay, etc., while the weekly earnings question asks respondents to include such sources. All results related to earnings shown here do not include individuals who earn less than $1 per hour or more than $100 per hour. The patterns are qualitatively similar to those shown in Tables 1 and 2 if we include workers who are paid at other frequencies (although, unsurprisingly, a lower proportion of workers earn exactly the minimum wage).

among low-skilled natives, assuming compliance with the law. The wage distributions in Table 1 also suggest that minimum wage effects should be larger among teens than among low-skilled adults and larger among women than among men.

This finding that immigrants are more likely than natives to earn less than the minimum wage is somewhat at odds with previous research. Using data from the June 1988 and November 1989 Current Population Surveys (CPS), Fry and Lowell (1997) find that immigrants are less likely to earn below the federal minimum wage than natives (2.3% versus 2.9%). Trejo (1998) reports that 2.9% of natives and 2.8% of immigrants paid hourly earn less than the federal minimum wage in the 1994 CPS ORG data. However, Trejo notes that 3.8% of natives and 5.5% of immigrants earn less than the federal minimum wage when workers not paid hourly are also included. (When we include all workers regardless of pay frequency, we obtain subminimum rates of 3% for natives and 4.8% for immigrants.[12])

There are several potential reasons for the difference between our results and previous findings on the relative incidence of subminimum wages. The difference may be due in part to declines in immigrant "quality" across cohorts, as discussed by Borjas (1985, 1995), since we use more recent data than previous studies. Trejo (1998) shows that, for the same duration of U.S. residence, immigrants in recent cohorts were more likely to earn low wages than were earlier cohorts of immigrants in a comparison of 1979, 1989, and 1994 CPS data. In addition, we incorporate state minimum wages above the federal level into our analysis, raising the effective minimum wage in several key states that have disproportionately large numbers of immigrants, most notably California.

[12] As with all earnings results, this does not include individuals with hourly earnings less than $1 per hour or more than $100 per hour. Including them gives subminimum rates of 3.2% for natives and 4.9% for immigrants (3.2% and 3.8% when only including workers paid hourly).

Figures 1 and 2 show the distribution of hourly earnings among low-skilled natives and immigrants and among all teens. Figure 1 shows the fraction of workers in each group earning various percentiles of the minimum wage (measured in 25% increments) while Figure 2 shows the cumulative density function for each group. As the descriptive statistics suggest, teens are considerably more likely to earn near the minimum wage than low-skilled adults. Low-skilled adult immigrants have a lower earnings distribution than low-skilled adult natives. The figures suggest that relatively few low-skilled adult native workers are likely to be affected by minimum wage increases. During the period 1994-2005, the average increase in nominal minimum wages was less than 10% of the initial level; the federal increases that occurred in 1996 and 1997 were about 12% and 8% of the initial levels, respectively. Few adult natives, even among those who do not have a high school diploma, earn little enough to have been affected by such small increases in the wage floor.

The various age/education and nativity groups we examine exhibit differences in employment rates as well as in earnings, as shown in the last column in Table 1. Although immigrants and natives as a whole both have employment-to-population rates of about 0.63, less-educated immigrants are more likely to be employed than less-educated natives. This difference is driven by males; the employment rate among less-educated adult male immigrants is more than 18 percentage points higher than among male natives. Teens have lower employment rates than low-skilled adults, and employment rates are similar among teen males and females.

Low-wage workers are disproportionately young, female, and less-educated as well as disproportionately foreign-born. Table 2 reports average characteristics for low-wage workers as well as for all workers paid hourly. The descriptive statistics indicate that the foreign-born are overrepresented among low-wage workers. While immigrants account for about 13% of all

workers during this period, they make up 22% of minimum wage workers and 15% and 17% of workers earning below and slightly above the minimum wage, respectively. Teenagers and workers who have not (yet, in some cases) graduated from high school are particularly overrepresented among low-wage workers. However, a substantial fraction of minimum wage workers are not young; almost one-half of low-wage workers are at least 25 years old.

Before examining employment and hours effects we consider the impact of the minimum wage on average hourly earnings. Because the federal minimum wage and most state minimum wages are set by legislatures and raised infrequently, inflation ameliorates the real value of the minimum wage over time, making the wage floor not always binding.[13] In addition, minimum wages are not necessarily binding for all low-wage jobs because of variation in wages across areas and sectors. If we fail to find evidence of positive effects on hourly earnings, there is little reason to expect disemployment effects.

We examine the relationship between real average hourly earnings and the real minimum wage using a basic panel data regression model:

$$\ln \text{Wage}_{st} = \alpha + \beta \ln \text{MW}_{st} + \gamma \text{BusCycle}_{st} + \sigma S_s + \tau T_t + \varepsilon_{st}, \quad (1)$$

where *s* indexes states and *t* years in annual state-level data. The coefficient on the real minimum wage variable, β, gives the elasticity of average hourly earnings with respect to the minimum wage. We estimate the wage model separately for less-educated native workers, less-educated foreign-born workers, and teens in order to examine how groups' average earnings are related to the minimum wage.

[13] Only Oregon and Washington (and, as of 2007, Arizona, Florida, and Missouri) have state minimum wages indexed to inflation, and those were passed during the 2000s. (As on 2007, Vermont's minimum wage increases by the smaller of 5% and the inflation rate.)

Some specifications include controls for state-level economic conditions. We use three controls for the business cycle: the natural log of real gross state product (GSP) per capita, initial unemployment insurance claims, and the real value of permits issued for privately-owned residential construction (single-family homes, apartments, and condominiums). We include these variables as business cycle controls because they are indicators of current or 'coincident' economic activity; the unemployment rate, which previous research often used to control for the business cycle, is in contrast a lagging indicator of economic activity. If the minimum wage is endogenous with respect to business cycle conditions, with states more likely to raise their wage floor when the economy booming, then the estimated coefficient on the minimum wage variable in the earnings model tends to be biased upward because wages would be increasing anyway due to the growing economy. Including the business cycle controls helps reduce this endogeneity bias.

The empirical model includes state and year fixed effects. The state fixed effects capture any time-invariant factors that affect average wages within each state while the year fixed effects capture any time factors that are common across states, such as the national business cycle. Because we use the higher of state and federal minimum wages as the minimum wage variable, the model measures the effect of both state-level increases beyond the federal rate and federal increases in states that do not have minimum wages above the federal level. The standard errors are Huber-White corrected and clustered on the state to control for heteroscedasticity. In the earning regressions, observations are weighted using the sum of the outgoing rotation weights within the state-year-group cell in the CPS ORG data.

The standard model of labor supply and demand posits that imposition of a binding minimum wage will reduce employment by moving the equilibrium employment level back

along the labor demand curve. The higher the minimum wage, the lower the employment level. Minimum wage studies are, in essence, measuring the elasticity of labor demand with respect to wages by using the minimum wage as an exogenous source of variation in wages.

The basic regression model we use to examine employment effects is similar to the earnings model:

$$\ln \text{Emp/Pop}_{st} = \alpha + \beta \ln \text{MW}_{st} + \gamma \text{BusCycle}_{st} + \sigma S_s + \tau T_t + \varepsilon_{st} \quad (2)$$

where *s* indexes states and *t* years in annual state-level data. The left-hand-side variable is the employment rate for a particular age/education/nativity group. The minimum wage variable, *MW*, is the real effective minimum wage. We take the natural log of both variables of interest, the employment rate and the minimum wage, so the estimated coefficients can be interpreted as elasticities. As in the wage regressions, the model controls for the business cycle since it might confound the effect of the minimum wage on employment. The business cycle controls (which are the same as those used in the earnings regression model) also reduce any endogeneity bias that would occur if minimum wage increases are cyclical; this would tend to bias up (toward zero) the estimated coefficient on the minimum wage variable in employment models because it would attenuate the negative effect of minimum wage increases. The employment regression model includes state and year fixed effects, and the standard errors are Huber-White corrected and clustered on the state. Observations are weighted using the sum of the survey population weights within the state-year-group cell in the CPS ORG data.

The above model is a reduced form specification that estimates the relationship between the employment rate and the real minimum wage. It does not capture how binding the minimum

wage is. We therefore also estimate a variant that uses the relative minimum wage instead of the real minimum wage. Following Neumark and Wascher (2006), this model is specified as

$$\ln Emp/Pop_{st} = \alpha + \beta \ln(MW_{st}/Wage_{st}) + \rho \ln(Wage_{st}) + \gamma BusCycle_{st} + \delta Demographics_{st} + \sigma S_s + \tau T_t + \varepsilon_{st} \quad (3)$$

and includes both the log of the relative minimum wage and the log of the real average wage. The variable *Wage* is the average wage among adults aged 20-54 in a state and year; it does not vary across age/education/nativity groups. The goal of this specification is to control for how expensive low-wage workers (who are hired at or near the minimum wage) are relative to other workers. As the minimum wage increases relative to the average wage among prime-age workers, employers are expected to substitute more prime-age, skilled workers for relatively younger, less-skilled workers, creating larger disemployment effects.

We use similar models to examine the effect of the minimum wage on average usual weekly hours worked. For each age/education/nativity group, the hours models are estimated in a sample restricted to workers and in the entire survey population (which includes non-workers with zero hours worked). The sample of workers captures whether businesses react to higher minimum wages by increasing hours among remaining workers, such as substituting full-time workers for part-time workers, or by cutting hours. Those results are best interpreted together with the employment results; the distributional implications of finding no disemployment effects but a decline in hours might be different than finding a negative employment effect but an increase in hours among individuals who remain employed. The regressions that include all

individuals, not just workers, aim at capturing the effect of the minimum wage on total hours worked, which implicitly incorporates employment effects.

We show the robustness of our main results to using a specification which controls for the business cycle with the unemployment rate, similar to Neumark and Wascher (1992). This specification sometimes adds a variable measuring the size of the group examined as a fraction of the population aged 16-64 to control for any labor supply or cohort size effects. We also examine the robustness of our main results for teens to controlling for the fraction of teens enrolled in school.

Results

Earnings Effects

The regression results suggest that minimum wages boost earnings among low-skilled immigrants and among teens but not among low-skilled natives.[14] As Table 3 shows, a 10% increase in the minimum wage is associated with a 2.2% increase in average hourly earnings among immigrant men and a 2.4% increase among immigrant women when not controlling for the business cycle. As expected, controlling for state-level economic conditions reduces the estimated effect of the minimum wage; the effect of a 10% increase is to raise less-educated immigrants' average hourly earnings by about 1.6% among both men and women. The estimated coefficients for less-educated adult natives, in contrast, are both smaller in magnitude (and sometimes negative) and statistically insignificant. This result is not surprising given the earnings distribution relative to the minimum wage among natives who do not have a high school diploma, as discussed above.

[14] The results are similar (although generally slightly larger in magnitude) when only workers paid hourly are included in the sample.

The estimated earnings effect is largest among teens, with an elasticity of about 0.19, when combining the sexes and controlling for business cycle effects. This result appears to be driven by male teens; the estimated elasticity of average hourly earnings with respect to the minimum wage is considerably larger among male teens than among female teens when controlling for the business cycle (0.22 and 0.14, respectively). This result is somewhat surprising given that female teens are more likely than male teens to be paid near the minimum wage (Table 1). Gender differences in the distribution of workers in tipped jobs (i.e., waitresses) may account for this difference since female teens are more likely than male teens to hold such jobs.[15]

Employment Effects

The results do not indicate that higher minimum wages have adverse effects on employment rates among low-skilled adults. As the top panel in Table 4 shows, employment among neither low-skilled adult immigrants nor natives is significantly negatively associated with the real minimum wage. The estimated coefficients among low-skilled adult men are positive but, controlling for state-level economic conditions, insignificant. Given the absence of positive wage effects, it is not surprising that we do not find adverse employment effects among natives. We do find evidence of positive wage effects among immigrants, but the results in Table 4 indicate that these wage increases do not cause employment losses. As expected,

[15] In the CPS ORG data for 1994-2005, about 7.5% of employed female teens work as waitresses/waiters or bartenders versus 2.2% of employed male teens. Under current federal law, "an employer of a tipped employee is only required to pay $2.13 an hour in direct wages if that amount plus the tips received equals at least the federal minimum wage, the employee retains all tips and the employee customarily and regularly receives more than $30 a month in tips. If an employee's tips combined with the employer's direct wages of at least $2.13 an hour do not equal the federal minimum hourly wage, the employer must make up the difference." (http://www.dol.gov/esa/minwage/q-a.htm)

including controls for general economic conditions to reduce endogeneity bias lowers the estimated coefficients on the minimum wage variable in all of the specifications.

The results do indicate adverse employment effects among teens, with a 10% increase in the minimum wage reducing teen employment by about 1.6% when controlling for state-level economic conditions. This estimate is similar to previous studies that report adverse effects among teens when combining the sexes (e.g., Burkhauser, Couch, and Wittenburg, 2000; Neumark and Wascher, 1992, 1994). The result is again driven by male teens, among whom a 10% increase in the minimum wage reduces employment by about 1.8%. The results do not indicate a significant effect among female teens. Our finding that the minimum wage has a more adverse employment effect among male teens than among female teens is similar to Bernstein and Schmitt (1998) and Neumark and Wascher (2007) and fits with our finding of larger earnings effects among male teens than among female teens.[16]

We find similar results when using the relative minimum wage to measure the level of the wage floor. As shown in the bottom panel of Table 4, the estimated coefficients of the relative minimum wage variable are fairly similar in magnitude and significance level to those of the real minimum wage variable. As with the real minimum wage results, the adverse employment effects of higher relative minimum wages are concentrated among male teens in the specifications that control for the business cycle.

Hours Effects

Another possible effect of higher minimum wages is changes in hours worked. As discussed above, average hours could increase or decrease among the sample of workers while

[16] However, Pabilonia (2002) finds a more adverse effect among females than males when examining workers aged 14-16 using data from the National Longitudinal Survey of Youth 1997.

average hours worked are expected to decrease among the population as a whole in response to higher minimum wages. Previous research has reached mixed conclusions about the effect of minimum wage increases on average hours (Couch and Wittenberg, 2001; Neumark, Schweizer, and Wascher, 2004; Zavodny, 2000).

The results suggest that, like employment, average hours worked do not fall among low-skilled immigrants when the real minimum wage increases.[17] As the top panel of Table 5 shows, average hours among low-skilled immigrants who work are not significantly associated with the minimum wage. In addition, average hours among low-skilled immigrants as a whole, including nonworkers, are not significantly associated with the minimum wage, as shown in the bottom panel of the table. The results also do not indicate significant effects on average hours among low-skilled natives, which again is not surprising given the lack of earnings effects.

The results do indicate that changes in the real minimum wage lead to changes in average hours among employed teens. When the minimum wage increases, average hours tend to increase among male teens who work while falling among female teens who work. The estimated responses to a 10% increase in the real minimum wage are a 1% increase in male teen workers' average hours (although only significant at p=0.11) and a 1.2% decrease in female teen workers' average hours. The latter result explains our failure to find adverse employment effects among female teens—their hours are cut instead. There is also a negative effect on average hours among female teens as a whole (panel B) while there is no significant negative effect among all male teens. However, our earlier results did indicate a negative overall employment effect among male teens.

[17] For brevity, we only present hours results for the real minimum wage specifications. Results using the relative minimum wage are similar.

Robustness of Results

Our results thus far suggest that teens experience adverse effects from higher minimum wages, either in the form of employment losses among males or hours cuts among females. We find no evidence of significant employment or hours reductions among low-skilled adult immigrants despite positive effects on hourly earnings. We find no effects on average earnings, employment, or hours among low-skilled adult natives. We examine the robustness of these results to three variations on our main specification: using the unemployment rate to control for state-level economic conditions; controlling for the relative population size of the age/education/nativity group; and, among teens, controlling for the enrollment rate.

The results are, in general, robust to these changes (see Appendix Table 1). The employment rate among low-skilled adult male natives is positively associated with the real minimum wage when the unemployment rate is included, and the employment rate among low-skilled adult male immigrants is positively associated with the real minimum wage when the relative population size is added to the specification that includes the unemployment rate. The negative employment effects among teen males become smaller in magnitude and significance when the unemployment rate and then the relative population size are included in the regression. Again, we focus above on results that use other variables to control for the business cycle because the unemployment rate, unlike employment, lags the business cycle. The negative hours result among female teen workers is sensitive to including the enrollment rate, but we note concerns that enrollment may be endogenous with respect to the minimum wage.

The full effect of changes in the minimum wage may not occur immediately but rather with a lag. To investigate this possibility, we include a one-year lag of the real minimum wage

in the earnings, employment, and hours regressions. Neumark and Wascher (1992), Baker et al. (1999), and Burkhauser et al. (2000), among others, use a similar approach in state-level panel data. The results are not shown here because we do not find that the one-year lag of the real minimum wage is significantly negatively associated with employment rates or average hours, with one exception: employment among low-skilled adult immigrant women. The results for the sum of the estimated coefficients of the current and lag minimum wage variables are also not different from the current minimum wage results shown in the tables: higher minimum wages lead to lower employment among male teens and lower hours among female teens but do not have a significant effect on low-skilled adult immigrants or natives.

Mobility and the Minimum Wage

Our failure to find adverse employment or hours effects of higher minimum wages on low-skilled adult immigrants is at odds with the conventional competitive labor market model. If minimum wages raise average earnings among workers, the competitive model predicts that the equilibrium quantity of labor hired should fall. Yet we do not find evidence that this occurs. One potential explanation of our results within the framework of a competitive labor market model is that low-skilled immigrants' locational choices may be influenced by the minimum wage. Low-skilled immigrants who have little safety net, particularly the undocumented, may move to another state or even return home if they lose their jobs when the minimum wage increases. Also, newly-arriving low-skilled immigrants may be less likely to settle in states with higher minimum wages if their employment prospects are worse in such states. Such endogenous locational choice would explain our finding of positive wage effects yet no

disemployment impact from higher minimum wages. We therefore investigate whether minimum wages affect locational choices among low-skilled immigrants (and natives).

We examine whether higher minimum wages are related to the skill composition of the population within a state and to the distribution of low-skilled workers across states. If a higher minimum wage in a state causes low-skilled immigrants who lose their jobs to leave a state (either to move to another state or to leave the U.S.) or discourages other low-skilled immigrants from moving to that state, we should observe that the fraction of a state's population that is composed of low-skilled immigrants is negatively associated with the level of the real minimum wage. Further, the average education level among immigrants should be positively associated with the real minimum wage within a state, and the fraction of immigrants without a high school diploma should be negatively associated with the real minimum wage. We should also observe that low-skilled immigrants are more likely to live in states with lower minimum wages.

We examine these hypotheses using state-level panel data models similar to those estimated above. Instead of labor market outcomes, the left-hand-side variable is the fraction of the state population aged 16-64 that is composed of low-skilled immigrants (or natives) aged 20-54; average years of education among adult immigrants (or natives) living in a state; the fraction of adult immigrants (or natives) within a state who do not have a high school diploma or equivalent; or the fraction of low-skilled adult immigrants (or natives) who live in a given state.[18] All of these variables are derived from the CPS ORG data for 1994-2005 and are annual, state-level averages. The right-hand-side variables are the natural log of the real minimum wage, the business cycle controls, and state and year fixed effects. The standard errors are clustered on the state.

[18] The last variable is the distribution of low-skilled individuals across states each year. In cases where the CPS reports education in categories (e.g., grades 1-4), we imputed years of schooling as the median number of years within the category.

The results strongly suggest that minimum wages influence low-skilled immigrants' location patterns. As shown in Table 6, the fraction of the state population that is composed of low-skilled adult immigrants is significantly negatively associated with the real minimum wage (panel A). The fraction composed of low-skilled adult natives, in contrast, is positively associated with the minimum wage; this result is consistent with low-skilled natives moving away from states with more low-skilled immigrants (Borjas, 2006) or with legislatures raising the minimum wage when the share of voters who have little education and therefore probably earn relatively low wages increases. Further, average years of education among adult immigrants is positively associated with the minimum wage (panel B). This suggests that raising the minimum wage causes less-educated immigrants to leave (or not move to) a state or attracts relatively well-educated immigrants. The same result does not occur among adult natives. In addition, the fraction of adult immigrants who do not have a high school diploma is negatively associated with the real minimum wage; the opposite result holds among adult natives (panel C). The distribution of low-skilled immigrants across states also appears to be inversely related to effective minimum wages while the distribution of low-skilled natives is not related to the minimum wage (panel D)

Migration-induced changes in population composition potentially underlie why higher minimum wages boost average wages among low-skilled immigrants without creating adverse employment or hours effects. Higher minimum wages might encourage low-skilled immigrants to leave a given state and move to another or to leave the U.S. For low-skilled immigrants remaining within that state, the smaller number of competing workers may mitigate any adverse employment effects that minimum wage increases would otherwise cause. As noted by Ottaviano and Peri (2005), among others, recent immigrants tend to be more substitutable for

other immigrants than for natives, so a reduction in the number of low-skilled immigrants in a state (or a reduction in their growth rate) would be expected to have a greater effect on immigrants' labor market outcomes than on natives' outcomes.

Immigrants and natives may not move directly in response to state or federal changes in minimum wages, but firms in low-wage industries may be more likely to open or expand establishments in states with lower effective minimum wages. Immigrants moving in response to firms' locational choices, and natives reacting to immigrants' locational choices (Borjas, 2006), could underlie the patterns we observe in the population composition and in the distribution of low-skilled immigrants across states.

Conclusion

The standard model of competitive labor markets predicts that minimum wages raise earnings and reduce employment probabilities for workers who are at the bottom of the wage distribution. Along with teens and young adults, the foreign-born account for a large share of low-wage workers in the U.S., and the size of the foreign-born workforce has been rising in recent years. Immigrant workers may be particularly affected by minimum wage increases given their relatively low levels of human capital, such as less formal education and limited English proficiency, and lack of institutional knowledge.

Our results indicate that higher minimum wages boost average hourly earnings among immigrants who do not have a high school diploma or equivalent education. However, we do not find evidence of adverse employment or hours effects among low-skilled immigrants. We do find evidence of a decline in work among teens, with a difference by gender in whether employment or hours changed in response to higher minimum wages. Our failure to find an

adverse employment effect among low-skilled immigrants despite a positive wage effect could result from employers substituting low-skilled adults for teens when the minimum wage increases. In addition, immigrants' locational choices could respond to changes in minimum wages. We find some evidence that this may occur, with the educational composition of immigrants within states and the distribution of low-skilled immigrants across states related to minimum wage levels.

The period we examine, 1994-2005, marks an era when immigrants began settling in large numbers in new parts of the U.S. in addition to going to traditional gateways like California, New York, and Texas. As the U.S. in the 1990s experienced the largest inflow of foreign-born people ever in its history, North Carolina and Georgia were the states that experienced the greatest percentage gains in foreign-born population.[19] Notably, these two states did not increase their minimum wage beyond the federal level during that period. If firms that hire low-wage immigrants increased employment more in states with lower effective minimum wages, immigrants likely responded by moving to those states. Research on the effect of minimum wages on locational choices among firms that hire immigrants versus natives is a promising area for future research.

The large increase in the federal minimum wage that is likely to occur over the next few years will provide an opportunity for economists to examine the effects of a sizable increase in minimum wages across most of the country. The proposed increase in the federal minimum wage to $7.25 per hour from $5.15 would exceed the state minimum wages as of January 2007 in all states except California, Connecticut, Hawaii, Massachusetts, Oregon, Rhode Island, Vermont, and Washington. By creating a relatively high national wage floor, the proposed

[19] See http://www.census.gov/prod/2003pubs/c2kbr-34.pdf

increase would reduce firms' opportunity to move or expand operations in areas with low state minimum wages and could lead to larger disemployment effects among immigrants than those found here.

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Figure 1. Distribution of Hourly Earnings Relative to Minimum Wage

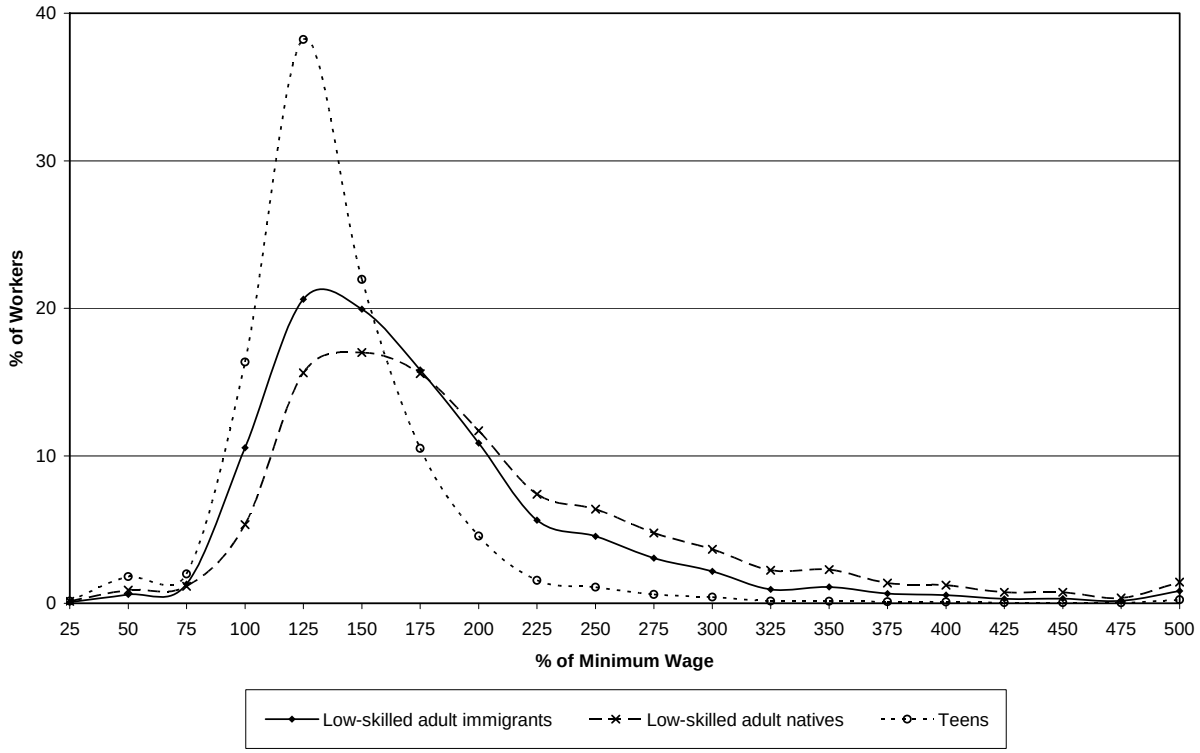

Figure 2. Cumulative Distribution of Hourly Earnings Relative to Minimum Wage

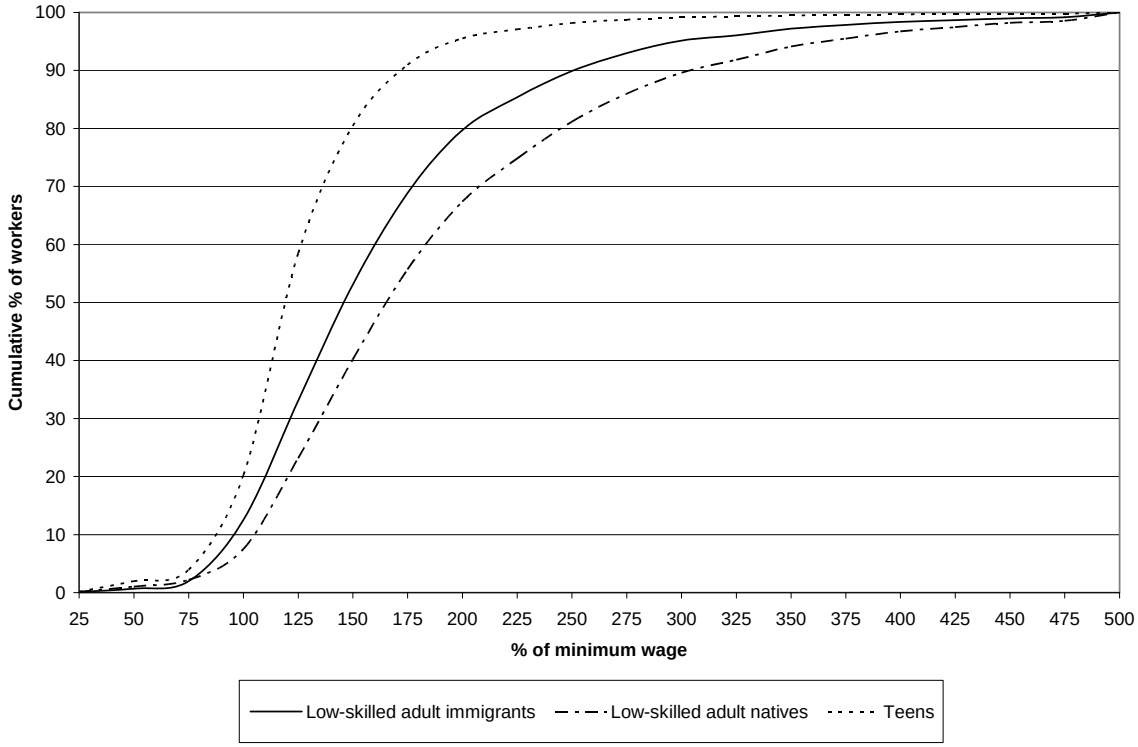

Table 1
Share of Hourly Workers Earning Exactly or Near the Minimum Wage and Employment Rates, by Demographic Group

	Exactly MW	Below MW	Within 125% of MW	Employment Rate
All workers	0.023	0.033	0.120	0.633
Immigrants	0.038	0.038	0.155	0.626
Natives	0.020	0.032	0.115	0.634
Not high school graduate (aged 20-54)	0.041	0.043	0.189	0.614
Immigrants	0.059	0.049	0.218	0.679
Males	0.047	0.037	0.181	0.857
Females	0.085	0.072	0.297	0.467
Natives	0.028	0.038	0.168	0.576
Males	0.016	0.023	0.108	0.676
Females	0.044	0.060	0.250	0.468
Teens (aged 16-19)	0.091	0.104	0.395	0.416
Males	0.086	0.083	0.377	0.413
Females	0.096	0.125	0.414	0.419

Note: Shown are the fractions of workers in the indicated age/education group earning exactly the minimum wage, less than the minimum wage, and more than the minimum wage but within 125% above the minimum wage, and the employment-to-population rate. Wage shares are based on weighted individual-level data from the CPS-ORG during the period 1994-2005 for workers who report being paid hourly, excluding workers who earn less than $1 per hour or more than $100 per hour, weighted using the outgoing rotation weights (1,221,585 total observations). Employment rates are based on state-level averages for all individuals, weighted using the final weights.

Table 2
Characteristics of Low-Wage Hourly Workers

	Workers Earning:			
	Exactly MW	Below MW	Within 125% of MW	All Workers
Average age	29.1	30.2	30.8	37.0
	(14.3)	(14.4)	(14.6)	(13.4)
Teen (aged 16-19)	0.334	0.265	0.274	0.083
	(0.472)	(0.442)	(0.446)	(0.276)
Young adult (20-24)	0.213	0.244	0.219	0.142
	(0.410)	(0.429)	(0.414)	(0.349)
Foreign born	0.222	0.154	0.173	0.133
	(0.415)	(0.361)	(0.378)	(0.340)
Female	0.589	0.640	0.593	0.501
	(0.492)	(0.480)	(0.491)	(0.500)
Less than high school graduate	0.462	0.349	0.377	0.175
	(0.499)	(0.477)	(0.485)	(0.380)
High school graduate, no college	0.278	0.297	0.325	0.382
	(0.448)	(0.457)	(0.468)	(0.486)
Some college, not college graduate	0.230	0.293	0.254	0.319
	(0.421)	(0.455)	(0.436)	(0.466)
Sample size	26,034	39,764	143,224	1,221,585

Note: Shown are means (standard deviations) based on individual-level data from the CPS-ORG during the period 1994-2005 for workers who report being paid hourly, weighted using the outgoing rotation weights. Workers who earn less than $1 per hour or more than $100 per hour are not included.

Table 3
Effect of the Minimum Wage on Average Hourly Earnings

	Both sexes		Males		Females	
	(1)	(2)	(3)	(4)	(5)	(6)
Less-educated immigrants	0.220**	0.143†	0.219**	0.156*	0.244**	0.159†
	(0.062)	(0.074)	(0.055)	(0.071)	(0.091)	(0.092)
Less-educated natives	0.031	-0.016	0.065	-0.004	-0.067	-0.051
	(0.082)	(0.077)	(0.091)	(0.071)	(0.075)	(0.102)
All teens	0.214**	0.187**	0.223**	0.223**	0.203**	0.144**
	(0.026)	(0.034)	(0.038)	(0.043)	(0.047)	(0.053)
Business cycle controls	No	Yes	No	Yes	No	Yes

† p<.1; * p<.05; ** p<.01

Note: Shown are estimated coefficients on the natural log of the real minimum wage from OLS regressions. The dependent variable is the natural log of the average real hourly earnings for workers in the indicated group. Each coefficient is from a separate regression. All regressions include state and year fixed effects; some specifications add business cycle controls (the natural log of real gross state product per capita, the real contract value of residential building permits, and the number of initial unemployment claims). Less-educated adults are aged 20-54 and do not have a high school diploma; teens are aged 16-19. The number of observations in each regression is a maximum of 612, representing the 50 states and DC during the period 1994-2005. Robust, clustered standard errors are in parentheses. Observations are weighted using the sum of the outgoing rotation weights for each cell.

Table 4
Effect of the Minimum Wage on Employment Rates

	Both sexes		Males		Females	
	(1)	(2)	(3)	(4)	(5)	(6)
A. Real minimum wage						
Less-educated immigrants	0.026	-0.055	0.073*	0.021	0.029	-0.064
	(0.048)	(0.048)	(0.036)	(0.044)	(0.097)	(0.114)
Less-educated natives	0.231	0.110	0.195†	0.063	0.231	0.160
	(0.140)	(0.087)	(0.116)	(0.066)	(0.143)	(0.130)
All teens	-0.001	-0.162†	0.003	-0.178†	-0.004	-0.140
	(0.124)	(0.090)	(0.125)	(0.094)	(0.133)	(0.111)
B. Relative minimum wage						
Less-educated immigrants	0.075	-0.028	0.100**	0.063	0.049	-0.168
	(0.047)	(0.075)	(0.035)	(0.059)	(0.086)	(0.154)
Less-educated natives	0.202	0.023	0.181	-0.002	0.139	0.026
	(0.181)	(0.112)	(0.150)	(0.074)	(0.198)	(0.181)
All teens	0.023	-0.156†	0.006	-0.208**	0.046	-0.096
	(0.127)	(0.089)	(0.115)	(0.071)	(0.145)	(0.128)
Business cycle controls	No	Yes	No	Yes	No	Yes

† p<.1; * p<.05; ** p<.01

Note: Shown are estimated coefficients on the natural log of the real minimum wage or the natural log of the relative minimum wage from OLS regressions. The dependent variable is the natural log of the employment-to-population rate for each group. Each coefficient is from a separate regression. Regressions in panel B include the natural log of the real average wage as well as the relative minimum wage (the minimum wage divided by the average wage). All regressions include state and year fixed effects; some specifications add business cycle controls (the natural log of real gross state product per capita, the real contract value of residential building permits, and the number of initial unemployment claims). Less-educated adults are aged 20-54 and do not have a high school diploma; teens are aged 16-19. The number of observations in each regression is a maximum of 612, representing the 50 states and DC during the period 1994-2005. Robust, clustered standard errors are in parentheses. Observations are weighted using the sum of the final weights for each cell.

Table 5
Effect of the Minimum Wage on Average Hours Worked

	Both sexes		Males		Females	
	(1)	(2)	(3)	(4)	(5)	(6)
A. Employed individuals						
Less-educated immigrants	0.001	-0.008	0.027	0.008	-0.057	-0.038
	(0.020)	(0.024)	(0.023)	(0.032)	(0.035)	(0.042)
Less-educated natives	0.014	-0.008	0.019	-0.002	-0.007	-0.015
	(0.029)	(0.027)	(0.021)	(0.020)	(0.048)	(0.061)
All teens	0.072	0.001	0.184**	0.104	-0.065	-0.119**
	(0.059)	(0.041)	(0.069)	(0.068)	(0.061)	(0.043)
B. All individuals						
Less-educated immigrants	-0.002	-0.110	0.091	0.012	-0.072	-0.169
	(0.071)	(0.070)	(0.056)	(0.069)	(0.109)	(0.135)
Less-educated natives	0.237	0.093	0.205	0.053	0.232	0.145
	(0.179)	(0.122)	(0.141)	(0.087)	(0.198)	(0.199)
All teens	0.028	-0.204†	0.130	-0.139	-0.101	-0.282*
	(0.169)	(0.112)	(0.180)	(0.150)	(0.174)	(0.117)
Business cycle controls	No	Yes	No	Yes	No	Yes

† p<.1; * p<.05; ** p<.01

Note: Shown are estimated coefficients on the natural log of the real minimum wage from OLS regressions. The dependent variable is the natural log of average usual weekly hours worked among employed individuals (panel A) or all individuals (panel B) for each group. Each coefficient is from a separate regression. All regressions include state and year fixed effects; some specifications add business cycle controls (the natural log of real gross state product per capita, the real contract value of residential building permits, and the number of initial unemployment claims). Less-educated adults are aged 20-54 and do not have a high school diploma; teens are aged 16-19. The number of observations in each regression is a maximum of 612, representing the 50 states and DC during the period 1994-2005. Robust, clustered standard errors are in parentheses. Observations are weighted using the sum of the final weights for each cell.

Table 6
Compositional Effects of the Minimum Wage

	Both sexes	Males	Females
A. Fraction of state population aged 16-64 composed of:			
Less-educated adult immigrants	-0.015*	-0.010*	-0.006†
	(0.007)	(0.004)	(0.003)
Less-educated adult natives	0.016*	0.004	0.012**
	(0.008)	(0.004)	(0.004)
B. Average years of education among:			
Adult immigrants	2.214**	2.168*	2.218**
	(0.765)	(0.934)	(0.662)
Adult natives	-0.124	-0.176	-0.074
	(0.097)	(0.108)	(0.102)
C. Fraction that does not have a high school diploma among:			
Adult immigrants	-0.203*	-0.202*	-0.181*
	(0.077)	(0.090)	(0.071)
Adult natives	0.022*	0.014	0.030**
	(0.010)	(0.012)	(0.011)
D. Fraction of individuals without a high school diploma living in a state:			
Adult immigrants	-0.032†	-0.037†	-0.026†
	(0.017)	(0.019)	(0.015)
Adult natives	0.002	0.003	0.001
	(0.001)	(0.003)	(0.002)

† p<.1; * p<.05; ** p<.01

Note: Shown are estimated coefficients on the natural log of the real minimum wage from OLS regressions. In panel A, the dependent variable is the fraction of the state population aged 16-64 that is immigrants (or natives) aged 20-54 who do not have a high school diploma. In panels B and C, the sample is restricted to immigrants or natives aged 20-54; in panel D, the sample is further restricted to individuals who do not have a high school diploma. Each coefficient is from a separate regression. All regressions include state and year fixed effects and business cycle controls (the natural log of real gross state product per capita, the real contract value of residential building permits, and the number of initial unemployment claims). The number of observations in each regression is a maximum of 612, representing the 50 states and DC during the period 1994-2005. Robust, clustered standard errors are in parentheses.

Appendix Table 1
Robustness Checks

	Hourly Earnings			Employment-to-Population			Hours among Workers		
	Both	Males	Females	Both	Males	Females	Both	Males	Females
A. Use unemployment rate to control for business cycle									
Less-educated immigrants	0.206**	0.210**	0.211*	-0.019	0.039	-0.056	-0.005	0.016	-0.051
	(0.065)	(0.055)	(0.096)	(0.043)	(0.041)	(0.127)	(0.023)	(0.024)	(0.046)
Less-educated natives	0.015	0.047	-0.071	0.136	0.108†	0.138	-0.006	0.004	-0.034
	(0.086)	(0.091)	(0.087)	(0.083)	(0.063)	(0.113)	(0.027)	(0.020)	(0.054)
All teens	0.212**	0.217**	0.203**	-0.103	-0.097	-0.109	0.033	0.142**	-0.102*
	(0.031)	(0.042)	(0.051)	(0.073)	(0.077)	(0.092)	(0.037)	(0.051)	(0.048)
B. Add control for fraction of population aged 16-64									
Less-educated immigrants	0.227**	0.208**	0.275*	0.018	0.077*	-0.068	-0.013	0.004	-0.062
	(0.070)	(0.057)	(0.106)	(0.053)	(0.038)	(0.146)	(0.023)	(0.024)	(0.051)
Less-educated natives	0.032	0.070	-0.064	0.087	0.099	0.097	-0.001	0.006	-0.031
	(0.094)	(0.098)	(0.094)	(0.081)	(0.062)	(0.112)	(0.028)	(0.020)	(0.055)
All teens	0.206**	0.219**	0.199**	-0.114	-0.120	-0.117	0.030	0.130*	-0.101*
	(0.033)	(0.043)	(0.053)	(0.079)	(0.085)	(0.095)	(0.039)	(0.051)	(0.048)
C. Add enrollment rate									
All teens	0.201**	0.210**	0.209**	-0.128	-0.186*	-0.098	0.013	0.062	-0.063
	(0.037)	(0.043)	(0.056)	(0.083)	(0.089)	(0.104)	(0.038)	(0.042)	(0.057)

† p<.1; * p<.05; ** p<.01

Note: Shown are estimated coefficients on the natural log of the real minimum wage from OLS regressions. The dependent variable is the natural log of real average hourly earnings, the natural log of the employment-to-population rate, or the natural log of average usual weekly hours worked among employed individuals in the indicated group. Each coefficient is from a separate regression. All regressions include state and year fixed effects. Less-educated adults are aged 20-54 and do not have a high school diploma; teens are aged 16-19. Robust, clustered standard errors are in parentheses. The number of observations in each regression is a maximum of 612, representing the 50 states and DC during the period 1994-2005. Observations are weighted using the sum of the outgoing rotation (earnings) or final (employment and hours) weights for each cell.