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THEORY AND EVIDENCE

Timothy N. Bond
Osea Giuntella
Jakub Lonsky

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ABSTRACT

We develop a theoretical framework to analyze the effects of immigration on native job amenities, focusing on work schedules. Immigrants have a comparative advantage in production at, and lower disamenity cost for nighttime work, which leads them to disproportionately choose nighttime employment. Because day and night tasks are imperfect substitutes, the relative price of day tasks increases as their supply becomes relatively more scarce. We provide empirical support for our theory. Native workers in local labor markets that experienced higher rates of immigration are more likely to work day shifts and receive a lower compensating differential for nighttime work.

Timothy N. Bond
Department of Economics
Krannert School of Management
Purdue University
403 W. State Street
West Lafayette, IN 47907
tnbond@purdue.edu

Jakub Lonsky
University of Liverpool
Jakub.Lonsky@liverpool.ac.uk

Osea Giuntella
Department of Economics
University of Pittsburgh
Posvar Hall
Pittsburgh, PA 15260
and IZA
and also NBER
osea.giuntella@gmail.com

1 Introduction

A popular argument in favor of immigration is that immigrants work in “bad” jobs that natives do not want. Indeed, several recent papers have found that immigrants are more likely to hold jobs involving worse work conditions ([Orrenius and Zavodny, 2012, 2009](#); [Giuntella et al., 2018](#)). This of course does not mean that immigrants have no impact on native labor market outcomes. To the extent that “bad” and “good” jobs interact in the market, an increase in the supply of those willing to take “bad” jobs can have important consequences on the market for “good” jobs. The impact of immigration on native job amenities has received surprisingly little attention in the literature.

This paper attempts to fill this void, specifically focusing on work schedules. We build a model similar in spirit to [Peri and Sparber \(2009\)](#) where night tasks and day tasks are separate inputs in production. Immigrants have a comparative advantage in producing night tasks, and/or a lower relative disamenity cost for working nights, which causes them to specialize in non-traditional schedules. Because night tasks and day tasks are imperfect substitutes, this nighttime labor supply shock raises the relative daytime wages for native workers, and induces more native workers to work during the day.

We confirm our predictions empirically using the Decennial Censuses, American Community Survey, and the American Time Use Survey. We adopt the [Altonji and Card \(1991\)](#) and [Card \(2001\)](#) instrumental variable approach to exploit temporal and spatial variation in the concentration of immigrants, and find that a 10 percentage point increase in the fraction of foreign workers in a local labor market, which represents .66 standard deviations of the cross commuting zone variation in immigrant concentration, leads to a .8 percentage point decrease in the probability of natives working at night (or 3% of the mean of the dependent variable), and a .79 percent increase in native daytime annual wages. These changes are due to both a movement of native workers into occupations and industries which specialize in daytime employment, and changes in schedules within industry and occupation. The strongest effects are among workers without a college degree, consistent with the prior that low-skilled natives would be the closest substitutes to immigrant workers.

Similar to other studies of immigrant effects on natives (e.g., [Ottaviano and Peri, 2012](#)), we

find effect sizes that are relatively small but not economically negligible. Ignoring these effects would lead economists to overstate welfare losses and understate welfare improvements from immigration. From just the medical costs of sleep deprivation associated with night work, we estimate natives received \$262 million in non-pecuniary benefits from the increase in the foreign born population between 1990 and 2015. Based on our estimate of the compensating differential, these previously undocumented gains may be orders of magnitude larger.

Our theoretical results rely on two key assumptions. First, night tasks and day tasks are imperfect substitutes, so that a relative increase in the supply of night tasks leads to a relative decrease in wages for night work. Second, immigrants have a comparative advantage in the provision and/or production of night tasks. The former assumption is conventional in production functions with multiple inputs. The latter is motivated by differences in both the occupational composition of night-time work, and differences in characteristics between native and non-native workers.

Previous studies have found that immigrants have a comparative advantage in manually intensive occupations relative to communicative intensive occupations (e.g., [Peri and Sparber, 2009](#); [Ottaviano and Peri, 2012](#)). In our data the average occupation we observe in a night-shift is .6 standard deviations higher in an index of manual intensiveness than the average occupation overall. This likely understates the true difference in manual intensiveness across shifts. The same occupation may require less communication skills when performed at night due to less interaction with native customers. Further, English language skills will be less important for coordination at work during night shifts since more co-workers will be immigrants. Speaking directly to this point, we find that immigrants with poor or no English skills are more likely to work night shifts than the average immigrant.

In addition, immigrants tend to be younger and healthy, and have lower socioeconomic status. This can cause them to be more willing to accept worse working condition in exchange for higher lifetime earnings, consistent with the implications of a standard [Grossman \(1972\)](#) model ([Giuntella and Mazzonna, 2015](#); [Orrenius and Zavodny, 2009](#)). We find in our data that based on observable characteristics alone, immigrants would be predicted to work night-shifts at higher rates even if they were native-born. Furthermore, night schedules may reduce fears of discrimination and increase the likelihood of working with people from a similar background ([Banerjee,](#)

2008; Abrego, 2011; Galbis, 2020). While our mathematical framework interprets these factors as a comparative advantage in providing night-time work, they can be equivalently thought of as encapsulating the different constraints that prevent immigrants from working jobs with the same amenities and natives, and cause them to sort into low amenity work at lower wages than most natives would accept. Put another way, immigrants' comparative advantage in night task provision may be due to costly barriers to daytime employment.

Economists have long been interested in understanding the effects of immigration on labor markets and human capital (e.g., Card, 1990; Hunt, 1992; Dustmann et al., 2005; Borjas et al., 2012, 2008; Glitz, 2012; Hunt, 2017). While most studies have found little evidence of negative effects of immigration on overall native wages and employment, the debate becomes more controversial when looking at subgroups who are likely to be complements or substitutes with these immigrants. For example, Ottaviano and Peri (2012) find immigration has a small positive long run effect on native wages, but large negative effect for previous immigrants. Peri and Sparber (2009), using a model similar to the one we employ, find that immigration raises the provision of jobs with manual tasks, and thus the wages of complementary jobs that require a high-degree of communication skill.

There has been much less discussion of how immigration affects non-wage job characteristics. Giuntella and Mazzonna (2015) and Giuntella et al. (2018) find immigration reduced occupational risk and physical intensity among high-skilled natives, while Giuntella (2012) finds immigration is associated with less non-standard schedules for natives in Italy. Using supplements of the Current Population Surveys containing information on the timing of work, Hamermesh (1998) finds that immigrants and natives differ little with respect to non-pecuniary working condition and that immigrant concentration has no consistent effect on the amenities natives enjoy. Of these studies, only Hamermesh (1998) develops a theoretical framework for understanding how immigrants impact native job amenities. Our approach differs from Hamermesh (1998) by allowing night tasks and day tasks to be imperfect substitutes, which causes immigration to lead to a reallocation of native work schedules by decreasing the equilibrium compensating differential. We confirm these predictions using recent data from the American Time Use Survey, US Census and the American Community Survey.

Work scheduling is a particularly important job dimension for studying immigration. Nearly

5.5 million foreign-born workers work in jobs with non-standard hours, accounting for more than 18% of non-regular hours in the United States (Dramski, 2017). In sectors such as manufacturing, where stopping or idling machines is a large cost, non-standard shift workers are crucial, yet several reports have shown that firms have frequent trouble staffing overnight shifts.¹ Non-standard hours are also a particularly costly job disamenity. There is growing evidence that night shifts can severely impact individual health (Schernhammer et al., 2001; Costa, 1996; Knutsson, 2003). Indeed, the disruption of circadian rhythms can have negative effects on obesity, diabetes, cardiovascular diseases and certain types of cancer (Kecklund and Axelsson, 2016; Giuntella and Mazzonna, 2019; Rajaratnam et al., 2013). Furthermore, working night shift may pose challenges for work-family balance (Liu et al., 2011; Strazdins et al., 2006).

Our model offers a novel take on the determination and magnitude of compensating differentials. The canonical approach focuses on the tradeoff between the firm’s cost of providing job amenities and the wage decreases workers are willing to take in exchange for those amenities (e.g., Thaler and Rosen, 1976).² In equilibrium, workers with lower valuation of these amenities sort into low amenity jobs. We embed this approach into a simple model where high and low amenity jobs (day and night employment) are imperfect substitutes in a CES production function, and thus labor supply determines the equilibrium provision of amenities and compensating differential. It would be easy to adopt our approach to occupational safety, the focus of much of the previous literature on compensating differentials, or any other task characteristic across which labor cannot be perfectly substituted.

This paper is organized as follows. In Section 2 we build our general equilibrium model of work schedules. Section 3 describes the data. Section 4 lays out our empirical strategy and discusses threats to identification. In section 5 we estimate the causal effect of immigration on native work schedules and compensating differentials, and provide a host of robustness exercises. We discuss welfare implications and some concluding remarks in Section 6.

¹<https://www.cpbj.com/incentives-opportunities-attract-workers-to-off-hour-shifts/>

²This theory obviously implies that jobs with worse amenities should have higher pay, a prediction which has remarkably little support. Guardado and Ziebarth (2019) develop a model where workers, rather than firms, take action to provide job safety, which produces a negative correlation between job accidents and wages in equilibrium.

2 A Model of Equilibrium Work Schedules with Immigration

2.1 Primitives

We consider an open economy similar to [Peri and Sparber \(2009\)](#). Perfectly competitive assembly firms combine two intermediate services, high skill (H) and low skill (L), through a CES production function to produce a consumption good Y ,

$$Y = \left[\alpha Y_L^{\frac{\sigma-1}{\sigma}} + (1 - \alpha) Y_H^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}}, \quad (1)$$

where $\sigma \in (0, \infty)$ measures the elasticity of substitution between inputs and α captures their relative productivities.

High skill workers produce high skill services. They are endowed with a unit of labor which they supply inelastically to the market. The production function is linear so that

$$Y_H = H \quad (2)$$

where H is the measure of the set of high skill workers in the economy.

Low skill services are produced by low skill workers by combining two different tasks, night tasks (N) and day tasks (D), through the CES production function

$$Y = \left[\beta D^{\frac{\theta-1}{\theta}} + (1 - \beta) N^{\frac{\theta-1}{\theta}} \right]^{\frac{\theta}{\theta-1}}. \quad (3)$$

Similar to equation (1), $\theta \in (0, \infty)$ measures the elasticity of substitution between tasks and β captures the relative task productivities in the production of low skill services.³

Low skill workers have one indivisible unit of labor which they must allocate to either a daytime job or a nighttime job. Their output (quantity of day/night tasks) in each job depends on their skill endowment, with d being their stock of day skills and n being their stock of night

³Nested CES production functions are commonly used to model production functions with heterogeneous labor inputs (e.g., [Peri and Sparber, 2009](#); [Ottaviano and Peri, 2012](#); [Diamond, 2016](#)), and allow for a tractable characterization of our equilibrium. As we are interested in comparative statics rather than, for instance, structurally estimating elasticities, the functional form assumption is innocuous. Our core results are driven by the imperfect substitutability of daytime and nighttime tasks, and would hold across a wide array of alternative production functions that allow this property.

skills. This endowment in turn is determined by their type, which is either foreign (f) or native (n). A foreign worker allocated to a nighttime job produces an output of n_f night tasks, and similarly for daytime jobs and native workers. Foreign workers have a comparative advantage in night production so that $\frac{n_f}{d_f} \geq \frac{n_n}{d_n}$. Define $\frac{n_n}{d_n} \equiv \eta$ and $\frac{n_f}{d_f} \equiv \nu\eta$ where $\nu \geq 1$ represents the degree to which foreign workers possess a comparative advantage at night tasks. The set of low skill workers in the economy is of measure 1, with f being the fraction foreign.

Working a nighttime job creates a private disamenity cost that is in part determined by the worker's nativity. Native worker i incurs cost c_i , while a similar foreign worker incurs cost λc_i , with $\lambda \leq 1$ representing the degree to which foreign workers have a comparative advantage in the provision of night tasks. The parameter c is distributed continuously over $(0, \infty)$ with twice differentiable cdf $G(c)$. In other words, the distribution of native disamenity costs stochastically dominates that for foreign workers, or foreign workers are on average more willing to work nighttime jobs.

Workers have concave utility with respect to wages. Specifically a worker who earns income x receives utility $U = \ln(x)$. This functional form allows for a tractable characterization of the equilibrium, but is otherwise inconsequential.

Note that while we focus on work schedules, we could equivalently view the inputs as risky and safe tasks, or tasteful and distasteful work. We treat Y as the numeraire good so that all prices are in terms of Y .

2.2 Task Demand

Perfectly competitive intermediate service firms maximize profits by choosing the amount of day tasks and night tasks to purchase from workers given market low skill task prices w_D and w_N , and low skill service price P_L ,

$$\pi = P_L \left[\beta D^{\frac{\theta-1}{\theta}} + (1-\beta) N^{\frac{1-\theta}{\theta}} \right]^{\frac{\theta}{1-\theta}} - w_D D - w_N N. \quad (4)$$

From the two first order conditions, we obtain the relative demand function,

$$\frac{D^D}{N^D} = \left(\frac{1-\beta}{\beta} \right)^{-\theta} \left(\frac{w_N}{w_D} \right)^{\theta}. \quad (5)$$

2.3 Task Supply

Low skill workers take task prices as given and choose whether to work a daytime or nighttime job. Turning first to natives, the utility for such a worker in a daytime job is

$$U_i = \ln(d_n w_D), \quad (6)$$

while for a nighttime job,

$$U_i = \ln(n_n w_N) - c_i. \quad (7)$$

By equating (6) and (7), a native worker will choose a nighttime job so long as

$$e^{c_i} \leq \omega \eta, \quad (8)$$

where $\omega \equiv \frac{w_N}{w_D}$ is the relative price of night tasks. Then, denoting $j(c) \equiv \exp g(c)$, the total output of night tasks from native workers is

$$N_n = (1 - f)J(\omega \eta)n_n. \quad (9)$$

The first two terms represent the fraction of the low skill population which is native multiplied by the fraction of natives who prefer nighttime jobs to daytime jobs at market prices. The final term is simply the per native output of night tasks. Likewise for daytime jobs,

$$D_n = (1 - f)[1 - J(\omega \eta)]d_n. \quad (10)$$

Foreign workers' daytime employment utility differs from natives only due their different skill endowment,

$$U_i = \ln(d_f w_D). \quad (11)$$

For nighttime jobs, their utility also differs by their lower (average) disamenity cost,

$$U_i = \ln(d_n w_N) - \lambda c_i. \quad (12)$$

They will thus choose a nighttime job provided

$$e^{c_i} \leq (\omega v \eta)^{\frac{1}{\lambda}}. \quad (13)$$

Integrating over the distribution of c , we can find the total output of night tasks from foreign workers,

$$N_f = f J \left([v \omega \eta]^{\frac{1}{\lambda}} \right) n_f. \quad (14)$$

The first two terms again represent the fraction of low skill workers which are foreign multiplied by the fraction of foreigners who prefer nighttime jobs. The final term is the per foreign worker output of night tasks. The same applies for the total output of day tasks,

$$D_f = f \left[1 - J \left([v \omega \eta]^{\frac{1}{\lambda}} \right) \right] d_f. \quad (15)$$

Combining the expressions for the task supply of low skill foreign and native workers, we can arrive at the total relative low skill task supply in the economy,

$$\begin{aligned} \frac{D^S}{N^S} &= \frac{D_n + D_f}{N_n + N_f} \\ \frac{D^S}{N^S} &= \frac{(1-f) [1 - J(\omega \eta)] d_n + f \left[1 - J \left([v \omega \eta]^{\frac{1}{\lambda}} \right) \right] d_f}{(1-f) J(\omega \eta) n_n + f J \left([v \omega \eta]^{\frac{1}{\lambda}} \right) n_f}. \end{aligned} \quad (16)$$

2.4 Task Equilibrium

At equilibrium, the relative task supply is equal to the relative demand. Equating (5) to (16),

$$\omega = \left[\frac{(1-f) [1 - J(\omega \eta)] d_n + f \left[1 - J \left([v \omega \eta]^{\frac{1}{\lambda}} \right) \right] d_f}{(1-f) J(\omega \eta) n_n + f J \left([v \omega \eta]^{\frac{1}{\lambda}} \right) n_f} \right]^{\frac{1}{\theta}} \frac{1-\beta}{\beta}. \quad (17)$$

Equation (17) implicitly defines the equilibrium relative task prices in the economy. The equilibrium relative task output is then determined through equation (5), which, given f and the respective native and foreign worker endowments determines the output of low skill services. The output of high skill services is determined by (2). We can then close the model for general equilibrium by assuming that workers spend all of their income on Y .

2.5 Comparative Statics: The Effect of Immigration on Native Working Conditions

We now prove a series of results regarding the impact of immigration on the labor market. For ease of exposition, we will assume that at least one of the inequalities $\lambda \leq 1$ and $\nu \geq 1$ is strict. In other words, our results require that either immigrants have a comparative advantage in the production ($\nu > 1$) or provision ($\lambda < 1$) of night tasks, but not necessarily both.⁴ If both $\lambda = 1$ and $\nu = 1$ then foreign and native workers are identical, and there is no impact of immigration.

We first show that immigrants sort into nighttime jobs.

Lemma 1. *The proportion of foreign workers in nighttime jobs is strictly higher than the proportion of native workers in nighttime jobs.*⁵

The proof is straightforward. Foreign workers have a comparative advantage in night task production and a relatively lower disamenity cost for nighttime jobs. Both these factors push foreign workers to work nighttime jobs at higher rates. Proposition 1 then immediately follows.

Proposition 1. *An increase in the proportion of foreign workers leads to an increase in the relative provision of night tasks and a decrease in the relative price of night tasks.*

Since foreign workers work in nighttime jobs at higher rates than native workers, increasing the relative proportion of foreign workers leads to an increase in the relative provision of night tasks. In equilibrium then, since day and night tasks are imperfect substitutes, the relative price of day tasks increases as their supply becomes relatively more scarce.

Note that our result speaks to the equilibrium provision of *tasks* and not the overall rate of *employment*. The latter depends on the relative skill endowments of native and foreign low-skill

⁴If one of these inequalities is violated our results will hold so long as the other inequality is sufficiently strong. That is, if foreign workers have a comparative disadvantage in producing night tasks, our arguments would follow if λ was small enough that they still prefer night tasks compared to natives at any given relative wage.

⁵For proof of this and all other results, see Appendix A.

workers. For example, suppose that foreign workers have an absolute advantage in night task production. It is possible then that night task provision could increase (and thus night task prices decrease), but that there would be less overall workers employed in nighttime jobs. However, as the next proposition shows, the effects on employment and wages within demographic group are unambiguous.

Proposition 2. *An increase in the proportion of foreign workers leads to an increase in the proportion of native workers working in daytime jobs and an increase in the relative daytime wages of native workers.*

This result follows directly from Proposition 1. A decrease in relative night task prices raises relative daytime job wages, which in turn pushes natives to work in more daytime jobs.

3 Work Schedules, Immigration, and Earnings Data

Our primary sources of data are the 1990 and 2000 US Census, and the 2005-2015 waves of the American Community Survey (ACS, [Ruggles et al., 2017](#)). These data include a variety of economic and demographic variables, including country of birth, as well as the time of departure from home and work. For our instrument we draw on the 1970 Census. All data is obtained from the Integrated Public Use Microdata Series (IPUMS) housed at the University of Minnesota's Minnesota Population Center. We will focus on employed prime-age workers (25-54), but our results are substantively unchanged when including the full working age population (16-64).⁶

We define a local labor market as a commuting zone (CZ), following the definitions created by [Tolbert and Sizer \(1996\)](#). We assign individuals to a CZ based on their county group (1970) or Public Use Micro Area (PUMA; 1990, 2000, and ACS) using the crosswalks constructed in [Autor and Dorn \(2013\)](#) and [Autor et al. \(2019\)](#). We classify immigrants based on their country of birth into 16 distinct groups or regions (see [Smith, 2012](#)) and calculate the share of immigrants by region of origin living in each CZ.⁷

Our main dependent variable is the likelihood of working a night shift. We construct an indicator for night shifts which takes values equal to one for all workers who left home to work

⁶In 1980-2000 Census and ACS, the employment status is asked only of individuals age 16 or above.

⁷The countries were grouped in the following regions: Canada, UK, Australia, New Zealand; Mexico; Central America; Cuba; Other Caribbean; South America; Northern/Northwestern Europe; Southern Europe; Central Europe/Russian; China; Japan, Korea, Singapore; Other Southeast Asia; India, Central Asia; Middle-East, North Africa; Other Africa; Other.

between 6pm and 6am. Descriptive statistics are reported in Table 1. Hourly wage is on average higher among those working during the day. However, this is due to low skill jobs being more common at night (see Table C.1). Night workers are more likely to be male, low education, and black. Approximately 16.5% of native workers in our sample report working night shifts (as defined above), while among non-natives the percentage is 18.2%. Panel A of Table 2 provides basic OLS estimates between immigrant status and work schedules. After inclusion of CZ and year fixed effects, immigrants are 2.2 percentage points (or 13% relative to the mean native) more likely than natives to work a night shift (column 1).

Our model assumed that immigrants had a comparative advantage in the provision and production of night tasks. As discussed previously, one reason that immigrants may have a comparative advantage in night production is that these jobs are less communicative intensive. To provide some supportive evidence for this, in columns 2 and 3 we analyze the importance of English language skills in explaining these differences in work schedules. Individuals who report speaking no English at home are 7.2 percentage points more likely to work night shifts than natives (column 2), while those reporting bad or no English are 5.9 percentage points more likely (column 3).

The final two columns of Table 2 provide further evidence of these descriptive differences using the 2003-2015 waves of the American Time Use Survey (ATUS). These data include precise information on the hours worked from personal time diaries, but substantially smaller samples and coarser geographic information. We restrict the sample to full-time employed individuals ages 15-64 reporting to have worked on the day of the diary. Using the same definition adopted for the ACS, we classify approximately 19% of native workers as working night shifts, compared to 25% of immigrants. After accounting for CZ and year fixed effects, this amounts to an 7 percentage point difference (column 4). With the richer ATUS data we can also construct measures based on actual work times. Roughly 8% of natives report working more than half of their daily hours between 6pm and 7am, compared to 11% of immigrants. We find a 2.8 percentage point difference after including CZ and year fixed effects (column 5). Unfortunately the ATUS does not include information on language spoken at home. In Panel B, we include controls for gender, age, race, marital status, number of children, and education. We find that differences in observable characteristics can account for a large portion of the schedule differences by nativity in the

ACS, though immigrants remain statistically significantly more likely to work at night (columns 1-3, Panel B). Point estimates are largely unaffected when using the ATUS data (columns 4 and 5, Panel B).

Our results in Panel B suggest that observable differences play a large role in explaining why immigrants work in night shifts. We explore this further in Table C.2. We construct an index of characteristics that predict night work among natives, by regressing an indicator for night work on age, education, experience, marital status, number of children, language proficiency; and using the predicted values from these regression as a probabilistic measure of working nightly shift based on these observable characteristics. We then estimate how this index varies between foreign- and native-born workers. The average immigrant is .2 standard deviations higher ($p < 0.001$) on this index. Similarly, immigrants are 8.1 percentage points more likely to be above the median of the index, and 8.8 percentage points more likely to be in the upper quartile. Still, even conditional on observable characteristics immigrants are more likely to work in nightly shifts. This reflects additional unobserved heterogeneity. It also reflects that immigrants face structural and institutional barriers, have worse outside options, less information, and different attitudes towards risk (Orrenius and Zavodny, 2012; Giuntella et al., 2018). As discussed in the introduction, these factors are abstractly reflected in our model through immigrants' lower relative disamenity cost for nightly work.

4 Estimation Strategy and Identification Threats

To identify the effect of immigration on natives' likelihood of working night shifts, we exploit variation across time in the share of immigrants living in a given CZ. Formally, for individual i living in CZ c in time t we estimate the following equation:

$$N_{ict} = \alpha + \beta S_{ct} + X'_{ict}\gamma + Z'_{ct}\lambda + \delta_c + \tau_t + \epsilon_{ict}, \quad (18)$$

where N_{ict} is an indicator for whether the individual worked at night; S_{ct} is the share foreign-born in the CZ working age population; X_{ict} is a vector of individual-level characteristics (age, sex, education, experience, marital status, number of children); Z_{ct} is a vector of time-varying

CZ-level controls (such as share of males and share of the population with a high school degree); δ_c is a vector of CZ fixed effects; τ_t is a vector of year fixed effects, and ϵ_{ict} captures the residual variation in the likelihood of working a night shift.⁸ We focus on the sample of employed workers, which leaves open the possibility that we may find immigration causes a relative increase in native daytime employment simply through disemployment of previous nighttime workers. Reassuringly, we find no evidence that the foreign born share decreases native employment or hours worked. See section 5.1.

We slightly modify this approach to test our prediction on wages:

$$W_{ict} = \alpha_h + \beta_0 D_{ict} + \beta_1 S_{ct} + \beta_2 S_{ct} * D_{ict} + X'_{ict} \gamma + Z'_{ct} \lambda + \delta_c + \tau_t + \epsilon_{ict}, \quad (19)$$

where W is the worker's log wage, and D_{ict} is an indicator for whether the individual worked a day shift. $\beta_2 > 0$ (i.e., a positive coefficient on the interaction between day shift and immigrant share) indicates an increase in relative daytime wages in response to immigration as predicted by our model.

While the spatial correlation approach has been widely used in the immigration literature, it is subject to two main criticisms (e.g., Borjas et al., 1996; Borjas, 2003). First, immigration may induce out-migration of natives, which would bias wage and employment effects upwards. We note that while the literature on the effects of *immigration* on native migration is mixed (e.g., Card, 2001; Borjas, 2006), a large body of research has found little to no migratory response due to *economic* shocks to the local labor market, particularly for low-skill workers who would face the most direct competition from immigrants (e.g., Bound and Holzer, 2000; Glaeser and Gyourko, 2005; Autor et al., 2013; Batistich and Bond, forthcoming). Nonetheless, our model views immigration as a relative supply shock to nighttime labor. If night working natives move out of the CZ in response, it would bias us towards finding effects on employment, but away from finding effects on wages.

The second concern is that immigration is a non-random process and immigrants will cluster in areas with better economic opportunities. Previous work has shown that during expansionary periods (particularly in the short-run) employers prefer to increase production by extending work

⁸To abstract from any impact immigration can have on population growth, we use 1970 CZ population as the denominator in our foreign born share variable.

hours, and therefore the relative composition of night tasks, rather than hiring (Nunziata, 2003). We would therefore expect that OLS results would be biased away from finding the effects on natives predicted by our model.

To address these concerns, we instrument for the local immigrant population share using a “shift-share” instrumental variable (IV) approach originally proposed by Altonji and Card (1991) and Card (2001), and used more recently at the CZ-level by Smith (2012) and Orrenius and Zavodny (2015). This strategy exploits the fact that immigrants tend to locate in CZs that have higher densities of residents from their country of origin, and thus we identify off of a “pull factor” related to social preferences rather than economic forces.⁹

Specifically, we define the predicted number of immigrants in CZ c and year t as:

$$\hat{I}_{ct} = MED\left(\frac{I_{1970}}{N_{1970}}\right) N_{c,1970} + \sum_{p=1}^{16} \left(\frac{I_{c,p,1970}}{I_{p,1970}}\right) \Delta I_{-c,p,t,1970} \quad (20)$$

where $\hat{I}_{ct}$ is the predicted number of immigrants living in commuting zone c at time t ; $MED(\frac{I_{1970}}{N_{1970}})$ is the median CZ immigrant-to-native ratio in 1970, $N_{c,1970}$ is the number of natives in c in 1970, $\left(\frac{I_{c,p,1970}}{I_{p,1970}}\right)$ is the share of all immigrants from region of origin p living in c in 1970, and $\Delta I_{-c,p,t,1970}$ is the inflow of immigrants from p into the U.S. (excluding the inflow into c) between 1970 and t . In other words, the first part of (20) provides an exogenous measure of predicted immigrant population in c in 1970, whereas the second part redistributes the subsequent national inflows of immigrants based on the origin-specific 1970 distributions. Using (20), we then impute the total share of immigrants in each CZ as:

$$\hat{S}_{ct} = \frac{\hat{I}_{ct}}{P_{c,1970}} \quad (21)$$

where $P_{c,1970}$ is the total CZ population in 1970. We then estimate equation (18) by two-stage least squares (2SLS), using $\hat{S}_{ct}$ as an instrument for S_{ct} , and similarly for (19). In words, our instrument is the CZ-level immigrant population share that would have been predicted based on the historical geographic distribution of immigrants in the United States. Cross-time variation in $\hat{S}_{ct}$ is driven only by changes in the national population of immigrants; the denominator is held

⁹Note, however, that social networks can have important benefits for immigrant labor markets (Åslund et al., 2014; Dustmann et al., 2015). What matters for our identification, however, is that these economic benefits are orthogonal to positive aggregate shocks to the local labor market.

fixed at its 1970 value.¹⁰

We note that the CZ-level fixed effects in our main specification will absorb any cross-CZ variation in immigrant origin shares. Thus, as in [Borusyak et al. \(2022\)](#), our identifying variation comes from cross-time variation in the national flows of immigrants by country of origin.¹¹ We thus assume that the immigrant flow “shocks” are as good as randomly assigned to country of origin. This assumption works well in our context, as our 1970 base year predates the large recent structural changes in labor demand (e.g. skill-biased technical change and increases in trade from low-income countries), as well as most of the shift away from Europe as the primary source of immigration (e.g., [Borjas, 1994](#); [Katz and Autor, 1999](#); [Autor et al., 2008, 2013](#)). We can thus view these drivers that changed the flow of immigrants to the United States as being as good as random from the perspective of 1970 employers. As a robustness exercise, we present alternative estimates using 1960 as a base year, which predates the passage of the Immigration and Nationality Act of 1965 (and its full implementation in 1968), further decoupling our instrument from the economic shocks attracting recent immigrant cohorts.¹²

As noted by [Borusyak et al. \(2022\)](#), an additional concern is that immigrant flows may be correlated with unobservables in the CZs which are the predicted receivers of the largest shocks. For our context, we would be concerned that CZs whose local economies received shocks that made night-work more profitable also had large quantities of immigrants in 1970 from countries that would be the largest national sources of American immigrants during the post-1970 period. To assuage this concern, we show that our results are robust to the inclusion of state-specific time trends or region-year fixed effects capturing time-varying shocks at a larger geographic level. In addition, we test whether predicted immigrant inflows are systematically related to previous trends in natives’ night work time by estimating a regression of the the 1990-2000 CZ-level trend in nighttime work on the 2000-2015 trend in the instrument. We find no significant correlation, providing support for the validity of the instrument.

¹⁰Our results are robust to alternative definitions of $\hat{I}_{ct}$. See Section 5.3.

¹¹[Goldsmith-Pinkham et al. \(2020\)](#) provides an alternative framework for interpreting shift-share instruments that instead relies on the exogeneity of the CZ-level composition of immigrants, which we do not adopt due to the aforementioned fixed effects. This assumption has been frequently criticized in the immigration literature, as the local economic shocks that drove the initial distribution of immigrants can persist.

¹²Prior to the Immigration and Nationality Act of 1965, U.S. immigrant flows were regulated by a system of quotas based on the primarily-European ethnic composition of early 20th century immigrant populations, which thus constrained immigration from Latin America and Asia.

An additional recent criticism raised by [Jaeger et al. \(2018\)](#) is that the exclusion restriction of our instrument may be violated in the presence of strong serial correlation of immigrant flows. For example, if Mexico were persistently the primary source of immigrants in the United States, the share of the Mexican population in a CZ in 1970 will predict both immigrant flows in the 1980s and the 1990s. We may thus conflate the impact of recent immigrants on native schedules with the long run adjustment effects to previous waves. If anything, we expect this to bias our estimate towards zero. A short run increase in the relative supply of night workers would attract capital investment complementary to such work in the long run, ameliorating some of the initial wage effects. Nonetheless, we follow the suggestion of [Jaeger et al. \(2018\)](#), and address this concern by controlling for lagged immigrant flows and including a lagged instrument in our first stage (see section 5.1).

5 The Effect of Immigration on Work Schedules

We begin by using the ACS to estimate the relationship between immigration and the probability of natives working a night shift. Table 3 reports results using OLS. In column (1) we control simply for gender, education (11 categories), work experience, and a quadratic in age. Consistent with our model, we find a 10 percentage point increase in the share of immigrants in the local labor market is associated with a .26 percentage point decrease in the probability of natives working at night, or 1.5% relative to the average native.¹³ Column (2) presents our preferred specification which includes time-varying CZ-level controls for the share of high school dropouts, high school degree holders, college degree holders, males, whites, blacks, the log of population, as well as CZ and year fixed effects. These controls reduce our point estimate by about 40%, but it remains statistically significant. The latter four columns re-estimate columns (1) and (2) for men and women separately. There is little evidence of heterogeneous effects by gender when looking at the point-estimates; the confidence intervals largely overlap. However, the effect on men is less precisely estimated when including controls for CZ-level characteristics (column 4).

¹³While a 10 percentage point increase in the national immigrant share would represent a stark change in the employment composition of the United States, it corresponds to only two-thirds of a standard deviation in the variation across CZs (mean: 10%; std.dev: 15.69%).

Table 4 applies the instrumental variable strategy outlined in Section 4. First-stage estimates are reported in Table C.3 and the first-stage F is above conventional levels. Our 2SLS estimate for the full population (column 1) is more than 2 times larger (in absolute value) than that from OLS. This is consistent with our prior that OLS estimates may be upward biased as immigrants may locate into places where the demand for night shifts is increasing.¹⁴ The magnitude of the coefficient increases further when including time-varying controls (column 2). A 10 percentage point increase in immigrant share decreases the probability of working a night shift by .8 percentage points (column 2, 4.7% of native mean). We find more pronounced gender differences when measured in percentage points, though the relative impact is similar compared to the gender-specific sample means. A 10 percentage point increase in immigrant share decreases the probability of males working a night shift by .73 percentage points (column 3, 3.3% of native mean), and .39 percentage points for women (column 5, 3.2% of native mean). Time-varying CZ-level controls again increase the magnitudes when estimating separately by gender, but decrease the precision (columns 4 and 6). Table C.5 shows that the effects are larger when focusing on occupations with larger presence of immigrants with low English proficiency. This is consistent with our prior that differences in language skills may be an important factor behind the observed differences in work schedules between immigrant and natives.

We turn to the ATUS in Table 5. Using the more precise measure of night work, having 50% or more of one's working hours occurring between 6pm and 7am, we find similar effects. A 10% increase in the foreign-born share decreases natives' likelihood of working night shifts by .51 percentage points (column 2). We again observe IV estimates (column 2) larger than OLS (column 1). Columns 3-6 report the results separately by gender. If anything, they suggest a larger effect among women, although the difference is not precisely estimated. It is also worth noting the coefficient estimated with the ATUS data are always within the 95% confidence intervals of those estimated using ACS data (and vice versa).

In Table 6, we test our predictions on wages. We estimate (19) via 2SLS on our sample of prime age native workers from the Census and ACS. Looking at annual wage income in column 1, we find evidence of a substantial 7.7 percentage point compensating differential for night work.

¹⁴OLS estimates may be also attenuated because of measurement error (Aydemir and Borjas, 2011). We report the reduced-form estimates of the alternative instrumental variables in Table C.4 in the Appendix.

Consistent with our theory, we find that this differential is decreased by higher rates of immigration (the Share foreign-born $\times$ Day shift interaction). Specifically, we estimate a 10 percentage point increase in immigrant share causes a .77 percentage point increase (lowering) of relative daytime income (nighttime premium). Including time-varying CZ characteristics has little impact on these estimates in column 2. Columns 3 and 4 report the effects on (imputed) hourly and weekly wage. We find a smaller magnitude of immigration on the relative hourly wage, suggesting that one margin on which native day workers gain is through a relative increase in hours worked. This is consistent with previous studies that have shown increases in absenteeism for workers assigned to night shifts (Hafner et al., 2017). Our weekly wage estimates look very similar to our annual wage estimates.¹⁵

5.1 Robustness and Validity Tests

We provide several robustness tests. Table 7 replicates our main results using a first difference approach. We aggregate our census and ACS data by CZ, and estimate the effect of a change in the immigrant share of the CZ population on the change in the share of employed natives who are working at night in that same period. Note that our estimates will differ from those in Table 4 as we do not weight by CZ population; they reflect the effects for the average CZ rather than those experienced by the average worker. Column 1 applies stacked differences using data from the 1990 and 2000 US Census and the 2005 and 2010 ACS. Our results are overall very similar to those reported in Tables 3- 4; a 10 percentage point increase leads to a .54 decrease in relative native night employment. The 2SLS estimate is larger in absolute value (column 2) with a 10 percentage point increase leading to a 1.3 decrease in relative native night employment. Columns 3 and 4 instead use a long difference specification over the 1990-2015 period. We again find similar estimates to those of our preferred specification. One threat to identification is that CZ-level economic shocks are correlated with immigrant inflows. To assess this concern, in columns 5 and 6, we test whether predicted immigrant inflows are systematically related to prior trends in natives' night time work. In practice, we estimate the relationship between our instrumental variable from 2000-2015 on changes in the fraction of natives employed in night work in the previous period (1990-2000). We find no evidence of a relationship suggesting that

¹⁵OLS estimates, which are slightly larger in absolute value, are reported in Table C.6

our instrumental variable is not correlated with pre-existing trends in work schedules, providing some reassurance to our identification strategy.

In Appendix Table C.7 we re-estimate our effects by gender using stacked-differences. Our results largely confirm the main estimates presented in Table 4. A 10 percentage point increase in the share of immigration is associated with a 8 percentage point reduction in the share of natives working nightly shifts. We find possibly larger effects for women, though we cannot reject equality across gender. Tables C.8 and C.9 show that our results are largely unchanged by the inclusion of state-specific trends or region-year fixed effects, providing further assurance our results are not driven by pre-existing trends.

In the first two columns of Table 8, we further address concerns about temporal correlations in economic shocks (columns 1 and 2), by using 1960 rather than 1970 as the base year for our instrument.¹⁶ This base year choice predates the Immigration and Nationality Act of 1965, which removed ethnicity based immigration quotas and thus shifted the source of American immigrants away from Europe. We find smaller and less precise estimates, likely due to the substantially weaker first stage. Still, while not always statistically significant, the results are qualitatively similar.

As discussed previously, the exclusion restriction of the shift-share instrument may be violated in the presence of strong serial correlation of immigrant flows (Jaeger et al., 2018). This would be particularly problematic in a country like the US that has been characterized by a stable flows of immigrants from the same countries of origin (e.g. Mexico). In columns 3 and 4 of Table 8 we follow Jaeger et al. (2018) and control for the dynamic market adjustment to shocks (e.g. capital adjustment) by adding lagged immigrant flows to the regression and instrumenting for the lags using the analogous shift-share instrument.¹⁷ Doing so, we isolate the short-run effect from the longer-term reaction to past supply-shocks. Given the strong serial correlation in the instrument we of course lose substantial power, but the results are quantitatively similar and not statistically different from those obtained in our baseline estimation.

We also provide several further exercises in the Appendix. We find no evidence of significant

¹⁶We use the crosswalk provided in Rose (2018) from 1960 Public Use Microdata Areas (PUMAs) to 1990 Commuting Zones (CZs). We identify 728 commuting zones in the 1960 Census.

¹⁷We use 10-year lagged foreign-born share for 2000, 5-year lag for 2005, 4-year lag for 2015, and 3-year lags for 2008 and 2011.

negative effects on employment and hours worked (Table C.10) suggesting our main results are unlikely driven by composition or displacement effects. When we measure the share of immigrants separately by gender, the effects are slightly larger and more precise (Table C.11). In particular a 10 percentage point increase in the share of female immigrants in a commuting zone would lead to a .52 percentage points decline in native likelihood to work a night shift (4% with respect to the mean, column 2). A 10 percentage point increase in the share of male immigrants in a commuting zone would lead to a .97 percentage points decline in native likelihood to work a night shift (4.4% with respect to the mean, column 4). Our estimates are substantively unchanged when using the employed immigrant share (Table C.12) or when extending the analysis to the entire working age population (Table C.13). Our main results are also robust to the inclusion of an occupation-level index of manual intensity in the controls (Table C.14), which suggests that the effects of immigration on native working schedules is not just a consequence of the effects of immigration on task allocation previous found by [Peri and Sparber \(2009\)](#).¹⁸

We further show our results are robust to alternative formulations of the instrumental variable. In particular, in Table C.15 we consider two alternative definitions of $\hat{F}_{ct}$. The first distributes the stock of immigrants in the US rather than the inflow (see [Orrenius and Zavodny, 2015](#)). Formally:

$$\hat{F}_{ct} = \sum_{p=1}^{16} \left(\frac{I_{c,p,1970}}{I_{p,1970}} \right) I_{c,p,t} \quad (22)$$

where, as before, $\left(\frac{I_{c,p,1970}}{I_{p,1970}} \right)$ is the share of all immigrants from region of origin p living in c in 1970. However, in contrast with equation (20), in equation (22), we distribute the total national counts of immigrants based on the baseline 1970 distributions. The second excludes immigrants living in commuting zone c from the national stock of immigrants. Formally:

$$\hat{F}_{ct} = \sum_{p=1}^{16} \left(\frac{I_{c,p,1970}}{I_{p,1970}} \right) I_{-c,p,t}. \quad (23)$$

We replicate our main result using the simple number of immigrants in a CZ in 1970 as the initial CZ stock in Table C.16, while in Table C.17, we normalize by current native population, rather

¹⁸For this analysis, we used the occupation-level index of manual intensity adopted by [Peri and Sparber \(2009\)](#). This is constructed using O*NET data and averaging 19 measures that capture the intensity of several physical abilities (dexterity, strength, coordination).

than by native population in the baseline year. Our results are robust to all of these exercises.

As argued by [Borjas and Edo \(2021\)](#), CZs that are thriving typically attract more workers, and therefore have larger populations. Population size may be therefore endogenous to CZ economic characteristics. We therefore replicate our main results in [Table C.18](#) while omitting the population size control. Results are substantially unchanged.

Our model used a nested CES function, where day and night tasks are inputs only for low skill tasks. Consistent with this approach, when we focus on low skill migration ([Table 9](#)), we find stronger and more precise effects on both night schedules and daily wages. This follows previous studies that find the effects of immigration are often amplified when considering native groups who are more similar to immigrants (e.g., [Peri and Yasenov, 2019](#)). [Table C.19](#) further explores the heterogeneity of our main effects across education groups. We find the strongest effects for both the probability of working on a night shift (Panel A) and for night shift wages (Panel B) on those with less than a college degree. The night time wage premium for native high school dropouts appears more affected than their work schedules, while the reverse is true for those with some college. High school graduates see strong effects on both schedules and wages. We also analyze effects separately by age group ([Table C.20](#)). We find little evidence for a heterogeneous effect on work schedules, but the strongest effects on the night wage premium appear to be among younger workers.

5.2 Industry and Occupational Adjustments

In the previous two subsections, we established that, consistent with our theory, an increase in immigration leads to a movement of native workers from night shifts to day shifts, and a relative increase in the earnings of day shift workers. There are two possibilities for how this could occur. Native workers could move to a new shift within their same occupation, or they could switch to a new occupation which itself has different work scheduling. Understanding which of these mechanisms is dominant will inform us about the flexibility of work scheduling across the economy.

We explore this in [Table 10](#). In [Table C.21](#) we report the industries and occupations which have the highest share of night employment. Relative to our main results (column 2 of [Table 4](#)), we

find the inclusion of occupation (column 1) and industry (column 2) fixed effects slightly reduces the magnitude of our coefficients. With both sets of fixed effects (column 3), our coefficient is reduced by about 20% relative to our baseline estimate in Table 4. While our estimate loses statistical significance, it remains economically large. This strongly suggests that part of the margin of adjustment is through within occupation shifts from night shifts to day shifts.

In the final 3 columns we turn to within industry and occupation annual income effects. We again find slightly smaller magnitudes for the estimated compensating differential relative to column 2 of table 6. This is consistent with our results on employment; as part of equilibrium effects occur due to changes in schedules within occupation, the occupation-level compensating differential should adjust in kind.

An alternative explanation is that our results may partially reflect a movement of immigrants to CZs whose local industry and occupational composition is intensive in night shifts. To assess this hypothesis, in Table C.22, we include 1990 occupation (column 2) and industry shares (column 3) as well as an indicator for whether the CZ had a share of night workers above the median in 1990. Our estimates are only marginally reduced when including these controls, suggesting this hypothesis is unlikely to be the dominant mechanism. Similarly, we show the results are largely unaffected when controlling for differential trends in areas with high/low shares of nightly shifts as of 1990 in our baseline short difference estimates (see Table C.23).

6 Discussion

6.1 Welfare Implications

Our above results suggest that previous efforts to quantify the welfare effects of immigration will overstate any costs and understate any benefits, by neglecting the improvement in native job amenities. To provide some idea of the consequences of this oversight, in this subsection we perform back-of-the-envelope calculations, primarily based on previous research on the health costs of sleep deprivation. We emphasize that these are rough estimates and that have substantial uncertainty. Among other reasons, our descriptive exercises show that natives who work night-shifts are different on a number of observable dimensions than natives who work day-shifts. Thus the marginal native whose work schedule changes in response to an increase in immigration

may reasonably have different health costs than the average worker. Still, we believe this exercise is informative at understanding the importance of accounting for job amenity changes when designing immigration policy.

According to the CDC, 44% of night shift workers sleep less than 6 hours per night compared to just 28% of day shift workers. [Giuntella and Mazzonna \(2019\)](#) find that a 4 percentage point gap in sleeping less than 6 hours is linked to a \$82 per capita annual difference in health expenses.¹⁹ Based on our results from column 2 of Table 4, a 10 percentage point increase in the size of the local immigrant population as the share of the civilian labor force would lead to a .8 percentage point decrease in the proportion of natives who work night shifts. Thus, not accounting for this single health consequence would amount to a missed welfare gain of \$2 per native worker, or \$262 million nationally.²⁰

But sleep deprivation is just one of the negative consequences of working night shifts. Previous research has also found adverse effects on emotional wellbeing and marital stability, the welfare effects of which are difficult to quantify ([Liu et al., 2011](#); [Strazdins et al., 2006](#)). Our results on wages suggest that marginal natives are willing to give up 9% of their annual income to work in a day shift (see Table 6). Based off a \$52,574 average annual income for night shift working natives, this presents the possibility of \$37.8 in unaccounted welfare gains per worker per year (or \$4.8 billion nationwide). This is not to suggest our results imply that immigration has unambiguously positive effects. Native workers for whom it was previously optimal to work night shifts at the old compensating differential will likely see a welfare loss from moving to a lower paid day shift. However, looking purely at these workers' income decreases will overstate their losses. Similarly, as night-working immigrants are complements to day-working natives, workers who only work day shifts may see wage gains. While most of our wage estimates in Table 6 suggest absolute wage decreases for natives working day shifts, we cannot reject the null of zero effects for any specification, and in one specification, the estimate of the absolute effect is positive.

Further, we studied just the impact on a single job amenity. One could imagine immigration also affecting the physical intensity of native jobs, injury and fatality risks, and job flexibility,

¹⁹They consider a battery of outcomes including the health care costs associated with increased risk of obesity, diabetes, cancer, and cardiovascular diseases.

²⁰This is based on the 2018 BLS estimate of a size of the native workforce being 128.5 million (March 2018).

each of which would have heretofore unmeasured welfare effects. From a welfare perspective, it is worth noting that while immigrants bear the same detrimental effects of working night shifts, their working conditions may nonetheless improve with respect to their home country.

6.2 Conclusion

This paper develops a simple theoretical framework to analyze the effects of immigration on the allocation of work schedules. Because immigrants have lower disamenity costs for working at night, and a comparative advantage in nighttime production, immigrants specialize in non-standard shifts. Thus immigration increases the supply of night shifts, pushing natives towards daily schedules. We find strong empirical support for the model. Immigration reduces natives' likelihood of working night shifts, as well as their wage premium for working at night.

There is growing evidence suggesting that American firms have trouble staffing overnight shifts (e.g. manufacturing, growers of fresh produce). Difficulties in filling these positions may affect overall expansion and the ability of firms to add jobs at all hours.²¹ In many industries, almost half of workers work non-standard shifts. As immigrants have a comparative advantage in working non-standard shifts, immigration may allow firms relying on a flexible workforce to remain competitive (Dramski, 2017). At the same time, there is abundant evidence on the long-lasting detrimental effects of working night shifts on individual health. Our results show that immigration led to a reallocation of work schedules resulting in a reduction of natives' night work hours. The resulting positive effects on native individual health and well-being should not be neglected when assessing the overall impact of immigration on the labor market.

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²¹<https://www.chicagobusiness.com/article/20170128/ISSUE01/170129840/third-shift-jobs-go-unfilled-at-chicago-manufacturers>

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Table 1: Main estimation sample – simple descriptive statistics

	<i>Night workers</i>			<i>Day workers</i>		
	Obs.	Mean	Std. dev.	Obs.	Mean	Std. dev.
Annual wage income	3,634,971	42,242.5	37,058.2	16,486,993	46,111.1	48,529.3
Weekly wage	3,634,971	874.4	868.2	16,486,993	951.3	1,095.8
Hourly wage	3,634,971	20.5	55.1	16,486,993	22.9	49.3
Age	3,802,148	39.9	8.6	17,644,935	39.5	8.6
Male	3,802,148	0.68	0.47	17,644,935	0.50	0.50
Married	3,802,148	0.60	0.49	17,644,935	0.60	0.49
# of own children	3,802,148	1.1	1.2	17,644,935	1.0	1.2
Less than high school degree	3,802,148	0.10	0.29	17,644,935	0.06	0.23
High school degree	3,802,148	0.38	0.48	17,644,935	0.25	0.43
Some college	3,802,148	0.36	0.48	17,644,935	0.33	0.47
College degree	3,802,148	0.17	0.37	17,644,935	0.36	0.48
Experience	3,802,148	20.9	8.9	17,644,935	19.5	9.0
White	3,802,148	0.80	0.40	17,644,935	0.83	0.37
Black	3,802,148	0.14	0.35	17,644,935	0.11	0.31
Native American	3,802,148	0.009	0.093	17,644,935	0.007	0.086
Asian	3,802,148	0.010	0.101	17,644,935	0.012	0.110
Hispanic	3,802,148	0.08	0.27	17,644,935	0.07	0.26

Notes - Data are drawn from the 1990 and 2000 US Census and the 2005-2015 American Community Survey. Estimation sample is restricted to all currently employed natives ages 25-54. *Night workers* – all currently employed individuals who departed for work at some point between 6pm and 6am. *Day workers* – all currently employed individuals who are not classified as “night workers”. *Annual wage income* – total yearly pre-tax wage and salary income. *Hourly wage* - imputed hourly wage. *Weekly wage* - imputed weekly wage. *Experience* – work experience, defined as: *Age* - *Years of education* - 6.

Table 2: Work Schedules by Immigrant Status and English Proficiency: OLS Estimates, Including Individual Controls

	Any night work				50% work at night
	ACS (1)	ACS (2)	ACS (3)	ATUS (4)	ATUS (5)
Panel A: Individual Demographics Not Included					
Foreign-born	0.023*** (0.000)			0.069*** (0.007)	0.028*** (0.005)
No English		0.072*** (0.002)			
Bad or no English			0.059*** (0.001)		
Panel B: Individual Demographics Included					
Foreign-born	0.006*** (0.001)			0.062*** (0.008)	0.032*** (0.006)
No English		0.023*** (0.002)			
Bad or no English			0.018*** (0.001)		
Commuting zone FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES
Observations	23,729,458	23,729,458	23,729,458	58,239	58,239
Mean of dep. variable	0.178	0.178	0.178	0.239	0.095
St.dev. of dep. variable	0.382	0.382	0.382	0.426	0.294

Notes - Heteroskedasticity-robust standard errors in parentheses. Data for columns 1-3 are drawn from the 1990 and 2000 US Census and the 2005-2015 American Community Survey and include all currently employed individuals ages 25-54. Data for columns 4 and 5 are drawn from the 2003-2015 ATUS and include all currently employed individuals ages 15-64. *Any night work* - binary var. equal 1 if individual departed for work at some point between 6pm and 6am. *50% work at night* - binary var. equal to 1 if individual worked 50% or more of his/her work time at night (i.e. between 6pm and 7am of the following day). *Foreign-born* - binary var. equal 1 if individual born outside of U.S. (and its territories) and they are not born abroad of American parents. *No English* - binary var. equal 1 if individual "Does not speak English". *Bad or no English* - binary var. equal 1 if individual either "Does not speak English" or "Yes, but not well". All regressions in Panel B also control for the following personal demographics: sex, age, age-squared, race (categorical), married (binary), number of own children residing with the individual, less than HS degree (binary). *** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level.

Table 3: Effect of Immigration on Native Likelihood of Working Night Shifts: OLS Estimates (Census/ACS, 1990-2015)

	All		Men		Women	
	(1)	(2)	(3)	(4)	(5)	(6)
Share foreign-born	-0.026*** (0.008)	-0.015** (0.007)	-0.026** (0.011)	-0.016* (0.009)	-0.025*** (0.005)	-0.015*** (0.005)
Personal demographics	YES	YES	YES	YES	YES	YES
CZ-level characteristics	NO	YES	NO	YES	NO	YES
Commuting zone FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Observations	21,447,083	21,447,083	11,403,216	11,403,216	10,043,867	10,043,867
St. dev. of indep. variable	0.211	0.211	0.211	0.211	0.211	0.211
Mean of dep. variable	0.177	0.177	0.227	0.227	0.121	0.121
St. dev. of dep. variable	0.382	0.382	0.419	0.419	0.326	0.326

Notes - Standard errors in parentheses, clustered at CZ level. Data are drawn from the 1990 and 2000 US Census and the 2005-2015 American Community Survey. The following samples were used in the estimation: all currently employed natives ages 25-54 (cols. 1, 2); all currently employed male natives ages 25-54 (cols. 3, 4); all currently employed female natives ages 25-54 (cols. 5, 6). Dependent var.: *Any night work* - binary var. equal 1 if individual departed for work at some point between 6pm and 6am. *Share foreign-born* - share of immigrants as % of total population in 1970. Personal demographics: sex, education (non-parametric), experience, age, age-squared, race (categorical), married (binary), number of own children residing with the individual (non-parametric). CZ-level characteristics: % with less than HS degree, % with HS diploma (or equivalent), % with college degree, % male, % white, % black, log of total population. *** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level.

Table 4: Effect of Immigration on Native Likelihood of Working Night Shifts: 2SLS Estimates (Census/ACS, 1990-2015)

	All		Men		Women	
	(1)	(2)	(3)	(4)	(5)	(6)
Share foreign-born	-0.059** (0.024)	-0.080* (0.044)	-0.073** (0.030)	-0.096* (0.057)	-0.039** (0.016)	-0.055* (0.029)
Personal demographics	YES	YES	YES	YES	YES	YES
CZ-level characteristics	NO	YES	NO	YES	NO	YES
Commuting zone FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Observations	21,447,083	21,447,083	11,403,216	11,403,216	10,043,867	10,043,867
Mean of dep. variable	0.177	0.177	0.227	0.227	0.121	0.121
St. dev. of dep. variable	0.382	0.382	0.419	0.419	0.326	0.326
Kleibergen-Paap rk Wald F	62.90	20.68	63.41	20.17	62.10	21.26

Notes - Standard errors in parentheses, clustered at CZ level. Data are drawn from the 1990 and 2000 US Census and the 2005-2015 American Community Survey. The following samples were used in the estimation: all currently employed natives ages 25-54 (cols. 1, 2); all currently employed male natives ages 25-54 (cols. 3, 4); all currently employed female natives ages 25-54 (cols. 5, 6). Dependent var.: *Any night work* - binary var. equal 1 if individual departed for work at some point between 6pm and 6am. *Share foreign-born* - share of immigrants as % of total population in 1970. Personal demographics: sex, education (non-parametric), experience, age, age-squared, race (categorical), married (binary), number of own children residing with the individual (non-parametric). CZ-level characteristics: % with less than HS degree, % with HS diploma (or equivalent), % with college degree, % male, % white, % black, log of total population. *** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level.

Table 5: Effect of Immigration on Native Likelihood of Working Night Shifts (2003-15 ATUS)

	All		Men		Women	
	OLS (1)	2SLS (2)	OLS (3)	2SLS (4)	OLS (5)	2SLS (6)
Share foreign-born	-0.030** (0.012)	-0.051* (0.026)	-0.035* (0.021)	-0.031 (0.036)	-0.023 (0.018)	-0.066** (0.033)
Personal demographics	YES	YES	YES	YES	YES	YES
Interview characteristics	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Commuting zone FE	YES	YES	YES	YES	YES	YES
Observations	49,304	49,304	24,868	24,868	24,429	24,429
Mean of dep. variable	0.093	0.093	0.101	0.101	0.084	0.084
St. dev. of dep. variable	0.290	0.290	0.301	0.301	0.278	0.278
Kleibergen-Paap rk Wald F		32.19		30.68		32.63

Notes - Standard errors in parentheses, clustered at CZ level. Data are drawn from the 2003-2015 ATUS. Estimation sample is restricted to all currently employed natives ages 15-64. Dependent var.: *50% work at night* - binary var. equal to 1 if individual worked 50% or more of his/her work time at night (i.e. between 6pm and 7am of the following day). *Share foreign-born* - share of immigrants as % of total population in 1970. *Personal demographics:* sex, education (non-parametric), experience, age, age-squared, race (categorical), married (binary), number of children under 18 in household (non-parametric). *Interview characteristics:* day of the week (categorical), month of the year (categorical), and whether interview during weekend/during holiday (both binary). *** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level.

Table 6: Effect of Immigration on Native Relative Wages: 2SLS Estimates (Census/ACS, 1990-2015)

	Ln(Annual wage income)		Ln(Hourly wage)	Ln(Weekly wage)
	(1)	(2)	(3)	(4)
Share foreign-born	-0.073 (0.059)	-0.101 (0.067)	-0.048 (0.053)	-0.110 (0.067)
Share foreign-born $\times$ Day shift	0.077*** (0.019)	0.079*** (0.019)	0.042*** (0.011)	0.074*** (0.017)
Day shift	-0.089*** (0.005)	-0.090*** (0.005)	-0.028*** (0.003)	-0.081*** (0.005)
Personal demographics	YES	YES	YES	YES
CZ-level characteristics	NO	YES	YES	YES
Commuting zone FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Observations	20,121,964	20,121,964	20,121,964	20,121,964
Kleibergen-Paap rk Wald F	31.33	10.63	10.63	10.63
Sanderson-Windmeijer F test (first stage #1)	93.54	81.41	81.41	81.41
Sanderson-Windmeijer F test (first stage #2)	114.9	109.3	109.3	109.3

Notes - Standard errors in parentheses, clustered at CZ level. Data are drawn from the 1990 and 2000 US Census and the 2005-2015 American Community Survey. Estimation sample is restricted to currently employed native individuals ages 25-54. *Ln (Annual wage income)* - natural log of total yearly pre-tax wage and salary income. *Ln (Hourly wage)* - natural log of imputed hourly wage. *Ln (Weekly wage)* - natural log of imputed weekly wage. *Share foreign-born* - share of immigrants as % of total population in 1970. *Day shift* - binary var. equal 1 if individual departed for work at some points between 6am and 6pm. *Personal demographics*: sex, education (non-parametric), experience, age, age-squared, race (categorical), married (binary), number of own children residing with the individual (non-parametric). *CZ-level characteristics*: % with less than HS degree, % with HS diploma (or equivalent), % with college degree, % male, % white, % black, log of total population. *** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level.

Table 7: Effect of Immigration on Fraction of Natives working at Night: First Differences Estimates & Correlation with Prior Trends

	2000-2015		1990-2015		1990-2000	
	Stacked differences		Long difference		Long difference	
	OLS (1)	2SLS (2)	OLS (3)	2SLS (4)	OLS (5)	OLS (6)
Δ Share foreign-born	-0.054*** (0.011)	-0.139** (0.068)				
Δ Share foreign-born (1990-2015)			-0.020 (0.022)	-0.281* (0.168)		
Δ Share foreign-born (2000-2015)					0.002 (0.010)	
Δ IV (2000-2015)						0.107 (0.084)
Year dummies	YES	YES	NO	NO	NO	NO
CZ-level characteristics	YES	YES	YES	YES	YES	YES
Observations	2,897	2,897	674	674	674	674

Notes - Heteroskedasticity-robust standard errors in parentheses. In columns (1) & (2), standard errors are clustered at CZ level. Data are drawn from the 1990 and 2000 U.S. Census and the 2005, 2010, 2015 American Community Survey. Columns (1) & (2) use data only from years 1990, 2000, 2005, 2010, and 2015. *2000-2015 Stacked differences* - stacked first difference level changes (2000-1990; 2005-2000; 2010-2005; 2015-2010) in the share of employed natives ages 25-54 working in a CZ at night (i.e. between 6pm and 6am). *1990-2015 Long difference* - a 1990-2015 level change in the share of employed natives ages 25-54 working in a CZ at night (i.e. between 6pm and 6am). *1990-2000 Long difference* - a 1990-2000 level change in the share of employed natives ages 25-54 working in a CZ at night (i.e. between 6pm and 6am). *Δ Share foreign-born* - stacked first difference level changes in the share of immigrants in a CZ (2000-2015). *Δ Share foreign-born (1990-2015)* - level change in the share of immigrants in a CZ between 1990 and 2015. *Δ Share foreign-born (2000-2015)* - a level change in the CZ-level immigrant share between 2000 and 2015. *Δ IV (2000-2015)* - a level change in the shift-share CZ-level instrument between 2000 and 2015. *CZ-level characteristics*: % with less than HS degree, % with HS diploma (or equivalent), % with college degree, % male, % white, % black, log of total population. Note that in columns (1) & (2), CZ-level characteristics are included in lagged form. CZ fixed effects in columns (1) & (2) are differenced out. *** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level.

Table 8: Effect of Immigration on Native Likelihood of Working Night Shifts, Alternative Base Years and Lagged Immigrants Shares: 2SLS Estimates

	1960 base IV		1970 base IV	
	1990- 2015 (1)	1990- 2015 (2)	2000; 2005; 2008 2011; 2015 (3)	2000; 2005; 2008; 2011; 2015 (4)
Share foreign-born	-0.034* (0.020)	-0.038 (0.025)	-0.040 (0.032)	-0.059 (0.043)
Share foreign-born (lagged)			-0.020 (0.029)	-0.017 (0.028)
Personal demographics	YES	YES	YES	YES
CZ-level characteristics	NO	YES	NO	YES
Year FE	YES	YES	YES	YES
Commuting zone FE	YES	YES	YES	YES
Observations	21,015,659	21,015,659	9,581,090	9,581,090
R-squared	0.040	0.041	0.039	0.039
Number of CZs	728	728	741	741
Kleibergen-Paap rk Wald F	4.89	5.87	11.7	7.72
Sanderson-Windmeijer F test (first stage #1)			48.56	56.40
Sanderson-Windmeijer F test (first stage #2)			28.24	21.84

Notes - Standard errors in parentheses, clustered at CZ level. Data are drawn from the 1990 and 2000 US Census and the 2005-2015 American Community Survey and include all currently employed native individuals ages 25-54. Dependent var.: *Any night work* - binary var. equal 1 if individual departed for work at some point between 6pm and 6am. *Share of foreign-born* - share of immigrants as % of total population in 1960 (1970, respectively). Personal demographics: sex, education, experience, age, age-squared. CZ-level characteristics: % with less than HS degree, % with HS diploma (or equivalent), % with college degree, % male, % white, % black, log of total population. Columns 3 and 4 restrict the analysis to 2000, 2005, 2008, 2011, and 2015. The respective lagged shares of foreign-born are derived from 1990, 2000, 2005, 2008, and 2011. *** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level.

Table 9: Effect of Immigration on Native Likelihood of Working Night Shifts, Low-Skilled Workers: 2SLS Estimates (1990, 2000 Census & 2005-15 ACS)

	<i>Any night work</i>		<i>Ln(Annual wage income)</i>	
	(1)	(2)	(3)	(4)
Share of foreign-born low-skilled	-0.067** (0.027)	-0.084* (0.045)	-0.118* (0.064)	-0.123 (0.084)
Share of foreign-born low-skilled × Day shift			0.074*** (0.018)	0.076*** (0.018)
Personal demographics	YES	YES	YES	YES
CZ-level characteristics	NO	YES	NO	YES
Commuting zone FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Observations	9,682,165	9,682,165	8,963,741	8,963,741
Mean of dep. variable	0.235	0.235	9.924	9.924
St. dev. of dep. variable	0.424	0.424	0.888	0.888
Kleibergen-Paap rk Wald F	66.10	22.11	32.81	11.24
Sanderson-Windmeijer F test (first stage #1)			78.25	53.86
Sanderson-Windmeijer F test (first stage #1)			70.29	71.49

Notes - Standard errors in parentheses, clustered at CZ level. Data are drawn from the 1990 and 2000 US Census and the 2005-2015 American Community Survey. Estimation sample is restricted to all currently employed low-skilled (i.e. those with high school degree or less) natives ages 25-54. *Any night work* - binary var. equal 1 if individual departed for work at some point between 6pm and 6am. *Ln (Annual wage income)* - natural log of total yearly pre-tax wage and salary income. *Share of foreign-born low-skilled* - share of low-skilled immigrants as % of low-skilled population in 1970. *Day shift* - binary var. equal 1 if individual departed for work at some point between 6am and 6pm. Personal demographics: sex, education (non-parametric), experience, age, age-squared, race (categorical), married (binary), number of own children residing with the individual (non-parametric). CZ-level characteristics: % with less than HS degree, % with HS diploma (or equivalent), % with college degree, % male, % white, % black, log of total population. Cols. (3) and (4) also control for the binary var. *Day shift*. *** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level.

Table 10: Effect of Immigration on Native Work Habits and Income within Industry and Occupation: 2SLS Estimates (Census/ACS, 1990-2015)

	Any night work			Ln(Annual wage income)		
	(1)	(2)	(3)	(4)	(5)	(6)
Share foreign-born	-0.068*	-0.064*	-0.059	-0.061	-0.035	-0.041
	(0.041)	(0.039)	(0.038)	(0.059)	(0.057)	(0.055)
Share foreign-born × Day shift				0.068***	0.046***	0.055***
				(0.013)	(0.014)	(0.013)
Personal demographics	YES	YES	YES	YES	YES	YES
CZ-level characteristics	YES	YES	YES	YES	YES	YES
Occupation FE	YES	NO	YES	YES	NO	YES
Industry FE	NO	YES	YES	NO	YES	YES
Commuting zone FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Observations	21,447,083	21,447,083	21,447,083	20,121,964	20,121,964	20,121,964
Kleibergen-Paap rk Wald F	20.67	20.67	20.66	10.63	10.63	10.63
Sanderson-Windmeijer F test (first stage #1)				81.65	81.75	81.74
Sanderson-Windmeijer F test (first stage #2)				108.6	106.8	106.7

Notes - Standard errors in parentheses, clustered at CZ level. Data are drawn from the 1990 and 2000 US Census and the 2005-2015 American Community Survey. Estimation sample is restricted to all currently employed natives ages 25-54. *Any night work* - binary var. equal 1 if individual departed for work at some point between 6pm and 6am. *Ln (Annual wage income)* - natural log of total yearly pre-tax wage and salary income. *Share foreign-born* - share of immigrants as % of total population in 1970. *Day shift* - binary var. equal 1 if individual departed for work at some point between 6am and 6pm. *Personal demographics*: sex, education (non-parametric), experience, age, age-squared, race (categorical), married (binary), number of own children residing with the individual (non-parametric). *CZ-level characteristics*: % with less than HS degree, % with HS diploma (or equivalent), % with college degree, % male, % white, % black, log of total population. Cols. (4), (5), (6) also control for the binary var. *Day shift*. *** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level.

Appendix

A Proofs of Main Results

Proof of Lemma 1

Proof. The proportion of foreign workers in nighttime jobs is simply $H\left([\nu\omega\eta]^{\frac{1}{\lambda}}\right)$, while that same proportion for native workers is $H(\nu\omega)$. As H is a strictly increasing function, inspection of the arguments proves the lemma. $\square$

Proof of Propostion 1

Proof. Implicitly differentiating (17),

$$\frac{\partial\omega}{\partial f} = \frac{1}{\theta}\omega^{1-\theta}\Delta_S \left(\frac{1-\beta}{\beta}\right)^{\frac{1}{1-\theta}} \left(1 - \frac{\partial D^S}{\partial\omega}\right)^{-1}, \quad (24)$$

where

$$\Delta_S \equiv \frac{\left[1 - J\left([\nu\omega\eta]^{\frac{1}{\lambda}}\right)\right] J(\omega\eta)n_nd_f - [1 - J(\omega\eta)]J\left([\nu\omega\eta]^{\frac{1}{\lambda}}\right)n_fd_n}{\left[(1-f)J(\omega\eta)n_n + fJ\left([\nu\omega\eta]^{\frac{1}{\lambda}}\right)n_f\right]^2} \quad (25)$$

is the change in the relative supply function, $\frac{D^S}{N^S}$, due to a change in f holding w_N fixed. Wages and the elasticity of substitution are always positive. The relative supply of day tasks due to a decrease in the relative price of day tasks, $\frac{\partial D^S}{\partial\omega}$ is always negative, so $\left(1 - \frac{\partial D^S}{\partial\omega}\right)^{-1}$ is also positive.²² The sign of this derivative thus depends on Δ_S . From Lemma 1 we know that $1 - J\left([\nu\omega\eta]^{\frac{1}{\lambda}}\right) < 1 - J(\omega\eta)$ and $J(\omega\eta) < J\left([\nu\omega\eta]^{\frac{1}{\lambda}}\right)$. Comparing the last two terms, $n_nd_f \leq n_fd_n$ follows from the comparative advantage of foreign workers to night tasks ($\nu \geq 1$). Thus $\frac{\partial\omega}{\partial f} < 0$.

For relative task output, from equation (16)

$$\frac{D}{N} = \left(\frac{1-\beta}{\beta}\right)^{-\theta} \omega^\theta. \quad (26)$$

Since $\frac{d\omega}{df} < 0$, it follows that $\frac{\partial D}{\partial f} < 0$. $\square$

²²It is easy to show this derivative is strictly negative. The exact expression is long but is available upon request.

Proof of Proposition 2

Proof. The proof follows directly from Proposition 1. From equations (9) and (10), the relative employment of native workers is

$$\frac{L_{Dn}}{L_{Nn}} = \frac{1 - J(\omega\eta)}{J(\omega\eta)} \quad (27)$$

which is a strictly decreasing function of ω . Native relative daytime wages are simply $(\omega\eta)^{-1}$, which are also strictly decreasing in ω . $\square$

B Supplemental Figures and Tables

Table C.1: Compensating Wage Differentials

	(1) Ln(Annual wage income)	(2) Ln(Annual wage income)	(3) Ln(Annual wage income)	(4) Ln(Annual wage income)
Night shift	-0.002** (0.001)	0.061*** (0.001)	0.081*** (0.001)	0.079*** (0.001)
Personal demographics		YES		YES
Occupation FE			YES	YES
Observations	20,121,964	20,121,964	20,121,964	20,121,964
R-squared	0.000	0.223	0.270	0.344
Mean of dep. variable	10.16	10.16	10.16	10.16
St. dev. of dep. variable	0.922	0.922	0.922	0.922

Notes - Heteroskedasticity-robust standard errors in parentheses. Data are drawn from the 1990 and 2000 US Census and the 2005-2015 American Community Survey. The estimation sample comprises all currently employed natives ages 25-54. *Ln (Annual wage income)* - natural log of total yearly pre-tax wage and salary income. *Night shift* - binary var. equal 1 if individual departed for work at some point between 6pm and 6am. Personal demographics: sex, education (non-parametric), experience, age, age-squared, race (categorical), married (binary), number of own children residing with the individual (non-parametric). *** Significant at the 1% level.

** Significant at the 5% level. * Significant at the 10% level.

Table C.2: Immigrant-Native Difference in Socio-Demographic Predictors of Working Night Shifts

	(1) Night shift index	(2) Night shift index > median	(3) Night shift index > 75p
Foreign-born	0.012*** (0.000)	0.081*** (0.001)	0.088*** (0.001)
Observations	23,729,458	23,729,458	23,729,458
R-squared	0.004	0.004	0.006
St. dev. of indep. variable	0.295	0.295	0.295
Mean of dep. variable	0.174	0.500	0.250
St. dev. of dep. variable	0.075	0.500	0.433

Notes - Heteroskedasticity-robust standard errors in parentheses. Data are drawn from the 1990 and 2000 US Census and the 2005-2015 American Community Survey. The estimation sample comprises all employed individuals ages 25-54. *Foreign-born* – binary var. equal 1 if individual born outside of U.S. (and its territories) and they are not born abroad of American parents. *Night shift index* – predicted dependent variable from regression of *Any night work* (binary var. equal 1 if individual departed for work at some point between 6pm and 6am) on the following personal demographics: sex, marital status (categorical), education (non-parametric), experience, age, age-squared, English proficiency (categorical), # of own children residing with the individual (non-parametric), family size (non-parametric). *** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level.

Table C.3: Effect of Immigration on Native Likelihood of Working Night Shifts: First-Stage Estimates (Census/ACS, 1990-2015)

	<i>Share foreign-born</i>		
	All	Men	Women
	(1)	(2)	(3)
Predicted share foreign-born	0.254*** (0.056)	0.249*** (0.056)	0.258*** (0.056)
Personal demographics	YES	YES	YES
CZ-level characteristics	YES	YES	YES
Commuting zone FE	YES	YES	YES
Year FE	YES	YES	YES
Observations	21,447,083	11,403,216	10,043,867
Kleibergen-Paap rk Wald F	20.68	20.17	21.26

Notes - Standard errors in parentheses, clustered at CZ level. Data are drawn from the 1990 and 2000 US Census and the 2005-2015 American Community Survey. The following samples were used in the estimation: all currently employed natives ages 25-54 (col. 1); all currently employed male natives ages 25-54 (col. 2); all currently employed female natives ages 25-54 (col. 3). *Dependent var.: Share foreign-born* - share of immigrants as % of total population in 1970. *Predicted share foreign-born* - predicted share of immigrants as % of total population in 1970. *Personal demographics*: sex, education (non-parametric), experience, age, age-squared, race (categorical), married (binary), number of own children residing with the individual (non-parametric). *CZ-level characteristics*: % with less than HS degree, % with HS diploma (or equivalent), % with college degree, % male, % white, % black, log of total population. *** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level.

Table C.4: Effect of Immigration on Native Likelihood of Working Night Shifts: Reduced-Form Estimates (Census/ACS, 1990-2015)

	All		
	(1)	(2)	(3)
Main IV	-0.020*** (0.008)		
Alt IV #1		-0.019** (0.008)	
Alt IV #2			-0.020** (0.008)
Personal demographics	YES	YES	YES
CZ-level characteristics	YES	YES	YES
Commuting zone FE	YES	YES	YES
Year FE	YES	YES	YES
Observations	21,447,083	21,447,083	21,447,083
R-squared	0.052	0.052	0.052
St. dev. of indep. variable	0.184	0.212	0.195
Mean of dep. variable	0.177	0.177	0.177
St. dev. of dep. variable	0.382	0.382	0.382

Notes - Standard errors in parentheses, clustered at CZ level. Data are drawn from the 1990 and 2000 US Census and the 2005-2015 American Community Survey. The following sample was used in the estimation: all currently employed natives ages 25-54. Dependent var.: *Any night work* - binary var. equal 1 if individual departed for work at some point between 6pm and 6am. Personal demographics: sex, education (non-parametric), experience, age, age-squared, race (categorical), married (binary), number of own children residing with the individual (non-parametric). CZ-level characteristics: % with less than HS degree, % with HS diploma (or equivalent), % with college degree, % male, % white, % black, log of total population. *** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level.

Table C.5: Effect of Immigration on Native Likelihood of Working Night Shifts: 2SLS Estimates (Census/ACS, 1990-2015, by Average Proficiency in Occupation)

	(1) Overall	(2) below 50pct	(3) below 25pct
Share foreign born	-0.080* (0.044)	-0.105* (0.057)	-0.137*** (0.051)
Personal demographics	YES	YES	YES
CZ-level characteristics	YES	YES	YES
Commuting zone FE	YES	YES	YES
Year FE	YES	YES	YES
Observations	21,447,083	9,558,316	4,237,324
Kleibergen-Paap rk Wald F	20.68	22.37	27.20

Notes - Standard errors in parentheses, clustered at CZ level. Data are drawn from the 1990 and 2000 US Census and the 2005-2015 American Community Survey. The following samples were used in the estimation: all currently employed natives ages 25-54 (col. 1); all currently employed natives ages 25-54 working in occupations with below-median share of immigrants with good English proficiency (col. 2); all currently employed natives ages 25-54 working in occupations with below-25th perc. share of immigrants with good English proficiency (col. 3). Dependent var.: *Any night work* - binary var. equal 1 if individual departed for work at some point between 6pm and 6am. *Share foreign-born* - share of immigrants as % of total population in 1970. Personal demographics: sex, education (non-parametric), experience, age, age-squared, race (categorical), married (binary), number of own children residing with the individual (non-parametric). CZ-level characteristics: % with less than HS degree, % with HS diploma (or equivalent), % with college degree, % male, % white, % black, log of total population. *** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level.

Table C.6: Effect of Immigration on Native Wages: OLS Estimates (Census/ACS, 1990-2015)

	Ln(Annual wage income)		Ln(Hourly wage)	Ln(Weekly wage)
	(1)	(2)	(3)	(4)
Share foreign-born	0.025 (0.026)	-0.029 (0.027)	-0.002 (0.019)	-0.035 (0.023)
Share foreign-born * Day shift	0.103*** (0.020)	0.104*** (0.020)	0.062*** (0.014)	0.099*** (0.018)
Day shift	-0.095*** (0.004)	-0.096*** (0.004)	-0.032*** (0.003)	-0.086*** (0.004)
Observations	20,121,964	20,121,964	20,121,964	20,121,964
R-squared	0.270	0.271	0.313	0.303
Mean of dep. variable	10.16	10.16	2.725	6.327
St. dev. of dep. variable	0.922	0.922	0.656	0.811

Notes - Standard errors in parentheses, clustered at CZ level. Data are drawn from the 1990 and 2000 US Census and the 2005-2015 American Community Survey. Estimation sample is restricted to currently employed native individuals ages 25-54. *Ln (Annual wage income)* - natural log of total yearly pre-tax wage and salary income. *Ln (Hourly wage)* - natural log of imputed hourly wage. *Ln (Weekly wage)* - natural log of imputed weekly wage. *Share foreign-born* - share of immigrants as % of total population in 1970. *Day shift* - binary var. equal 1 if individual departed for work at some points between 6am and 6pm. Personal demographics: sex, education (non-parametric), experience, age, age-squared, race (categorical), married (binary), number of own children residing with the individual (non-parametric). CZ-level characteristics: % with less than HS degree, % with HS diploma (or equivalent), % with college degree, % male, % white, % black, log of total population. *** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level.

Table C.7: Effect of Immigration on Share of Natives Working Night Shifts: 2SLS Estimates (Census/ACS, 1990-2015)

	All		Men		Women	
	(1)	(2)	(3)	(4)	(5)	(6)
Share foreign-born	-0.089** (0.044)	-0.081* (0.046)	-0.078* (0.047)	-0.051 (0.048)	-0.092** (0.037)	-0.106** (0.051)
CZ-level characteristics	NO	YES	NO	YES	NO	YES
Average Manual Intensity Index	NO	YES	NO	YES	NO	YES
Commuting zone FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Observations	9,365	9,365	9,365	9,365	9,365	9,365
Mean of dep. variable	0.180	0.180	0.226	0.226	0.126	0.126
St. dev. of dep. variable	0.047	0.047	0.065	0.065	0.038	0.038
Kleibergen-Paap rk Wald F	14.59	12.95	14.59	11.76	14.59	12.19
Anderson-Rubin chi-sq. test p-val.	0.003	0.005	0.025	0.174	0.000	0.000

Notes - Standard errors in parentheses, clustered at CZ level. Data are drawn from the 1990 and 2000 US Census and the 2005-2015 American Community Survey. Dependent var.: *Night share* – share of employed natives (all, men, women) ages 25-54 who departed for work at some point between 6pm and 6am. *Share foreign-born* – share of immigrants as % of total population in 1970. *Average Manual Intensity Index* – average index of manual intensity among employed natives (all, men, women) ages 25-54. CZ-level characteristics: % with less than HS degree, % with HS diploma (or equivalent), % with college degree, % male, % white, % black, log of total population. Column (2) also controls for % male, % with HS diploma (or equivalent), % with some college, % with college degree, average experience, average age, % white, % black, % Native American, % Asian, % married, and average # of own children, among employed natives ages 25-54. Column (4) also controls for % with HS diploma (or equivalent), % with some college, % with college degree, average experience, average age, % white, % black, % Native American, % Asian, % married, and average # of own children, among employed native males ages 25-54. Column (6) also controls for for % with HS diploma (or equivalent), % with some college, % with college degree, average experience, average age, % white, % black, % Native American, % Asian, % married, and average # of own children, among employed native females ages 25-54. *** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level.

Table C.8: Effect of Immigration on Native Likelihood of Working Night Shifts: 2SLS Estimates (Census/ACS, 1990-2015), Controlling for State-Specific Trends

	All	Men	Women
	(1)	(2)	(3)
Share foreign born	-0.081* (0.044)	-0.098* (0.057)	-0.055* (0.028)
Personal demographics	YES	YES	YES
CZ-level characteristics	YES	YES	YES
State-specific linear trends	YES	YES	YES
Commuting zone FE	YES	YES	YES
Year FE	YES	YES	YES
Observations	21,447,083	11,403,216	10,043,867
Mean of dep. variable	0.177	0.227	0.121
St. dev. of dep. variable	0.382	0.419	0.326
Kleibergen-Paap rk Wald F	20.48	19.92	21.13

Notes - Standard errors in parentheses, clustered at CZ level. Data are drawn from the 1990 and 2000 US Census and the 2005-2015 American Community Survey. The following samples were used in the estimation: all currently employed natives ages 25-54 (col. 1); all currently employed male natives ages 25-54 (col. 2); all currently employed female natives ages 25-54 (col. 3). Dependent var.: *Any night work* - binary var. equal 1 if individual departed for work at some point between 6pm and 6am. *Share foreign-born* - share of immigrants as % of total population in 1970. Personal demographics: sex, education (non-parametric), experience, age, age-squared, race (categorical), married (binary), number of own children residing with the individual (non-parametric). CZ-level characteristics: % with less than HS degree, % with HS diploma (or equivalent), % with college degree, % male, % white, % black, log of total population. *** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level.

Table C.9: Effect of Immigration on Share of Natives Working Night Shifts: 2SLS Estimates (Census/ACS, 1990-2015), Controlling for Region-By-Year Fixed Effects

	All	Men	Women
	(1)	(2)	(3)
Share foreign-born	-0.067* (0.039)	-0.082* (0.046)	-0.048 (0.032)
Personal demographics	YES	YES	YES
CZ-level characteristics	YES	YES	YES
Region-by-year FE	YES	YES	YES
Commuting zone FE	YES	YES	YES
Year FE	YES	YES	YES
Observations	21,447,083	11,403,216	10,043,867
Mean of dep. variable	0.177	0.227	0.121
St. dev. of dep. variable	0.382	0.419	0.326
Kleibergen-Paap rk Wald F	20.50	19.83	21.32

Notes - Standard errors in parentheses, clustered at CZ level. Data are drawn from the 1990 and 2000 US Census and the 2005-2015 American Community Survey. The following samples were used in the estimation: all currently employed natives ages 25-54 (col. 1); all currently employed male natives ages 25-54 (col. 2); all currently employed female natives ages 25-54 (col. 3). Dependent var.: *Any night work* - binary var. equal 1 if individual departed for work at some point between 6pm and 6am. *Share foreign-born* - share of immigrants as % of total population in 1970. Personal demographics: sex, education (non-parametric), experience, age, age-squared, race (categorical), married (binary), number of own children residing with the individual (non-parametric). CZ-level characteristics: % with less than HS degree, % with HS diploma (or equivalent), % with college degree, % male, % white, % black, log of total population. *** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level.

Table C.10: Effect of Immigration on Native Employment, Hours & Weeks Worked: 2SLS Estimates (Census/ACS, 1990-2015)

	Unemployed	Out of labor force	Not working	Ln (hours worked)	Ln (weeks worked)
	(1)	(2)	(3)	(4)	(5)
Share foreign-born	-0.011 (0.017)	0.018 (0.016)	0.006 (0.021)	-0.076 (0.088)	-0.030 (0.078)
Personal demographics	YES	YES	YES	YES	YES
CZ-level characteristics	YES	YES	YES	YES	YES
Commuting zone FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES
Observations	24,077,903	29,630,202	29,630,202	29,630,202	29,630,202
Mean of dep. variable	0.054	0.187	0.231	3.111	3.195
St. dev. of dep. variable	0.226	0.390	0.422	1.387	1.439
Kleibergen-Paap rk Wald F	20.99	21.49	21.49	21.49	21.49

Notes - Standard errors in parentheses, clustered at CZ level. Data are drawn from the 1990 and 2000 US Census and the 2005-2015 American Community Survey. The estimation sample is restricted to all natives ages 25-54. Dependent variables: *Unemployed* - binary var. equal 1 if individual is currently unemployed. *Out of labor force* - binary var. equal 1 if individual is currently out of the labor force. *Not working* - binary var. equal 1 if individual is currently not working (i.e. either unemployed or out of the labor force). *Ln (hours worked)* - natural log of # of usual hours worked per week during past year. *Ln (weeks worked)* - natural log of # of weeks worked during past year. Personal demographics: sex, education (non-parametric), experience, age, age-squared, race (categorical), married (binary), number of own children residing with the individual (non-parametric). CZ-level characteristics: % with less than HS degree, % with college degree, % male, % white, % black, log of total population. *** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level.

Table C.11: Effect of Immigration on Native Likelihood of Working Night Shifts, Gender-Specific Immigrant Shares: 2SLS Estimates (1990, 2000 Census & 2005-15 ACS)

	Women		Men	
	(1)	(2)	(3)	(4)
Share of foreign-born females	-0.038** (0.015)	-0.052** (0.026)		
Share of foreign-born males			-0.072** (0.031)	-0.097 (0.062)
Personal demographics	YES	YES	YES	YES
CZ-level characteristics	NO	YES	NO	YES
Commuting zone FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Observations	10,043,867	10,043,867	11,403,216	11,403,216
Mean of dep. variable	0.121	0.121	0.227	0.227
St. dev. of dep. variable	0.326	0.326	0.419	0.419
Kleibergen-Paap rk Wald F	44.85	19.56	66.01	19.34

Notes - Standard errors in parentheses, clustered at CZ level. Data are drawn from the 1990 and 2000 US Census and the 2005-2015 American Community Survey. Estimation sample in col. (1) & (2) is restricted to all currently employed native females ages 25-54. Estimation sample in col. (3) & (4) is restricted to all currently employed native males ages 25-54. *Any night work* - binary var. equal 1 if individual departed for work at some point between 6pm and 6am. *Share of foreign-born females* - share of female immigrants as % of female population in 1970. *Share of foreign-born males* - share of male immigrants as % of male population in 1970. Personal demographics: education (non-parametric), experience, age, age-squared, race (categorical), married (binary), number of own children residing with the individual (non-parametric). CZ-level characteristics: % with less than HS degree, % with HS diploma (or equivalent), % with college degree, % male, % white, % black, log of total population. *** Significant at the 1% level. ** Significant at the 5% level. *Significant at the 10% level.

Table C.12: Effect of Immigration on Native Likelihood of Working Night Shifts: Employed Immigrant Share, 2SLS Estimates (1990, 2000 Census & 2005-15 ACS)

	<i>Any night work</i>	
	(1)	(2)
Share of employed foreign-born	-0.046** (0.018)	-0.060** (0.030)
Personal demographics	YES	YES
CZ-level characteristics	NO	YES
Commuting zone FE	YES	YES
Year FE	YES	YES
Observations	21,447,083	21,447,083
Mean of dep. variable	0.177	0.177
St. dev. of dep. variable	0.382	0.382
Kleibergen-Paap rk Wald F	82.96	35.41

Notes - Standard errors in parentheses, clustered at CZ level. Data are drawn from the 1990 and 2000 US Census and the 2005-2015 American Community Survey. Estimation sample is restricted to all currently employed natives ages 25-54. *Any night work* - binary var. equal 1 if individual departed for work at some point between 6pm and 6am. *Share of employed foreign-born* - share of employed immigrants as % of employed population in 1970. *Personal demographics*: sex, education (non-parametric), experience, age, age-squared, race (categorical), married (binary), number of own children residing with the individual (non-parametric). *CZ-level characteristics*: % with less than HS degree, % with HS diploma (or equivalent), % with college degree, % male, % white, % black, log of total population. *** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level.

Table C.13: Effect of Immigration on Native Likelihood of Working Night Shifts : Working Age Population (16-64), 2SLS Estimates (1990, 2000 Census & 2005-15 ACS)

	<i>Any night work</i>	
	(1)	(2)
Share of foreign-born	-0.044** (0.022)	-0.063 (0.038)
Personal demographics	YES	YES
CZ-level characteristics	NO	YES
Commuting zone FE	YES	YES
Year FE	YES	YES
Observations	30,452,596	30,452,596
Mean of dep. variable	0.173	0.173
St. dev. of dep. variable	0.378	0.378
Kleibergen-Paap rk Wald F	64.45	22.28

Notes - Standard errors in parentheses, clustered at CZ level. Data are drawn from the 1990 and 2000 US Census and the 2005-2015 American Community Survey. Estimation sample is restricted to all currently employed natives ages 16-64. *Any night work* - binary var. equal 1 if individual departed for work at some point between 6pm and 6am. *Share of foreign-born* — share of immigrants as % of total population in 1970. *Personal demographics*: sex, education (non-parametric), experience, age, age-squared, race (categorical), married (binary), number of own children residing with the individual (non-parametric). *CZ-level characteristics*: % with less than HS degree, % with HS diploma (or equivalent), % with college degree, % male, % white, % black, log of total population. *** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level.

Table C.14: Effect of Immigration on Native Likelihood of Working Night Shifts: 2SLS Estimates (Census/ ACS, 1990-2015), Controlling for Index of Manual Intensity

	All		Men		Women	
	(1)	(2)	(3)	(4)	(5)	(6)
Share foreign-born	-0.059** (0.024)	-0.070* (0.041)	-0.073** (0.030)	-0.081 (0.053)	-0.039** (0.016)	-0.053* (0.028)
Index of Manual Intensity		0.275*** (0.003)		0.232*** (0.005)		0.311*** (0.006)
Personal demographics	YES	YES	YES	YES	YES	YES
CZ-level characteristics	NO	YES	NO	YES	NO	YES
Commuting zone FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Observations	21,447,083	21,077,313	11,403,216	11,153,829	10,043,867	9,923,484
Mean of dep. variable	0.177	0.176	0.227	0.225	0.121	0.120
St. dev. of dep. variable	0.382	0.380	0.419	0.417	0.326	0.326
Kleibergen-Paap rk Wald F	62.90	20.54	63.41	19.82	62.10	21.37

Notes - Standard errors in parentheses, clustered at CZ level. Data are drawn from the 1990 and 2000 US Census and the 2005-2015 American Community Survey. The following samples were used in the estimation: all currently employed natives ages 25-54 (cols. 1, 2); all currently employed male natives ages 25-54 (cols. 3, 4); all currently employed female natives ages 25-54 (cols. 5, 6). Dependent var.: *Any night work* - binary var. equal 1 if individual departed for work at some point between 6pm and 6am. *Share foreign-born* - share of immigrants as % of total population in 1970. Personal demographics: sex, education (non-parametric), experience, age, age-squared, race (categorical), married (binary), number of own children residing with the individual (non-parametric). CZ-level characteristics: % with less than HS degree, % with HS diploma (or equivalent), % with college degree, % male, % white, % black, log of total population. *** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level.

Table C.15: Effect of Immigration on Native Likelihood of Working Night Shifts: Alternative IV Construction (Census/ACS, 1990-2015)

	Main IV		Alt IV #1		Alt IV #2	
	(1)	(2)	(3)	(4)	(5)	(6)
Share of foreign-born	-0.059** (0.024)	-0.080* (0.044)	-0.049** (0.020)	-0.076* (0.042)	-0.053** (0.023)	-0.076* (0.042)
Personal demographics	YES	YES	YES	YES	YES	YES
CZ-level characteristics	NO	YES	NO	YES	NO	YES
Commuting zone FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Observations	21,447,083	21,447,083	21,447,083	21,447,083	21,447,083	21,447,083
Mean of dep. variable	0.177	0.177	0.177	0.177	0.177	0.177
St. dev. of dep. variable	0.382	0.382	0.382	0.382	0.382	0.382
Kleibergen-Paap rk Wald F	62.90	20.68	70.12	21.32	65.68	23.97

Notes - Standard errors in parentheses, clustered at CZ level. Data are drawn from the 1990 and 2000 US Census and the 2005-2015 American Community Survey. See Appendix B for alternative IV construction: eq. (22) for definition of *Alt IV #1*; eq. (23) for definition of *Alt IV #2*. Estimation sample is restricted to all currently employed natives ages 25-54. *Any night work* - binary var. equal 1 if individual departed for work at some point between 6pm and 6am. *Share of foreign-born* - share of immigrants as % of total population in 1970. *Personal demographics*: sex, education (non-parametric), experience, age, age-squared, race (categorical), married (binary), number of own children residing with the individual (non-parametric). *CZ-level characteristics*: % with less than HS degree, % with HS diploma (or equivalent), % with college degree, % male, % white, % black, log of total population. *** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level.

Table C.16: Effects of Immigration on Native Likelihood of Working Night Shifts - 2SLS Estimates (Census/ ACS, 1990-2015), Alternative Definition of the IV (No Median)

	All	Men	Women
	(1)	(2)	(3)
Share foreign-born	-0.080* (0.044)	-0.096* (0.057)	-0.055* (0.029)
Personal demographics	YES	YES	YES
CZ-level characteristics	YES	YES	YES
Commuting zone FE	YES	YES	YES
Year FE	YES	YES	YES
Observations	21,447,083	11,403,216	10,043,867
Mean of dep. variable	0.177	0.227	0.121
St. dev. of dep. variable	0.382	0.419	0.326
Kleibergen-Paap rk Wald F	20.68	20.17	21.26

Notes - Standard errors in parentheses, clustered at CZ level. Data are drawn from the 1990 and 2000 US Census and the 2005-2015 American Community Survey. The following samples were used in the estimation: all currently employed natives ages 25-54 (col. 1); all currently employed male natives ages 25-54 (col. 2); all currently employed female natives ages 25-54 (col. 3). Dependent var.: *Any night work* - binary var. equal 1 if individual departed for work at some point between 6pm and 6am. *Share foreign-born* - share of immigrants as % of total population in 1970. Personal demographics: sex, education (non-parametric), experience, age, age-squared, race (categorical), married (binary), number of own children residing with the individual (non-parametric). CZ-level characteristics: % with less than HS degree, % with HS diploma (or equivalent), % with college degree, % male, % white, % black, log of total population. *** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level.

Table C.17: Effects of Immigration on Native Likelihood of Working Night Shifts-2SLS Estimates, Normalized By Current Population

	All	Men	Women
	(1)	(2)	(3)
Share foreign-born	-0.170* (0.097)	-0.193 (0.130)	-0.130** (0.058)
Personal demographics	YES	YES	YES
CZ-level characteristics	YES	YES	YES
Commuting zone FE	YES	YES	YES
Year FE	YES	YES	YES
Observations	21,447,083	11,403,216	10,043,867
Mean of dep. variable	0.177	0.227	0.121
St. dev. of dep. variable	0.382	0.419	0.326
Kleibergen-Paap rk Wald F	17.23	16.99	17.48

Notes - Standard errors in parentheses, clustered at CZ level. Data are drawn from the 1990 and 2000 US Census and the 2005-2015 American Community Survey. The following samples were used in the estimation: all currently employed natives ages 25-54 (col. 1); all currently employed male natives ages 25-54 (col. 2); all currently employed female natives ages 25-54 (col. 3). Dependent var.: *Any night work* - binary var. equal 1 if individual departed for work at some point between 6pm and 6am. *Share foreign-born* - share of immigrants as % of current total population. The instrument is also normalized by the current total population. Personal demographics: sex, education (non-parametric), experience, age, age-squared, race (categorical), married (binary), number of own children residing with the individual (non-parametric). *CZ-level characteristics*: % with less than HS degree, % with HS diploma (or equivalent), % with college degree, % male, % white, % black, log of total population. *** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level.

Table C.18: Effect of Immigration on Native Likelihood of Working Night Shifts: 2SLS Estimates (Census/ACS, 1990-2015), Without Controlling for Log of Population

	All	Men	Women
	(1)	(2)	(3)
Share foreign-born	-0.065** (0.032)	-0.075* (0.040)	-0.049** (0.022)
Personal demographics	YES	YES	YES
CZ-level characteristics	YES	YES	YES
Commuting zone FE	YES	YES	YES
Year FE	YES	YES	YES
Observations	21,447,083	11,403,216	10,043,867
Mean of dep. variable	0.177	0.227	0.121
St. dev. of dep. variable	0.382	0.419	0.326
Kleibergen-Paap rk Wald F	34.50	33.03	36.24

Notes - Standard errors in parentheses, clustered at CZ level. Data are drawn from the 1990 and 2000 US Census and the 2005-2015 American Community Survey. The following samples were used in the estimation: all currently employed natives ages 25-54 (col. 1); all currently employed male natives ages 25-54 (col. 2); all currently employed female natives ages 25-54 (col. 3). Dependent var.: *Any night work* - binary var. equal 1 if individual departed for work at some point between 6pm and 6am. *Share foreign-born* - share of immigrants as % of total population in 1970. Personal demographics: sex, education (non-parametric), experience, age, age-squared, race (categorical), married (binary), number of own children residing with the individual (non-parametric). CZ-level characteristics: % with less than HS degree, % with HS diploma (or equivalent), % with college degree, % male, % white, % black. *** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level.

Table C.19: Effect of Immigration on Native Likelihood of Working Night Shifts: 2SLS Estimates (Census/ACS, 1990-2015), Heterogeneity By Education Level

Education group:	HS dropouts (1)	HS degree (2)	Some college (3)	College degree (4)
Panel A: Any night work				
Share foreign-born	-0.036 (0.023)	-0.081*** (0.025)	-0.071** (0.035)	-0.041* (0.024)
Observations	1,770,895	6,647,429	7,114,424	5,914,335
Mean of dep. variable	0.265	0.235	0.180	0.083
St. dev. of dep. variable	0.442	0.424	0.384	0.276
Kleibergen-Paap rk Wald F	63.75	64.67	61.68	42.72
Panel B: Ln(Annual wage income)				
Share foreign-born	-0.260*** (0.091)	-0.125 (0.083)	-0.025 (0.077)	-0.029 (0.101)
Share foreign-born × Day shift	0.034* (0.019)	0.095*** (0.016)	0.001 (0.018)	-0.005 (0.035)
Observations	1,597,635	6,172,053	6,703,447	5,648,829
Mean of dep. variable	9.643	9.948	10.13	10.59
St. dev. of dep. variable	0.950	0.863	0.856	0.886
Kleibergen-Paap rk Wald F	7.709	11.27	10.05	10.89
Personal demographics	YES	YES	YES	YES
CZ-level characteristics	YES	YES	YES	YES
Commuting zone FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES

Notes - Standard errors in parentheses, clustered at CZ level. Data are drawn from the 1990 and 2000 US Census and the 2005-2015 American Community Survey. The following samples were used in the estimation: currently employed natives ages 25-54 with less than a high school degree (col. 1); currently employed natives ages 25-54 with a high school degree or equivalent (col. 2); currently employed natives ages 25-54 with some college education (col. 3); currently employed natives ages 25-54 with a college degree (col. 4). *Any night work* - binary var. equal 1 if individual departed for work at some point between 6pm and 6am. *Ln (Annual wage income)* - natural log of total yearly pre-tax wage and salary income. *Share foreign-born* - share of immigrants as % of total population in 1970. *Day shift* - binary var. equal 1 if individual departed for work at some point between 6am and 6pm. Personal demographics: sex, experience, age, age-squared, race (categorical), married (binary), number of own children residing with the individual (non-parametric). *CZ-level characteristics*: % with less than HS degree, % with HS diploma (or equivalent), % with college degree, % male, % white, % black, log of total population. Panel B also controls for the binary var. *Day shift*. *** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level.

Table C.20: Effect of Immigration on Native Likelihood of Working Night Shifts and Wages: 2SLS Estimates (Census/ ACS, 1990-2015), Heterogeneity By Age

Age group:	(1) 25-54	(2) 25-34	(3) 35-44	(4) 45-54
Panel A: Effect of Immigration on Night Shifts				
Share foreign-born	-0.080* (0.044)	-0.068 (0.050)	-0.099* (0.051)	-0.067* (0.037)
Personal demographics	YES	YES	YES	YES
CZ-level characteristics	YES	YES	YES	YES
Commuting zone FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Observations	21,447,083	6,698,174	7,508,269	7,240,640
Mean of dep. variable	0.177	0.175	0.177	0.180
St. dev. of dep. variable	0.382	0.380	0.382	0.384
Kleibergen-Paap rk Wald F	20.68	18.95	18.76	24.82
Panel B: Effect of Immigration on Native Wages				
Share foreign-born	-0.101 (0.067)	-0.228* (0.122)	-0.078 (0.077)	-0.027 (0.064)
Share foreign-born*day	0.079*** (0.019)	0.070** (0.034)	0.102*** (0.019)	0.066*** (0.018)
Observations	20,121,964	6,372,206	7,025,068	6,724,690
Kleibergen-Paap rk Wald F	10.63	9.723	9.689	12.75
Sanderson-Windmeijer F test (first stage #1)	81.41	76.72	78.70	85.72
Sanderson-Windmeijer F test (first stage #2)	109.3	102.9	109.6	103.0

Notes - Standard errors in parentheses, clustered at CZ level. Data are drawn from the 1990 and 2000 US Census and the 2005-2015 American Community Survey. The following samples were used in the estimation: all currently employed natives ages 25-54 (col. 1); all currently employed natives ages 25-34 (col. 2); all currently employed natives ages 35-44 (col. 3); all currently employed natives ages 45-54 (col. 4). Dependent var.: *Any night work* - binary var. equal 1 if individual departed for work at some point between 6pm and 6am. *Share foreign-born* - share of immigrants as % of total population in 1970. Personal demographics: sex, education (non-parametric), experience, age, age-squared, race (categorical), married (binary), number of own children residing with the individual (non-parametric). CZ-level characteristics: % with less than HS degree, % with HS diploma (or equivalent), % with college degree, % male, % white, % black, log of total population. *** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level.

Table C.21: Prevalence of Night Work by Industry and Occupation

Industry	% Working Night Shifts	Occupation	% Working Night Shifts
<i>Panel A: Occupations and Industries with Largest % of Nightly Shifts (US Census, 1990)</i>			
Logging	54.2	Structural metal workers	55.9
Army	53.7	Bakers	54.5
Retail bakeries	50.1	Crane, derrick, winch & hoist operators	49.6
Coal mining	48.1	Miners	48.6
Meat products	47.1	Millwrights	48.1
Iron & steel foundries	46.7	Machinery maintenance occupations	47.9
Metal mining	45.1	Explosive workers	47.9
Bakery products	44.0	Postal clerks (excluding mail carriers)	47.9
Navy	41.9	Garbage & recyclable material collectors	47.7
U.S. Postal Service	41.7	Fishers, hunters & kindred	47.1
<i>Panel B: Occupations and Industries with Largest % of Nightly Shifts (ACS, 2015)</i>			
Metal mining	59.7	Nail & tacking machine operators (woodworking)	57.2
Coal mining	49.4	Explosive workers	54.7
Logging	49.3	Power plant operators	53.9
Railroad locomotives & equipment	46.6	Tool & die makers & die setters	53.7
Army	46.6	Crane, derrick, winch & hoist operators	48.9
Structural clay products	46.1	Fishers, hunters & kindred	48.9
Ship & boat building/repairing	44.2	Miners	48.7
Iron & steel foundries	43.5	Other plant & system operators	48.4
Nonmetallic mining & quarrying (except fuels)	43.1	Furniture & wood finishers	48.2
Primary aluminum industries	41.8	Sawing machine operators & sawyers	47.2

Notes - Data are drawn from the 1990 US Census. Table is based on variables OCC1990 and IND1990, and shows breakdown by the % of individuals working night shifts. Table was generated from the sample of all individuals aged 25-54 regardless of the immigration status. Night work is defined by a binary variable equal to 1 if individual departed for work at some point between 6pm and 6am.

Table C.22: Effects of Immigration on Fraction of Natives Working Night Shifts: 2SLS First-Difference Estimates (Census/ ACS, 1990 & 2015), Controlling for CZ levels of Night Jobs in 1990

	1990-2015 Long difference			
	(1)	(2)	(3)	(4)
Δ Share foreign-born (1990-2015)	-0.281* (0.168)	-0.273* (0.154)	-0.255* (0.148)	-0.234* (0.128)
1990 CZ occupation shares		YES	YES	YES
1990 CZ industry shares			YES	YES
1990 CZ night share above median				YES
CZ-level characteristics	YES	YES	YES	YES
Observations	674	674	674	674
R-squared	0.285	0.301	0.349	0.425
Kleibergen-Paap rk Wald F	6.141	7.222	7.157	7.290

Notes - Standard errors in parentheses, clustered at CZ level. Data are drawn from the 1990 U.S. Census and the 2015 American Community Survey. *1990-2015 Long difference* – a 1990-2015 level change in the share of employed natives ages 25-54 working in a CZ at night (i.e. departing for work between 6pm and 6am). *Δ Share foreign-born (1990-2015)* - a level change in the CZ-level immigrant share between 1990 and 2015. *Δ IV (1990-2015)* - a level change in the shift-share CZ-level instrument between 1990 and 2015. *CZ-level characteristics*: % with less than HS degree, % with HS diploma (or equivalent), % with college degree, average experience, average age, % married, average # of own children, % male, % white, % black, log of total population. *** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level.

Table C.23: Effects of Immigration on Native Likelihood of Working Night Shifts: 2SLS Estimate (Census/ACS, 1990-2015), Controlling for Differential Trends Across CZs with High vs. Low Share of Night Workers in 1990

	All	Men	Women
	(1)	(2)	(3)
Share foreign-born	-0.068* (0.038)	-0.079* (0.048)	-0.049* (0.027)
Personal demographics	YES	YES	YES
CZ-level characteristics	YES	YES	YES
High/low night share in 1990 (linear trends)	YES	YES	YES
Commuting zone FE	YES	YES	YES
Year FE	YES	YES	YES
Observations	21,447,083	11,403,216	10,043,867
Mean of dep. variable	0.177	0.227	0.121
St. dev. of dep. variable	0.382	0.419	0.326
Kleibergen-Paap rk Wald F	19.23	18.69	19.84

Notes - Standard errors in parentheses, clustered at CZ level. Data are drawn from the 1990 and 2000 US Census and the 2005-2015 American Community Survey. The following samples were used in the estimation: all currently employed natives ages 25-54 (col. 1); all currently employed male natives ages 25-54 (col. 2); all currently employed female natives ages 25-54 (col. 3). Dependent var.: *Any night work* - binary var. equal 1 if individual departed for work at some point between 6pm and 6am. *Share foreign-born* - share of immigrants as % of total population in 1970. *High/low night share in 1990 (linear trends)* - 2 linear trends; one for commuting zones with above-median share of night workers in 1990; the other for commuting zones with below-median share of night workers in 1990. *Personal demographics*: sex, education (non-parametric), experience, age, age-squared, race (categorical), married (binary), number of own children residing with the individual (non-parametric). *CZ-level characteristics*: % with less than HS degree, % with HS diploma (or equivalent), % with college degree, % male, % white, % black, log of total population. *** Significant at the 1% level. ** Significant at the 5% level. * Significant at the 10% level.