Extended Abstract

The Effect of Immigrants on the U.S. Labor Market: The Spatial versus the Occupational Approach

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Introduction

The impact of immigration on the local labor market has been studied intensively in recent years, but a consensus regarding its net effect has remained elusive. Previous research (e.g., Grossman 1982; Smith and Edmonston 1997) usually finds little net effect of immigrants on local labor market outcomes. These studies frequently compare U.S. states (or sometimes metropolitan areas) with a high proportion of immigrants to those with a lower proportion. Because immigrants are geographically concentrated (Waldinger and Lee 2001), and because they tend to have fewer human capital endowments than natives (Borjas 1999), the expectation has been that areas with a higher proportion of immigrants should have lower average incomes (or lower average incomes among less educated workers) *ceteris paribus*. This is the spatial approach in the study of the impact of immigrants, and it usually does not find strong evidence of a significant net effect on local labor market conditions.

Because empirical studies using large data sets typically do not find any net effect of immigrants, some sociologists (e.g., Sassen 1995; Waters 2003) have explained this result as indicating that immigrant labor markets are highly segregated from those of natives. That is, new immigrants are said to enter occupational enclaves or niches that tend to be occupied by previous immigrants. The further influx of immigrants would therefore only increase competition among immigrants themselves rather impact the incomes of native workers.

A contrasting approach is advanced, however, by Borjas *et al* (1996) who have challenged the aforementioned conventional wisdom in this field. They argue that the

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effect of the influx of immigrants spreads quickly throughout the nation, and that investigating states as the unit of analysis does not reveal the real effect of immigrants on natives' wage. First of all, Borjas *et al* contend that natives respond quickly to the influx of immigrants by fleeing those areas where there are large numbers of immigrants. Secondly, capital tends to conversely relocate to those areas where there is a cheap supply of labor that is provided by immigrants. These contrary movements of capital and native labor imply that the impact of the immigrants on the labor market is more national than local.[1]

Using data from the 1980 and 1990 Censuses, and applying a factor proportion methodology, Borjas *et al* find that the influx of less educated immigrants reduces natives' wages in the lower part of the distribution (particularly among high school dropouts). Their model implicitly assumes that the impact of immigrants cannot be identified at the level of the local labor market, but must instead be considered at the national level. Their results differ from previous research in that they indicate that the influx of immigrants has a negative net effect on the incomes of native workers.

In this paper, we extend the approach of Borjas *et al.* (1996) by investigating the impact of immigrants on the national labor market. Although reasonable, the conclusions of Borjas *et al.* (1996) are highly dependent upon the particular assumptions of their methodology (involving labor supply functions and a production function that specifies the substitutability of immigrant for native workers). In our extension of their general approach, we estimate a multilevel model that is based on three-digit occupational categories as the unit of analysis. Our study is also a national level approach, but it utilizes many more degrees of freedom by investigating variation in the proportion immigrant across three-digit occupational categories over time. Our methodology thereby avoids microeconometric assumptions and is instead more descriptive of actual patterns in the data which, for our analysis, are obtained from the Outgoing Rotation Groups for the Current Population Survey from 1994 to 2002. Finally, we use these same data to estimate a state-level model in order to demonstrate how conclusions about the impact of immigrants are sensitive to the unit of analysis that is employed.

In other words, our analysis provides additional evidence to investigate Borjas *et al*'s contention that the effect of immigrants on labor market outcomes is best considered at the national level. The fundamental problem is how to define and investigate processes that operate at the national level. Treating the national labor market as a single unit of analysis generally does not provide many degrees of freedom for multivariate statistics. In principle, a comparative cross-national study would increase the degrees of freedom,

[1]Some ethnographic studies also find that immigrants sometimes substitute for native workers in several occupations. These studies have been conducted in narrowly defined geographical areas.

but this approach is limited in its capacity to explain changes in a single country over time.

We adopt an alternative approach which is to investigate the impact of immigrants in occupational labor markets. Ethnographical studies have already adopted occupational markets as a basic unit of analysis, and many if not all occupational labor markets are significantly national or at least are embedded in national labor market conditions. Therefore, if there is a significant negative effect of immigrants on labor market outcomes, then the higher the proportion of immigrants in an occupation at the national level, the lower the mean income of that occupation other things being equal.

Cross-sectional comparison between occupations, however, might reach conclusions that derive from a spurious correlation. In the case of the spatial apprach, immigrants often cluster in states that have better labor market conditions thus producing a spurious correlation between immigrants and area outcomes. Similarly, the correlation between immigrants and occupational outcomes might reflect occupational changes such as skill biased technological change which cannot be fully measured by schooling. To overcome this pitfall, we investigate the correlation between the change in occupational income and the change in the proportion of immigrants over time. In sum, our hypothesis is that *the higher the proportion of immigrants in an occupation increases over time, the lower the mean income of that occupation over time* after controlling for other relevant factors.

Data and Method

To test this hypothesis, a longitudinal data which contains variables such as the change of occupation mean wage, the change of proportion of immigrants in occupation, and other time varying predictors is necessary. We construct the data from Current Population Survey Outgoing Rotation Group (CPS-ORG) from year 1994 to year 2002. CPS-ORGs have started to add questions on nativity and birth place from 1994. The mean wage by occupation, the proportion of immigrants of each occupation, and other proportions by the educational level, gender, union membership, part time job, public sector, and manufacturing sector of each occupation are calculated from each year's CPS-ORG data-set, producing longitudinal data-set whose unit of analysis is an occupation. To compare occupational approach with spatial approach, we construct another data-set whose unit of analysis is a state, which has the same variables as the occupational data-set.

Immigrants are defined those who were born in foreign countries and whose parents also have foreign citizenship. Mean wages refers to hourly mean wages. CPS-ORGs report hourly wage of hourly workers and weekly workers of all other workers. For

non-hourly workers, we estimated it by dividing weekly wage by weekly hours of work. For hourly workers, we estimated it by the survey question itself. Top-coding problem is adjusted by log-normal distribution. Inflation effect is fixed at 2002 constant price according to CPI-X. We exclude the cases whose hourly wages after adjustments are less than 50 cents. Sample is restricted aged 18 to 65 wage workers. Both male and female are included. Self-employed and military force are excluded.

The trajectories of mean wage and the proportion of immigrants in the given period of time vary across occupation and initial statuses also vary across occupation. Multilevel growth models are appropriate with this condition. Equation (1) shows the model with random intercept and random slope of time effect. The mean hourly wage of occupation j at time t is the function of the yearly change, $YEAR_{jt}$, the proportion of immigrants of occupation j at time t, $IMMIG_{jt}$, and the other k time-varying control variables, $CONTROL_{kjt}$. ε_{jt} refers to a level 1 disturbance. u_{0j} refers to the level 2 disturbance of intercept and u_{1j} refers to the level 2 disturbance of time. Model 5 in Table 2 shows the result of this model. The parameter estimated in equation (1) reflects both the effect of independent variables on the initial status and the effect on yearly change.

$$\begin{aligned} MEANWAGE_{jt} = &[\gamma_{00} + \gamma_{10}YEAR_{jt} + \gamma_{20}IMMIG_{jt} + \sum^{K}\gamma_{j0}CONTROL_{kjt}] \\ &+ [u_{0j} + u_{1j}YEAR_{jt} + \varepsilon_{jt}] \\ &\text{where} \\ \varepsilon_{jt} \sim &N(0, \sigma_{\varepsilon}^2) \quad \text{and} \quad \begin{bmatrix} u_{0j} \\ u_{1j} \end{bmatrix} \sim N\left(\begin{bmatrix} 0 \\ 0 \end{bmatrix}, \begin{bmatrix} \sigma_0^2 & \sigma_{01} \\ \sigma_{10} & \sigma_1^2 \end{bmatrix}\right) \end{aligned} \tag{1}$$

To isolate the effect of the increase of immigrants at each occupation over time, all variables are centered to the initial value. $CMEANWAGE_{jt}$ in Equation (2) is the change of mean wage of occupation j at time t from the initial mean wage at time 0 which is year 1994. Thus every occupation has initial mean wage of 0 at time 0. All independent variables are also centered to its initial value. Parameter estimators are not affected by the initial differences by occupation. The parameter estimator of immigrants in Equation (2) shows the net effect of the increase of immigrants over time. The intercept of Equation (2) is fixed to 0 for all occupation, thus we set only the slope of time random. Model 6 in Table 2 shows the result of this model.

$$
\begin{aligned}
CMEANWAGE_{jt} = [\gamma_{00} + \gamma_{10} CYEAR_{jt} + \gamma_{20} CIMMIG_{jt} + \sum^{K} \gamma_{j0} CHofCONTROL_{kjt}] \\
+ [u_{1i} YEAR_{jt} + \varepsilon_{jt}] \\
\text{where} \\
\varepsilon_{jt} \sim N(0, \sigma_{\varepsilon}^2) \quad \text{and} \quad u_{1j} \sim N(0, \sigma_1^2)
\end{aligned}
\tag{2}
$$

We run the exactly same model except the unit of analysis with a state level data. Model 1 in Table 1 is the model using Equation (1) using state s instead of occupation j as the unit of analysis. The dependent variable is the mean hourly wage in state s at time t, $MEANWAGE_{st}$. The main independent variable is the proportion of immigrants in state s at time t, $IMMIG_{st}$. Model 2 in Table 1 is the mirror model of Equation (2) with a state level data. The dependent variable is the change of mean hourly wage at state s at time t from the initial value at time 0. Independent variables are the percentage point change over time from time 0. Model 3 and Model 4 in Table 1 use the same data with Model 1 and Model 2 with different dependent variables. Model 3 and Model 4 use the hourly wage of 10th percentile by state instead of the mean hourly wage by state. Model 3 and Model 4 show the effect of immigrants at low income group in each state.

Empirical Results

Table 1 and Table 2 show the result of our model. No negative effects of immigrants are found in Model 1 through Model 4, which are congruent with the results of the previous spatial approaches. The result of Model 1 shows the net positive effect of immigrants at state level, which could be the spurious effect due to the tendency that immigrants concentrate in states where the mean hourly wage are relatively higher. When we control the initial status, the net positive effect of immigrants disappear in Model 2. The increase or the decrease of immigrants in a state does not affect the mean hourly wage of that state.

Contrary to the result of spatial approaches, the occupational approaches the net negative effect of the influx of immigrants. Model 5 in Table 2 shows that the change of the proportion of immigrants in an occupation would be likely to lower the mean wage of that occupation. The higher the proportion of immigrants of an occupation, the lower the mean hourly wage of that occupation. Model 6 in Table 2 shows that even after controlling the initial mean wages by occupation, the increase of the proportion of

immigrants tends to lower the mean hourly wage of that occupation. These results are congruent with the prediction of Borjas *et al.*'s.

In summary, the effects of the influx of immigrants are not limited to the geographically concentrated area of immigrants. The effects of immigrants might spread out nationally. Occupational approach which estimates the impact of immigrants at the national level reveals the net negative effect of immigrants on labor markets. In the full paper, we will discuss the difference between a spatial approach and an occupational approach and we will estimate how much change of income in the given period can be attributed to the influx of immigrants.

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Table 1: The Effect of Immigrants across State[a]

	Model 1		Model 2		Model 3		Model 4	
Fixed Effects								
Year	.1251	***	.1463	***	.0810	***	.0810	***
	(.0175)		(.0232)		(.0091)		(.0139)	
Immigrants[b]	6.6959	***	.0218		.5500		-.0019	
	(1.5238)		(.0216)		(.7612)		(.0129)	
Mean Age[c]	.2802	***	.0004		.1175	***	-.0002	
	(.0374)		(.0006)		(.0212)		(.0004)	
Female	-2.0830		-.0560	*	1.7789		-.0174	
	(2.0566)		(.0219)		(1.2001)		(.0131)	
Black	.5625		-.0580	**	-.7307		-.0041	
	(1.0130)		(.0207)		(.4628)		(.0124)	
Less than HSG	-8.4194	***	-.0981	***	-3.0136	*	-.0285	
	(2.4173)		(.0260)		(1.3810)		(.0156)	
HSG	.9170		-.0124		-.0189		-.0114	
	(1.5820)		(.0186)		(.8702)		(.0112)	
BA	9.6229	***	.0615	**	3.2129	**	.0048	
	(2.1167)		(.0232)		(1.2046)		(.0139)	
Grad	24.6678	***	.1901	***	5.6454	***	.0417	*
	(2.7413)		(.0314)		(1.4458)		(.0188)	
Part Time	.4617		.0049		-1.8532		-.0395	***
	(1.8450)		(.0195)		(1.0648)		(.0117)	
Public Sector	-.0771		.0109		.2066		-.0022	
	(1.7071)		(.0196)		(.8828)		(.0118)	
Union	6.4390	***	.0916	***	1.9014	**	.0317	**
	(1.3526)		(.0168)		(.6702)		(.0101)	
Manufacturing	.9571		-.0523		.7969		-.0304	**
	(1.4926)		(.0184)		(.7702)		(.0110)	
Variance Components								
Level-1 within-state, σ_ε^2	262.92	***	325.97	***	101.23	***	117.36	***
Level-2 In level-1 intercept, σ_0^2	.6191	***			.0776	***		
Level-2 In rate of change, σ_1^2	.0033	**	.0061	***	.0007	**	.0022	***
Level-2 Covariance, σ_{01}	-.0011				.0008			
Goodness-of-fit								
-2LL	517.2		476.3		10.6		7.4	
AIC	551.2		506.3		44.6		37.4	
BIC	584.1		535.3		77.5		66.4	

[a] Source: Authors' own calculation.

[b] All proportions are multiplied by 100. Thus, the meaning of the parameter is net change of mean hourly wage by the increase of independent variable by 1%.

[c] The mean age is not multiplied by 100 unlike other independent variables.

Table 2: The Effect of Immigrants across Occupation[a]

	Model 5		Model 6	
Fixed Effects				
Year	.1229	***	.0948	***
	(.0096)		(.0198)	
Immigrants[b]	-1.5358	**	-.0147	**
	(.5249)		(.0056)	
Mean Age[c]	.3440	***	.0017	***
	(.0089)		(.0002)	
Female	-2.9147	***	-.0454	***
	(.3324)		(.0048)	
Black	-1.3464	*	-.0188	***
	(.5477)		(.0055)	
Less than HSG	-3.0739	***	-.0258	***
	(.6001)		(.0067)	
HSG	-.1717		-.0077	
	(.4331)		(.0047)	
BA	10.1294	***	.0381	***
	(.5266)		(.0063)	
Grad	13.2796	***	.0884	***
	(.5471)		(.0087)	
Part Time	-.7034		.0005	
	(.5179)		(.0059)	
Public Sector	-.3086		.0182	**
	(.4383)		(.0060)	
Union	4.2905	***	.0450	***
	(.4381)		(.0050)	
Manufacturing	1.4580	***	.0030	
	(.3329)		(.0061)	
Variance Components				
Level-1 within-state, σ^2_ε	161.90	***	183.36	***
Level-2 In level-1 intercept, σ^2_0	6.4037	***		
Level-2 In rate of change, σ^2_1	0.0178	***	.1579	***
Level-2 Covariance, σ_{01}	.1242	***		
Goodness-of-fit				
-2LL	17383.5		17221.7	
AIC	17417.5		17251.7	
BIC	17489.1		17314.9	

[a] Source: Authors' own calculation.

[b] All proportions are multiplied by 100. Thus, the meaning of the parameter is net change of mean hourly wage by the increase of independent variable by 1%.

[c] The mean age is not multiplied by 100 unlike other independent variables.