Recent Immigration: The Diversity of Economic Outcomes in Metropolitan America[1]

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Abstract

Immigration to the United States is a hotly debated political topic that also generates considerable academic study. Studies routinely examine subnational areas to take advantage of the widely varying local concentrations of immigrants. Yet their conclusions are wide ranging. One reason why the regional influence of immigrants is so hard to assess is the varied economic responses that can occur. For example, in response to an influx of recent immigrants, natives and previous immigrants may out-migrate to produce no net effect on total labor supply and, hence, no net effect on employment or wages. Moreover, differences in industry composition, amenities, and housing stocks can lead to heterogeneous labor market effects of immigration across regions. Using county- and metropolitan area-level data, this study examines the effects of recent immigration on U.S. metropolitan labor market outcomes, such as internal migration, wages, labor force participation, and housing costs. Using instrumental variables estimation, the study detects large net out-migration responses of nonimmigrants to recent immigration. The analysis also finds that recent immigration has heterogeneous effects across different-sized metropolitan areas. Finally, the study detects threshold effects beyond which nonimmigrants become more responsive to immigration.

[1] The authors presented an earlier version of this article at the 55th North American Regional Science Association Meetings, New York, New York; the 48th Western Regional Science Association Meetings, Napa Valley, California; and the 2009 Annual Meeting of the Association of American Geographers, Las Vegas, Nevada.

Introduction

Immigration has become a hot-button issue in most advanced economies. A widely held view in many quarters is that immigrants take jobs away from native workers, create crime, and place burdensome demands on public services (for related discussion, see Borjas, Grogger, and Hanson, 2006; Cutler, Glaeser, and Vigdor, 2007). Others point to favorable aspects of immigration, including providing new labor supply, attracting needed residents to declining communities, and providing a source of new ideas and innovation (Chellaraj, Maskus, and Mattoo, 2005). Not surprisingly then, the controversy surrounding immigration has drawn renewed academic attention regarding its effect on labor and housing markets (Borjas 2003, 2005; Card, 2001; Card and DiNardo, 2000).

Regarding the overall national labor market effects of immigration, Borjas (2003, 2005) argued that a 10-percent increase in immigration reduces the wages of low-skilled workers by 3 to 4 percent. Most of the literature, however, argues that immigration has a very small effect on native workers' wages (Card, 2005). Rather than examining national effects, recent studies have primarily appraised the so-called "area" effects of immigration by examining its effects on local labor markets. These studies examine whether wages of native workers in areas that have received more immigrants have responded differently than areas that have not received as many immigrants (Borjas, 2005; Card, 1990). The studies have produced varied findings, however, although most tend to find very little effect on wages and very little offsetting migration behavior of native-born residents (for example, Card, 2005; Peri, 2007).

Area studies face a host of complexities that complicate discerning the effects of immigration. The major complexity perhaps is whether native workers migrate elsewhere in response to immigrants, which would diffuse the labor market effects across the country (Borjas, Freeman, and Katz, 1997; Frey, 1995). To the extent that immigrants depress local wages, native workers would have incentives to relocate to different areas. A critical factor then is the degree of substitutability between immigrants and native workers. So, studies in recent years have focused on the effects of immigration on particular education/experience cohorts (Borjas, 2003; Card and Lewis, 2005) to assess the degree of substitutability between immigrant and native workers. A general finding is that immigration has relatively small effects on even the most directly affected workers, such as native high school dropouts (Card, 2005), although research by Borjas (2003, 2005) is a notable exception.

Card and Lewis (2005) noted that one explanation for the relatively small area effects for native workers is that immigration has widespread effects beyond those with low skill levels in the local area. This point motivated Ottaviano and Peri (2005) and Peri (2007) to consider how low-skilled immigrants may even be complementary for a wide range of higher skilled native workers. Immigrants bring different cultures, skills, and languages than those possessed by natives. Ottaviano and Peri contended that too much emphasis had been placed on the income distribution effects of immigrants, with the focus on the wages of low-skilled versus high-skilled cohorts. Rather, they argued that more attention should be paid to the *aggregate* effects to reflect these complementarities. Consistent with low-skilled immigrants being complementary to higher skilled native workers, their findings suggest that an 8-percent increase in immigration reduces the wages of native high school dropouts by about 2 percent, but *overall* wages of native workers increase by 2 percent.

An aggregate focus seems prudent for understanding the widespread angst that many native residents—even those who appear only tangentially affected in the labor market—feel regarding immigration. Recent studies found that immigrants have wide-ranging effects on local housing markets (Glaeser and Gyourko, 2005; Saiz, 2003), public service provisions such as schools, and possibly crime, as previously mentioned. Thus, all residents may be affected by recent immigrants, which could alter their residential location decisions within and between urban areas.

Our point of departure is that if immigrants have such far-sweeping socioeconomic effects within and between metropolitan areas, assessments of aggregate outcomes would help inform the overall adjustments that are taking place within local communities. With the weaker economy during the current decade and the fact that immigrants are becoming a larger share of the workforce, it is also possible that immigration's influence differs from that in past decades; that is, rather than having very little effect as in the past, the effect may become more important as immigration levels cross certain thresholds.

Perhaps more important is the possibility that, given the differences in geographic location, industry and skill compositions, urbanization, and so forth, immigration has heterogeneous effects across different metropolitan areas. Partridge et al. (2008a) found that immigration has diverse effects across the country, with the Eastern United States having a more favorable link between immigration and job growth.[2] Indeed, given differing housing markets and access to jobs, distinctive effects may even exist *within* given metropolitan areas, such as between the suburbs and the central city. For example, as reported in the 2000 census, although the percentage of the population that was foreign born in the Chicago metropolitan area was 16 percent, it varied from 20 percent in Cook County (22 percent in the city of Chicago) to 1.5 percent in suburban Jasper County. Only considering aggregate-metropolitan area-level analysis as done in the past literature may be obscuring important *intrametropolitan area* effects. Such disparate patterns within and between metropolitan areas could explain why the relative political support for immigration can vary greatly by place.

Therefore, this study examines the effect of immigration on economic outcomes across and within U.S. metropolitan areas. Within metropolitan areas, the study differentiates central city from suburban responses to immigration. Given the need to understand the effects of immigration on existing residents, it stresses their response to recent immigration. It also considers heterogeneous responses across different-sized metropolitan areas, between high- and low-immigrant destinations, and the eastern and western regions of the nation. Finally, because the past literature has generally examined the effects of immigration at the aggregate metropolitan level, we compare our within-metropolitan area (county) results to aggregate metropolitan area results to show some key labor market adjustments missed in the past literature. The results point to heterogeneous responses that show how immigration has more complex implications than previously assumed.

[2] Past small area studies have tended to focus on the effects in high-immigration areas, such as California or Miami (Borjas, 2005; Card, 1990; Peri, 2007).

In the remainder of this article, the section on past research and theory describes the model used in the study, followed by the section on empirical implementation. The next section presents the empirical results, which is followed by a section containing summary and concluding thoughts.

Past Research and Theory

Immigration has been modeled in numerous ways, but this study focuses on models that inform econometric efforts. Card's (2001) model has become a workhorse for assessing the effects of immigrants on local labor markets. It is based on an aggregate production function that allows for substitutability between different labor-skill cohorts. Card specified a constant elasticity of substitution production function for a single good, which implies a common elasticity of substitution between occupation/skill cohorts. He showed that wages in occupation or skill cohort *j,* city *c* depend on the foreign worker employment share f_{jc}, fixed effects for city *c* (u^w_c), and fixed effects for occupation *j* (u^w_j). Likewise, he also showed that the native labor-force participation function for cohort *j* (N_{jc}/P_{jc}) also is a function of the same variables (where P_{jc} is the native population). The wage and labor-force participation equations Card used for estimation can be written as:

$$\log w_{jc} = u^w_c + u^w_j + d_1 f_{jc} + e^w_{ij}, \tag{1}$$

$$\log (N_{jc}/P_{jc}) = u^N_c + u^N_j + d_2 f_{jc} + e^N_{ij}, \tag{2}$$

where *e* is the residual. The regression coefficient on the foreign worker share *d* reflects how wages and native labor force participation are affected by changes in immigration.

Ottaviano and Peri (2005) argued that a key disadvantage of the common form of Card's model is that it assumes a common elasticity of substitution between all skill cohorts. In particular, they noted that, (1) even within the same skilled cohort, immigrants and native workers may not be perfect substitutes, and (2) it is quite plausible that, across cohorts, immigrants and native workers may be complements (for example, immigrant high school dropouts and native college graduates). Thus, in trying to assess aggregate labor market outcomes, simply aggregating the various *within*-cohort effects may lead to a form of aggregation bias.[3] Further reinforcing this effect, as noted previously, when one considers that immigration possibly affects a host of offsetting factors outside the labor market, including government services and quality of life, examining particular subgroups in isolation may further give a misleading picture of the role of immigrants on aggregate-native migration patterns.

To provide a more generalized assessment of immigration, then, the framework of this study starts with a model developed by Borjas (2003, 2005). His model differs from the one just described; it directly focuses on how existing-resident migration patterns respond to new immigrants. The key feature is that increases in labor supply, whether from foreign or domestic sources, reduce

[3] Industry composition may change in response to local businesses anticipating more immigrant inflows; for example, food processors may expand in high-immigrant receiving areas or areas with high concentrations of low-skilled workers in general. Yet, Card and Lewis (2005) and Card (2005) found that no more than about 25 percent of relative difference in the shares of high school dropouts across regions can be explained by between-industry composition differences, while at least 75 percent is due to within-industry differences in high school dropout employment shares.

local wages. The decline in wages induces net out-migration until nominal wages are equalized across locations and the long-run equilibrium is restored. For example, when assuming native and immigrant labor are nearly perfect substitutes, an influx of immigrants produces a correspondingly equal (net) out-migration of native workers and past immigrants. In the medium to long term, the offsetting net out-migration implies that local wages are not affected, unemployment (or employment) rates are unchanged, and long-term population growth is unaltered.

Aside from native worker out-migration, if natives and immigrants are nearly perfect substitutes, the local labor market would then appear to be unaffected by a surge in recent immigrants. For this reason, Borjas' model can explain why past studies tend to find that influxes in immigration have little effect on local labor markets (for example, Card's 1990 study of the influence of Mariel Boatlift on Miami). Indeed, Partridge and Rickman (2006) found almost one-for-one offsetting native out-migration in response to new immigrants when considering counties of metropolitan areas. Note that, although local labor markets may appear to be *relatively* unaffected by immigration, in this formulation the net out-migration of native workers spreads the labor market effects of immigration across the country until the spatial equilibrium is restored. Although Borjas' approach may more accurately represent regional labor market dynamics, it may still be too narrowly focused on particular labor market interactions.

In this study, we use Borjas' labor market model and also extend it to consider immigrant effects that occur outside the labor market. Following Borjas (2005), we write labor demand for location *i* (which can be a county or metropolitan area), period *t* as:

$$w_{it} = \boldsymbol{X}_{it}\boldsymbol{L}^{\eta}_{it,}\ \mathbf{L}_{it} = \mathbf{M}_{it} + \mathbf{N}_{it}, \tag{3}$$

where w is the average wage in location i, and $\boldsymbol{X}$ is a demand shifter. We allow labor demand to be affected by total labor force size to account for agglomeration economies ($X(\mathbf{L})$, $X_L > 0$). One possible shortcoming in past efforts to model immigration is that they typically overlook the observation that immigrants can improve labor market outcomes because of favorable net agglomeration effects and complementarities (or worsen outcomes if there are severe congestion effects).[4] The elasticity of labor demand is η, and $\boldsymbol{L}$ is the total labor supply composed of $\boldsymbol{M}$ and $\boldsymbol{N}$, which are, respectively, the stocks of immigrants and natives.

We treat past immigrants as part of the native stock $\mathbf{N}$ after a sufficient lapse of time, and thus $\boldsymbol{M}$ represents recent immigrants in our empirical assessment, becoming a flow. That is, while Borjas (2003, 2005) stressed the stock of immigrants, we focus on the marginal effects of recent immigrants. One reason to focus on the recent immigrants is that it is more consistent with policy proposals that seek to limit or alter new immigrant inflows, which immediately have much stronger effects on flows rather than on stocks. Another reason is that the longer immigrants remain in the country, the more they assimilate into the labor market by learning the language and culture and receiving specific workplace training.

[4] Immigrants can favorably affect agglomeration effects by increasing the size of the local labor market and labor productivity and by increasing the variety of consumption amenities that are available; for example, the number of Thai restaurants (Ottaviano and Peri, 2005).

If recent immigrants in equation (3) push wages below those found in other regions, there would be some offsetting migration flows of natives and past immigrants away from location *i*. Borjas assumed that the net native migration rate at location *i* is a positive function of the difference between local wages w_{it} and the national equilibrium wage w^*_{t-1}:

$$\Delta N_{it}/L_{it-1} = v_{it} = \sigma(w_{it-1} - w^*_{t-1}), \tag{4}$$

where σ is the labor supply elasticity. Migration is assumed to respond to wage differentials after a lag due to moving costs and information decay. The period of time that we consider is sufficiently long so that almost all such offsetting migration generally should be completed.

Borjas (2005) solved equations (3) and (4), leading to expressions in which local wages and net migration are reduced-form functions of immigrant inflows. Because he assumed that immigrant and native workers are perfect substitutes, he showed that, as the local market approaches a new long-run equilibrium, net native migration entirely offsets new immigrants, with wages fully returning to the initial level w^*. Given our focus on immigrant flows, it should be noted that, in the interim, if supply adjusts sluggishly, influxes of migrants may increase the local unemployment rate and reduce local wages and the employment rate (employment/population).

A weakness of using equation (4) for our empirical estimation is that native migrants respond only to labor market effects that are manifested through *nominal* wage differentials. Immigrants also can affect *real* wages through altering the cost of housing (Saiz, 2007). Moreover, migration responses in general are associated with utility differentials that cause households to "vote with their feet" in a Tiebout fashion (Banzhaf and Walsh, 2008). If immigration affects regional *utility* differentials, such as by altering quality of life, native migration may still respond even if nominal/real wages do not change. Note that offsetting native migration may simply be in the form of prospective in-migrants avoiding areas with high rates of immigration (Keeton and Newton, 2005).

To reflect these additional considerations, we rewrite equation (4) to show that migration positively responds to differentials between indirect utility in region *i* (V) and the representative national level V*:

$$\Delta N_{it}/L_{it-1} = v_{it} = \sigma^U(V_{it-1}(w_{it-1}, \mathbf{A}_{it-1}, \mathbf{Z}_{it-1}, \Delta \mathbf{M}_{it}/\mathbf{L}_{it-1}) - V^*(w^*_{t-1}, \mathbf{A}^*, \mathbf{Z}^*)), \tag{5}$$

where σ^U is the migration response to utility differentials, $\boldsymbol{A}$ represents a vector of constant and time-varying amenity and quality-of-life attributes, and $\mathbf{Z}$ depicts other shifters that affect migration behavior, such as moving costs, industry composition, or cost of living. New immigration is denoted by $\Delta \boldsymbol{M}_{it}$, which affects native migration through changing labor market conditions, as well as through other quality-of-life changes that immigration may induce. Likewise, because other labor market indicators, such as employment/population rates, are affected by the same underlying factors, we include the same $\boldsymbol{A}$ and $\mathbf{Z}$ variables in corresponding empirical models that follow.

Estimating a more general reduced-form model based on equation (5) rather than the labor market model in (4) requires including more underlying factors of the region than local labor market conditions. The interpretation of the empirical results also differs in the more general formulation. For example, by allowing for potential agglomeration economies, local wages may be only modestly depressed below w^* after an influx of immigrants. Thus, fewer natives would out-migrate to restore equilibrium. Similarly, if immigrants are substitutes for low-skilled natives but complements for the remaining native workforce, immigration may lead to net native *in*-migration in the aggregate. Finally, if immigrants also increase the costs of public-service provision, then a larger out-migration response of native residents would occur than would otherwise.

Empirical Implementation

In this study, we examine both samples of U.S. metropolitan counties (excluding those in Alaska and Hawaii) and aggregations of these counties into their metropolitan areas, as defined by the U.S. Office of Management and Budget in 2003 using population from the 2000 census (OMB, 2003). To allow for spatial heterogeneity in the labor market effects of immigration, we also construct several subsamples of metropolitan counties and metropolitan areas.

We examine the effects of immigration on several labor market indicators during the 2000-to-2005 period for each sample and subsample. The change in the labor market indicator (Y) for county or metropolitan area *i* over the period is regressed on a vector of location-specific fixed or predetermined factors (**X**), immigration over the period (*Immigrant*), state fixed effects (σ_s), and a stochastic term (ε):

$$Y_{i,00\text{-}05} = \alpha + \gamma X_i + \beta \mathit{Immigrant}_{i,00\text{-}05} + \sigma_s + \varepsilon_{i,} \tag{6}$$

where **X** includes the variables in the **A** and **Z** vectors in equation (5). One difference from equation (5) is that, in equation (6), we are estimating a reduced form model that omits wages.

In specifying the **X** variables, along with the need to fully model a community's quality of life, we agree with Borjas' (2005) point that omitting key time-varying factors associated with an area's persistent growth could lead to greater contemporaneous levels of both native and international migration—in which this bias from omitting these lagged time-varying factors could positively bias the *Immigrant* coefficient in the native migration model. In fact, many of these omitted time-varying factors could be demographic in nature. Thus, by more fully specifying the **X** variables than is common in the literature, we are more likely to detect that native migration is more responsive than the relative small response that characterizes much of the literature (Card, 2005). To be sure, the omitted variable bias we are referring to is different than a contemporaneous reverse causality that would positively bias international immigration effect (for example, contemporaneous demand shocks that lift both native and international migration that are only emphasized in the past literature). In exhibits 1A and 1B, we describe the specific **X** variables, showing the descriptive statistics for the major variables by all county and metropolitan subsamples, respectively.

The labor market indicators include net internal migration over the period as a percentage of the beginning population level as reported by the Census Bureau, the change in the Bureau of Labor Statistics employment/population rate, the percentage of change in Bureau of Economic Analysis wage rates, and the percentage of change in the median Fair Market Rent of two-bedroom apartments by the U.S. Department of Housing and Urban Development.

We expect *Immigrant* to induce native out-migration. The greater the native out-migration response, the smaller will be the expected negative effects of *Immigrant* on the employment and

Exhibit 1A

Mean and Standard Deviations (in parentheses) of Major Variables by Subsamples: Metropolitan Counties (1 of 2)

Variable	Description	All MA	Large	Medium	Small	High Mig	Low Mig	Eastern	Western
Internal migration%	Net internal migration during 2000-to-2005 period as percent of 2000 population	3.22 (7.42)	5.19 (9.76)	3.41 (6.24)	1.61 (5.52)	2.36 (8.58)	3.66 (6.71)	3.17 (7.44)	3.31 (7.38)
Population growth	Percent change in estimated population during 2000-to-2005 period	6.32 (7.85)	9.38 (9.65)	6.15 (6.69)	4.13 (6.14)	8.25 (8.51)	5.34 (7.30)	5.77 (7.78)	7.33 (7.88)
Change in employment rate	Change in BLS employment rate during 2000-to-2005 period	– 0.006 (0.02)	– 0.015 (0.02)	– 0.007 (0.01)	0.002 (0.02)	– 0.009 (0.02)	– 0.004 (0.02)	– 0.007 (0.02)	– 0.003 (0.02)
% change in wage	Percent change in BEA wage rate during 2000-to-2005 period	17.84 (6.85)	17.29 (5.23)	18.10 (8.97)	18.08 (6.23)	17.14 (5.37)	18.20 (7.47)	17.78 (7.28)	17.96 (5.99)
% change in house rent	Percent change in HUD Fair Market Rent for two bedrooms ($/month)	18.98 (11.52)	24.47 (12.81)	18.51 (10.09)	15.18 (9.67)	19.37 (11.37)	18.79 (11.60)	18.05 (10.68)	20.71 (12.76)
Immigrant	Net international migration during 2000-to-2005 period as percent of 2000 population	1.06 (1.47)	1.55 (1.87)	0.88 (1.07)	0.82 (1.27)	2.59 (1.58)	0.29 (0.46)	0.94 (1.44)	1.29 (1.51)
Centrality	If a county is within 16 km (10 mi) of the center of the MA	0.41 (0.49)	0.18 (0.38)	0.35 (0.48)	0.62 (0.49)	0.60 (0.49)	0.31 (0.46)	0.39 (0.49)	0.45 (0.50)
Immigrant x centrality	Immigrant-centrality interaction	0.63 (1.35)	0.62 (1.66)	0.56 (1.08)	0.69 (1.24)	1.66 (1.86)	0.11 (0.41)	0.51 (1.25)	0.86 (1.48)
% foreign born 1970	1970 population share that is foreign born or has foreign-born parents	9.03 (9.13)	11.73 (10.74)	8.23 (8.67)	7.55 (7.56)	13.75 (10.81)	6.63 (7.02)	8.27 (9.58)	10.44 (8.05)
House rent 1970	Weighted average owner- and renter-occupied house rent ($/month)	91.92 (28.73)	106.42 (33.71)	87.74 (24.25)	83.87 (22.85)	109.58 (30.90)	82.93 (22.82)	93.39 (29.00)	89.23 (28.06)
% foreign born 1980	Foreign-born population in 1980 census as percent of 1980 population	2.88 (3.65)	4.09 (4.93)	2.49 (2.87)	2.23 (2.63)	5.32 (5.13)	1.63 (1.45)	2.58 (3.37)	3.43 (4.07)

Exhibit 1A

Mean and Standard Deviations (in parentheses) of Major Variables by Subsamples: Metropolitan Counties (2 of 2)

Variable	Description	All MA	Large	Medium	Small	High Mig	Low Mig	Eastern	Western
Dist to Mexico border	Distance to the nearest major U.S.-Mexico border cross point	1,626.41 (675.26)	1,707.02 (722.63)	1,628.39 (709.12)	1,564.48 (606.40)	1,553.00 (790.11)	1,663.80 (605.71)	1,959.04 (498.64)	1,013.02 (508.11)
Dist to center of own MA[a]	Distance (in km) between the county and the center of the MA	25.78 (22.22)	41.02 (24.40)	25.80 (18.54)	14.32 (14.67)	17.71 (19.18)	29.89 (22.55)	26.02 (21.53)	25.34 (23.47)
Inc dist to MA>350k	Incremental distance to the nearest MA with >350,000 population	51.28 (83.21)	NA	NA	124.73 (87.64)	35.43 (62.46)	59.36 (90.98)	39.76 (57.91)	72.53 (113.29)
Inc dist to MA>1.3mil	Incremental distance to the nearest MA with >1.3 million population	82.08 (115.10)	NA	183.03 (122.90)	75.09 (99.62)	76.94 (127.85)	84.70 (108.04)	63.55 (78.02)	116.25 (157.16)
Inc dist to MA>2.5mil	Incremental distance to the nearest MA with >2.5 million population	111.05 (156.23)	133.77 (191.8)	105.53 (125.22)	97.73 (143.41)	98.77 (168.60)	117.31 (149.27)	108.00 (127.87)	116.68 (198.25)
Number of counties		1,058	327	296	435	357	701	686	372

BEA = Bureau of Economic Analysis, Regional Economic Information Service. BLS = Bureau of Labor Statistics, U.S. Department of Labor. HUD = U.S. Department of Housing and Urban Development. MA = metropolitan area, following 2003 definitions. NA = Not applicable.

[a] *The distances are measured from the population-weighted center of the county and the metropolitan area, respectively.*

Notes: Percent foreign born 1970 and 1980 and house rent 1970 are from GeoLytics data. Large MAs: population >1.3 million. Medium MAs: 350,000< population <1.3 million. Small MAs: population <350,000. High Mig is Immigrant *>1%. Low Mig is* Immigrant *<1%. Eastern MA is for metropolitan area counties east of the Mississippi River. Western MA is for metropolitan area counties west of the Mississippi River.*

Exhibit 1B

Mean and Standard Deviations (in parentheses) of Major Variables by Subsamples: Metropolitan Areas (1 of 2)

Variable	Description	All MA	Large	Small	High Mig	Low Mig	Eastern	Western
Internal migration	Net internal migration during 2000-to-2005 period as percent of 2000 population	1.21 (4.86)	1.36 (5.11)	1.09 (4.65)	1.69 (5.60)	0.77 (4.04)	1.07 (4.41)	1.42 (5.48)
% population growth	Percent change in estimated population during 2000-to-2005	4.99 (5.50)	5.83 (5.65)	4.26 (5.28)	7.32 (5.87)	2.84 (4.12)	3.78 (4.73)	6.79 (6.07)
Change in employment rate	Change in BLS employment rate during 2000-to-2005 period	– 0.001 (0.02)	– 0.006 (0.02)	0.003 (0.02)	– 0.005 (0.02)	0.002 (0.02)	– 0.004 (0.02)	0.004 (0.02)
% change in wage	Percent change in BEA wage rate during 2000-to-2005 period	17.44 (4.78)	17.00 (4.63)	17.82 (4.89)	17.22 (4.68)	17.64 (4.88)	17.07 (4.82)	17.99 (4.69)
% change in house rent	Percent change in 2000-to-2005 period in HUD Fair Market Rent for two bedrooms ($/month)	16.16 (9.60)	17.94 (10.38)	14.65 (8.63)	17.91 (10.80)	14.55 (8.05)	15.36 (7.84)	17.35 (11.68)
Immigrant	Net international migration during 2000-to-2005 period as percent of 2000 population	1.39 (1.42)	1.81 (1.50)	1.03 (1.24)	2.48 (1.30)	0.40 (0.50)	1.10 (1.27)	1.83 (1.52)
% foreign born 1970	1970 population share that is foreign born or has foreign-born parents	11.23 (9.01)	13.71 (9.98)	9.13 (7.50)	14.12 (10.02)	8.58 (7.01)	9.97 (8.91)	13.11 (8.86)
House rent 1970	Weighted average owner- and renter-occupied house rent ($/month)	99.47 (20.35)	106.26 (22.47)	93.71 (16.32)	106.41 (22.86)	93.10 (15.21)	99.09 (19.17)	100.04 (22.05)
% foreign born 1980	Foreign-born population in 1980 census as percent of 1980 population	3.83 (3.86)	4.92 (4.36)	2.90 (3.09)	5.54 (4.84)	2.25 (1.35)	2.95 (2.64)	5.14 (4.89)
Dist to Mexico border	Distance to the nearest major U.S.-Mexico border cross point	1,574.73 (725.26)	1,591.71 (791.57)	1,560.28 (665.44)	1,429.39 (793.90)	1,708.40 (628.87)	1,998.11 (492.83)	942.59 (530.54)
Dist to the nearest MA>350k[a]	Distance (in km) between MA and its nearest MA with >350,000 population	83.90 (97.30)	26.67 (55.53)	132.58 (98.78)	58.74 (73.68)	107.04 (110.03)	64.83 (61.34)	112.38 (129.26)
Inc dist to MA>1.3mil	Incremental distance to the nearest MA with >1.3 million population	96.16 (121.81)	118.72 (134.65)	76.98 (106.35)	96.71 (136.66)	95.66 (106.71)	76.74 (79.37)	125.16 (162.18)

Exhibit 1B

Mean and Standard Deviations (in parentheses) of Major Variables by Subsamples: Metropolitan Areas (2 of 2)

Variable	Description	All MA	Large	Small	High Mig	Low Mig	Eastern	Western
Inc dist to MA>2.5mil	Incremental distance to the nearest MA with >2.5 million population	104.21 (159.17)	115.96 (169.57)	94.21 (149.48)	98.54 (167.25)	109.41 (151.63)	95.70 (117.08)	116.90 (206.50)
Number of MAs		359	165	194	172	187	215	144

BEA = Bureau of Economic Analysis, Regional Economic Information Service. BLS = Bureau of Labor Statistics, U.S. Department of Labor. HUD = U.S. Department of Housing and Urban Development. MA = metropolitan area, following 2003 definitions.

[a] *The distances are measured between respective population-weighted centroids of each metropolitan area.*

Notes: Percent foreign born 1970 and 1980 and house rent 1970 are from GeoLytics data. Large MAs: population >250,000. Small MAs: population <250,000. High Mig is Immigrant >1%. *Low Mig is* Immigrant <1%. *Eastern MA is for metropolitan areas east of the Mississippi River. Western MA is for metropolitan areas west of the Mississippi River.*

wage rates, and the less will be the positive effect on housing rents. Thus, to the extent there is heterogeneity in the native migration response, there will be heterogeneity in the responses of the other labor market indicators.

Fixed location-specific factors (**X**) include natural amenities, measured by a 1-to-7 amenity scale constructed by the U.S. Department of Agriculture based on climate, topography, and percentage of water area. To control for market threshold and urban-hierarchy effects on labor market outcomes, three fixed factors also include distances between the population-weighted centroids of the county and the nearest higher tiered metropolitan statistical areas (MSAs) of various population thresholds (Partridge et al., 2008b): (1) the incremental distance to the nearest MSA containing at least 350,000 people, (2) the incremental distance to the nearest MSA containing at least 1.3 million people, and (3) the incremental distance to the nearest MSA containing more than 2.5 million people.[5]

We also include several variables controlling for preexisting demographic and economic conditions, which are from the 1990 census to reduce the potential for statistical endogeneity. To control for industry composition, we include the three 1990 census employment shares comprising agricultural, manufacturing, and mining. Likewise, we control for education composition by including four 1990 educational attainment shares among the adult population.

To control for disequilibrium effects, we include the 1990-level variable that corresponds to the dependent variable in changes. (We use the log 1990 population level in both the migration and population equations.) In addition, we also include the industry mix employment growth rate from shift-share analysis as an exogenous measure of local demand shocks that are national in origin (for example, see Blanchard and Katz, 1992).[6]

For each county-level regression, we also separately add an interaction term between *Immigrant* and an indicator for whether the county is a central county, which is defined as being near the center of the metropolitan area.[7] Partridge and Rickman (2008) found that labor supply, especially among low-skilled workers, appears to be less responsive in central counties to labor demand shocks. Thus, the native migrant response may be more muted in the central part of larger metropolitan areas, which in turn means that immigration would lead to a greater net increase in labor supply, yielding more adverse effects on wages and employment rates.

Immigrant is the net in-migration of the foreign born during the 2000-to-2005 period as a percentage of the population level in year 2000. Net international immigrants are those who crossed the U.S. border (in all 50 states and the District of Columbia) during the specified period.[8] Net internal

[5] If the nearest metropolitan area has a population of more than 2.5 million, all incremental distance variables equal 0. The same principle applies to the calculated incremental distances if the nearest metropolitan area in the next higher tier is of yet a higher tier. See Partridge et al. (2008b) for a similar formulation.

[6] In the county-level model, we include the county's own log population and the overall metropolitan area's log population, as well as the corresponding county-level and metropolitan area-level industry mix growth rates. The metropolitan area-level models include only the corresponding metropolitan area-level measures.

[7] We define a county as being near the center of a metropolitan area if its population-weighted centroid is within 16 kilometers (10 miles) of the population-weighted centroid for the corresponding metropolitan area.

[8] The Census Bureau calculates net international immigration as the sum of three components: (1) net migration of the foreign born, (2) emigration of natives, and (3) net movement from Puerto Rico to the United States (U.S. Census Bureau, 2008a).

migration is defined by moves in which both the origin and destination are within the United States (excluding Puerto Rico) (U.S. Census Bureau, 2008b). In our definition, native migrants can include people who were international immigrants in a previous period. Immigrants include both low-skilled and high-skilled workers, although the foreign born in the United States have lower than average educational attainment levels (Ottaviano and Peri, 2005), among which recent immigrants are increasingly undocumented and uneducated (Passel, 2006).

A primary econometric concern in the past literature is that the *Immigrant* variable may be contemporaneously endogenous. For example, if immigrants chose to locate in areas that face favorable labor demand shocks, the ordinary least square (OLS) estimate of immigration effects on net native migration would be biased upward. Indeed, controlling for the long-term determinants of growth (as we do) will be insufficient if the demand shocks are contemporaneous. Thus, in addition to using ordinary least squares to estimate equation (6), we also estimate equation (6) using the instrumental variables (IV) approach. Our identifying instruments for immigration are the 1970 share of the population that is either foreign born, or people with one foreign-born parent, and the 1980 population share that is foreign born. These two instruments follow other studies that used past immigration patterns to predict current locations (for example, Card and DiNardo, 2000; Saiz, 2007). Basing our selection on the joint strength of the instruments in the first stage in most models, we also select as additional instruments the 1970 median housing costs in the county-level model and the distance to the nearest major Mexican border crossing in the metropolitan area-level model.[9]

We create the subsamples of metropolitan counties and metropolitan areas based on size, intensity of immigration, and geographic proximity. First, we divide metropolitan counties and metropolitan areas into subsamples according to population. We divide metropolitan counties according to whether the county is located in a metropolitan area of 350,000 people or fewer (*Small*), in a metropolitan area between 350,000 and 1.3 million people (*Medium*), and in a metropolitan area of 1.3 million people or more (*Large*). We divide metropolitan areas into only two sizes (*Large* and *Small*), using the population of 250,000 as the dividing point. The past literature suggests that low-wage metropolitan labor markets respond differently, depending on size (Bartik, 2001; Partridge and Rickman, 2008; Weinberg, 2004). In particular, issues of metropolitan job accessibility and potential spatial mismatch appear to increase when the population reaches approximately more than 500,000 residents.

Second, we divide metropolitan area counties and metropolitan areas according to whether immigration during the 2000-to-2005 period constituted 1 percent or more of the 2000 population level (*High*) or not (*Low*). Adverse effects of immigrants are more likely to be observable in areas that have high rates of immigration (Peri, 2007). For example, if there is just a trickle of immigrants, local labor markets and quality of life would change imperceptibly, which would suggest that original native residents would not find it worthwhile to expend the moving costs to relocate.

[9] Except for the distance variables, we obtained the values for the regression variables from the GeoLytics database. We also experimented with distances from the county to various immigrant gateway communities in New York, Miami, Chicago, and San Francisco, as instruments, but they, in general, had weak explanatory power.

We create additional subsamples of metropolitan area counties and metropolitan areas based on whether they were located east (*East*) or west of the Mississippi River (*West*). Many metropolitan areas in the East have long experienced population stagnation or loss, potentially providing housing opportunities for immigrants (Glaeser and Gyourko, 2005). In such cases, the influx of immigrants could improve economic prospects and reduce the likelihood of adverse effects of immigrants on previous residents. Indeed, Partridge et al. (2008a) found immigration to more likely be associated with positive employment growth in the East.

Empirical Results

The empirical results for the entire sample of counties and subsamples described previously appear in exhibits 2 and 3. Exhibit 2 provides results for all metropolitan counties and for subsamples organized by metropolitan size. For each sample, exhibit 2 shows the coefficients and corresponding t-statistics estimated by both OLS and IV for the various labor market effects of recent immigration, including for regressions containing the interaction of recent immigration with central county status. The exhibit reports a chi-square statistic for the joint significance of the immigration variable and its interaction with central county status in this IV regression, followed by the F-statistic for the instruments in the first-stage IV regression, where the interaction term is omitted. The final line of results for each sample reports the centered R-squared for the corresponding second-stage IV regression model without the central county interaction. Exhibit 3 reports the same information for the remaining subsamples of counties but, to conserve space, only for the regressions omitting central county interactions. Exhibit 4 shows corresponding results for all metropolitan areas and selected subsamples.

All Metropolitan Counties

As shown in the first two lines of results in exhibit 2, the OLS estimates for the entire metropolitan county sample suggest that immigrant inflows are associated with significant net native out-migration. Yet, the less-than-proportionate response of native migrants is associated with significantly positive population growth, reduced wages, and a negative (although insignificant) effect on the employment rate.

To account for the possibility that immigrants are attracted to areas where the demand for labor is relatively strong (Card, 2005), we also employ IV estimation. Because the first-stage results help inform our analysis, exhibit 1 in the appendix reports these results in which *Immigrant* for the 2000-to-2005 period is the dependent variable for the all-metropolitan area county model. The first-stage results suggest that immigrants prefer to locate in central counties and in metropolitan areas that are either more populous themselves or closer to successively larger metropolitan areas. Likewise, immigrants appear to prefer to locate in more populous counties and more populous metropolitan areas (all else being constant). Immigration rates also are positively associated with counties and metropolitan areas with greater industry mix employment growth in the 1990s and with counties with greater intensities of agriculture and mining. Finally, the immigration rates for the 2000-to-2005 period also are positively associated with a greater 1990 college graduate share and negatively associated with the 1990 African-American population share. The positive link with college graduates is consistent with immigrants being complements to more highly skilled labor.

The subsequent second-stage IV estimates in exhibit 2 reveal a significantly greater native out-migration in response to immigration. The out-migration response is sufficient to produce no net population growth, an insignificant effect on wages, and an increased employment rate. The greater-than-proportionate response of native migration may be attributable, in part, to three different circumstances: (1) census underestimates of illegal immigration, which means that more immigrants are actually moving to a given location than reported; (2) greater natural population growth among an immigrant population that is younger than natives and has more children; and/or (3) utility and quality-of-life effects that are external to the labor market.[10]

The large estimated out-migration response relative to estimates in the past literature also may be due simply to differences in specifications. Our specification accounts for more persistent time-varying lagged effects. For example, due to complementarities between skilled native workers and immigrants—as well as the link between skilled workers and local growth—omitting lagged educational attainment variables may have positively biased the immigration coefficient in the migration equation in past studies (for example, immigrants and native migration may be greater in areas with historically higher levels of college graduates). To consider this possibility, we reestimated the migration equation after omitting all the other variables except for state fixed effects and international immigration (not shown). In the county-level results, the native migrant response moderated slightly to -2.13.

Exhibit 2

Metropolitan County Results by Metropolitan Area Population[a] (1 of 3)

Sample	Net Native Migration/ Population	%∆Population	∆Employment Rate	%∆Wages	%∆Rent
All metropolitan counties (N=1,058)					
Immigration-OLS[b]	β = – 0.62 (2.21)	β = 0.88 (3.09)	β = – 0.001 (1.49)	β = – 0.63 (2.42)	β = 0.25 (0.72)
Interaction model-OLS[c] *Immigration*	β = – 0.57 (1.59)	β = 0.82 (2.09)	β = – 0.001 (0.72)	β = – 0.56 (1.64)	β = – 0.06 (0.11)
Central cty × immigration	β = – 0.11 (0.29)	β = 0.10 (0.25)	β = – 0.001 (0.62)	β = – 0.11 (0.34)	β = 0.49 (0.92)
Immigration-IV[b]	β = – 2.25 (5.31)	β = – 0.13 (0.30)	β = 0.0025 (2.27)	β = 0.25 (0.63)	β = 0.23 (0.36)
Interaction model-IV[c] *Immigration*	β = – 6.64 (4.49)	β = – 5.11 (3.18)	β = 0.007 (2.15)	β = – 2.31 (1.85)	β = 0.19 (0.11)
Central cty × immigration	β = 7.14 (3.19)	β = 8.08 (3.33)	β = – 0.007 (1.45)	β = 4.44 (2.19)	β = 0.06 (0.02)
χ^2 –Immig & interaction[d]	27.32***	11.11***	6.94**	5.12*	0.31
Inst. F-stat. on immigration[e]	20.47***	20.47***	20.47***	20.47***	20.47***
R^2-2nd stage-IV immigration[f]	0.42	0.41	0.49	0.20	0.31

[10] Dye (2008) reported that, in 2006, fully 20 percent of births were to foreign-born women 15 to 50 years old. The fertility rate corresponds to 71 per 1,000 foreign-born women and 52 per 1,000 domestic-born women, or a 37-percent greater birth rate among immigrant women.

Exhibit 2

Metropolitan County Results by Metropolitan Area Population[a] (2 of 3)

Sample	Net Native Migration/ Population	%ΔPopulation	ΔEmployment Rate	%ΔWages	%ΔRent
Large MAs pop>1.3 million (N=327)					
Immigration-OLS[b]	β = – 1.63	β = – 0.04	β = – 0.002	β = – 0.51	β = – 0.66
	(4.63)	(0.12)	(2.36)	(1.65)	(1.27)
Interaction model-OLS[c]	β = – 1.58	β = – 0.13	β = – 0.002	β = – 0.58	β = – 1.26
Immigration	(3.69)	(0.27)	(2.07)	(1.46)	(1.73)
Central cty × immigration	β = – 0.10	β = 0.17	β = – 0.00	β = 0.15	β = 1.25
	(0.17)	(0.32)	(0.21)	(0.39)	(1.94)
Immigration-IV[b]	β = – 1.72	β = – 0.29	β = – 0.002	β = – 0.13	β = – 0.65
	(3.12)	(0.48)	(2.61)	(0.40)	(0.88)
Interaction model-IV[c]	β = – 4.58	β = – 3.70	β = – 0.004	β = – 1.11	β = – 1.64
Immigration	(3.38)	(2.46)	(2.21)	(1.68)	(1.27)
Central cty × immigration	β = 5.94	β = 7.03	β = 0.03	β = 2.30	β = 2.41
	(2.42)	(2.60)	(1.13)	(1.77)	(0.93)
χ^2 –Immig & interaction[d]	12.61**	6.94*	7.60**	3.26	1.65
Inst. F-stat. on immigration[e]	5.48***	5.48***	5.48***	5.48***	5.48***
R^2-2nd stage-IV immigration[f]	0.59	0.49	0.75	0.40	0.49
Medium MAs 350,000<pop<1.3 million (N=296)					
Immigration-OLS[b]	β = – 0.24	β = 1.09	β = – 0.001	β = – 1.37	β = 0.84
	(0.29)	(1.22)	(0.94)	(1.34)	(0.95)
Interaction model-OLS[c]	β = 0.78	β = 1.85	β = – 0.001	β = – 1.29	β = 0.91
Immigration	(0.72)	(1.59)	(0.41)	(0.92)	(0.68)
Central cty × immigration	β = – 1.68	β = – 1.25	β = – 0.001	β = – 0.11	β = – 0.12
	(1.74)	(1.25)	(0.64)	(0.12)	(0.07)
Immigration-IV[b]	β = 0.42	β = 2.25	β = 0.005	β = – 0.25	β = 4.64
	(0.31)	(1.50)	(2.00)	(0.12)	(1.91)
Interaction model-IV[c]	β = 12.97	β = 8.53	β = 0.003	β = – 10.39	β = 26.28
Immigration	(1.35)	(1.06)	(0.27)	(0.97)	(1.68)
Central cty × immigration	β = – 11.94	β = – 5.97	β = 0.002	β = 10.38	β = – 22.33
	(1.34)	(0.80)	(0.17)	(0.97)	(1.42)
χ^2 –Immig & interaction[d]	1.83	2.41	4.10	0.95	3.53
Inst. F-stat. on immigration[e]	3.61***	3.61***	3.61***	3.61***	3.61***
R^2-2nd stage-IV immigration[f]	0.50	0.47	0.63	0.26	0.25

Exhibit 2

Metropolitan County Results by Metropolitan Area Population[a] (3 of 3)

Sample	Net Native Migration/ Population	%ΔPopulation	ΔEmployment Rate	%ΔWages	%ΔRent
Small MAs pop<350,000 (N=435)					
Immigration-OLS[b]	β = 0.62 (1.5)	β = 2.11 (5.40)	β = – 0.001 (0.82)	β = – 0.41 (1.14)	β = 0.33 (0.57)
Interaction model-OLS[c] *Immigration*	β = – 0.31 (0.6)	β = 1.15 (2.35)	β = 0.003 (1.96)	β = 0.27 (0.46)	β = 1.57 (2.00)
Central cty × immigration	β = 1.21 (1.78)	β = 1.24 (1.92)	β = – 0.005 (2.80)	β = – 0.87 (1.15)	β = – 1.60 (1.77)
Immigration-IV[b]	β = – 0.63 (0.60)	β = 4.42 (3.60)	β = 0.002 (0.50)	β = 2.00 (1.56)	β = – 4.07 (1.91)
Interaction model-IV[c] *Immigration*	β = 6.12 (0.29)	β = 5.79 (0.27)	β = – 0.09 (0.43)	β = – 2.03 (0.12)	β = 98.37 (0.49)
Central cty × immigration	β = – 6.41 (0.32)	β = – 1.30 (0.06)	β = 0.083 (0.44)	β = 3.71 (0.24)	β = – 93.70 (0.51)
χ^2 –Immig & interaction[d]	0.34	11.95***	0.23	2.48	0.40
Inst. F-stat. on immigration[e]	5.03***	5.03***	5.03***	5.03***	5.03***
R^2-2nd stage-IV immigration[f]	0.40	0.35	0.58	0.21	0.17

MA = metropolitan area.

[a] *The model is based on the component metropolitan area counties for the dependent variable shown in each column heading. OLS refers to ordinary least squares and IV refers to instrumental variable estimation in which, depending on the model, the* Immigrant *and/or the* Central cty × immigration *variables are treated as endogenous. The identifying instruments are described in the text. The following variables are also included in each OLS/IV specification: centrality indicator (if within 16 km (10 mi) of metropolitan area centroid), log (county population 1990), log (own metropolitan area population 1990), industry mix employment growth 1990 to 2000, industry mix employment growth 1990 to 2000 of own metropolitan area, percent agricultural employment 1990, percent mining employment 1990, percent manufacturing employment 1990, percent high school graduate 1990, percent with some college 1990, percent with associates degree 1990, percent college graduate 1990, percent African American 1990, amenity rank, incremental distance to metropolitan area with population >350,000, incremental distance to metropolitan area with population >1.3 million, incremental distance to metropolitan area with population >2.5 million, an intercept, and state fixed effects. The IV models further used* percent foreign born 1970, house rent 1970, *and* percent foreign born 1980 *as instruments for* Immigration *and* Central cty × immigration *variables.*

[b] *The* Immigrant *variable is 2000-to-2005 international immigration as a share of 2000 population.*

[c] *The model includes the* Central county *indicator interacted with the* Immigrant *variable.*

[d] *The χ^2 statistic testing the joint significance of the* Immigrant *and the* Central cty × immigration *variables.*

[e] *The F-statistic testing the joint significance of the identifying instruments in the first-stage model for the* Immigration *variable. The F-statistic measures the strength of the identifying instruments.*

[f] *The R^2 statistic for the second-stage IV* Immigration *model shown in the first row.*

*Notes: Absolute value of robust t-statistics (from STATA cluster command) for OLS models and z-statistics for IV models are reported in parentheses. ***, **, * denote significance at the .01, .05, and .10 levels.*

The overall IV pattern is consistent with Frey (1995), Borjas (2005), and Borjas, Freeman, and Katz (1997), whereby native out-migration mostly offsets the labor market effects of new immigrants. The rise in the employment rate may be a sign of revitalization associated with immigration or may indicate that sufficient native out-migration resulted in increased employment rates. For example, over this time period, low-skilled immigrants had higher labor force participation rates and lower unemployment rates than low-skilled natives (Capps, Fortuny and Fix, 2007). Also, complementarity in production may cause immigration of the low-skilled to increase high-skilled employment rates (Peri, 2007).[11] Overall, OLS estimates appear to underestimate the native migration response and overestimate the adverse effects on employment and wage rates.

Differences Between Central and Suburban Counties

The interaction of central county status and immigration reveals heterogeneous effects within metropolitan areas. The positive coefficient on the interaction between immigration and central county status in the IV native migration equation is consistent with the view that native migration in central counties is less responsive to labor market shocks (Partridge and Rickman, 2008). Only in central counties then is immigration associated with positive population growth. Increased labor supply in central counties also eliminates any positive compositional effects of immigrants on the employment rate, although wages increase, perhaps through either demand- or supply-induced changes in industry composition. Recent immigration is associated with large net out-migration flows from suburban counties, which appear to reflect additional self-sorting.

The IV results for counties in large metropolitan areas generally mirror those for all metropolitan counties, including those for the regressions, including central county interaction terms. The exception is that immigration significantly reduces the employment rate in large metropolitan counties. Yet, in small- and medium-sized metropolitan area samples, immigration is not statistically significant in the IV results. Likewise, central counties are not statistically different than suburban counties in terms of how immigration affects native migration. Thus, the overall IV findings in the panel of exhibit 2 appear to be more due to the behavior of large metropolitan area counties, not due to patterns in small- and medium-sized metropolitan area counties.

For counties in small- and medium-sized metropolitan areas, we found no significant negative effects on native migration that indicate immigration spurs population growth in these counties (significantly in small metro counties). The immigration variable for most other labor market variables in the small- and medium-sized metropolitan area counties is insignificant; the primary exception being the positive effect on the employment rate in medium-sized metropolitan area counties. Thus, the positive compositional effect on the employment rate of immigration occurs primarily in medium-sized metropolitan area counties, whereas, in large metropolitan area counties, we found the traditional negative effect. We suggest taking the subsample results with some caution, though, because the first-stage F-test suggests that the instruments are weaker than for the full sample.

[11] We also attempted to capture production complementarity between low- and high-skilled labor by adding the interaction of the 1990 share of college graduates with the 2000-to-2005 immigration variable; however, the interaction term was, in general, very insignificant.

Metropolitan Area Counties: High and Low Rates of Immigration and Threshold Effects

Exhibit 3 displays the results for the *high/low* immigration and *East/West* subsamples. Immigration significantly reduces net native migration in high-immigration counties, producing no net effect on population growth, the employment rate, the wage rate, and housing costs. In low-immigration counties, immigration positively affects native migration and population growth (although the IV results are insignificant). Immigration reduces nominal wages, although insignificantly, and the employment rate. The weakness of the instruments for low-immigration counties may occur because of a lack of historical variation in their values across low-immigration counties, suggesting these results should be viewed with caution; however, these results suggest an immigration threshold above which natives begin to consider out-migrating (or not in-migrating).[12]

Such threshold effects may somewhat explain why we find a larger native migration response than in the past literature that considered earlier decades. As immigration flows increase over time,

Exhibit 3

Metropolitan County Results by Region and Immigration Intensity[a] (1 of 2)

Sample	Net Native Migration/ Population	%ΔPopulation	ΔEmployment Rate	%ΔWages	%ΔRent
High-immigration counties					
***Immigrant* >1% (N=357)**					
Immigration-OLS[b]	β = – 1.38 (5.18)	β = 0.19 (0.60)	β = – 0.001 (0.68)	β = – 0.40 (1.59)	β = 0.74 (1.64)
Immigration-IV[b]	β = – 2.09 (4.55)	β = – 0.63 (1.24)	β = 0.002 (1.30)	β = – 0.34 (1.00)	β = – 0.32 (0.45)
Inst. F-stat. on immigration[c]	27.05***	27.05***	27.05***	27.05***	27.05***
R^2-2nd stage-IV immigration[d]	0.60	0.50	0.52	0.38	0.43
Low-immigration counties					
***Immigrant* <1% (N=701)**					
Immigration-OLS[b]	β = 3.10** (4.37)	β = 3.48 (4.39)	β = – 0.007 (3.93)	β = – 4.38 (4.31)	β = 0.64 (0.66)
Immigration-IV[b]	β = 3.19*** (0.94)	β = 6.23* (1.61)	β = – 0.023** (2.36)	β = – 9.51 (1.57)	β = – 8.60 (1.00)
Inst. F-stat. on immigration[c]	1.83	1.83***	1.83***	1.83***	1.83***
R^2-2nd stage-IV immigration[d]	0.50	0.46	0.51	0.17	0.24

[12] We also experimented with including a quadratic (*Immigrant2*) term to the all-metropolitan area county-level model and the all-metropolitan-area-level model to examine other nonlinearities, but the quadratic term was statistically insignificant in both cases, suggesting that nonlinearities better reveal themselves when dividing the sample.

Exhibit 3

Metropolitan County Results by Region and Immigration Intensity[a] (2 of 2)

Sample	Net Native Migration/ Population	%ΔPopulation	ΔEmployment Rate	%ΔWages	%ΔRent
Eastern U.S. MA counties (N=686)					
Immigration-OLS[b]	β = – 0.63 (1.88)	β = 0.84 (2.63)	β = – 0.000 (0.43)	β = – 0.61 (1.76)	β = 0.94 (2.97)
Immigration-IV[b]	β = – 2.23 (4.99)	β = – 0.59 (1.24)	β = 0.005 (3.88)	β = 0.54 (1.12)	β = 2.52 (3.64)
Inst. F-stat. on immigration[c]	33.65***	33.65***	33.65***	33.65***	33.65***
R^2-2nd stage-IV immigration[d]	0.46	0.43	0.47	0.20	0.27
Western U.S. MA counties (N=372)					
Immigration-OLS[b]	β = – 0.70*** (1.46)	β = 0.81 (1.49)	β = – 0.003 (3.96)	β = – 0.68 (1.65)	β = – 1.10 (2.30)
Immigration-IV[b]	β = – 2.51 (2.32)	β = 0.28 (0.24)	β = – 0.001 (0.43)	β = 0.42 (0.52)	β = – 4.12 (2.81)
Inst. F-stat. on immigration[c]	7.34***	7.34***	7.34***	7.34***	7.34***
R^2-2nd stage-IV immigration[d]	0.38	0.47	0.63	0.26	0.25

MA = metropolitan area.

[a] *The model is based on the component metropolitan area counties for the dependent variable shown in each column heading. OLS refers to ordinary least squares and IV refers to instrumental variable estimation in which the* Immigrant *variable is treated as endogenous. The identifying instruments are described in the text. The following variables are included in each OLS/IV specification: centrality indicator (if within 16 km (10 mi) of MA centroid), log (county population 1990), log (own metropolitan area population 1990), industry mix employment growth 1990 to 2000, industry mix employment growth 1990 to 2000 of own metropolitan area, percent agricultural employment 1990, percent mining employment 1990, percent manufacturing employment 1990, percent high school graduate 1990, percent with some college 1990, percent with associates degree 1990, percent college graduate 1990, percent African American 1990, amenity rank, incremental distance to metropolitan area with population >350,000, incremental distance to metropolitan area with population >1.3 million, incremental distance to metropolitan area with population >2.5 million, an intercept, and state fixed effects. The IV models further used* percent foreign born 1970, house rent 1970*, and* percent foreign born 1980 *as instruments for* Immigration *variable.*

[b] *The* Immigrant *variable is 2000-to-2005 international immigration as a share of 2000 population.*

[c] *The F-statistic testing the joint significance of the identifying instruments in the first-stage model for the* Immigration *variable. The F-statistic measures the strength of the identifying instruments.*

[d] *The R^2 statistic for the second-stage IV* Immigration model *shown in the second row.*

*Notes: Absolute of robust t-statistics (from STATA cluster command) for OLS models and z-statistics for IV models are reported in parentheses. ***, **, * denote significance at the .01, .05, and .10 levels.*

native residents may be becoming more sensitive to their effects. To examine such threshold effects further, we divided the all-metropolitan area county model into the 671 counties with less than 4 percent of the 2000 population that was foreign born and the 387 counties with greater than 4 percent of the 2000 population that was foreign born. Although we note that these results (not shown) should be cautiously interpreted, the IV native migration results suggest that virtually no statistically detectable native response to immigrants existed in traditionally low-immigrant metropolitan area counties, but a relatively large response occurred in traditionally high-immigrant counties. For example, in the migration equations, in the less-than-4-percent foreign-born sample, the immigrant coefficient was *positive*, suggesting immigrants were associated with more native migration (t=1.82). In the above 4-percent sample, this coefficient equaled -2.59 (t=4.24), which is a little larger than the overall sample. Thus, our findings suggest threshold effects that are likely increasingly being exceeded this decade.

Differences Between Eastern and Western Metropolitan Area Counties

Immigration does not generally appear to have differential effects in western counties when compared with eastern counties, although the instruments are much stronger in the East. The exceptions are that the IV results suggest positive effects of immigration on the employment rate and housing costs in the East. The positive effects on housing in the East may be attributable to immigrants absorbing vacated housing (Glaeser and Gyourko, 2005), supported by the increase in the employment rate. The negative housing cost effect in the West may result from an increase in the supply of new lower cost housing relative to the county average (Saiz, 2007) for two-bedroom apartments.

Aggregate Metropolitan-Level Results

Because of potential *within* metropolitan area migration and commuting responses to immigration, we next estimate the effects of immigration at the aggregate metropolitan level to consider how much of the county-level results simply reflect sorting within given metropolitan areas. Moreover, our aggregate metropolitan area results enable us to compare our findings with the past literature, which usually employs aggregate metropolitan area-level data (or state-level data). In general, the labor market effects of immigration may vary with geographic scale as local labor market adjustments diffuse the effects across a broader area (Borjas, 2003; Borjas, Freeman, and Katz, 1997). Native migration responses are usually thought to be smaller in larger geographies because some of the offsetting native migration would be *intraregional* when considering larger geographies. Yet, at the county level, there may be a smaller response than at the metropolitan area level, because commuting and migration are more likely to be substitutes within a given metropolitan labor market (Eliasson, Urban, and Olle, 2003).

As shown in exhibit 4, the pattern of results for the all metropolitan area sample generally comports with those for the sample of all metropolitan counties. The OLS results suggest no native out-migration, positive population growth, and negative effects on the employment rate and nominal wages. Correspondingly, the IV results suggest significant net native out-migration and an absence of effects on the employment rate and wages. The more negative IV estimated native migration response at the metropolitan area level suggests that commuting may serve as a potential substitute for native migration at the county level *within* a given metropolitan area (which is less feasible when considering *between* metropolitan-area adjustments; that is, commuting is the response *within* a metropolitan area, but migration is the response *between* metropolitan areas). The positive employment rate effect at the county level, but the lack of significance at the metropolitan level, may be related to natives who possess lower employment rates than the immigrants (Capps, Fortuny and Fix, 2007) moving to other counties *within* the metropolitan area.

Exhibit 4

Metropolitan-Level Results[a] (1 of 2)

Sample	Net Native Migration/ Population	%∆Population	∆Employment Rate	%∆Wages	%∆Rent
All MAs (N=359)					
***Immigration-OLS*[b]**	β = – 0.06 (0.16)	β = 1.69 (4.52)	β = – 0.004 (3.20)	β = – 0.53 (2.16)	β = 0.27 (0.48)
***Immigration-IV*[b]**	β = – 3.64 (4.75)	β = – 0.94 (1.31)	β = 0.001 (0.43)	β = 0.20 (0.40)	β = 1.87 (1.49)
Inst. F-stat. on immigration[c]	8.35***	8.35***	8.35***	8.35***	8.35***
R^2-2nd stage-IV immigration[d]	– 0.13	0.22	0.38	0.43	0.17
Large MAs pop>250,000 (N=165)					
***Immigration-OLS*[b]**	β = 0.16 (0.36)	β = 1.72 (3.33)	β = – 0.004 (2.42)	β = – 1.07 (3.84)	β = – 0.94 (1.04)
***Immigration-IV*[b]**	β = – 2.98 (3.08)	β = – 1.24 (1.26)	β = 0.005 (1.60)	β = 0.36 (0.56)	β = 1.87 (1.19)
Inst. F-stat. on immigration[c]	8.95***	8.95***	8.95***	8.95***	8.95***
R^2-2nd stage-IV immigration[d]	0.08	0.23	0.17	0.46	0.28
Small MAs pop<250,000 (N=194)					
***Immigration-OLS*[b]**	β = 0.02 (0.05)	β = 1.76 (4.27)	β = – 0.002 (1.57)	β = 0.06 (0.19)	β = 0.71 (0.86)
***Immigration-IV*[b]**	β = – 4.06 (2.90)	β = – 0.40 (0.32)	β = – 0.003 (0.65)	β = 1.38 (1.28)	β = 1.27 (0.56)
Inst. F-stat. on immigration[c]	6.26***	6.26***	6.26***	6.26***	6.26***
R^2-2nd stage-IV immigration[d]	– 0.15	0.31	0.45	0.42	0.17
High immigration *Immigrant* >1% (N=172)					
***Immigration-OLS*[b]**	β = – 0.24 (0.62)	β = 1.41 (3.28)	β = – 0.003 (2.04)	β = – 0.54 (1.75)	β = – 0.08 (0.10)
***Immigration-IV*[b]**	β = – 2.87 (3.22)	β = – 0.93 (1.01)	β = 0.001 (0.33)	β = – 0.21 (0.35)	β = 1.26 (0.76)
Inst. F-stat. on immigration[c]	6.71***	6.71***	6.71***	6.71***	6.71***
R^2-2nd stage-IV immigration[d]	0.25	0.27	0.34	0.48	0.27

Exhibit 4

Metropolitan-Level Results[a] (2 of 2)

Sample	Net Native Migration/ Population	%∆Population	∆Employment Rate	%∆Wages	%∆Rent
Low immigration					
***Immigrant* <1% (N=187)**					
Immigration-OLS[b]	β = 1.75	β = 2.49	β = – 0.008	β = – 1.79	β = 1.83
	(2.13)	(2.85)	(1.87)	(1.81)	(1.14)
Immigration-IV[b]	β = – 3.26	β = 0.27	β = – 0.04	β = – 0.47	β = 1.00
	(0.90)	(0.08)	(2.15)	(0.15)	(0.15)
Inst. F-stat. on immigration[c]	1.98	1.98	1.98	1.98	1.98
R^2-2nd stage-IV immigration[d]	0.23	0.35	0.24	0.50	0.17
Eastern U.S. MAs (N=215)					
Immigration-OLS[b]	β = 0.18	β = 1.68	β = – 0.003	β = – 0.28	β = 1.43
	(0.51)	(4.04)	(2.50)	(1.16)	(2.68)
Immigration-IV[b]	β = – 0.93	β = 0.34	β = – 0.000	β = 0.65	β = 1.94
	(1.69)	(0.56)	(0.15)	(1.13)	(1.60)
Inst. F-stat. on immigration[c]	36.36***	36.36***	36.36***	36.36***	36.36***
R^2-2nd stage-IV immigration[d]	0.47	0.46	0.49	0.52	0.17
Western U.S. MAs (N=144)					
Immigration-OLS[b]	β = – 0.04	β = 1.63	β = – 0.005	β = – 0.40	β = – 1.96
	(0.08)	(2.95)	(2.36)	(1.36)	(2.13)
Immigration-IV[b]	β = – 4.13	β = – 1.24	β = 0.005	β = 1.92	β = – 3.99
	(2.61)	(0.82)	(0.90)	(1.90)	(1.43)
Inst. F-stat. on immigration[c]	4.07***	4.07***	4.07***	4.07***	4.07***
R^2-2nd stage-IV immigration[d]	0.013	0.27	0.23	0.33	0.28

MA = metropolitan area.

[a] *The model is based on the aggregate* MA-level *observations for the dependent variable shown in each column heading. OLS refers to ordinary least squares and IV refers to instrumental variable estimation in which the* Immigrant *variable is treated as endogenous. The identifying instruments are described in the text. The following variables are included in each OLS/IV specification: log (population 1990), industry mix employment growth 1990 to 2000, percent agricultural employment 1990, percent mining employment 1990, percent manufacturing employment 1990, percent high school graduate 1990, percent with some college 1990, percent with associates degree 1990, percent college graduate 1990, percent African American 1990, amenity rank—all measured at the metropolitan area level plus distance to the nearest metropolitan area with population >350,000, incremental distance to nearest metropolitan area with population >1.3 million, incremental distance to nearest metropolitan area with population >2.5 million, and an intercept. The IV models further used* percent foreign born 1970, percent foreign born 1980, *and* distance to the nearest U.S.-Mexico border cross point *as instruments for* Immigration *variable.*

[b] *The* Immigrant *variable is 2000-to-2005 international immigration as a share of 2000 population.*

[c] *The F-statistic testing the joint significance of the identifying instruments in the first-stage model for the* Immigration *variable. The F-statistic measures the strength of the identifying instruments.*

[d] *The R^2 statistic for the second-stage IV* Immigration Model *shown in the second row.*

*Notes: Absolute value of robust t-statistics (from STATA cluster command) for OLS models and z-statistics for IV models are reported in parentheses. ***, **, * denote significance at the .01, .05, and .10 levels.*

As we considered with the county-level analysis, we also consider the scaled-back migration model that included only *Immigrant* and state fixed effects. The native migration response now becomes insignificant in the metropolitan-level regression with a coefficient of -0.32. Thus, because of the emphasis on aggregate metropolitan-area-level data, past area studies of immigration may understate the native out-migration response by omitting important control variables such as education.

Different-Sized Metropolitan Areas

Regarding the subsamples of metropolitan areas, the results for large metropolitan areas generally fit the results for all metropolitan areas and those for the subsample of large metropolitan area counties. The native out-migration IV response is somewhat larger in small metropolitan areas, and the other IV coefficients are insignificant.

Metropolitan Areas and Threshold Effects for Immigration

The native net out-migration response similarly is significantly negative for the high-immigration metropolitan area subsample but insignificant for low-immigration metropolitan areas, which further suggests a threshold effect in which native residents do not consider immigration until it reaches some level. The significant negative effect on the employment rate for low-immigration metropolitan areas fits the insignificant native migration response; that is, greater labor supply.

The larger estimated negative effect for high-immigration metropolitan areas relative to high-immigration counties (shown in exhibit 3) follows the same result for all counties in which the commuting response likely reduces out-migration in counties relative to metropolitan areas. Yet, because the instruments for the low-immigration sample are weak—as was true for the low-immigration county sample—their results should be interpreted with greater caution. Nonetheless, to reinforce the possible threshold pattern, we again find that when we divide the sample into the 170 metropolitan areas with less than 4 percent foreign born and the 189 metropolitan areas with more than 4 percent foreign born (in 2000), we again find a large native net out-migration response in traditionally high-immigration counties but virtually no response in traditionally low-immigration counties (not shown).[13]

Differences Between Eastern and Western Metropolitan Areas

Finally, the metropolitan area-level analysis reveals the expected larger net out-migration response in the West (Partridge et al., 2008a). Thus, the negative county-level native net out-migration response found in the East in exhibit 3 appears to result primarily from within metropolitan area county migration. The within-metropolitan area adjustments in the East are associated with an increase in the employment rate, where, at the metro level in the East, there is no change in the employment rate; that is, those with lower employment rates moved to other counties *within* the same metropolitan area.

Consistent with county results, immigration leads to higher housing costs in the East and lower housing costs in the West, although the IV estimates are statistically insignificant. It appears then

[13] In the 2000-to-2005 population change model, we also find that immigration is associated with a statistically significant positive effect in low-immigrant metropolitan areas (<4 percent) but a statistically insignificant influence in high-immigrant metropolitan areas.

that immigrants are more likely serving as needed labor supply and absorbing excess durable housing (Glaeser and Gyourko, 2005) in the East, consistent with the immigrant-employment grsowth findings of Partridge et al. (2008a).

Summary and Conclusion

This study examined the effect of immigration on economic outcomes across and within U.S. metropolitan areas during the 2000-to-2005 period. A key factor that underlies the overall labor market effects of immigration is the native migration response to higher immigration. Furthermore, we allowed for geographic heterogeneity in the native migration response to immigrants and, hence, in other labor market effects of immigration both within and across metropolitan areas. We also searched for threshold effects that may affect native migration responses.

Using IV estimation, we found significantly greater net native out-migration in counties experiencing higher immigration. Greater native out-migration neutralized other potential adverse effects on employment and wage rates. Within metropolitan areas, however, the native migrant response largely appeared to be absent in central counties. This result is consistent with the spatial mismatch literature that focuses on potentially limited central city commuting and migration responses to local labor market shocks. We also find evidence of threshold effects, above which immigration had larger marginal effects on native migration.

Across metropolitan areas, the native out-migration response was proportionately greater in metropolitan areas with high rates of immigration, suggestive of a threshold effect in the labor market or in other factors affecting utility of residence. The native out-migration response also was larger in metropolitan areas west of the Mississippi River, in which wages also declined. The older, declining cities in the East appeared to provide sufficient employment opportunities and affordable durable housing to the immigrants.

We generally find a larger native migration response to immigration than in past studies. One reason may be differences in specification where, beyond contemporaneous endeogeneity, we found that controlling for lagged factors associated with contemporaneous native and international migration led to larger net out-migration responses to immigration. Another possible reason for our larger responses is threshold effects, in which these thresholds are increasingly being crossed in our latter sample period. A final reason could be that the response is simply larger this decade than in the past decades considered by past research. The results also generally suggest significant heterogeneity in the labor market effects of immigration beyond that typically considered.

Our findings of significant heterogeneities and threshold effects help explain why public reactions to immigration are so diverse. Future studies could further consider heterogeneities and probe deeper into the underlying reasons. Spatially varying regression analysis, possibly combined with case study analysis, appears well suited to this purpose. Future analysis should assess the possible threshold effects uncovered in our analysis. In general, we see research more focused on the spatial variation in labor market processes surrounding immigration as essential to informing both regional and national immigration policymaking.

Appendix

Exhibit A-1

First-Stage Regression of Percent Immigrant 2000 to 2005 for All Metropolitan Area Counties

Variable	Coefficient	Robust-t
Centrality indicator (if within 16 km (10 mi) of MA centroid)	0.272	2.70***
Log (county population 1990)	0.314	4.40***
Log (own MA population 1990)	0.002	0.04
Industry mix employment growth 1990-00	3.547	1.60
Industry mix employment growth 1990-00 of own MA	5.485	1.98**
% agricultural employment 1990	0.073	4.20***
% mining sector employment 1990	0.040	1.99**
% manufacturing sector employment 1990	0.036	4.11***
% high school graduate 1990	– 0.013	– 1.10
% with some college education 1990	– 0.123	– 6.45***
% with associates degree 1990	– 0.036	– 1.01
% college (4-yr) graduate 1990	0.063	5.90***
% african American 1990	– 0.007	– 2.72***
Amenity rank	– 0.149	– 3.05***
% foreign born 1970	– 0.043	– 4.26***
House rent 1970	0.004	1.48
% foreign born 1980	0.240	7.53***
Incremental distance to MA>350k	– 0.002	– 2.25**
Incremental distance to MA>1.3mill	– 0.001	– 2.17**
Incremental distance to MA>2.5mill	– 3.6E-04	– 1.12
Intercept	– 2.364	– 2.38**
Number of counties	1,058	
R-squared	0.698	
F-stat of the instruments *(in italics)* = 0	20.47***	

MA = metropolitan area.

*Notes: Robust t-statistics from STATA cluster command are reported. ** and *** indicate significance at the 1-percent and 5-percent levels, respectively. State fixed effects were also included in the model. Distances are measured in kilometers between the centroid of the county and the 2000 population-weighted centroid of the metropolitan area. Demographic (population, education, and race) and employment (agriculture, mining, and manufacturing) shares are from the 1990 census. Education variables are defined as percent of 1990 population more than 25 years. Industry mix employment growth is calculated by multiplying each industry's national employment growth (between 1990 and 2000) by the initial period (1990) county industry employment shares in each one-digit sector and summing across all sectors. Amenity rank ranges from 1 to 7, with 7 being the highest natural amenity as defined by the Economic Research Services, U.S. Department of Agriculture.* Percent foreign born 1970, percent foreign born 1980*, and* house rent 1970 *are from GeoLytics data.*

Acknowledgments

The authors thank John Carruthers for the invitation to contribute to this issue of *Cityscape*.

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