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ABSTRACT

Immigration and Housing Rents in American Cities*

Is there a local economic impact of immigration? Immigration pushes up rents and housing values in US destination cities. The positive association of rent growth and immigrant inflows is pervasive in time series for all metropolitan areas. I use instrumental variables based on a "shift-share" of national levels of immigration into metropolitan areas. An immigration inflow equal to 1% of a city's population is associated with increases in average rents and housing values of about 1%. The results suggest an economic impact that is an order of magnitude bigger than that found in labor markets.

JEL Classification: J61, R23, R31

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1. Introduction

Immigration continues to be one of the most important factors in the demographic evolution of the United States. Immigrants and their offspring will account for as much as two thirds of population growth from 1995 to 2050 (NRC [29]). The effects of immigration will be particularly salient in the areas where immigrants cluster. In 2000, 68 percent of all foreign-born persons (as opposed to 36 percent of the native population) lived in only six states: California, New York, Florida, Texas, New Jersey, or Illinois.[1] Major American metropolitan areas such as New York, Los Angeles, Miami, and San Francisco have seen major levels of immigration.

What is the local impact of such immigration inflows in American immigrant gateway cities? To answer this question, economists have focused on wage impacts and have found only small effects. In this paper I argue for the importance of the housing market. In principle, new immigrant demand for housing coupled with an upward-sloping housing supply in the metropolitan areas where immigrants settle should yield rising housing rents and prices. At the same time, immigration may be associated with offsetting native out-migration, or with decreasing wages and income, thus reducing housing demand in the city. Therefore, it is important to learn about the sign of the association between housing prices and rents, and also about its magnitude.

I use annual data on legal immigration inflows and Census decennial data on the stock of the foreign-born, housing rents, and home values at the metropolitan area level, and find a very robust impact on rents and housing prices that is *an order of magnitude* bigger than the estimates from the wage literature. Immigration inflows equal to 1% of a city's population were associated with increases in average or median housing rents and prices of about 1%. The results are very important in understanding the local economic impact of immigration and the link between immigration and the residential location decisions of natives.

To avoid the possible endogeneity of immigration with respect to other omitted factors that generate rent growth, I use instruments based on general changes in the national levels of immigration, on changes in the characteristics of the immigrants' countries of origin, and on

[1] See Passel and Zimmerman [30].

the distribution of immigrants in earlier periods. Metropolitan Statistical Area (MSA) fixed-effects regressions, which are identified by using within-city variation in the immigration inflows between censuses, yield similar results. The results support a causal interpretation. I also use data from the American Housing Survey to control for unit-specific quality characteristics that could account for the results via composition effects. The results are very robust to the use of a number of alternative data sets.

These findings contrast with the results from the labor literature on immigration (Borjas [4]; Friedberg and Hunt [16]). Studies that use historical data find a negative local association between immigration and wages in periods previous to WWI (Goldin [20]; Ferrie [13]; Ferrie [14]). But remarkably, there is not much evidence of such a relationship holding in the contemporaneous metropolitan US.[2] Even unexpected immigration shocks that rapidly expand the local labor supply do not seem to decrease wages (Card [10]). There have been so far at least three possible explanations for this surprising result. Natives may be choosing to leave when immigrants arrive, rather than face increased competition in the labor market (Filer [15]); immigrants may be moving into cities with positive shocks in productivity and wage growth; or the local labor demand may be more elastic than economists had thought (Lewis [25]).

The evidence in this work supplies the literature with a new piece in the puzzle of the local impact of immigration. It shows an important way by which immigrants have a local economic impact. The finding of a positive effect of immigration on rents and housing prices is consistent with the idea that immigrants do not displace natives from gateways cities *one-for-one*. However, it also suggests another major mechanism by which immigration *might* affect the migration decisions of *some* natives in areas with inelastic housing supply. Rents and housing prices should not be neglected when thinking about the "dynamic process through which natives respond to these supply shocks and reestablish labor market equilibrium" (Borjas [4]).

The rest of the paper is organized as follows. Section 2 reviews some ideas that are relevant to the economics of immigration and housing prices. I lay out a simple model that studies the

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[2] Structural models of the economy that use realistic parameters to calibrate a simple model of labor demand predict an impact of immigration on wages at the national level (Borjas, Freeman and Katz [6]).

response of the housing market in the short run and the long run. The model also contemplates mobility by natives and the interplay between labor and housing markets. Section 3 describes the data sources. Section 4 introduces the methodology and results of the paper. Section 5 concludes.

2. The economics of immigration and rents

Not much is known about the impact of immigrants on the housing markets of destination cities.[3] Muller and Espenhade [27] report that rental housing experienced major price increases in Los Angeles, compared to other American metropolitan areas, during the period 1967-83. Los Angeles was one of the most important "gateway" cities for immigration in that period. Burnley, Murphy and Fagan [7] report that immigration was one of the important correlates of short and long-term inflation of housing prices in Sidney, the main immigrant city in Australia. Ley and Tuchener [26] find a similar time-series correlation between housing prices and immigration in Toronto and Vancouver, Canada. All these studies are descriptive in nature. The authors do not control for other variables that could account for changes in housing prices, such as economic cycles.

Research in this area presents several challenges. Firstly, omitted variables that are not observed by the researcher could be driving both immigration inflows and housing costs. Immigrants may respond to other factors that cause rents to increase, such as expectations of future economic growth, improved amenities or changes in the preferences for existing amenities. In principle, this could lead the researcher to *overestimate* the impact of immigration on rents. Secondly, immigration could be endogenous. Immigrants may be looking for better deals: they might settle in areas where rents are increasing more slowly. If immigration inflows are very sensitive to housing costs, then the estimates of the relation between immigration and rents could be *biased downward*. In this context, one needs to look for exogenous sources of variation in the immigration inflows to ascertain causality.

Saiz [33] provides evidence of a causal relationship between immigration inflows and housing rents. This author used the "Mariel Boatlift" [4] as a natural experiment,

[3] For a descriptive view of immigrant housing in the US see Callis [8].

[4] About 150,000 Cuban refugees arrived on the United States between May and September 1980. They had been allowed to flee from Cuba after political turmoil in the island. A short-lived decision by the Castro government

following Card's [10] study about labor market outcomes. This immigration *shock* represented an exogenous increase of 9% in Miami's renter population in one year (or about 4% of the total population). Saiz [33] showed that rents increased 8% more in the Miami metropolitan area than in the rest of metropolitan Florida and two other groups of comparison cities. Immigration was the most likely explanation for this differential growth in rents; but the differences-in-differences approach that Saiz [33] uses has shortcomings worth mentioning. Different trends in the "treatment" and "control" groups can generate spurious results.[5] This criticism does not claim there is a systematic bias in the *diffs-in-diffs* estimates, but suggests a potential lack of power of the methodology. A second shortcoming of the differences-in-differences approach is that, even if the econometrician can establish causality, the estimates need not be generalizable. Saiz [33] measures the impact of a very big unexpected immigration shock on a very particular housing market, at a specific point in time.

But why should we be specifically interested in the impact of immigration on rents? How is immigration different from general population growth? Is it surprising to find a substantial impact of immigration on local housing markets? From a housing market perspective, several facts distinguish immigration from general population growth.

Immigrants are much more spatially concentrated than natives. Consider the 20 major metropolitan areas by the number of new immigrant permanent residents in the period 1983-1997.[6] Two thirds of immigrants in metropolitan areas moved into conurbations that represented only one third of the United States' urban population. More than half of the new immigrants settled in only ten MSA, which contained just 20% of the metropolitan population. About 20% of Americans lived in non-metropolitan areas in 1980. Only 4.34% of

granted them a permit to leave. Many of these immigrants (an estimated 80,000) decided to settle in Miami because of the proximity of Southern Florida to Cuba and the fact that a major Cuban émigré community was already present there.

[5] Other factors may have been at play in Miami during the early 80s. These factors may have affected rents differently in that metropolitan area. Angrist and Krueger [2] show how another failed "Mariel boatlift" in 1994 -thousands of Cubans took to the sea that year but were prevented from landing in Miami by the US Navy- could have been interpreted as having a negative effect on wages using a *diffs-in-diffs* methodology.

[6] See Table A.1 in the Appendix. The data sources for the number of permanent residents are described below.

immigrants admitted during the 1983-97 period reported settling outside metropolitan areas. We can thus expect the effect of immigration to be stronger on specific housing markets.

Yet it is not obvious that we should actually see a local correlation between immigration and changes in housing rents and prices. Consider one of the arguments in the labor literature. Natives may move out or avoid areas where immigrants settle because of the competition in the local labor market. If native outflows offset immigrant inflows "one-for-one," then we would not see any increase in the local demand for housing. Finding a positive local effect of immigration on rents allows us to reject the strong null of "complete displacement" in the labor market.

A similar argument applies to competition in the housing market. Immigrants may be less sensitive to housing rents, because local immigrant-specific amenities and networks are more important for them. Natives, though, may be more sensitive to local rents. If this is the case, immigration inflows could spur net out-migration of natives *because of the increased housing costs* that are associated with a housing demand shock. There is no way to separate the effect of increased housing demand (immigration) from the potential decreased demand associated with potential native out-migration. Part of the local response to the *treatment* (immigration) can occur through native out-migration. In this case, we need to be careful about the interpretation of the coefficient of immigration on rents. In general it will not correspond to the housing supply elasticity. Nevertheless, we should expect a positive effect of immigration on rents if natives are not extremely sensitive to changes in housing costs, and if they are not displaced "one for one" in the labor market.

I introduce a simple model that incorporates all these ideas. The model can be used as a roadmap to understand the local impact of immigration on housing. The focus is on partial equilibrium. I concentrate on the effects of immigration on a city, which I will name city C. The model contemplates housing supply and the mobility of natives. Whereas the exposition of the model assumes homogeneity in labor quality, and in the wages, and rents faced by all individuals in the local economy, one can think of the model as being more relevant for those native workers who are *marginal* in the local housing market (this is, close to being indifferent between living in the city and leaving the city).

Start by assuming that the preferences of native residents can be represented by the following separable utility function:

(1) $$U_{iC} = V_{iC} + \alpha \frac{h^{(1-\theta)} - 1}{(1-\theta)} + w_C(L) - R \cdot h$$

V_{iC} is the value of local amenities in city C for individual i, h is the consumption of housing services by the individual. w_C is the going wage in city C; all city dwellers are assumed to also be workers and w_C to be a function of the population (L). R stands for housing rents (the annual cost of a dwelling). The model abstracts from income effects in housing consumption. The optimal consumption of housing in this setup is given by $h = \left(\frac{\alpha}{R}\right)^{1/\theta}$.

Preferences for the city's amenities are heterogeneous. We can order individuals according to their preferences for the city's amenities: $i \in \{0,...,N\}$. Assume that the preferences for each individual can be represented thus: $V_{iC} = A - a \cdot i$. I also use a linear approximation for the demand of labor: $w_C = \overline{w_C} - \rho \cdot (N + I)$. N is the number of native residents and I is the foreign-born population in C. Total population is $L = N + I$.

The utility level outside the city is normalized to $\overline{U}$. Residents in the city prefer staying to emigrating, so $U_{iC} \geq \overline{U}$, $\forall i \subset C$. The marginal native will be indifferent between staying at C and leaving.

(2) $$A - a \cdot N + \frac{\theta}{1-\theta} \cdot \alpha^{\frac{1}{\theta}} \cdot R^{\frac{\theta-1}{\theta}} - \frac{\alpha}{1-\theta} + \overline{w_c} - \rho \cdot (N + I) = \overline{U}$$

From this equation we derive the supply of natives in C:

(3) $$N = \frac{1}{(a+\rho)} \cdot \left\{ \Omega - \rho \cdot I + \frac{\theta}{1-\theta} \cdot \alpha^{\frac{1}{\theta}} \cdot R^{\frac{\theta-1}{\theta}} \right\},$$

where $\Omega = \left[A + \overline{w} - \overline{U} - \frac{\alpha}{1-\theta}\right]$. Note that the model does not put any constrain on the sign of the parameter ρ (the impact of immigration on local wages). With $\rho > 0$ local labor demand is downward-sloping. With $\rho < 0$, the general marginal productivity of labor is growing with population (a case of agglomeration economies), albeit then we would have to explain why the economy is initially in equilibrium. In a local economy with constant returns to scale and fast capital adjustment one could see $\rho = 0$. Alternatively, one could focus on the specific (positive or negative) effect of immigration on the wages of the natives who are in the leaving/staying margin of the local housing market.

For the purposes of this work, the only distinction between immigrants and natives is a preference for specific "immigrant" cities. Immigrants always prefer C. I therefore treat the supply of immigration into the city as exogenous to the initial spatial equilibrium. My empirical specifications try to make this assumption as accurate as possible.

The optimal individual consumption of housing services for immigrants will be assumed identical to the consumption of natives. Aggregate demand for housing services (H^D) is equal to the number of residents times the consumption per resident ($L \cdot h$). Taking logarithms of this identity after substituting for optimal housing consumption yields:

(4) $$\ln H^D = \ln(N+I) + \frac{1}{\theta} \cdot \ln \alpha - \frac{1}{\theta} \cdot \ln R$$

Let's first analyze the effects of an unexpected immigration shock in the short run. I define the short run as the situation in which the supply of housing space and native population cannot change (because of arbitrarily high adjustment costs). Differentiating equation (4) with respect to the number of immigrants, we obtain the short run impact of unexpected immigration shocks:

(5) $$\left.\frac{dR}{dI}\right|_{H=\overline{H}, N=\overline{N}} = \theta \cdot \frac{R}{L} > 0$$

The percentage change in rents depends on the "immigration impact" (number of immigrants over population) and the elasticity of the demand for space. All of the adjustment in the short run comes through changes in the individual demand for space. This effect can be interpreted as temporary reductions in vacancy rates, increased crowding, or conversion of other spaces to residential usage.

Besides changes in housing space consumption, in the long run we have to consider the adjustment of the housing supply and the mobility of natives. The price elasticity of the long-run housing supply schedule is assumed constant:

(6) $$\ln H^S = \beta_0 + \beta_1 \ln P$$

The long run housing price capitalizes the steady state housing rent at discount rate d.[7]

(7) $$P = \frac{R}{d}, \qquad \text{or} \qquad \ln P = \ln R - \ln d$$

Housing demand (4) equals the long-run housing supply (6) in the steady state. Combining the equilibrium condition with (7) we obtain:

(8) $$\ln R = \frac{1}{\left(\beta_1 + \frac{1}{\theta}\right)} \left\{ \ln(N+I) + \frac{1}{\theta} \cdot \ln \alpha - \beta_0 + \beta_1 \cdot \ln d \right\}$$

Substituting equation (3) into (8), differentiating with respect to I , and rearranging yields:

(9) $$\frac{dR}{dI} = \frac{a \cdot R^{\frac{1}{\theta}}}{\left(\beta_1 + \frac{1}{\theta}\right) \cdot L \cdot (a+\rho) \cdot R^{\frac{1-\theta}{\theta}} + \alpha^{\frac{1}{\theta}}} > 0$$

The impact of expected immigration inflows (or the long run effect of unexpected shocks) is smaller than the short run impact of unexpected shocks. New supply of housing, reductions in the consumption of space, and the potential out-migration of natives account for this result. At the same time, even in the long run, immigration is expected to have an impact on rents and prices in destination cities as long as there are natives with a positive consumer surplus derived from living in city C. It is straightforward to show that:

(10) $$\frac{\partial \frac{dR}{dI}}{\partial \beta_1} < 0, \quad \frac{\partial \frac{dR}{dI}}{\partial \theta} > 0, \quad \frac{\partial \frac{dR}{dI}}{\partial a} > 0, \text{ and } \frac{\partial \frac{dR}{dI}}{\partial \rho} < 0$$ [8]

Thus the impact of immigration on rents is lower in cities with elastic housing supply and higher in cities with low price elasticity of housing demand or an inelastic supply of natives (i.e. low native mobility).

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[7] d can be interpreted here more generally as the user cost of residential capital. Note that we are assuming homogeneity in housing quality. It is possible that rentals and owner-occupied units are of different quality, and that immigration has a different impact at different levels of the quality distribution.

[8] For the second result (the derivative with respect to θ), I assume that the initial consumption of space is greater than 1 unit (h>1).

Less intuitively, the impact of immigration on rents is smaller (bigger) the more negative (positive) the impact of immigration on the wages of the marginal city-dweller. If, for instance, the marginal native's wages go up with immigration because of relative skill complementary,[9] rents have to go further up in order to make the city a bit less desirable and keep the marginal native indifferent between the city and the rest of the nation. If, conversely, the marginal native's wages go down with immigration, there will be some "native flight" out of the city and rents will not increase by as much.

Note that it is not enough to look at *net* migration inflows to ascertain if immigration has a local economic impact. Think about a city with a very inelastic housing supply. Assume that the demand for space is relatively inelastic, maybe because of indivisibilities in the existing housing stock. Under this scenario most of the impact of immigration is on housing rents, as opposed to population: higher rents may prompt natives and previously settled immigrants to move out of the city. Shifts in the demand curve (as opposed to movements along it) are better captured by gross immigrant inflows.

Similarly, note that endogenous population growth need not be associated with increasing rents. Natives are attracted by areas with low housing costs, so the native population level is endogenous to the evolution of rents. Positive shifts in the housing supply (reductions in β_0 in the model) are associated with bigger populations and smaller housing rents. The correlation between general *endogenous* population growth and changes in rents needn't be identical to the association between *exogenous* population inflows and rent growth.

3. Data

In this section, I describe and summarize the data that I use in the empirical part. A more detailed explanation of how variables are constructed can be found in the data Appendix.

One data source for immigration inflows is the Immigration and Naturalization Service (INS) "Immigrants Admitted to the United States" series. This data source documents admission of foreign-born individuals as permanent residents in the United States (obtaining what is popularly known as a Green Card). The main variables of interest for this work are the

[9] For example, the marginal native may be highly-skilled, whereas immigrants in the city have lower skills, and the two types of labor are complements in the production function (Borjas, [5]).

nationality of the immigrant and the zip code of intended residence. I construct yearly legal permanent immigration inflows by metropolitan area from 1983 to 1997 matching zip codes to 1993 metropolitan statistical areas using the census MABLE geo-correlation engine. The datasets contain annual individual information on *all* immigrants admitted as permanent residents in the United States. However, the timing of the admission of a foreign person as a permanent resident does not necessarily coincide with the actual date of entry into the US. Also, the data do not yield any information on illegal immigrants or foreign-born individuals who stay in the United States temporarily (such as tourists and students). Nevertheless, there are several advantages that make the data attractive. First, most immigrants are admitted shortly after they arrive in the US. In 1990, the median year in my sample, 70 percent of admitted immigrants entered the country the same year in which they were admitted. About 90 percent of the immigrants admitted in 1990 report having arrived in the United States in or after 1988. Illegal immigrants who had already been in the United States for a long time and adjusted their status by taking advantage of "amnesties" are not included in the data. Moreover, admission as a permanent resident is by itself a *treatment* of considerable interest, since the counterfactual may imply having to leave the country, being present for only short periods of time, and lacking the ability to work, and since it is useful to forecast the impact of future immigration inflows with the data that are available annually.[10] Therefore, I will treat these data as a noisy indicator of *recent* immigration inflows, and obtain a panel with 306 MSAs and 15 years' worth of data. The measurement error in the exact timing of arrival will typically lead us to underestimate the impact of immigration when using higher frequencies. Second, the data give us information about the nationality of all recent immigrants and I can link this with relatively high frequency data on changes in economic and social conditions in their origin countries. Third, the data provide information on the original destination of every immigrant so that the "treatment" (immigration) is plausibly more exogenous to the subsequent evolution of rents in the metropolitan area.

[10] It is important to point out that the results in the paper are not sensitive to the time of entry of immigrants in the US. Most of the variance in immigrant inflows in the data is *between* cities. In fact, as I will argue later, regressions using long-differences (changes in rents and the cumulative number of new immigrants over the 14-year period for which I assemble the data) yield similar results.

An alternative data source for the number of immigrants is the decennial Census change in the number of foreign-born individuals by MSA. The benefits of using the Census tabulations are that they enumerate both legal and illegal immigrants (and other inflows of foreign-born individuals who may be in the US temporary) and that they provide a relatively accurate head-count of the number of immigrants by metropolitan area. The costs of using the Census tabulations are the reduction in the periodicity (only every ten years), the loss of some micro information, and the fact that immigrants may decide to resettle between censuses to locations that are becoming relatively cheaper. Our IV strategy should help to mitigate these concerns. It is remarkable that the results from using both types of immigration data are very similar.

One of the data sources for rents in MSAs is the Department of Housing and Urban Development's (HUD) Fair Market Rent series (FMR).[11] The FMR corresponds to the price of a vacant 2-bedroom rental unit at the 45^{th} percentile of the MSA's distribution. It is calculated annually by HUD using data from the census, AHS, and CPI samples, when available, combined with local random samples.[12] Data on rents and other characteristics of rental units also come from the 1985 and 1995 national samples of the American Housing Survey. Finally, I obtain similar results using median rent data by metropolitan area from the census. Data on housing prices come from the Freddie Mac (FM) repeat sales index and from reported median house values by MSA from the census.[13]

Data on the evolution of population and income at the MSA level are from the BEA Regional Information System (REIS). Unemployment rates at the metro area level are obtained from the Bureau of Labor Statistics (BLS). Data on weather and elevation are obtained from the United States Department of Agriculture Economic Research Service

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[11] Fair market rents for a fiscal year are determined before October of the previous calendar year. The 2002 fiscal year, for example, spans from October 2001 to the end of September 2002. I use the calendar year in which FMR are *calculated* and released to define my rent variable.

[12] From 1996 on, HUD changed the definition of FMR to the rent for a unit in the 40^{th} percentile. HUD provides data for both the 45^{th} and the 40^{th} percentile in 1995. I use the ratio of rents in both percentiles and the evolution of rents in the 45^{th} percentile from 1995 to extrapolate the evolution of rents in the 40^{th} percentile.

[13] I combine the Freddie Mac data from repeat sales data from the Office of Federal Housing Oversight (OFHEO) in order to improve the coverage of the data.

Natural Amenities Scale Database. Data on murders are obtained from the FBI's Uniform Crime Reports series. Other MSA data were obtained from the HUD State of the Cities Database

Several data sources pertain to the countries of origin of the foreign-born. These data will be used later to predict immigration inflows by country and year that are exogenous to US economic conditions. My main data sources here are the "World Bank Indicators" and the IMF "Financial Indicators" databases. Data on military conflicts and governance failures are from the "Internal Wars and Failures of Governance 1954-1996" database, from the Center for International Development and Conflict Management at the University of Maryland.

The main unit of observation in most of the empirical work is the MSA-year. In Table 1, I provide some descriptive statistics for the MSAs in 1990. I define the yearly *immigration impact* as the number of new immigrants divided by population in the previous year. The average city (means are population-weighted) received a yearly inflow of immigrants equivalent to 0.3% of its initial population. But the variance of this impact is considerable. The maximum impact in 1990 was 1.6% of the population, in Miami. Miami was also the city with the greatest share of foreign-born population in 1980 (35.55%). Considering all MSA, about 8% of the urban population was foreign-born in 1980.

4. Methodology and Results

4.1. Least squares results (Immigrant Admissions)

The empirical model that I posit uses data for a number of cities (subscript k) and years (subscript t), and takes the form:

(I) $$\Delta \ln\left(r_{kt}\right) = \beta \cdot \frac{immigrants_{kt-1}}{population_{kt-2}} + \alpha \cdot X_k + \pi \cdot W_{kt-1} + \mu \cdot \Delta Z_{kt-1} + \Lambda_t + \Delta\varepsilon_{kt}$$

The dependent variable is the annual change in the log of rents.[14] Taking differences in the rents series eliminates the impact of city-specific characteristics that account for rent levels and may be correlated with immigration settlement patterns, at the cost of increasing the noise-to-signal ratio of the dependent variable. The main independent variable is the annual *inflow* of immigrants over population. β has an intuitive interpretation here as the percentage change in rents corresponding to an annual inflow of immigrants equal to 1% of the city's original population. When using INS and FMR data, and since rents do not adjust instantaneously to changes in fundamentals (Genesove [17]), I use lagged values of the dynamic independent variables. To decide on the lagged structure of the explanatory variables I used the Akaike Information Criterion (AIC). The AIC selects the specification that maximizes a transformation of the estimation's likelihood function. The tests concluded that the specification with one lag fit the data best.

In equation (I), X_k stands for a vector of initial city attributes. Amenities such as crime and weather (the logs of January temperature and July humidity), and the initial share of population with a bachelor's degree are important predictors of future population growth (Glaeser, and Saiz [18], Glaeser and Shapiro [19]). The log of MSA area may capture supply factors related to land availability. In equation (I), W_{kt-1} stands generally for lagged city characteristics (the local unemployment rate at t-1 in the current implementation of the model), and ΔZ_{kt-1} stands for changes in city attributes (changes in local income), both variables being well-known important determinants of rent and housing values (Jud, Benjamin and Sirmans [23]). As mentioned earlier, I control for changes in income, but the exclusion of this variable does not affect the main results in the paper. In fact, the omission of the other controls does not alter the main conclusions either. Only changes in log income, unemployment, and MSA area are somewhat robust correlates of rent and price growth in table 2. Finally, Λ_t are year dummies, which capture national trends in inflation and other economic variables.

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[14] I have estimated more general dynamic panel data models that use the current rent as the dependent variable and one lag in rents as independent variable, besides the other variables in the model. I implemented the GMM procedure in Arellano and Bond [3]. The Arellano-Bond procedure uses the model in first differences and lagged independent variables as instruments. If there is autocorrelation of second order the exogeneity assumption of the lagged instruments is not granted, which is unfortunately the case in these data. The qualitative results are always similar for rents, but the specification for prices is extremely sensitive to changes in the set of explanatory variables.

Levin and Lin [24] tests on the data for rents, prices, and immigration impact reveal stationarity in the first differences. Thus spurious regression is not a problem in this specification, though note that if there is a longer term cointegrating relationship between rent levels and the size of the foreign-born population we may be underestimating the parameter of interest.

Table 2 shows the results of the first-difference specification using the INS data. I present the OLS regressions with standard errors clustered by MSA. I also show regressions using maximum likelihood estimation of a model with ARMA(2,2) perturbations to address the possible existence of autocorrelation and moving averages, from which there is evidence in the data.[15] In this setup, OLS is a consistent but relatively inefficient estimator. The results show that immigration is a significant explanatory variable for changes in rents. Results are fairly robust across specifications and suggest that rents increase by about 1% with an immigration impact equal to 1% of the city's population. The estimates for prices are bigger and more imprecise. The price series displays greater volatility than the rents series, and most of the estimates of the price regressions have bigger standard errors. It is interesting to note that, in all tables, unreported regressions using lagged MSA population weights suggest a slightly *stronger* positive association between rents/prices and immigration.[16]

The estimates in Table 2 may actually represent a lower bound for the association between legal immigrant admissions and changes in housing prices. This could be the case because of measurement error, or due to the possibility that the impact of immigration on rents takes a long adjustment period.[17] In a previous working paper version of this research (Saiz [34]),

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[15] The covariance of the difference of the perturbation terms is different from zero for two consecutive observations: $\text{cov}(\varepsilon_t - \varepsilon_{t-1}, \varepsilon_{t-1} - \varepsilon_{t-2}) = -E(\varepsilon_{t-1}^2)$. By construction, the new perturbation is a moving average of the contemporaneous and past perturbation.

[16] From a research perspective the unweighted regressions are more interesting: using each city as an observation makes sense, since we should expect the theoretical effects of immigration to be at play in all cities. If there are heterogeneous "treatment effects," from a policy perspective, one could make the case that the big cities should matter more.

[17] I.e. immigration and rents are cointegrated. Cointegration tests in this context are not extremely informative. The time dimension is very short (13 periods). Furthermore, the null hypothesis of cointegration usually involves cointegration of all of the MSA series: rejecting that hypothesis does not imply that some or even most of the series are cointegrated.

however, I have used long-differences in the left and right-hand-side variables: the change of the log of housing rents and prices over the 1984-1997 period on the left-hand-side, and the cumulative number of new immigrants in this period divided by the initial population. The results, which are not sensitive with respect to the exact time of arrival of immigrants, are very similar to the ones reported in Tables 2 and 3.

Indeed, a major part of the variance in immigration inflows is between cities, as opposed to between different years within a city. Omitted variables that are differentially present in cities with high immigration inflows, and that might account for the growth in rents in these cities (such as economic shocks), are a potential threat to my interpretation of the results.

4.2. Instrumental Variables Estimates

A suitable strategy to address the endogeneity issue is to use variation in immigrant inflows that is plausibly exogenous to the evolution of housing prices. We can use the fact that immigrants tend to move to areas where other immigrants of the same nationality settled before to generate instruments (Altonji and Card [1]). [18] I make use of two kinds of instrumental variables. The first instrumental variable approach focuses on year-to-year changes in immigration inflows. There are good reasons to believe that the overall number of legal immigrants in the United States stems from political and administrative decisions.[19] I make use of this variation to construct a "shift-share" prediction of the inflows by city and year. Total immigration levels in the US are translated into expected immigration by city. I

[18] Edin, Fredriksson and Åslund [12] and Munshi [28] provide convincing evidence on the importance of ethnic enclaves and local immigrant networks. Some examples of the sociological literature on the topic include NRC [29]. Portes and Rumbaut [31], Rumbaut [32]. Zhou [35] reports that "over two thirds of the legal immigrants admitted to the United States since the 1970s are family-sponsored immigrants. Even among employer-sponsored migrants, the role of networking is crucial. Family, kin, and friendship networks also tend to expand exponentially serving as a conduit to additional and thus potentially self-perpetuating migration."

[19] Successive "Immigration Acts" have established a cap to the total number of immigrants in the United States. The number of applicants has always exceeded the total cap. In 1994, for example, the U.S State Department had 3.6 million people registered on a "waiting list" for family reunification visas: the supply of immigrants is virtually infinite and the total number of immigrants admitted depends on administrative and legal decisions. In recent years, administrative backlogs have been an important determinant of the year-to-year level of immigrants into the United States. The INS estimated that legal immigration during the fiscal years 95-98 period would have been 450,000-550,000 higher in the absence of the backlog.

use the cities of destination of immigrants in 1983, the first year for which I have data on the location of legal immigrants, and the formula:

(II) $$\widehat{immigrants_{k,t}} = \phi_{k,1983} \cdot immigrants_{US,t}$$

$\widehat{immigrants_{k,t}}$ is the predicted number of new immigrants in city k and year t, $immigrants_{US,t}$ is the total number of new immigrants in the United States in year t, and $\phi_{k,1983}$ is the *share* of immigrants who moved into city k in 1983, the first year for which such geographic detail is available in this dataset. This prediction is independent of city and time-specific shocks. Two basic identification assumptions are made. First, I assume that immigrant inflows in 1983 are not driven by omitted variables that will affect rents in the future. In other words, immigrants in 1983 did not predict the future evolution of housing rents and prices better than the participants in the local market.[20] The second identifying assumption is the exogeneity of annual changes in the national immigration inflows to the economic conditions of immigrant cities.

An alternative IV approach relaxes this second assumption and consists in estimating annual immigration inflows by country and year. To do so, I use variables from the immigrants' countries of origin that are exogenous to changes in city-specific amenities. Once I have predicted immigration inflows by country and year, I calculate the share of immigration by country into each MSA in 1983. I apply this share to predict the number of immigrants from each country into that city for the period 1984-1998. Finally, I consolidate these flows to obtain the total predicted immigration by city-year. This instrument takes the form:

(III) $$\overline{\overline{\Delta immigrants_{k,t}}} = \sum_{j=1}^{M} \phi_{j,k,1983} \cdot \overline{\overline{\Delta immigrants_{j,US,t}}}$$

$\overline{\overline{\Delta immigrants_{k,t}}}$ is the predicted number of new immigrants in city k at time t, $\phi_{j,k,1983}$ is the share of immigrants from country j who settled in city k in 1983, and $\overline{\overline{\Delta immigrants_{j,US,t}}}$ is the predicted number of new immigrants from country j and time t in the United States.

[20] Prices capitalize the discounted value of future rents and I find similar or bigger impacts of immigration on housing prices throughout the paper. Therefore, if one believed in the ability of immigrants in 1983 to pick the future "winner" cities (1984-1997) based on the available information, one has to explain why local participants in the housing market did not capitalize on the available information *ex ante*.

As described below, these predictions ($\widehat{\Delta immigrants_{j,US,t}}$) are obtained from using a number of origin country variables - which should be exogenous to the evolution of the economies of destination cities - to fit a migration model. M is the total number of countries that have emigrants in the U.S.

Appendix Table A.2 presents the results of a panel random effects model for the prediction of the number of immigrants by country. The dependent variable is the logarithm of immigrants from each country in a given year. The explanatory variables include lagged values of several of the sending countries' characteristics: the log of income per capita, log of population, log of the real exchange rate, dummies for the presence of military conflicts, collapse of state institutions, and transition out of communism, and the log of the number of immigrants from that country in 1979 (the first year for which the data are available). Income per capita in a country is negatively related to the number of immigrants admitted in the United States. The log of a country's population is also a significant determinant of the number of immigrants from that country. Real exchange rates have been shown to be an important determinant for Mexican immigration (Hanson and Spilimbergo [21]). I construct relative real exchange rates using 1979 as a benchmark. Results suggest that the greater the real purchasing power of the dollar in a country, the greater expected immigration inflows from that country. Military conflicts, collapse of state institutions and transition out of a communist regime are also positively related to emigration to the United States. The variable with the biggest explanatory power is the level of immigration by country in 1979. Overall levels of immigration by country are extremely persistent. Information, history, American foreign policy, ethnic networks, and permanent differences in the policies of sending countries may be important persistent determinants of the country-specific levels of emigration to the United States.

The prediction of immigrants by country and year does not use the estimated random effects, which may be correlated with factors that made it attractive to immigrate into the cities where immigrants of that nationality clustered during the 1984-98 period. The prediction is therefore a linear combination of the exogenous variables in Table A.2.

Once I have obtained the predictions by country, I use the share of immigrants from that country that decided to settle in each city in 1983 to obtain forecasts of the number of immigrants by nationality and metropolitan area. Adding these inflows by MSA, I obtain a prediction of immigrants per MSA and year.

Table A.3 shows the first stage of the 2SLS estimation. In the first stage actual immigration levels are regressed on a single instrument and the other control variables in Table 2. In the first two columns the dependent variable is the annual inflow of immigrants into a city, and the main explanatory variable is the predicted inflow of immigrants. Both the instrument based on the national level shift-share (column 1) and the instrument based on origin country characteristics (column 2) work very well. Partial F-test critical values for the excluded instruments are around 200. In fact, most of the variation in these inflows is between cities, and changes in the annual levels of immigration and the characteristics of sending countries account for a lesser part of the variance in the instruments. Thus, I can predict general immigration flows by city during the 1984-1997 period well by using the destinations of immigrants in 1983.

Table 3 presents the basic results using instrumental variables. The second stage uses the fitted values obtained from the regressions in Table A.3. The results are similar to those in the OLS specifications. In columns (1) and (2), I use the shift-share of the total number of immigrants admitted in the United States as an instrument. Columns (3) and (4) present the results with the instruments derived from predicting immigration by country. The results suggest estimates of the parameter β of around 1 for rents and bigger than 2 for housing prices.

4.3 Quality

Another issue is the quality of the housing units in the HUD sample. The Freddie Mac price index is based on a sample of repeat sales. The same units are tracked in time, and changes in quality may be small. The Fair Market Rent measure does not have this property. If the quality of housing increased systematically in "immigrant cities," maybe because growing cities tend to have housing units of newer vintages, my estimates could just be reflecting the effect of quality on rents. Conversely, immigration could actually be associated with lower qualities, and the previous results would then be biased downward. I address this issue using microdata from the 1985 and 1995 samples of the American Housing Survey. The AHS provides several quality indicators that I will use as controls. An additional advantage of using the AHS is to check on the robustness of my previous findings on an alternative data source. In Table 4, the log of reported rent for each unit in both years (1985 and 1995) is the left-hand-side variable. The interaction of the population impact of the cumulative number of INS-reported immigrants in the MSA (1984 –1994) and a 1995 dummy captures the impact of recent immigration on the change in rents between 1985 and 1995. Other explanatory variables are the change in log income and the interaction between city characteristics and the 1995 dummy. MSA fixed effects capture explicitly the covariance between observations in the same MSA, and make it unnecessary to include variables interacted with the 1995 dummy in non-interacted form.[21] The quantitative results are remarkably similar to previous specifications (1% extra rent growth for 1% impact), despite the fact that the time frame is different (10 years from 1985 to 1995), and the fact that the AHS tracks a much smaller number of metropolitan areas (only 141). Areas where immigrants settled tended to experience higher rent growth. The introduction of quality indicators (column 2) does not change the coefficient of interest by much. The fact that such estimates in column 2 are bigger than those in column 1 suggests that the impact of immigration on quality-adjusted rents may be slightly higher, but I cannot reject the hypothesis that both coefficients are identical.

4.4. Using the decennial censuses

The INS provides data about illegal immigrant apprehensions and estimates of the net flows of illegal immigrants in several issues of the "Statistical Yearbook of the Immigration and Naturalization Service." Unfortunately, estimates of the illegal net inflows are not disaggregated at the metropolitan area level. Moreover, estimates of illegal immigration are imprecise and do not change much from year to year. A shortcoming of the data that I have used so far is that they do not include figures for illegal immigrants. We need to interpret the results so far as the "treatment effect" of permanent residence admission on rents and housing prices. This would not be problematic if illegal immigration were uncorrelated with legal immigration inflows. Unfortunately, this is an unlikely assumption. Nevertheless, there are reasons to believe that the exclusion of illegal immigrants may not affect the primary *qualitative*

[21] As most units appear in both samples, I further cluster standard errors by unit.

conclusions so far. First, the estimated figures for net illegal immigration during the period correspond very well with the figures of emigration of legal residents. According to the Census Bureau (INS [22]) about 260,000 foreign-born residents emigrated annually from the United States in the 90s. The estimated net number of annual illegal aliens entering the country was 281,000 for 1988-92 and 275,000 for 1992-1996 (INS [22]). The effects of illegal immigration and emigration of the foreign-born may cancel each other to some extent. Second, it is unlikely that the correlation between legal and illegal inflows is equal to one.

However, a better way to approach the issue of the foreign born persons who are not legal immigrants is by using census data counts at the MSA level. The census counts most foreign-born residents, irrespective of their immigrant status.[22] The other advantage of using the census over the INS data is that it is free of measurement error in the reporting of the locations where the foreign born person decides to settle. The main disadvantage of the census is its periodicity. I will only be able to consider the "long" changes in rents and prices between the census years for which I have complete data (1970, 1980, 1990, and 2000). The other disadvantage of the census is that we do not obtain the MSA in which the immigrant first settled. Actual residence in an MSA may be endogenous to the rent level in the city. With a very inelastic housing supply, new immigration could have an impact on rents even if the net migration of the foreign-born into the city is small. Using instrumental variables techniques may help us deal with that problem.

Table 5 presents the results from regressions where the decadal changes in the census-reported log of median rent, or house value in the MSA are the main dependent variables. The change in the number of the foreign-born between two census years over population in the initial year is the main explanatory variable. As a check for the quality of the self-reported data, and in order to account for some of the changes in unobserved quality, I also present the results with the repeat sales price index. The dataset is a panel of 316 MSAs in the Continental US. I use similar controls as in the previous regressions.[23] OLS results

[22] There may be some concerns about the undercount of illegal immigrants in specific areas, but we can hardly improve on the census counts.

[23] The MSA definition here is the 1999 county-based one (see data Appendix). There were 318 such defined MSAs, two of which -Anchorage, and Honolulu – are outside the continental US (results including these two are virtually

(columns 1, 4 and 7) are notably consistent with the previous specifications in the paper. The parameter of interest is robust to the use of very different data sources. It is important to point out that only contemporaneous changes in income, high temperature, and low humidity seem to be related to price and rent growth in these regressions. Furthermore, the exclusion of the controls, or the inclusion of other plausible explanatory variables, does not affect the results. The results of the regressions without controls can be consulted by the interested reader in Appendix Table 4 (A.T.4).[24]

In columns 2, 5 and 8, I use an IV strategy in order to deal with the fact that changes in the location of the foreign-born may be driven by housing costs and could be correlated with other relevant omitted variables. I predict the MSA change in the foreign-born according to the formula:

$$\text{(IV)} \qquad \Delta foreign-born_{kt} = \Delta foreign-born_{US,t} \times \frac{foreign-born_{k,1970}}{foreign-born_{US,1970}}$$

Where $foreign-born_{kt}$ is the number of foreign-born people in city k at time t, and $foreign-born_{US,t}$ the number of foreign born in the US at time t. This basically amounts to multiplying the initial level of the foreign born by the national growth rate of the foreign-born, and thus is in the tradition of using initial immigration levels in an initial period (1970 in this case) to predict subsequent inflows in a "shift-share" approach (Altonji and Card [1]). I then divide by lagged population levels to generate a prediction for the expected

identical to those reported in Table 5, however). I have data for murder rates by MSA only for 1980, 1990 and 2000, so I use contemporaneous murder rates on the right-hand-side (excluding crime does not change the coefficient of interest in any of the tables).

24 Appendix Table A.4 also includes regressions that control for a host of other variables at the MSA level in 1970 that could plausibly be expected to forecast future rent and price growth: log of income, share workers in manufacturing, share workers in Finance, Insurance, and Real Estate, white population share, share of housing units older than 30 years, share of housing units newer than 10 years, presence of hills and mountains, a dummy for metro areas that border an ocean or Great Lake, and dummies for the Northeast, Midwest, South, and West Census regions. Results do not change much. Since housing prices and rents display a pattern of mean-reversion (Case, Shiller [11], Capozza, Hendershott, Mack, Mayer [9]) I also include lagged prices in TA.4, column 3: the results are somewhat stronger, but not statistically significantly different from the ones in Table 5.

immigration relative *impact* in each city. The IV estimates suggest an elasticity in the range of 0.6-1.5 for rents and prices.[25]

One potential concern of the IV estimates here and in the previous sections is that the initial geographic settlement patterns of immigration in 1970 might be correlated with city attributes that were associated with future rent and housing price growth. Columns 3, 6 and 8 include MSA fixed effects. The left-hand side variable is still the decadal *change* in the log of housing rents or prices. The fixed effects should control for the impact of city-specific amenities (or changes in the valuation of amenities) that were associated with rent *growth* during the period. The identification here comes from changes in immigration inflows within a city, rather than on the cross-sectional variation in the share of immigrants. Clearly, rent and house price growth in a city accelerated in the decades with bigger immigration inflows. The main parameters' estimates are higher than with the OLS specification, albeit more imprecisely estimated. The fact that rent and price growth accelerates when immigration inflows accelerate is consistent with a causal interpretation of the results. The parameter estimates do not change much when I run alternative specifications that control for the initial share of immigrants in the city and an interaction of the latter variable with a time trend.[26]

5. Conclusions

This paper shows that there is a local economic impact of immigration in American cities. Immigration pushes up the demand for housing in the destination areas. Rents increase in the short run, and housing prices catch up. The association between immigration and rents appears to be causal. Acceleration or deceleration in the immigrant's inflows within a city is associated with acceleration or deceleration in the evolution of rents. The results are general

[25] It is interesting to note that the results do not change much if we exclude Los Angeles, San Francisco and New York MSA, which have been salient areas of rent growth in recent periods.

[26] If one is very concerned about the use of the initial immigrant share anticipating city-wide rent trends in the IV approach, an alternative strategy is to include it as a control in the OLS regressions. This exercise can be seen in the Appendix table A.T.4, columns 4 and 5. Note that the relevant parameter estimate here uses the variation in the immigration variable that is orthogonal to the one used in the IV strategy, to obtain very similar results: no matter how and why immigrants arrived, rents and prices went up. I also introduce the initial immigrant share interacted with a time trend to address the issue that original amenities associated with initial immigration settlement patterns may have second derivative issues (i.e. its impact on growth changed).

in the US context and not limited to specific immigration episodes (as in Saiz [33]). They are consistent with the idea that immigrants do not displace natives from "gateway" cities *one-for-one*. However, they also suggest another major mechanism by which immigration *might* affect the migration decisions of at least *some* natives in areas with inelastic housing supply.

Instruments based on the characteristics of sending countries, the immigration level by country of origin in 1979 and the initial geographical distribution of immigrants by country, and instruments based on the year-to-year changes in national immigration levels and previous patterns of settlement, all yield similar results. Areas where one would have expected immigrants to settle experienced higher rent and housing price evolution, regardless of the economic shocks and different fates experienced by the cities during the 30-year period between 1970 and 2000.

Fixed effects models that control for the initial characteristics of the cities where immigrants tended to cluster during that period also yield positive impacts of immigration on average rents and home values.

The results are robust to the use of 5 alternative measures of housing costs (Freddie Mac repeat sales price index, HUD Fair Market Rents, American Housing Survey rents, Census median house prices, Census median rents), the measurement of immigration (INS legal immigrant data vs. census counts of the foreign-born), and time periods.

An immigration inflow that amounts to 1% of the initial metropolitan area population is associated with, roughly, a 1% increase in rents and housing values. It is useful to benchmark these results to the results in the wage literature. The population-weighted average share of the foreign-born in the US (metropolitan areas in the 2000 census) was 12%. To increase this share by 1%, the average city would need an immigration inflow equal to 1.15% of the initial population. Using the modal estimate in the paper this could increase rents by 1.15%. Arguably, from the labor literature, a 1% increase in the relative share of a skill group depresses the relative wages of that group by 0.03%. The typical renter-occupied household spends about ¼ of their income in rental payments. Thus, ceteris paribus, the change in rents amounts to 0.28% of initial income, which is an order of magnitude bigger than the relative labor market effect for renters. Homeowners, on average, do benefit from higher housing prices, pointing out to a small distributive impact in the short and medium run.

Family income, housing consumption, local amenities, and the evolution of other local and national prices are clearly endogenous to immigration, so welfare implications are complex and require further investigation. However, the paper demonstrates that housing rents and prices must be important explanatory variables in further research about the interplay between immigrants, labor markets, and the mobility of natives.

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TABLE 1

Descriptive Statistics (1990)

	Population Weighted		Non-weighted			
Variable	Mean	Std. Dev.	Mean	Std. Dev.	Min	Max
Rents	570	136	492	111	321	930
New Immigrants / Population at T-1	0.003	0.004	0.002	0.002	0.000	0.016
Population	2,420,757	2,530,639	680,758	1,090,127	56,327	8,840,981
Income per capita	21,142	3,714	18,518	3,533	9,335	31,516
Unemployment Rate	0.05	0.02	0.06	0.02	0.02	0.22
MSA Area (sq. miles)	3,728	4,191	2,355	3,147	47	39,369
Murders per 1,000 inhabitants at T-10	0.011	0.007	0.008	0.005	0.000	0.028
January Average Temperature - Fahrenheit Degrees (Average 1941-1970)	36.42	12.49	35.48	12.67	3.95	67.20
July Mean Relative Humidity (Average 1941-1970)	60.284	12.517	58.011	14.377	19	80
Share with Bachelor's Degree (1980)	18.02	4.35	16.47	5.32	7.74	38.56

Notes: Observations at the MSA, PMSA level. The number of MSA (with complete observations) is 306.

TABLE 2

Immigrant Inflows and Annual Log Rent Changes (1985-1998)

	Δ Log rent		Δ Log price	
	(1)	(2)	(3)	(4)
(New immigrants at T-1) / (Population at T-2)	**1.028**	**0.890**	**2.279**	**2.235**
	(0.386)***	(0.255)***	(0.506)***	(0.459)***
Δ Log income at T-1	0.042	0.069	0.669	0.148
	(0.043)	(0.036)*	(0.099)***	(0.033)***
Unemployment rate at T-1	-0.134	-0.087	-0.509	-0.161
	(0.031)***	(0.031)***	(0.078)***	(0.054)***
Murders per 100 inhabitants (1980)	0.054	0.039	-0.458	-0.910
	(0.107)	(0.132)	(0.314)	(0.223)***
Log MSA area	-0.001	-0.001	-0.003	0.000
	(0.0005)*	(0.001)	(0.002)*	(0.001)
Log January Average Temperature (Average 1941-1970)	0.002	0.001	-0.004	-0.007
	(0.001)	(0.002)	(0.004)	(0.004)*
Log July Mean Relative Humidity (Average 1941-1970)	0.000	0.000	-0.011	0.004
	(0.002)	(0.002)	(0.003)***	(0.004)
Percentage with Bachelor's Degree (1980)	0.000	0.000	-0.001	0.000
	(0.000)	(0.0001)**	(0.0002)***	(0.000)
Year fixed effects	Yes	Yes	Yes	Yes
ARMA(2,2)	No	Yes	No	Yes
Observations	4,286	4,286	2,198	2,198
R-squared	0.187	ML	0.22	ML

Notes:

1. Standard errors (clustered by MSA) in parentheses. Δ indicates first difference
2. * significant at 10%; ** significant at 5%; *** significant at 1%.
3. First differences for years 85 to 98: observations with all explanatory variables complete.
4. ML: Estimated using maximum likelihood. "Basic" disturbances are assumed to follow the normal distribution.
5. The table shows the results of a regression where the annual change in the logarithm of rents (prices) is the dependent variable. The lagged value of the number of new immigrants divided by population in the previous year is the main independent variable of interest. Rent and price data are from 1984 to 1998, for 306 MSA with FMR data, and for years with complete observations (unbalanced panel data). The regression also controls for annual changes in log income, lagged unemployment rates, and for other lagged MSA variables.

TABLE 3

Immigrant Inflows and Annual Log Rent Changes: Instrumental Variables

	US levels instrument		Origin country instrument	
	Δ Log rent	Δ Log price	Δ Log rent	Δ Log price
	(1)	**(2)**	**(3)**	**(4)**
(New immigrants at T-1) / (Population at T-2)	0.995	2.865	**0.961**	**3.358**
	(0.339)***	(0.562)***	(0.335)***	(0.653)***
Δ Log income at T-1	0.042	0.669	0.042	0.670
	(0.043)	(0.099)***	(0.043)	(0.099)***
Unemployment rate at T-1	-0.133	-0.526	-0.132	-0.541
	(0.030)***	(0.078)***	(0.031)***	(0.076)***
Year fixed effects	Yes	Yes	Yes	Yes
Other MSA variables in Table 2	Yes	Yes	Yes	Yes
Observations	4,286	2,198	4,286	2,198
R-squared	0.18	0.22	0.18	0.22

Notes:

1. Standard errors (clustered by MSA) in parentheses. Δ indicates first difference.
2. * significant at 10%; ** significant at 5%; *** significant at 1%.
3. First differences for years 85 to 98: observations with all explanatory variables complete.
4. The table shows the results of a regression where the annual change in the logarithm of rents (prices) is the dependent variable. The lagged value of the number of new immigrants divided by population in the previous year is the main independent variable of interest. Rent and price data are from 1984 to 1998, for 306 MSA with FMR data, and for years with complete observations (unbalanced panel data). The regression also controls for annual changes in log income, lagged unemployment rates, and for other lagged MSA variables.
5. The "US levels instrument" uses the total number of immigrants in the US each year and the share of immigrants going to each MSA in 1983 to predict the number of immigrants by MSA and year. The "origin country instrument" is a prediction of MSA yearly immigration inflows based on "expected" immigration by country and the shares of immigrants of each nationality settling into each MSA in 1983.

TABLE 4

Micro Data AHS: Rents and Qualities

	Log rent at T (T=1985,1995)	
	(1)	**(2)**
Immigration impact (1984-1994)* 1995	**1.076**	**1.202**
	(0.297)***	(0.283)***
Change in MSA Income * 1995	0.777	0.758
	(0.136)***	(0.130)***
Log Unemployment 1984 * 1995	0.177	0.027
	(0.463)	(0.448)
Log MSA Area * 1995	0.001	-0.003
	(0.013)	(0.013)
Log January Temperature * 1995	-0.023	-0.016
	(0.028)	(0.026)
Log July Humidity * 1995	0.025	0.013
	(0.027)	(0.025)
Murder Rate 1980 * 1995	-3.709	-4.716
	(1.672)**	(1.590)***
Share bachelors 1980 * 1995	-0.004	-0.005
	(0.002)*	(0.002)*
1995	0.100	0.208
	(0.218)	(0.208)
Cracks in walls		-0.056
		(0.014)***
Leaking ceiling		-0.033
		(0.016)**
Heat down on winter		-0.016
		(0.023)
Fuses blew last 3 months		0.029
		(0.011)***
Peels in paint		-0.016
		(0.015)
Rats or mice		-0.132
		(0.017)***
Number of units in building		0.000
		(0.000)
Elevator present		0.075
		(0.020)***
Number of bedrooms		0.128
		(0.006)***
Age of building		-0.005
		(0.0002)***
MSA fixed Effects	Yes	Yes
Observations	15,692	15,692
R-squared	0.3	0.38

Notes:

1. Standard errors clustered by unit in parentheses. MSA fixed effects directly control for the covariance between units within a MSA.
2. * significant at 10%; ** significant at 5%; *** significant at 1%.
3. Immigration impact stands for the number of immigrants during the 1984-1994 period divided by 1984 population. The impact is instrumented by the prediction from the "origin countries" IV.

TABLE 5

Census Data: 1970, 1980, 1990 and 2000

	Δ Log median Rent			Δ Log median home value			Δ Log repeated home sales index		
	OLS	IV	FE	OLS	IV	FE	OLS	IV	FE
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
ΔForeig Born/ Population at T-10	**0.665**	**0.626**	**1.726**	**1.327**	**0.845**	**2.505**	**1.452**	**0.676**	**4.713**
	(0.104)***	(0.147)***	(0.351)***	(0.203)***	(0.249)***	(0.666)***	(0.283)***	(0.493)	(2.037)**
Δ Log income	0.887	0.885	0.943	1.533	1.516	1.691	1.672	1.632	1.590
	(0.059)***	(0.058)***	(0.084)***	(0.114)***	(0.111)***	(0.170)***	(0.170)***	(0.169)***	(0.523)***
Unemployment Rate at T-10	-0.235	-0.230	-0.702	0.315	0.375	-1.234	1.089	1.069	0.418
	(0.160)	(0.162)	(0.412)*	(0.311)	(0.309)	(0.799)	(0.518)**	(0.479)**	(2.493)
Log January Average Temperature (Average 1941-1970)	0.042	0.043		0.006	0.024		-0.064	-0.029	
	(0.006)***	(0.007)***		(0.010)	(0.011)**		(0.020)***	(0.028)	
Log July Mean Relative Humidity (Average 1941-1970)	-0.030	-0.031		-0.062	-0.070		-0.003	-0.020	
	(0.007)***	(0.008)***		(0.014)***	(0.014)***		(0.023)	(0.024)	
Log MSA Area	-0.004	-0.003		-0.006	-0.003		-0.012	-0.007	
	(0.003)	(0.003)		(0.005)	(0.005)		(0.010)	(0.010)	
Murders per 1,000 inhabitants	0.189	0.197	2.149	-1.095	-0.995	10.129	-3.182	-3.129	-0.623
	(0.615)	(0.616)	(1.692)	(1.166)	(1.225)	(3.332)***	(2.239)	(2.391)	(12.883)
Percentage with bachelor's degree at T-10	-0.004	-0.004	-0.005	-0.004	-0.003	-0.042	-0.003	-0.001	-0.082
	(0.0005)***	(0.0005)***	(0.004)	(0.0009)***	(0.0009)***	(0.0069)***	(0.001)**	(0.002)	(0.032)**
Decade fixed effects	yes	yes	yes	yes	yes	yes	yes	yes	yes
MSA fixed effects	no	no	yes	no	no	yes	no	no	yes
MSA	316	316	316	316	316	316	284†	284†	284†
Observations	948	948	948	948	948	948	442	442	442
R-squared	0.88	0.88	0.9	0.78	0.78	0.83	0.36	0.34	0.68

Notes:
1. Standard errors (clustered by MSA) in parentheses
2. † Unbalanced panel for 1990 and 2000.
3. * significant at 10%; ** significant at 5%; *** significant at 1%
4. The table shows the regression where the intercensal change in the log of median rents or house prices is the main dependent variable and the change in the number of immigrants over initial MSA population is the main independent variable. the data includes all rent/price changes between Census years (1970, 1980, 1990, and 2000). Most control variables take values in the initial census year. Instrumental variables use the total decennial change in foreign born interacted with the share of foreign-born population in the initial year.

Appendix TABLE A.1

Major Immigrant Cities (New Permanent Residents, 1983-1997)

Rank	MSA	Population 1983	Legal immigrants 1983-1997	Impact*
1	New York	8,384,789	1,576,355	**18.80%**
2	Los Angeles-Long Beach	7,890,314	1,057,856	**13.41%**
3	Miami	1,725,589	435,697	**25.25%**
4	Chicago	7,259,019	408,727	**5.63%**
5	Washington	3,632,843	338,378	**9.31%**
6	San Francisco	1,531,795	253,691	**16.56%**
7	Anaheim-Santa Ana (Orange County)	2,072,418	243,263	**11.74%**
8	Houston	3,150,230	215,113	**6.83%**
9	San Jose	1,367,215	206,228	**15.08%**
10	Oakland	1,843,567	186,436	**10.11%**
11	Boston	5,359,877	182,568	**3.41%**
12	San Diego	2,003,313	174,730	**8.72%**
13	Newark	1,953,448	163,320	**8.36%**
14	Philadelphia	4,791,248	146,834	**3.06%**
15	Bergen-Passaic	1,298,675	143,482	**11.05%**
16	Nassau-Suffolk	2,621,072	132,523	**5.06%**
17	Dallas	2,249,095	125,081	**5.56%**
18	Seattle-Bellevue-Everett	1,712,491	113,649	**6.64%**
19	Jersey City	566,829	106,735	**18.83%**
20	Detroit	4,229,636	105,756	**2.50%**
	10 Biggest Immigrant Cities	38,857,779	4,921,743	12.67%
	% Metropolitan US	**19.90%**	**53.07%**	
	20 Biggest Immigrant Cities	65,643,463	6,316,422	9.62%
	% Metropolitan US	**33.61%**	**68.11%**	

Notes: All magnitudes at the PMSA or MSA level

*(Immigrants /1983 Population), total immigrants obtained as the sum of legal immigrants in fiscal years 1983 through 1997.

Appendix TABLE A.2
Accounting for Immigration

	Log immigrants at T
Log real GDP per capita at T-2	-0.109 (0.038)***
Log of population at T-2	0.265 (0.032)***
Log(exchange rate T-1)-Log(exchange rate 1979)	0.032 (0.013)**
Military Conflict T-2	0.256 (0.061)***
Collapse of State Insitutions T-1	0.458 (0.100)***
Transition out of Communism	1.698 (0.127)***
Log immigration in 79	0.878 (0.027)***
Country Random Effects	*yes*
Observations	1,936
Number of countries	131
R-squared	0.896

Notes:
1. Standard errors in parentheses.
2. * significant at 10%; ** significant at 5%; *** significant at 1%.
3. The regressions have the total number of legal immigrants by country and year as dependent variable and lagged country characteristics as independent variables. Observations for immigration are for the period 1983-1997 and for 131 origin countries (unbalanced panel).

Appendix TABLE A.3

First Stage for Instruments

	New Immigrants per Population		
	Yearly Differences (INS)		Decennial (census)
	(1)	**(2)**	**(3)**
Predicted impact (from national level shift-share)	0.943		0.663
	(0.064)***		(0.077)***
Predicted impact (from origin countries RE)		0.825	
		(0.051)***	
Other MSA variables in Table 5	yes	yes	yes
Year fixed effects	yes	yes	yes
Observations (N×T)	4286	4286	948
R-squared	0.83	0.85	0.51
F-test statistic for excluded instrument	212.78	256.1	72.38

Notes:

1. Robust standard errors in parentheses

2. * significant at 10%; ** significant at 5%; *** significant at 1%

3. The table shows the regressions of actual immigration inflows on the predictions (instrumental variables). The first two columns use annual legal immigration inflows from the INS. The "national level shift-share" instrument (column 1) uses the share of immigrants to each city in 1983 and the total number of immigrants in the US to predict immigration inflows by year and MSA after 1983. The "origin countries" instrument predicts immigration by nationality and year and uses the shares of immigrants by nationality and MSA in 1983 to predict the total number of immigrants by MSA and year after 1983. The "national level shift-share" regression in column 3 uses the decennial national change in the number of the foreign born between Census' years and the share of foreign-born in 1970 (our initial census year) to construct a "shift-share" instrument for the change in the foreign-born by MSA and year.

Appendix TABLE A.4

Further Robustness Tests

	(1)	(2)	(3)	(4)	(5)
	Δ Log median Rent				
New (10 year) Immigrants per initial population	**0.689**	**0.728**	**1.041**	**0.618**	**1.722**
	(0.106)***	(0.108)***	(0.125)***	(0.122)***	(0.353)***
Share Foreign-Born in 1970				0.487	
				(0.431)	
Share Foreign-Born in 1970 x Time Trend				-0.138	-0.123
				(0.126)	(0.195)
	Δ Log median home value				
New (10 year) Immigrants per initial population	**1.112**	**0.915**	**1.757**	**1.102**	**2.452**
	(0.180)***	(0.175)***	(0.229)***	(0.242)***	(0.666)***
Share Foreign-Born in 1970				5.871	
				(0.950)***	
Share Foreign-Born in 1970 x Time Trend				-1.835	-1.459
				(0.299)***	(0.396)***
	Δ Log repeat home sales index				
New (10 year) Immigrants per initial population	**0.585**	**0.945**	**1.003**	**1.022**	**3.441**
	(0.238)**	(0.281)***	(0.217)***	(0.256)***	(1.671)**
Share Foreign-Born in 1970				20.614	
				(5.248)***	
Share Foreign-Born in 1970 x Time Trend				-5.580	-4.521
				(1.404)***	(2.287)**
Control Variables in table 5	No	Yes	Yes	Yes	Yes
Other 1970 MSA Variables┴	No	Yes	Yes	No	No
Lagged Dependent Variable	No	No	Yes	No	No
MSA Fixed Effects	No	No	No	No	Yes

Notes:

1. Standard errors (clustered by MSA) in parentheses
2. * significant at 10%; ** significant at 5%; *** significant at 1%
3. The regressions correspond to 315 MSA with complete observations for all variables (284 MSA for the repeat sales sample) in 3 decades 70s, 80s, and 90s.
4. ┴ Other 1970 variables include: log of income, share workers in manufacturing, share workers in Finance, Insurance, and Real Estate, white population share, share of housing units older than 30 years, share of housing units newer than 10 years, presence of hills and mountains, a dummy for metro areas that border an ocean or Great Lake, and dummies for the Northeast, Midwest, South, and West Census regions. All these variables take their initial 1970 values in all observations.

Data Appendix

Variable	Definition/notes	Table
Rent	HUD Fair Market Rent. These are obtained directly from HUD by MSA. HUD reports rents at the 45% of the rent distribution. After 1996, rents for the 40^{th} percentile are reported. In 1995 both the 40^{th} and 45^{th} percentile are reported, and I use subsequent growth ratios to extrapolate 45^{th} percentile rents from 1996 on. The fair market rent that is applicable to a fiscal year (which starts in October) is calculated and published during the previous fiscal year. Thus, the 1997 FMR was actually calculated and published in 1996. I use the year of publication in the empirical specifications.	T1, T2, T3
Rent	American Housing Survey 1985-1995. Self-reported rent in renter occupied metropolitan households.	T4
Rent	Median MSA rent. HUD State of the Cities Data System (from Census)	T5, TA.4
House price	Freddie Mac Repeat sales index (Conventional Mortgage Home Price Index). Complemented with data from OFHEO (1980, 1990, and 2000).	T2, T3, T5, TA.4
House price	Median MSA Housing Value. HUD State of the Cities Data System (from Census)	T5, TA.4
Income	Average MSA per capita income from the Bureau of Economic Analysis (BEA)	T1, T2, T3, T4, T5, TA.3, TA.4
Unemployment Rate	At the MSA level. Bureau of Labor Statistics.	T1, T2, T3, T4, T5, TA.3, TA.4
Immigrants	Number of new legal immigrant admissions by MSA (from INS "Immigrants Admitted"). Immigrants are matched to 1990 MSA boundaries using the Census Mable Geocorrelation engine. Immigrants in zip codes that are not identified by MABLE are allocated to MSAs (non-MSA status) using the same proportions in the rest of the sample.	T1, T2, T3, T4, TA.1, TA.2, TA.3
Immigrants	Head count of the foreign born at the MSA level from Census	T4, TA.3, TA.4
January Average Temperature	A monthly average over the years 1941-1970. Measured in Fahrenheit degrees. From the United States Department of Agriculture (USDA) Economic Research Service (ERS) Natural Amenities Scale Database. 1999 MSA/NECMA definitions are used to aggregate county level data to MSA.	T1, T2, T3, T4, T5, TA.3, TA.4
July Mean Relative	A monthly average over the years 1941-1970. Relative humidity is	T1, T2, T3,

Humidity	the ratio between the quantity of steam effectively absorbed by the air and the maximum quantity that could be absorbed at the same temperature. From the United States Department of Agriculture (USDA) Economic Research Service (ERS) Natural Amenities Scale Database. 1999 MSA/NECMA definitions are used to aggregate county level data to MSA.	T4, T5, TA.3, TA.4
MSA Area	Area (square miles) of the MSA. HUD State of the Cities Database.	T1, T2, T3, T4, T5, TA.3, TA.4
Share with bachelors degree (decennial)	HUD State of the Cities Data System (from Census)	T5, TA.3, TA.4
Share Foreign-Born in 1970	HUD State of the Cities Data System (from Census)	T5, TA.3, TA.4
Share workers in manufacturing, Finance, Insurance, and Real Estate 1970	HUD State of the Cities Data System (from Census). Employed individuals.	T.A.4
White Population Share 1970	HUD State of the Cities Data System (from Census).	T.A.4
Share of housing units older than 30 years, and newer than 10 years in 1970	HUD State of the Cities Data System (from Census).	T.A.4
Presence of hills and mountains	(USDA) Economic Research Service (ERS) Natural Amenities Scale Database. The ERS classified each US county into one of 21 elevation codes ordered according to how rugged the terrain is (from category 1's 'flat plains' to category 21's 'high mountains'). The topographical variable used in the regression analysis here is a binary variable that equals to one if all counties in the metropolitan area have elevation codes of 16 or higher.	T.A.4
Dummy for metro areas that border an ocean or Great Lake	Author's calculation from Census TIGER files and ArcGis ® GIS software.	T.A.4
Census Region Dummies	2000 Census Region Definitions	T.A.4
Murders per 1000 persons (decennial)	National Archive of Criminal Justice Data. FBI County Uniform Crime Reports. 1999 MSA/NECMA definitions are used to aggregate county level data to MSA. Not available in 1970.	T1, T2, T3, T4, T5, TA.3, TA.4
Real GDP per capita	World Bank -World Development Indicators	TA.2
Population	World Bank -World Development Indicators	TA.2

Real exchange rate	World Bank -World Development Indicators. It is calculated as the (nominal GDP in domestic units/domestic GDP deflator) divided by (nominal GDP in US $/US GDP deflator)	TA.2
Collapse of state institutions	"Internal Wars and Failures of Governance 1954-1996" database, from the Center for International Development and Conflict Management at the University of Maryland.	TA.2
Transition out of communism	Takes value 1 for ex-communist countries after 1989.	TA.2
Military conflict	"Internal Wars and Failures of Governance 1954-1996" database, from the Center for International Development and Conflict Management at the University of Maryland	TA.2

Other notes

1. Tables 1-3 use the 1990 MSA definitions. Data from BEA and other sources use 1999 MSA/NECMA (county based) definitions, so I use initial population in 1980 and the growth rates of the closest NECMA-defined MSA (as reported by BEA) to estimate population by year by MSA (1990 defined). To assign income per capita to the New England MSAs I match the MSA to the NECMA with greatest overlap using the census Mable geocorrelation engine.

2. *Merging immigrant inflows with country of origin data:* Some of the countries in the INS files disappeared (merged or split). The World Bank data are reported for currently existing countries. I assign the individuals from these countries to a major "anchor" country as follows:

Anchor country (World Bank Data)	**INS country**
Germany	East Germany West Germany
Micronesia, Fed. Sts.	Northern Mariana Islands Marshal Islands Palau Micronesia
New Zealand	New Zealand Cook Islands Niue
Russian Federation	USSR Moldova Russia Tajikstan Turkmenistan Ukraine Uzbekistan Armenia Azerbaijan Belarus Georgia Kazahkstan Kyrgyzstan
Czech Republic	Czechoslovakia Czech Republic Slovakia

Ethiopia	Ethiopia Eritrea
Yemen, Rep. of	Yemen (Aden) Yemen (Saana) Yemen
Spain	Spain Gibraltar
Australia	Australia Christmas Island Cocos Islands
Yugoslavia	Yugoslavia Bosnia-Herzegovina Croatia Slovenia Macedonia

3. *Incomplete country data*: a number of countries have missing data. In those cases (in order to make a prediction of immigrants by year from those countries) I estimate a random effects model with immigration from that country in 1979 as the sole explanatory variable.