DON'T STAND SO CLOSE TO ME: THE URBAN IMPACT OF IMMIGRATION

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Abstract

We examine the impact of immigration on the residential market within urban areas. We develop a spatial equilibrium model that shows how the effect of an immigrant inflow in a district affects local housing prices through changes in how natives perceive the quality of their local amenities and how this influences their mobility. Predictions of the model are tested using a novel dataset on housing prices and population variables at the district level for a sample of 20 large Italian cities. To address endogeneity problems we adopt an instrumental variable strategy which uses historical enclaves of immigrants across districts to predict current settlements. We find that immigration raises average housing prices at the city level; however it reduces price growth in a district affected by an inflow vis-à-vis the rest of the city. This pattern is driven by the natives' flight from immigrant-dense districts towards other areas of the city. These findings are consistent with native preferences to live in predominantly native areas.

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«Urban development in our period [1789–1848] was a gigantic process of class segregation, which pushed the new laboring poor into great morasses of misery outside the centres of government and business and the newly specialised residential areas of the bourgeoisie. The almost universal European division into a 'good' west end and a 'poor' east end of large cities developed in this period»

Eric Hobsbawm [*The Age of Revolution: 1789–1848*]

1. Introduction[1]

Between 2000 and 2010 there was a huge increase in the immigrant population around the world, putting considerable pressure on urban areas in the developed countries.[2] Indeed, in the US and Europe, immigrants are disproportionately directed to cities. In 2010, the fraction of foreign-born individuals in the population of New York was 2.8 times the national average. Similar patterns are observed in London and Paris (3 and 1.8, respectively) and also in countries with a more recent history of immigration such as Italy (2.2 in Milan and 1.6 in Rome). An even more striking feature of immigrant settlements is the very skewed distribution across neighborhoods observed in many European and American metropolitan areas. In some Italian cities, for example, the proportion of immigrants in the most immigrant-dense district is 10 times higher than in districts with lower immigrant density. This asymmetrical population shock has some similarities with the urbanization process described by Hobsbawm in *The Age of Revolution: 1789–1848*, and with other historical periods in which cities became the destination for huge migration flows.

The insurgence of segregation patterns and natives' reaction to the presence of a large number of immigrants are typical concerns for sociologists, economists and policymakers. The aim of this paper is to analyze these phenomena by exploring the interplay between natives and foreigners in terms of real estate. Housing markets are particularly suitable for this kind of analysis: immigrant-native interactions occur on a very local spatial scale and housing prices are likely to be very sensitive to the natives' attitudes towards immigration. Nevertheless, most of the existing studies analyzing the impact of immigration on the residential housing market look at the average price at the city level

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[2] According to the United Nations (http://esa.un.org/migration/index.asp), the number of migrants in 2010 was 214 million – an increase of 20 per cent since 2000. Europe hosts the largest number of immigrants (nearly 70 million people) – followed by Asia (61 million) and North America (50 million) – and accounts for roughly one third of immigrant population growth in the decade.

(Saiz 2003 and 2007; Ottaviano and Peri 2006), thus ignoring the spatial distribution of the population (both natives and immigrants) within the city and different effects on local prices.

In this paper we fill this gap. On the theoretical side, we provide a simple spatial model that formalizes how an immigrant shock in a district affects local amenities, thus influencing local prices and native mobility. We assume that in relation to the area in which they live, natives give value to both housing prices and the perceived quality of amenities, which are a function of the number of immigrants residing in the district. No restrictions are imposed on the relationship between immigration and natives' perception of local amenities. On the one hand, natives may have racial or religious preferences that could induce a negative effect; they may find hurdles to communication; and/or they may be concerned by a deterioration of local standards of living due to the crowding effect on local indivisible goods (e.g. parks and transport). On the other hand, natives may have preferences for cultural diversity and may benefit from a rise in the variety of local goods (e.g. ethnic restaurants), thus inducing a positive effect of immigration on amenities. On the empirical side, we design an identification procedure to calculate which case is best supported by the data.

Specifically, according to our theoretical results, (i) an immigrant shock to a district increases the average price of housing at the city level; (ii) the district hit by the shock will have higher (lower) growth in house prices than the city average if and only if migrants have a positive (negative) effect on the natives' perception of local amenities; (iii) an immigrant shock may induce natives to re-settle in other areas of the city; native mobility is affected by an income effect (i.e. the crowding out of natives due to the increased demand for housing by immigrants) and an amenities effect whose sign depends on the effect of immigrants on local amenities; and (iv) if immigrants are concentrated in a district with a more rigid housing supply, we observe no additional effects on prices but a stronger native outflow.

The theoretical predictions are tested using a unique dataset of information collected on migrants and natives, and housing prices at the district level based on a sample of 20 large Italian cities in the period 2003-2010. To identify the causal impact of immigration on house price dynamics, we adopt an instrumental variable (IV) strategy. Our instrument, widely used in the literature on migration, uses historical enclaves of immigrants across districts to predict current settlements (Card, 2001). Consistently with the theoretical prediction, we find that immigration has a positive effect on average price growth at the city level. In particular a 10 per cent increase in immigrant stocks raises the average price by 1.6 percentage points. However at the intra-municipal level we find that the same 10 per cent increase in immigrant population in a district lowers prices by 2 percentage points vis-à-vis the city average. The negative dynamics in the housing market of immigrant-dense districts is driven by natives moving away (native-flight): 10 additional immigrants who

arrive in a district cause 6 natives to re-settle in other areas of the city. Native-flight is even greater when immigrants settle in districts where housing supply is more constrained (e.g. historic city centres). All in all, these findings provide clear evidence of a perceived deterioration of amenities on the part of natives and a growing spatial segregation of migrants.

Starting with the seminal work of Saiz (2003), several papers have documented a positive effect of immigration on housing prices at the city level.[3] However, only two very recent papers move the analysis towards the intra-city level, allowing for heterogeneous effects across districts. Saiz and Wachter (2011) focus on US metropolitan areas and use census waves to document that housing values have grown relatively more slowly in districts of immigrant settlement. Sá (2011) uses survey data from the Labor Force Survey and finds similar results for the UK cities over the period 2003-2010. We innovate as regards two main aspects. First, we provide a spatial equilibrium model which is able to replicate all the empirical findings. The model allows us to disentangle the impact of immigration on prices due to an increase in the housing demand from that due to a variation in the perception of local amenities. Moreover, it also allows us to consider the role of different housing supply elasticities across districts. Second, we provide new evidence on the urban impact of immigration in a markedly different setting with respect to the US or the UK. Indeed, historically Italy is not a destination country for migration flows and the bulk of immigration has been relatively recent.[4] This may affect the natives' attitudes towards foreign-born people and feelings about the impact of immigration on cultural and national identity. Moreover, Italian households have a comparatively high propensity to buy their own home and this may lead them to care more about neighborhoods' characteristics and local amenities. All these elements may play a significant role in house price adjustment to an immigration shock.

Our paper is also related to the literature on urban segregation. Residential segregation has been investigated in the sociological literature since the 1950s. In recent decades economists have entered the field. Their interest was mainly attracted by the economic consequences of ghettos – in terms of the economic performance of minorities, human capital accumulation and costly social behavior (e.g. crime) – and by the determinants of segregation. On the latter point, Cutler et al. (1999) examine segregation in American cities and argue that current patterns are determined by "decentralized racism", that is whites pay more than blacks to live in predominantly white areas.[5] Most of the literature on urban segregation concerns the US whereas evidence for Europe is much

[3] See Saiz (2003 and 2007) and Ottaviano and Peri (2006) for the US, Gonzales and Ortega (2010) for Spain, De Blasio and D'Ignazio (2010) for Italy.

[4] In 2010 there were 4.6 million resident foreigners, about 7.5 per cent of overall population, up from 2.5 per cent in 2000 and less than 1 per cent in 1991. Italy ranked among the first 5 destination countries for migration flows in the 2000s (together with the US, UK, Canada and Spain).

[5] Card et al. (2008) find that population flows exhibit tipping-like behavior: once the minority share in a district exceeds a "tipping point", all the whites leave. Bayer et al. (2004) analyze urban patterns in the San Francisco Bay Area and conclude that racial differences in socio-demographic features explain a large amount of the observed segregation.

more limited; however our paper provides evidence on urban segregation for a European country, shedding light on its potential determinants.[6]

The rest of the paper is organized as follows. In Section 2 we develop the theoretical model and derive a set of testable predictions. In Section 3 we describe the data and provide some analysis. In Section 4 we present the empirical strategies adopted to test the theoretical findings and in Section 5 we present the results. Section 6 discusses robustness checks and some extensions. Section 7 concludes.

2. Theoretical model

2.1 Assumptions and equilibrium in the housing market

Suppose a city with 2 districts, *1* and *2*. Each individual *i* located in district *d* maximizes the following utility function:

$$U_{id} = A_d \frac{C_i^{1-\alpha} H_i^{\alpha}}{(1-\alpha)^{1-\alpha}\alpha^{\alpha}} \tag{1}$$

where A_d are the amenities in district *d*, C_i and H_i is the amount of, respectively, consumption good and housing consumed by *i*.

Assuming that the consumption good is the numeraire and income does not depend on location within the city, the budget constraint is $C_i + r_d H_i = Y_i$, where r_d and Y_i represent, respectively, rents in district *d* and individual income.[7] Standard utility maximization leads to the following marshallian demands:

$$H_i^* = \frac{\alpha Y_i}{r_d} \tag{2}$$

$$C_i^* = (1-\alpha) Y_i \tag{3}$$

There are two types of individuals in the city: natives and immigrants. The total number of natives is N a share ω of which locates in area *1*. Natives are free to move across districts and their income is equal to Y. We assume that a mass m of immigrants locates in the city and concentrates in district *2*. Immigrant income is equal to γY, with $\gamma \in (0,1]$.

[6] Boeri et al. (2011) examine residential segregation in Italy. They focus on the (negative) labor market consequences of immigrant segregation using data for 8 Italian cities.

[7] We do not assume the existence of a production sector in our model for two complementary reasons. First, from an empirical point of view, most of the previous studies find a small (if any) impact of immigration on natives' wages – see Okkerse (2008) and the works cited therein for a review of the literature. Second, and more importantly, wages are reasonably set at the city (or local labor market) level and they do not vary at the district level, which is the geographic unit of analysis in this paper.

Aggregate housing demand for each area is therefore:

$$H_1^d = \omega N \frac{\alpha Y}{r_1} \tag{4}$$

$$H_2^d = [(1-\omega)N + \gamma m]\frac{\alpha Y}{r_2} \tag{5}$$

Housing supply in district *d* is assumed to be equal to:

$$H_d^s = \beta_d r_d \tag{6}$$

where β_d is the price elasticity of housing supply in district *d*.

Equilibrium prices are determined by the equations (4), (5) and (6):

$$r_1^* = \left(\omega N \frac{\alpha Y}{\beta_1}\right)^{\frac{1}{2}} \tag{7}$$

$$r_2^* = \left\{[(1-\omega)N + \gamma m]\frac{\alpha Y}{\beta_2}\right\}^{\frac{1}{2}} \tag{8}$$

In terms of amenities, we assume that the two districts are ex ante identical. However, the inflow of immigrants alters the natives' appreciation of local amenities. Specifically, amenities are a function of immigration, that is $A(m)$. We also assume that amenities in district *1*, unaffected by immigration, are fixed and equal to A, that is $A(0) = A$. No restrictions are imposed on the sign of the impact of immigration on local amenities. On the one hand, natives might have negative attitudes towards immigrants motivated by a preference for cultural homogeneity and/or by racial or religious prejudice. Moreover, natives might be concerned about a deterioration of local standards of living due to an increase in crime or a crowding effect on local indivisible goods (i.e. parks, transport, etc.). Further concerns might arise because immigrants are less likely to stay for a long period in the same place and therefore they may have a lower propensity to invest in local public goods. Finally, even local politicians could be tempted to invest less in immigrant-dense areas because foreigners do not have the right to vote. On the other hand, natives' may perceive that local amenities have improved as a result of migration leading to greater cultural diversity; moreover, natives may appreciate the increased variety of local public goods (e.g. ethnic restaurants).[8] In formulas, if immigrants cause a perceived deterioration in the quality of local amenities then $A > A(m)$ and $A'(m) < 0$; on the contrary, if an

[8] See Mayda (2006) for an analysis of natives' attitudes towards immigrants. For a discussion on the effects of cultural diversity see also Ottaviano and Peri (2006).

improvement in local amenities is perceived then $A < A(m)$ and $A'(m) > 0$.[9]

Free mobility of natives implies that in equilibrium their utility levels will equalize across locations. This implies:

$$\frac{A}{\left(\frac{\omega N}{\beta_1}\right)^{\frac{\alpha}{2}}} = \frac{A(m)}{\left[\frac{(1-\omega)N + \gamma m}{\beta_2}\right]^{\frac{\alpha}{2}}} \tag{9}$$

In equilibrium the share of natives in area *1* is therefore:

$$\omega^* = \frac{N + \gamma m}{N}\phi(m) \tag{10}$$

where $\phi(m) = \frac{\beta_1 A^{\frac{2}{\alpha}}}{\beta_1 A^{\frac{2}{\alpha}} + \beta_2 A(m)^{\frac{2}{\alpha}}} \in (0,1)$.

Using (6), (7), (8) and (10) we can derive the city level rent:

$$r^*_{med} = \frac{\left[(N + \gamma m)\alpha Y\right]^{\frac{1}{2}}}{\beta_1 \phi(m)^{\frac{1}{2}} + \beta_2 \left[1 - \phi(m)\right]^{\frac{1}{2}}} \tag{11}$$

2.2 Theoretical predictions

We can now assess how a local immigrant shock influences district- and city-level local amenities and prices. We organize our theoretical results with the aim of producing some clear testable predictions for the empirical part of the model. As shown below, our model predicts one of the most common results in the empirical literature:

Result 1: *Migration increases the average price of housing at the city level.*

This can be easily obtained by deriving the log equation (11) by *m*:

$$\frac{\partial \ln r^*_{med}}{\partial m} = \frac{1}{2}\left\{\frac{\gamma}{N + \gamma m} + \phi'(m)\frac{\beta_2 \phi(m)^{\frac{1}{2}} - \beta_1 \left[1 - \phi(m)\right]^{\frac{1}{2}}}{\beta_1 \phi(m)\left[1 - \phi(m)\right]^{\frac{1}{2}} + \beta_2 \phi(m)^{\frac{1}{2}}\left[1 - \phi(m)\right]}\right\} \tag{12}$$

The first term in equation (12) is always positive and represents an income effect (immigrants generate an increase in the demand for housing).

The second term is an amenity effect that is strictly positive when either migrants

[9] The hypothesis that immigrant-dense districts have the same amenities as other native-dense neighborhoods can seem at odds with the empirical evidence. Immigrants, indeed, tend to concentrate in poorer areas, characterized by a lower provision of public services and, in general, amenities. However, we made this hypothesis since in the empirical part we control for all possible time-invariant (i.e. pre-migration) differences between districts.

increase natives' utility – that is $A < A(m)$ and $A'(m) > 0$ – or migrants decrease natives' utility – that is $A > A(m)$ and $A'(m) < 0$; it is instead equal to zero when natives are indifferent towards migrants – that is $A = A(m)$ and $A'(m) = 0$. Therefore, the impact of immigration on amenities (either negative or positive) generates a further pressure on city-level prices because natives are willing to pay a premium for living close to (or far from) foreigners. If natives are indifferent to the presence of immigrants then the impact on prices is driven solely by the income effect.

The average effect at the city level might be the outcome of opposing forces within the city boundaries as shown by the following:

Result 2: *The impact of migration at the district level, in relation to the city average, is negative (positive) if migration deteriorates (improves) the perception of the quality of local amenities.*

The impact of migration at the district level is obtained by deriving the log of equations (7) and (8) with respect to *m*:

$$\frac{\partial \ln r_1^*}{\partial m} = \frac{1}{2}\left[\frac{\gamma}{N+\gamma m} + \frac{\phi'(m)}{\phi(m)}\right] \tag{13}$$

$$\frac{\partial \ln r_2^*}{\partial m} = \frac{1}{2}\left[\frac{\gamma}{N+\gamma m} - \frac{\phi'(m)}{1-\phi(m)}\right] \tag{14}$$

From (12), (13) and (14) we can derive the impact of immigration at the district level, in relation to the city average. Thus, with simple algebra it can be shown that:

$$\frac{\partial \ln\left(r_2^*/r_{med}^*\right)}{\partial m} < \frac{\partial \ln\left(r_1^*/r_{med}^*\right)}{\partial m} \quad \Leftrightarrow \quad \phi'(m) > 0 \tag{15}$$

Note that the differential effect of immigration on rents at the district level depends solely on the amenities. This is due to the fact that the income effect propagates symmetrically to the rest of the city because of the free mobility of natives while the amenity effect is purely local. Specifically, if migration decreases the level of satisfaction with amenities in district *2* – that is $A'(m) < 0$ – house prices tend to grow at a slower rate with respect to the rest of the city. House price dynamics are driven by the location choices of natives who move to district *1* and are willing to pay higher rents to "escape" from foreigners (native-flight), as shown in Result 3 below.

Result 3: *Migration generates pressures for the outflow of natives.*

This can easily be obtained by deriving equation (10) by *m*:

$$\frac{\partial \omega^*}{\partial m} = \frac{\gamma}{N}\phi(m) + \frac{N+\gamma m}{N}\phi'(m) \tag{16}$$

The first term on the right-hand side represents the change in the income effect – the crowding out of natives due to the increased demand for housing on the part of immigrants – and is always positive. The second term captures the change in satisfaction with local amenities and is positive whenever immigration lowers the level of satisfaction with local amenities. In other words, the income effect is emphasized (attenuated) by the amenities effect whenever immigrants decrease (increase) the value of local amenities in area *2*.

Our theoretical framework also allows us to consider the mediating role of housing supply elasticity. This is particularly relevant as long as housing supply in some city centres (consider Rome or Venice, for example) is much more constrained than that in sprawling peripheries.

Result 4: *Lower (higher) housing supply elasticity in the area affected by immigration implies a larger (smaller) outflow of natives without affecting the house price differentials within the city.*

$$\frac{\partial\left[\frac{\partial \ln\left(r_2^*/r_{med}^*\right)}{\partial m} - \frac{\partial \ln\left(r_1^*/r_{med}^*\right)}{\partial m}\right]}{\partial \beta_2} = 0 \tag{17}$$

$$\frac{\partial \omega^*}{\partial m \partial \beta_2} < 0 \tag{18}$$

The economics of this result is quite simple. Let us assume that immigrants lower the perceived level of local amenities and locate in a city centre. In this case, we should observe a steep rise in prices due to the fact that housing supply is particularly inelastic in historic city centres. However, this effect is perfectly offset by a stronger native outflow, up to the point that the differential in rents between districts remains solely driven by the amenity effect.

3. Data and variables

We test our theoretical results using a novel dataset which matches demographic information and housing prices at the district level for a group of 20 large Italian cities. Our set of municipalities includes 5 of 6 largest Italian metropolitan areas (with more than 500,000 residents) and nearly 40 per cent of mid-sized cities (between 100,000 and

500,000 residents).[10] The share of total Italian population residing in these municipalities is about 16 per cent; this percentage rises to 25 per cent for the immigrant population.

Our geographic unit of analysis corresponds to administrative districts. There are, on average, 8 districts per city and they encompass a population of about 50,000 inhabitants. For each district we use yearly data on the number of residents by nationality over the period 2000-2010 obtained from municipal statistics offices.

Data on house prices are obtained from the Italian Land Registry Office (henceforth the LRO), and are available for the period 2003-10. The LRO divides each Italian municipality into microzones (areas that are homogeneous in socioeconomic terms). For each microzone, the LRO provides prices for several kind of houses (villas and cottages, mansions, standard houses, typical houses) and information on the state of the building (poor, normal, and excellent). We restrict our observation to standard houses in normal conditions, which are those most frequently traded in the dataset.[11] The matching between the two data sources was done using the geographic references available in each source. Since the LRO data usually has a sharper partition into urban areas (see Figure 1), the housing price at the district level has been computed as a population-weighted average of microzone prices, with population measured at the beginning of the period. We obtained 1,128 observations broadly described in Table 1.

Looking at the data, immigration clearly emerges as the most important driver of the demographic evolution of metropolitan areas in the last decade. In 2010, immigrants accounted for 13 per cent of the total population in our sample of cities, significantly higher than the national figure (7.5 per cent) and about twice the corresponding figure in 2003 (see Table 2). Moreover, we find clear evidence of an uneven distribution of immigrants across districts. The incidence of foreigners in the most immigrant-dense areas is, on average, 3 times the corresponding figure in the least immigrant-dense areas. In some metropolitan areas the difference is even greater.

In the same years the increase in real estate values was substantial: between 2003 and 2010 the yearly growth in house prices in our sample of cities was 3.2 per cent in nominal terms. Price growth was steeper until 2007 and remained basically flat later. As shown in Figure 2a, immigration is positively correlated with the housing boom at the city level. However, the uneven distribution of immigrants within the city might lead to divergent dynamics across districts. In Figure 2b we plot house prices and immigrant population growth at the district level. Growth rates have been computed as deviation from the average growth rate in the city to control for any omitted shock at city level and common

[10] Specifically, the sample includes Genoa, Milan, Naples, Rome and Turin among the large metropolitan areas and Bergamo, Bologna, Brescia, Florence, Modena, Novara, Padua, Prato, Reggio Emilia, Trento, Trieste, Udine, Venice, Verona and Vicenza among the mid-sized cities. These municipalities have been chosen on the basis of the availability of data at the district level from municipal statistics offices. Obviously, we cannot claim that this group of cities is representative at the national level, nor that the estimates obtained can be used to forecast the effect of an immigrant inflow on the average Italian house price. See Section 6.2 for a check on the generalizability of our findings.

[11] House prices are collected by exploiting several sources such as bills of sales, assessments of real estate agencies and specialized magazines. There are roughly 700,000 residential property transactions per year recorded by LRO.

to all its districts. The sign of the correlation coefficient, in contrast with the previous case, is negative. This means that house price growth in a district affected by immigration is lower in relation to the city average.

However, these correlations are at best only suggestive as they may be affected by omitted variables or reverse causation. In the following empirical section we deal with these issues.

4. Empirical strategy

In this section we show our empirical strategy to test for the predictions of the theoretical model. In particular, subsection 4.1 presents the empirical counterparts of the results we obtained in Section 2. Subsection 4.2 deals instead with identification issues.

4.1 Testing the predictions

Testing Result 1 – Result 1 of the theoretical model predicts that an increase in immigrants would raise the average housing price at the city level. To test this prediction we use the following linear specification:

$$\log P_{d,c,t} = \alpha + \beta \log M_{d,c,t-1} + CITY_c + YEAR_t + \mu_{d,c,t} \qquad (19)$$

where *d*, *c* and *t* indicate district, city and year, respectively. The dependent variable *P* is the housing price in district *n*, and *M* is the number of immigrants, as measured at the end of the previous year. We include city fixed effects to control for time invariant heterogeneity among cities and year dummies to take account of the overall housing business cycle. Each district has a weight equal to the share of the municipal population at the beginning of the period of observation: thus, β estimates the effect of immigration at the city level.[12]

Testing result 2 – According to the theoretical predictions, if immigrants increase (decrease) the level of satisfaction with local amenities, then an inflow of migrants should raise (lower) house prices in the district vis-à-vis the city average. To identify this phenomenon, we use the following model:

$$\log P_{d,c,t} = \alpha + \delta \log M_{d,c,t} + \left(CITY_c \times YEAR_t\right) + DISTRICT_{d,c} + \varepsilon_{d,c,t} \qquad (20)$$

Compared with the previous specification, we now include district fixed effects and

[12] A more standard methodology would involve the collapse of all observations at city level, which has the major drawback of a change in the unit of observation compared to the subsequent estimates. Results, available upon request, remain qualitatively unchanged.

the interaction between city level and annual fixed effects. The first set of dummies aims at capturing the characteristics of time-invariant districts, which are likely to affect both the price levels and the location of immigrants. The second set aims at partialling out the city-year specific trends.[13] The estimated coefficient for δ is the effect of immigration on the difference between local and average housing prices. According to our theoretical model, the sign of δ solely depends on the effect of immigrants on amenities: a positive sign would imply that natives' perceive an improvement in local amenities as a result of an influx of migrants, while a negative sign would indicate the opposite.

Testing result 3 – An inflow of immigrants into a district generates two effects on native mobility. The first is the income effect which unambiguously pushes out natives from the area affected by the immigrant inflow. The second is the amenity effect: it opposes the income effect if immigrants improve local amenities, while it reinforces it if immigrants cause a deterioration in amenities. The net effect of immigration on native mobility within city boundaries is estimated by the following empirical model:

$$N_{d,c,t} = \alpha + \rho M_{d,c,t} + \left(CITY_c \times YEAR_t\right) + DISTRICT_{d,c} + \xi_{d,c,t} \qquad (21)$$

where N is the number of native individuals in district d, of city c, at time t.[14] The estimated coefficient for ρ is the effect of immigration on the natives' residential choices. Specifically, a negative sign of ρ would indicate native-flight to other areas of the city (and viceversa).

Testing result 4 – The theoretical model predicts heterogeneous effects depending on the elasticity of housing supply in the area affected by immigration. In particular, if immigration deteriorates local amenities, native-flight is greater if the district affected by the shock is characterized by a more rigid housing supply. The downward effect on local house prices due to native-flight would be offset by the greater responsiveness of housing prices to a demand shock. To test this mechanism, we slightly modify the equations (20) and (21) by adding an interaction term between the number of migrants in the area and a dummy variable equal to one if the district has a rigid housing supply ($B_{d,c}$):

$$\log P_{d,c,t} = \alpha + \delta \log M_{d,c,t} + \theta \log M_{d,c,t} \times B_{d,c} + \left(CITY_c \times YEAR_t\right) + DISTRICT_{d,c} + \omega_{d,c,i} \qquad (22)$$

[13] Note that we consider only legal immigrants. However, the presence of illegal immigrants would not bias our estimates if they were proportional to legal immigrants and the constant of proportionality depends on the characteristics of time-invariant districts and city-per-year trend variables (which we control for) plus a stochastic term (Bianchi et al. 2011).

[14] In model (21) both immigrants and natives are measured in *levels*. There are two reasons for this choice: first, the resulting estimate can be interpreted simply as the number of natives who move in response to the arrival of one additional migrant; second, the native stock is much bigger than the migrant one (on average it is ten-times bigger). As a result a one per cent rise in immigrants is likely to affect native stocks only marginally in percentage terms.

$$N_{d,c,t} = \alpha + \rho M_{d,c,t} + \lambda M_{d,c,t} \times B_{d,c} + \left(CITY_c \times YEAR_t\right) + DISTRICT_{d,c} + \xi_{d,c,t} \qquad (23)$$

Since we have no information on the actual price elasticity of housing supply, we proxy it by distinguishing between "bounded districts" (i.e. districts that are completely surrounded by other municipal districts) and peripheral ones. Bounded districts are often the historic city centres that are usually constrained in the supply of new buildings by city regulations for the preservation of areas of historical interest. The theoretical model predicts $\theta = 0$ and $\lambda < 0$.

4.2 Identifying causal effects

A simple OLS estimator is likely to yield inconsistent estimates of the effect of migrant inflows in equations (19)-(23) due to omitted variable bias and reverse causality issues. For example, the construction of a new transportation facility in a certain district could lead to both a change in house prices and an inflow of immigrants, thus leading to inconsistent estimates (omitted variable bias); alternatively, immigrants may tend to settle in cheaper districts (reverse causality).

In order to overcome these problems, we use a Two-Stage-Least-Squares (2SLS) strategy exploiting a standard "shift-share" instrument. This methodology is based on the idea that immigrants tend to settle in places where immigrants from the same country already reside (Card, 2001). Therefore, we predict the composition of district's immigrant population on the basis of the distribution of immigrants in 1991 by country of origin. Specifically, for each district *d*, we compute a fictional number of migrants:

$$S_{d,c,t} = \sum_i \pi_{i,d,c,t_0} M_{i,t} \qquad (24)$$

where π_{i,d,c,t_0} measures the fraction of immigrants from country *i* that were settled in the district *d* of the city *c* in 1991 over the total number of immigrants from country *i* in Italy in the same year;[15] $M_{i,t}$ is the total number of immigrants from country *i* in Italy at time *t*. Summing across all countries of origin we obtain a measure of the predicted total number of immigrants in district *d* in year *t*.

The exclusion restriction of this instrument relies on two assumptions. First, the immigrant stock in 1991 – the first term in equation (24) – must not be correlated with the current *district trend* in house prices. This assumption is likely to be fulfilled. At the beginning of the 1990s, there were relatively few immigrants; therefore, it is unlikely that their presence could affect price dynamics more than ten years later. Moreover, geographic

[15] In some cases these shares are computed in the middle of the 1990s instead of 1991 because of data availability.

clustering of immigrants is highly differentiated by country of origin and the composition of immigrants by ethnicity has changed markedly in the last two decades for reasons that do not depend on local economic conditions.[16] Therefore, our instrument may predict very divergent immigration patterns for districts having the same stock of foreigners in 1991 but a different composition in terms of nationality. Second, our instrument is not valid as long as the total flow of immigrants from country *i* to Italy – the second term in equation (24) – is affected by unobserved factors at the district level. This is not likely to be the case, because each district represents a tiny share of total immigrant population: indeed, over the period of analysis, the district with the largest number of immigrants (District 1 in Rome) accounted for less than 1 per cent of the total immigrant population in Italy.

5. Results

We start by testing **Result 1**. Table 3 presents the results of model (19).[17] Using the OLS estimator (first column), we fail to identify a significant effect at any conventional level. However, IV estimates reveal a positive and significant effect of migration on average house prices at the city level. The first stage F-statistics of the excluded instrument is above 50, which allows us to clearly reject the null hypothesis of a weak instrument (Stock and Yogo, 2005). The comparison between OLS and IV shows that there is an attenuation bias in the OLS estimates. This may be due to either reverse causality or omitted variables. For example, slower housing price trends in the city are likely to attract new migrants, thus generating attenuation of the city-level estimates. The presence of a large aging population, in turn, is likely to both create a downward pressure on prices and attract new migrants specialized in elderly care, thus attenuating the OLS results further. As regards the magnitude, according to IV estimates a 10 per cent increase in the stock of immigrants (roughly representing the annual average growth in the period of observation) would raise the average house price by 1.6 per cent. This indicates that about half of the growth in house prices over the period has been driven by the increase in the immigrant population. This result is fairly consistent with estimates in other countries such as the US or the UK.

However, as shown theoretically by **Result 2**, the average effect at the city level might be the outcome of opposing forces within the city boundaries, actually depending on the natives' perceptions of the effects of immigration on their quality of life. Table 4 shows the OLS and IV estimates of model (20) where the estimated coefficient of interest is

[16] With the exception of Morocco, the ranking of the first 5 countries is now different from that in 1991. The incidence of immigrants from Middle and Eastern Europe increased from around 10 per cent at the beginning of the 1990s to 50 per cent in 2010; during the same period, the fraction of immigrants from Africa decreased from 35 to 22 per cent. Generally speaking, in the past international migration flows were mainly South–North. Since the 1990s, the East-West migrations – from Asia and Central and Eastern Europe – have become predominant.

[17] In all regressions, standard errors are heteroskedasticity-robust and are clustered at the local level (city or district depending on the empirical specification) to account for correlation within groups.

approximately the difference between the local and city-average price growth rates. Both OLS and IV specifications reveal that prices tend to grow significantly more slowly than average in districts where immigrants settle. The first stage F-statistic clearly indicates the weak instrument problem is not an issue in this case either. The impact is also quantitatively significant: a 10 per cent increase in immigrant population decreases local prices by nearly 2 percentage points with respect to the city average. According to the theoretical model, this effect is entirely determined by the impact of immigration on the level of the natives' satisfaction with local amenities. This implies that the areas hit by immigration are likely to experience a deterioration of local amenities.

The house price dynamics can be explained by the fact that natives decide to move to other districts and are willing to pay higher rents to "escape" from foreigners, as stated in **Result 3**. We can provide direct evidence of this. Table 5 reports the results of model (21): while the OLS correlation between migrants and natives is not statistically significant, IV estimates show a negative and significant effect. Note that the first stage F-statistics is lower than before but it continues to be above the rule-of-thumb value of 10 traditionally used to test the relevance of the instrumental variable. OLS results are not surprising since we may expect that new real estate developments attract a growing share of the city's population – native and immigrant alike. Therefore, a simple correlation probably underestimates the causal impact of immigration. Indeed, according to IV estimates, 10 additional immigrants in a district above the city-year average induce 6 natives to relocate to other areas of the city.[18]

Finally, we test the theoretical **Result 4** by estimating the equations (22) and (23). Indeed, we might expect some heterogeneity in the local impact of immigration due to the differential housing supply elasticity of the urban areas. Given that housing supply is more rigid in central areas than in peripheries, the house prices should react more intensively to migration inflows in "bounded districts". However, this effect might be offset by larger native outflows. Indeed, Table 6 confirms that a 10 per cent increase in immigrant population decreases local prices by about 2 percentage points with respect to the city average. However, there are no statistically significant differences between bounded and unbounded districts. As far as demographic dynamics are concerned, native outflow is greater when immigrants settle in areas with a more rigid supply of housing (see Table 7). According to our estimates, for every additional 10 immigrants arriving, almost 7 natives in bounded districts and 4 natives in non-bounded districts move away from the area. Both these results are consistent with our theoretical predictions.

All in all these results point to the fact that immigration causes natives to perceive a deterioration of local amenities and, as a consequence, it causes natives to move to other areas of the city and house price to grow slowly in the district hit by immigration. Some

[18] It should be noted that migration does not generate a native relocation outside the city. IV estimates of the effect of migration on the total number of natives in the city (available upon request) are never statistically significant. This is also consistent with the evidence found by Mocetti and Porello (2010).

descriptive evidence drawn from the World Value Survey suggests that attitudes towards immigrants might play a role. In the last wave of the survey, the respondents were asked to indicate who they would not like to have as neighbors: 12 per cent of Italians mention people of different race as unwelcome neighbors against 4 per cent of Americans; the percentages are 11 and 2 per cent, respectively, in case of neighbors of a different religion (see Figure 3). These negative attitudes may be partly explained by the fact that, historically, Italy is not a country of immigration and that the inflows from abroad increased greatly over a very few years. However, we have no evidence to reject other competing explanations based on the deterioration of local amenities.

6. Robustness and extensions

6.1 Spatial effects

As explained above, our geographic unit of observation is the city district - a very detailed partition of the municipal area. A serious drawback of using a narrow partition of the space is that we could observe a high degree of spatial correlation among neighboring observations. This can have two important effects in the identification of the impact of immigration on local prices. First, the location of immigrants can be characterized by spatial dependence. This occurs when the 1991 stock of immigrants in district *d* is correlated with the current number of migrants in adjacent districts. This, in turn, represents a possible violation of the exclusion restriction for the instrument, thus leading to inconsistent IV estimates. Second, the housing prices in district *d* might be affected by the presence of migrants in neighboring districts thus violating the non-interference hypothesis (i.e. the treatment of any unit should not affect the potential outcomes of the other units).

We test for the presence of spatial effects (both in the first and second stage) including spatial lags of $M_{n,c,t}$ in model (20). In particular, we add the average of log immigrants in adjacent districts (i.e. those having a common boundary) to our baseline and we instrument this additional endogenous regressor with the spatial lag of the instrument described in (24).

Results are reported in Table 8. From the first stage regression we find that the effect of the spatially lagged instrument on the number of immigrants is not significantly different from zero. Thus, the immigrant stock in 1991 in district *d* does not affect the current immigration stock in the nearby districts of the city. This is probably due to the fact that the immigrant enclaves were not large enough to influence the location of new arrivals also in spatially contiguous districts. Looking at the second stage, we find that the number of immigrants in district *d* does not have any significant effect on house prices in neighboring districts. This may be due to the fact that either the number of immigrants in

one district is not large enough to affect house prices in nearby districts or the size of the district is too large to capture these spatial spillovers.

However, and more importantly for our scope, the sign and magnitude of our key coefficient is substantially unchanged with respect to the baseline specification reported in Table 5. Even after controlling for spatial dependence, a 10 per cent increase in immigrant population is confirmed to reduce house prices in the same district by nearly 2 percentage points vis-à-vis the city average.

6.2 Immigration and house price distribution at the city level

The urban impact of immigration does not only concern the larger urban areas. Indeed, immigrants are more geographically spread out over the territory than they were in the past and one might doubt whether previous findings can be generalized to the other Italian cities. Unfortunately, we do not have information on immigrant distribution across districts for all Italian municipalities. Nevertheless, we are still able to build indicators of price distribution at the municipal level and to correlate these indicators with immigration measured at the same level.[19]

Empirically, we run a regression with city price indicators and the log of immigrants, both measured at the municipal level:

$$PI_{c,t} = \alpha + \beta \log M_{c,t} + CITY_c + YEAR_t + \varepsilon_{c,t} \tag{25}$$

where $PI_{c,t}$ is a price indicator varying by municipalities (c) and year (t); we use different price indicators: the log of prices in the most expensive district, the log of the mean price, the log of prices in the cheapest district, the log of the ratio between the price in the cheapest district and the mean price. $M_{c,t}$ is the municipal stock of immigrants in year t. Finally, we include year dummies and fixed effects at the municipal level to control for common trend and time-invariant heterogeneity at the city level, respectively. To address endogeneity we exploit enclaves as before, that is, we use immigrants' settlements across municipalities in 1995 to predict current settlements.

Results are reported in Table 9. We get a positive effect of immigration on the mean price using both OLS and IV estimates. However, as in the previous section, OLS estimates suffer from a downward bias. The first stage F-statistics allow us to clearly reject the null hypothesis of a weak instrument. According to IV estimates, a 10 per cent increase in immigrants raises house prices on average by 3.4 per cent. This has a stronger effect on the price of the most expensive district and a weaker one on the cheapest district. Looking further for a differential impact across districts, we build a price indicator which broadly recalls the one proposed in Result 2. Namely, we consider the impact of immigration on

[19] We consider only municipalities with at least 5,000 residents and two LRO microzones to examine the differential price dynamics within cities which are above a minimum size threshold.

the log of the ratio between house price in the cheapest district (probably affected by immigration) and the city average. According to the IV estimates, a 10 per cent increase in immigrant stock leads to a reduction of 0.7 per cent in the ratio. In other words, immigrant population growth causes housing prices to appreciate more slowly in relative terms in poorer districts, thus leading to a widening of price differentials within the city. These findings mirror those obtained with the analysis at the district level.

7. Conclusions

The aim of this paper is to examine the impact of immigration on the residential market within urban areas. Most of the previous studies have examined the impact of immigration on house prices at the city level. However, focusing the analysis on different areas within the city is important for two complementary reasons. First, the average effect at the city level might hide substantial heterogeneous effects across urban areas. Second, the residential market at the intra-municipal level is an ideal laboratory to analyse the interplay between immigrants and natives within the city.

We first provide a theoretical guide to the empirical data showing that the effects of migration on prices at district level are solely driven by the changes in quality of life perceived by natives. These changes also influence the spatial distribution of natives within the city. Predictions of the model are tested using a novel dataset on housing prices and population variables at the district level for a sample of 20 large Italian cities. The empirical evidence shows that a 10 per cent increase in immigrant stocks at district level reduces housing prices by 2 percentage points vis-à-vis the city average. Moreover, the arrival of 10 migrants generates the outflow (to other areas of the city) of 6 natives. Native outflows are even greater in districts characterized by more rigid housing supply elasticity. These findings suggest that immigration generates a clear deterioration of local amenities as perceived by natives. From a more general point of view, our results document increasing urban inequality in the real estate market. Moreover, we also find evidence of a sizeable redistribution of natives within the city with growing spatial segregation of migrants, thus prefiguring potential difficulties in the integration process.[20]

What we learnt with this research is that important local economic effects of immigration are captured only when the territory is observed at a sufficiently disaggregated level. However, what is not yet clear is how the arrival of immigrants leads to a perceived deterioration of amenities in the urban areas where they concentrate. Some descriptive evidence highlights the fact that natives have a negative attitude towards immigrants. However other factors might be at work: disentangling the relative weight of each of these is left to future research.

[20] According to Battu and Zenou (2010), residential segregation plays a crucial role for ethnic identity. Those who live in a high ethnic concentration area have a higher probability of rejecting the native culture.

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Tables

Table 1: summary statistics

	Mean	Standard deviation	25th percentile	50th percentile	75th percentile
Number of immigrants	5,317	5,809,1	1,581	2,922	7,218
House price per square metre	2,317	948,6	1,631	2,099	2,724

Based Authors' elaboration on data from municipal administrative archives and LRO.

Table 2: demographic statistics

City	Number of districts	Population per district in 2010	Immigrants/population in 2003			Immigrants/population in 2010		
			City average	In most immigrant-dense district	In least immigrant-dense district	City average	In most immigrant-dense district	In least immigrant-dense district
Bergamo	7	17,242	7.7	11.4	4.1	15.0	19.1	6.0
Bologna	9	42,231	5.7	7.6	3.7	12.7	17.1	10.4
Brescia	5	39,410	10.0	16.4	6.2	17.9	23.4	12.0
Florence	5	74,398	7.7	13.3	4.7	13.5	19.5	9.6
Genoa *	9	67,549	5.5	9.3	2.2	8.3	14.5	3.1
Milan	9	146,972	8.5	12.1	6.9	16.4	24.3	13.0
Modena	4	46,166	7.6	15.9	5.5	14.7	25.9	11.8
Naples *	10	99,375	1.7	4.3	0.3	3.0	6.3	0.7
Novara	5	21,005	5.2	9.0	3.1	12.5	21.4	6.5
Padua	8	26,768	6.6	9.4	4.4	14.4	22.7	9.7
Prato	5	37,571	7.4	14.1	5.4	15.1	28.3	10.2
Reggio-Emilia	8	21,236	8.3	18.9	4.2	17.0	30.9	10.9
Rome	19	151,243	7.1	18.6	3.4	11.9	32.1	6.5
Turin	10	90,857	7.3	12.8	3.5	14.2	21.2	8.3
Trento	8	14,537	4.9	8.5	2.0	11.2	20.1	3.9
Trieste	7	29,803	4.9	9.0	1.8	8.7	16.7	2.1
Udine	7	14,232	6.2	9.0	4.5	13.5	16.9	10.3
Venice	12	22,574	3.8	5.7	0.7	10.8	17.7	1.9
Verona	8	32,967	7.2	11.5	3.3	13.9	20.5	5.6
Vicenza	7	16,555	9.2	13.4	6.9	16.0	19.3	12.2
Mean	**8**	**50,635**	**6.6**	**11.5**	**3.8**	**13.0**	**20.9**	**7.7**

Based Authors' elaboration on data from municipal administrative archives.
* Figures on immigrants for Genoa refer to 2005 instead of 2003; for Naples they refer to 2008 instead of 2010.

Table 3: Impact of immigration on house price growth at the city level

Dependent variable: Log of house prices	OLS	IV
Log of immigrants	0.034	0.160***
	(0.036)	*(0.053)*
City fixed effects	YES	YES
Year fixed effects	YES	YES
Number of observations:	1,128	1,128
First stage:		
Log of instrument	-	0.590***
	-	*(0.082)*
F-statistics on the excluded instrument	-	51.6

City price is defined as weighted (population) average of district prices. Heteroskedasticity-robust standard errors clustered at the city and year level.

Table 4: Impact of immigration on house price growth at the district level

Dependent variable: Log of house prices	OLS	IV
Log of immigrants	-0.105***	-0.195***
	(0.025)	*(0.048)*
District fixed effects	YES	YES
City × year fixed effects	YES	YES
Number of observations:	1,128	1,128
First stage:		
Log of instrument	-	0.756***
	-	*(0.151)*
F-statistics on the excluded instrument	-	25.2

Heteroskedasticity-robust standard errors clustered at the city and year level.

Table 5: Impact of immigration on native population growth at the district level

Dependent variable: Natives	OLS	IV
Immigrants	0.230	-0.564***
	(0.276)	*(0.134)*
District fixed effects	YES	YES
City × year fixed effects	YES	YES
Number of observations:	1,128	1,128
First stage:		
Instrument	-	0.808***
	-	*(0.231)*
F-statistics on the excluded instrument	-	12.2

Heteroskedasticity-robust standard errors clustered at the city and year level.

Table 6: Impact of immigration on house price growth in districts with different supply elasticity

Dependent variable: Log of house prices	OLS	IV
Log of immigrants	-0.111***	-0.212***
	(0.024)	*(0.053)*
Log of immigrants × bounded district	-0.028	-0.054
	(0.028)	*(0.041)*
District fixed effects	YES	YES
City × year fixed effects	YES	YES
Number of observations:	1,128	1,128

First stage		*Dependent variable:*	
		Log of immigrants	Log of immigrants × bounded district
Log of instrument	-	0.644***	0.133*
	-	*(0.150)*	*(0.063)*
Log of instrument × bounded district	-	-0.180***	0.601***
	-	*(0.050)*	*(0.052)*
F-statistics on the excluded instrument	-	29.3	67.4

Heteroskedasticity-robust standard errors clustered at the city and year level.

Table 7: Impact of immigration on native population growth in districts with different supply elasticity

Dependent variable: Log of house prices	OLS	IV
Immigrants	0.299	-0.410**
	(0.362)	*(0.169)*
Immigrants × bounded district	-0.511	-0.254**
	(0.312)	*(0.113)*
District fixed effects	YES	YES
City × year fixed effects	YES	YES
Number of observations:	1,128	1,128

First stage		*Dependent variable:*	
		Immigrants	Immigrants × bounded district
Instrument	-	1.042***	0.061
	-	*(0.193)*	*(0.170)*
Instrument × bounded district	-	-0.477**	0.870**
	-	*(0.143)*	*(0.270)*
F-statistics on the excluded instrument	-	37.0	8.3

Heteroskedasticity-robust standard errors clustered at the city and year level.

Table 8: Impact of immigration on house price growth including spatial lags

Dependent variable: Log of housing prices	IV
Log of immigrants	-0.194***
	(0.049)
Mean of the log of immigrants (spatially lagged)	0.000
	(0.001)
District fixed effects	YES
City × year fixed effects	YES
Number of observations:	1,128

First stage	*Dependent variable:*	
	Log of immigrants	Log of immigrants (spatially lagged)
Log of instrument	0.752***	-0.410
	(0.150)	*(0.658)*
Mean of the log of instrument (spatially lagged)	-0.003	0.649***
	(0.004)	*(0.080)*
F-statistics on the excluded instrument	12.8	33.2

Heteroskedasticity-robust standard errors clustered at the city and year level.

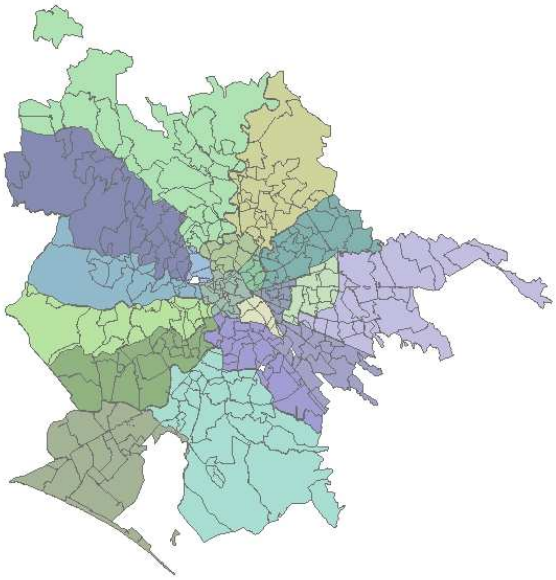
Table 9: Impact of immigration on city price distribution

	OLS				IV			
Dependent variable: Log of housing prices	mean	min	max	min/mean	mean	min	max	min/mean
Log of immigrants	0.050***	0.053***	0.048***	0.004	0.335***	0.269***	0.378***	-0.066**
	(0.013)	*(0.014)*	*(0.013)*	*(0.006)*	*(0.058)*	*(0.063)*	*(0.059)*	*(0.026)*
City fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
First stage:								
Log of instrument	-	-	-	-	0.330***	0.330***	0.330***	0.330***
	-	-	-	-	*(0.029)*	*(0.029)*	*(0.029)*	*(0.029)*
F-statistics	-	-	-	-	133.9	133.9	133.9	133.9
Num. of observations:	16,511	16,511	16,511	16,511	16,511	16,511	16,511	16,511

"Mean" refers to the average price at the city level, "min" to house prices in the cheapest district, "max" to house prices in the most expensive district and "min/mean" to the ratio between house prices in the cheapest district and the city average.
Data refer to all Italian cities with at least 5,000 inhabitants and partitioned in at least 2 LRO microzones. Heteroskedasticity-robust standard errors.

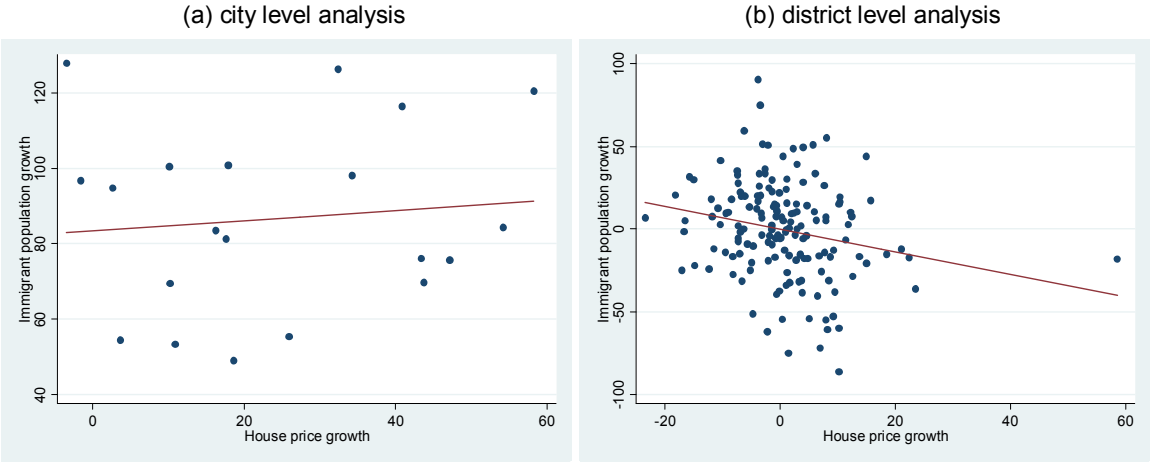
Figures

Figure 1: Matching between administrative districts and LRO's microzones: the map of Rome



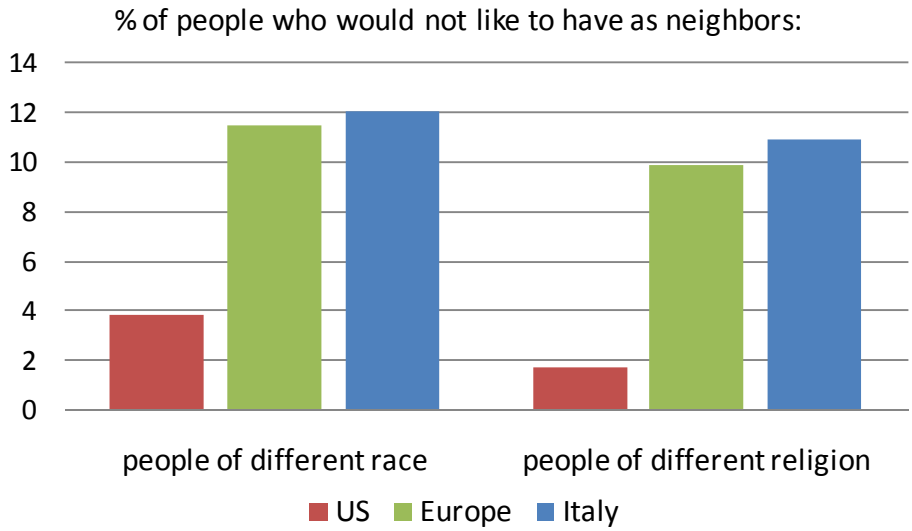
The sharpest partition represents LRO microzones. Colors represent administrative districts.

Figure 2: Immigrant population growth and house price growth in main Italian cities



In panel (a) we plot the growth rate of immigrant population and of house prices at the city level; in panel (b) the growth rates are computed at the district level and as a deviation from the city average.

Figure 3: Attitudes towards neighbors



Based Authors' elaborations on data drawn from the World Value Survey (wave 2005-2009). The figure for Europe is a weighted population average of the following countries: Bulgaria, Cyprus, Finland, France, Germany, Great Britain, Italy, Netherlands, Poland, Romania, Slovenia, Spain, and Sweden.