# Can Urban Renewal Policies Reverse Neighborhood Ethnic Dynamics?*

Nicolas González Pampillón[1,3], Jordi Jofre-Monseny[†2,3], and Elisabet Viladecans-Marsal[2,3,4]

[1]What Works Centre for Local Economic Growth - LSE

[2]Universitat de Barcelona

[3]Institut d'Economia de Barcelona (IEB)

[4]Center for Economic Policy Research (CEPR)

**Abstract**

This paper assesses the impact on neighborhood population dynamics of a major urban renewal policy that was implemented in Catalonia (Spain) between 2004 and 2010. The policy involved sizeable investments in the public spaces and facilities of some of the most deprived neighborhoods in the region. Besides seeking to improve the quality of life in the treated neighborhoods, one of the policy's goals was to attract natives and high income individuals and, as a consequence, reduce the concentration of poverty and immigration. The control group comprises rejected projects and projects accepted towards the end of the program that, due to a fall in public tax revenues, were never executed. The results indicate that the urban renewal projects had little (if any) effect on population dynamics, suggesting that substantial investment in public spaces and facilities in deprived neighborhoods is insufficient to attract natives and/or high income households. The interventions made in Barcelona's historic districts, however, seem to constitute an exception, as, here, the policy seems to have accelerated gentrification in the deprived neighborhoods of central Barcelona.

**JEL Codes**: R23, R30, R58

**Keywords:** Place-based policies, income mixing, neighborhood segregation.

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†Corresponding author: John M Keynes, 1-11 08034 Barcelona, jordi.jofre@ub.edu

# 1 Introduction

There are large differences in income across cities (Moretti, 2012); yet, at the same time, all cities, be they vibrant or lagging, present evidence of substantial disparities across their neighborhoods. Indeed, it would appear that in some regions of the world income differences are greater within than they are across cities. For example, Rosenthal and Ross (2015) report that while the interquartile range in the distribution of city income in the US is about 25%, the corresponding figure for neighborhood income within these cities is as high as 55%. Moreover, evidence suggests that within-city income disparities are increasing both in the US (Watson, 2009) and in Europe (Tammaru et al., 2016). Partly because income correlates with racial and ethnic backgrounds, and partly because of social interactions in relation to the demand for housing (Card, Mas and Rothstein, 2008), a salient feature of the urban landscape is residential segregation along lines of race and ethnicity (Cutler, Glaeser and Vigdor, 1999; Boustan, 2011).

Various reasons can be forwarded for seeking to reduce income and ethnic segregation at the city level. The first corresponds to reasons of local externalities. The socioeconomic characteristics of neighborhoods have been found to affect individual performance in both education (Chetty, Hendren and Katz, 2016) and the labor market (Bayer, Ross and Topa, 2008; Chetty, Hendren and Katz, 2016) and to impact both criminal behavior (Damm and Dustmann, 2014) and welfare use (Åslund and Fredriksson, 2009). Exploiting variation in racial segregation across US cities, Cutler, Glaeser and Vigdor (1999) and Ananat (2011) further show that minorities perform worse in more segregated cities. Hence, residential segregation could contribute to amplify performance differences between income and ethnic groups. Second, multiple equilibria are a prominent feature of neighborhood ethnic composition (Schelling, 1971; Card, Mas and Rothstein, 2008) and, thus, public policies aimed at deconcentrating poverty can potentially be welfare enhancing.

Policies aimed at deconcentrating poverty and minority population groups abound in OECD countries (Cheshire, 2009). These initiatives, often known as income-mixing policies, fall into two broad categories (Boustan, 2011). The first encompasses policies that encourage low income households to move into more affluent neighborhoods and include, for example, the Section 8 and the Moving to Opportunity programs in the US. The second category consists of policies that seek to improve deprived neighborhoods so as to attract higher income individuals. Major programs falling into this category include the HOPE VI and the Community Development Block Grant in the US and the URBAN projects in the EU[1]. While the reasons outlined above are used to justify measures aimed at reducing segregation, income-mixing policies are

[1]Sweden and Denmark, in a policy more explicitly related to ethnic enclaves, adopted refugee dispersal measures in the late 80s to reduce the concentration of immigrants in specific neighborhoods and urban areas (Edin, Fredriksson and Åslund, 2003; Damm and Dustmann, 2014). Around the same time, Singapore introduced ethnic quotas at the neighborhood level, limiting housing transactions that could further increase segregation (Wong, 2013).

controversial for three reasons (Cheshire, 2009)[2]. First, neighborhood effects are much smaller than the raw correlations suggest (Topa and Zenou, 2015). Second, if income-mixing policies work, investing in deprived neighborhoods will increase housing prices and cause gentrification, suggesting that such policies might end up hurting (rather than helping) the low income residents of the targeted neighborhoods. Finally, while income-mixing policies are costly, the effectiveness of such initiatives is unclear. The goal of this paper, therefore, is to assess the effectiveness of place-based policies that invest in deprived neighborhoods in order to deconcentrate poverty and immigration. To this end, we evaluate the effects on population dynamics at the neighborhood level of a prominent place-based policy implemented in the Spanish region of Catalonia.

The Catalan Neighborhoods Act was passed in 2004 by the regional government. The policy consisted of large, geographically concentrated investments that improved public spaces and facilities in the targeted neighborhoods. One objective of the policy was to deconcentrate poverty and immigration in a period when the share of immigrant population was rising rapidly, especially in low income urban neighborhoods (Fernández-Huertas, Ferrer and Saiz, 2017). In the areas that we study, immigration rose by more than 8.5 percentage points in the three-year period preceding the start of the policy. The intervention was implemented through annual calls for proposals, with an annual budget of 99 million EUR between 2004 and 2010. However, note that due to the fall in public sector revenues and the project length (4 years), the degree of execution was low among those projects accepted in the 2008-2010 calls for funding. For this reason, we focus on the 39 interventions corresponding to the 2004-2007 calls, with an average investment of 3,065 EUR per inhabitant. The intervention areas present an average population of 13,000 inhabitants, reflecting one of the policy guidelines, namely that of concentrating large investments in specific locations.

The selection process consisted of two rounds. In the first round, a deprivation index was calculated for each application made, using 20 socioeconomic indicators of neighborhood characteristics. Neighborhoods scoring above a certain threshold were included in the second round, when the projects were ranked according to a final score determined by this deprivation index (with a weight of 40%) and an assessment of the projects' characteristics. Our pool of control neighborhoods comprises the rejected projects and the projects accepted in the 2008-2010 calls that were never executed. Interestingly, here, we have access to all the neighborhood indicators used by the policy-makers when selecting the treated neighborhoods, which reduces the risk that unobserved neighborhood characteristics confound our treatment estimates. As the most deprived neighborhoods were treated first, the projects accepted during the initial calls differ significantly from the control neighborhoods. Moreover, these differences translate into differential pre-treatment trends in neighborhood population dynamics. We deal with this vi-

[2]An additional cost of income-mixing policies might be the disruptive effects of mobility on teenagers (Gibbons, Silva and Weinhardt, 2017; Chetty, Hendren and Katz, 2016).

olation of the parallel trends assumption in two ways. Our first strategy is to linearly control for pre-treatment trends in standard differences-in-differences estimators. Our second strategy is the adoption of the Oaxaca-Blinder estimator, as developed by Kline (2011) and as recently used in Busso, Gregory and Kline (2014) and Kline and Moretti (2014), to evaluate place-based policies. This matching approach is useful to assess if differences-in-differences specifications that linearly control for pre-trends suffer from functional form misspecifications. Fortunately, the results obtained with the two alternative approaches are qualitatively similar.

The average results suggest that the urban renewal projects had no effects on the population dynamics of the intervention areas, indicating that substantial investment in public spaces and facilities is insufficient to attract native and/or high income households to deprived neighborhoods. One notable exception seems to be the urban renewal projects carried out in the historic districts of Barcelona, the one large metropolitan area in the region. Here, the policy seems to have attracted native and EU15 college graduates. Overall, the policy reduced the share of non-EU15 immigrants by 4 to 5 percentage points, and increased the share of population with a college degree by 12 to 16 points. Since the late 1990s, the Barcelona city center has experienced an urban revival process and our findings suggest that the Neighborhoods Act might have intensified this process in some of the city's most deprived historic districts.

Earlier papers have estimated housing externalities arising from urban renewal policies Rossi-Hansberg, Sarte and Owens (2010), Ahlfeldt, Maennig and Richter (2016) and Koster and Van Ommeren (2019). Rossi-Hansberg, Sarte and Owens (2010) study a policy implemented in Richmond (Virginia) while Ahlfeldt, Maennig and Richter (2016) examine interventions in Berlin following re-unification. Using housing prices for renovated and non-renovated dwellings, these two studies estimate housing externalities in terms of the extent to which the value of a property depends on the quality of the nearby housing stock. While both papers analyze policies aimed at renovating the private housing stock, Koster and Van Ommeren (2019) analyze a Dutch program that targeted the public housing stock. They estimate the housing externalities caused by the policy in terms of both prices and sales times. Our paper differs from these studies in two respects. First, instead of estimating housing externalities, we assess the effectiveness of urban renewal measures for reducing income and ethnic segregation in cities. Second, while the above papers study programs targeting the housing stock, we examine an intervention that improved public spaces and public use facilities.

Our paper is closely related to Baum-Snow and Marion (2009) and Diamond and McQuade (2019), who study the effects of affordable housing developments in the US financed by the Low Income Housing Tax Credit (LIHTC). Although this policy is not strictly an urban regeneration program, some of the investments target disadvantaged neighborhoods. When focusing on developments in the least attractive locations, Baum-Snow and Marion (2009) find that these interventions increase local housing prices, reflecting either better neighbors or the conversion into new housing units of vacant buildings or unsightly empty lots. Similarly, Diamond and Mc-

Quade (2019)'s findings indicate that developments in disadvantaged areas cause a rise in local housing prices as well as in the income and the non-minority share in the neighborhood[3].

Our paper is also related to the literature surveyed in Neumark and Simpson (2015), which analyzes the effects of enterprise zones, focused mainly on the US and France[4]. Although enterprise zones are also place-based policies that target deprived neighborhoods, they differ from the urban renewal policy studied here in that they focus on tax incentives aimed at boosting local employment.

The paper is structured as follows. In Section 2 we consider, from a theoretical point of view, the potential effects of urban renewal policies on a neighborhood's population composition. Section 3 describes the urban renewal policy studied here, while section 4 introduces the data and the variables used. In Section 5 we explain the empirical approaches adopted in the paper. The results are presented in Section 6 and Section 7 concludes.

## 2 Theoretical framework

How does urban renewal policy affect a neighborhood's socioeconomic composition? In the absence of social interactions, the expected results are theoretically straightforward. Investing in the neighborhood improves the (exogenous) local amenities which, in turn, increases the residents' utility level. A higher level of utility implies a greater willingness to pay in the local area, which in turn will raise rents and housing prices in equilibrium. If the amenities are a normal good, the willingness to pay for these amenities will increase with income (Kuminoff, Smith and Timmins, 2013; Kahn and Walsh, 2015) and with preferences for these amenities[5]. As a result, high income individuals will tend to outbid other residents and an improved neighborhood should experience a change in composition, with an increasing proportion of high income neighbors. In other words, the neighborhood will gentrify as a response to the urban renewal policy.

The effects are less obvious when we take social interactions into consideration, that is, when the utility of living in a neighborhood depends on its social composition. The literature indicates that racial segregation is (largely) driven by the desire of non-minority residents to avoid neighborhoods with a high minority share (Cutler, Glaeser and Vigdor, 1999; Card, Mas and Rothstein, 2008; Boustan, 2011). If natives care sufficiently about the neighborhood immigrant share, there can be multiple equilibria in the dynamics of neighborhood composition. Card, Mas and Roth-

[3]In contrast, Baum-Snow and Marion (2009) and Diamond and McQuade (2019) find that LIHTC developments in more affluent neighborhoods decrease housing prices, reflecting a lower willingness to pay to live with lower income neighbors.

[4]Studies of enterprise zones in the US include Hanson (2009), Neumark and Kolko (2010), Hanson and Rohlin (2013) and Busso, Gregory and Kline (2014); while studies of the French experience include Gobillon, Magnac and Selod (2012), Givord, Rathelot and Sillard (2013), Briant, Lafourcade and Schmutz (2015) and Mayer, Mayneris and Py (2015).

[5]Koster, van Ommeren and Rietveld (2016) provide empirical evidence regarding this assumption for the case of historic amenities in Dutch cities.

stein (2008) have documented the prevalence of tipping in US neighborhoods. That is, mixed neighborhoods are dynamically stable until the minority share reaches a tipping point, when the neighborhood starts losing white population and continues to transition towards an equilibrium in which the minority share is very high [6]. In this multiple equilibria scenario, the effects of the urban renewal policy can vary greatly depending on the type of equilibrium each neighborhood is in.

If the neighborhood is in a mixed equilibrium, the qualitative results should be similar to those obtained in the case with no social interactions. Namely, an improved neighborhood should experience a compositional shift towards native individuals who also tend to be of a higher economic status (Jofre-Monseny, Sorribas-Navarro and Vázquez-Grenno, 2016). If a neighborhood has gone beyond the tipping point, a marginal investment will have no impact on the neighborhood's population dynamics. This is so because a slightly better exogenous amenity will not offset the negative impact that a high immigration share has on native utility. However, a big push policy that significantly changes the exogenous amenities of a neighborhood might be able to revert the neighborhood dynamics if the minority share falls below the tipping point.

The Neighborhoods Act was passed at a time when the aggregate immigrant share was rising fast and some low income urban areas were perceived to be undergoing ghettoization. Since these neighborhood transitions do not occur rapidly (Card, Mas and Rothstein, 2008), a substantial improvement in neighborhood amenities might be able to reverse the neighborhood population dynamics of the treated neighborhoods. Indeed, this seems to be one of the rationales underpinning the Neighborhoods Act, with one of the policy's goals being to deconcentrate poverty and immigration at a moment when the immigrant share in deprived areas was growing rapidly.

An urban renewal policy that is ineffective in changing the neighborhood's social composition (i.e. the big push is not big enough) is not necessarily a failure in terms of welfare. In fact, the policy can still increase the quality of life of the treated neighborhood. In that case, it would be a place-based policy that benefits the targeted population without changing its location decisions. Unfortunately, and due to data limitations, we do not have access to housing price data that would allow us to quantify the residents' willingness to pay for the investments made. Such an analysis would allow us to carry out a more complete evaluation of the policy.

We formalize the discussion of this section in appendix A, where we develop a residential choice model with two neighborhoods and two population groups, natives and immigrants. The model is a variant of those developed in Banzhaf and Walsh (2013) and in Glaeser (2008) to examine racial segregation. The model considers the size of the two neighborhoods, as well as the population and proportion of immigrants at the city level, as fixed. Both native and immigrant residents consume one unit of housing, have idiosyncratic preferences for neighborhoods

[6] González-Pampillón and Jofre-Monseny (2019) find neighborhood population dynamics for Spain that are consistent with the tipping documented by (Card, Mas and Rothstein, 2008) for the US case.

and value local exogenous amenities that increase with the urban renewal policy investments. Natives and immigrants differ in two respects: First, native utility depends negatively on the squared neighborhood immigrant share; and, second, native willingness to pay for (exogenous) amenities increases as native income levels also increase.

## 3 The urban renewal policy: the Neighborhoods Act

The regional government of Catalonia introduced the Neighborhoods Act (*Llei de Barris*) in 2004, with the aim of revitalizing neighborhoods deserving of special attention. The policy sought to improve public spaces and facilities in the targeted neighborhoods by means of large and geographically concentrated investments. One goal of the policy was to deconcentrate poverty and immigration and, ultimately, reduce income and ethnic segregation in a period when Spain was receiving a massive wave of immigration (Nello, 2009).

Between 2004 and 2010, there was an annual call for funding with an assigned yearly budget of 99 million EUR, to be distributed among the selected projects submitted by the local councils[7]. The length of the projects was fixed at 4 years. The funds were channeled as transfers from the regional government to the local councils. As a rule, the regional transfer could account for just 50% of the project, meaning that local governments had to cover the remaining 50%, possibly with transfers from other tiers of government. As discussed, the policy was clearly focused on investing in public spaces. As much as 80% of the funds was spent on public spaces and public use facilities, while an additional 10% was devoted to renovating the existing stock of apartment buildings. Finally, the remaining 10% was spent on social services aimed at improving the labor market performance of the neighborhoods' residents. The variation in the percentage spending that the different projects dedicated to these different items was limited[8]. By way of example, Appendix B shows the investments funded through the *Santa Caterina & Sant Pere* project, a 15 million EUR intervention carried out in Barcelona's city center.

Across the seven calls for funding, of the 450 applications received 143 were granted. However, owing to the fall in regional and local government revenues, the rate of execution was low among those projects accepted in the latter calls. All projects from the 2004 to 2006 calls (46 in total) were completed while, from the 2007 call, only 17 out of the 24 accepted projects were completed. Thus a total of 63 projects were executed (corresponding to the 2004 to 2007 calls) and completed between 2008 and 2011. We exclude (what were mostly small) projects in municipalities with less than 10,000 inhabitants. We do so because census tracts in these municipalities (which is the finest geographical detail for which data are available) do not provide a realistic approximation to neighborhoods. We also exclude a few cases in which the municipality underwent a complete redrawing of its census tract borders in the period under study.

[7] Each municipality could only be awarded one project per call (two in the case of Barcelona).

[8] For instance, in our final set of interventions, the share spent on renovating the existing stock of apartment buildings reached 36% in one intervention but is below 18% in all other projects.

Finally, we focus on 39 interventions with an average investment of 3,065 EUR per inhabitant[9].

The selection process consisted of two rounds. In the first round, a deprivation index was calculated for each application. The index considers a large number of indicators measuring the following items: property value, characteristics of the housing stock (share of ≥ 4-storey apartment buildings without elevator, share of apartments without piped water or sewerage connection), high density, drastic population growth or decline, concentration of young and old people, non-EU immigration, proportion of welfare benefit users, unemployment rate, percentage of low-educated inhabitants, percentage of people at risk of social exclusion, deficit of public transportation, lack of parking space, lack of parks and green areas and a high vacancy rate in commercial property. The areas with a score above a certain threshold were considered in the second round.

In the second round, projects were ranked according to a final score determined by this deprivation index (with a weight of around 40%), the population size of the treated area together with more qualitative aspects of the project, including, the financial effort of the municipality, the type of project (historic district renovation or not), the involvement of the local community, and the adequacy of the project to policy goals. After ranking the projects on the basis of their final score, the budget limit of 99 million EUR implicitly defined a cut-off, which varied across calls depending on the proposed budget of the applicants at the top of the ranking.

The first column in Table 1 shows the average values of all indicators used in the deprivation index as well as the population size of the 39 projects analyzed here. As explained above, the projects were implemented in under-performing neighborhoods. Unemployment is about three percentage points higher than the regional average (12.8 vs. 10.2%), while the share of individuals (above 10 years) with no high-school diploma (or equivalent) is remarkably high (76% compared to the regional average of 40%). The presence of foreigners is also high in the treated neighborhoods. In 2003, the share of non-EU15 immigrants was already high compared to the regional average (13.9 vs. 4.9%). Moreover, it was rising rapidly as the share of non-EU15 immigrants increased by 8.5 percentage points between 2001 and 2004. This dramatic increase is a consequence of the Spanish immigration wave, which meant Spain received almost 5 million immigrants between 1998 and 2008[10]. The increases in immigrant density experienced by the treated neighborhoods are particularly high as immigrants tended to concentrate in low-income urban areas (Fernández-Huertas, Ferrer and Saiz, 2017), that is, the locations specifically targeted by the Neighborhoods Act[11]. In fact, the massive immigration wave, coupled with

[9]This figure is relatively high compared to the urban renewal policies studied by Koster and Van Ommeren (2019) (2,454 euros per household) and by Rossi-Hansberg, Sarte and Owens (2010) (1,352 dollars per capita) but is smaller than the First Berlin Renewal Policy studied in Ahlfeldt, Maennig and Richter (2016).

[10]The largest inflows of (mostly low-skilled) immigrants originated primarily from Ecuador, Morocco, Romania and Colombia. See Fernández-Huertas, Ferrer and Saiz (2017) and Jofre-Monseny, Sorribas-Navarro and Vázquez-Grenno (2016) for a detailed description of the Spanish immigration wave.

[11]Public housing is quantitatively unimportant in Spain, hosting only 2 percent of households. In contrast to other European countries, public housing is not an important factor driving immigrants' locations decisions.

its unequal impact across the neighborhoods in the region, was one of the main reasons why the Neighborhoods Act was introduced in 2004 (Nello, 2009).

Insert Table 1 here

The control group consists of 68 rejected projects and 35 projects accepted during the 2008, 2009 and 2010 calls that, due to the fall in public tax revenues, present a degree of budget execution below 20%. The second column in Table 1 shows the average values of all the quantitative indicators used in the program. The fourth column in the table reports differences between treatments and controls. Overall, the treatment group scores higher on most of the indicators, reflecting greater needs. For instance, unemployment is almost 4 percentage points higher in treated than in control neighborhoods. In terms of immigration, in 2003 the treated areas presented a non-EU15 immigrant share that was 7.0 percentage points higher than that of the control neighborhoods.

The Neighborhoods Act does not overlap in space and time with any other major urban interventions, which means that the estimated policy effects are not confounded by concurrent urban policies. While the EU URBAN projects are very similar in goals and nature with the interventions studied here, only two such projects have been implemented in Catalonia and neither coincide with the neighborhoods studied here. Likewise, Plan-E was a stimulus investment plan launched by the Spanish Government in the midst of the great recession (2008) and operationalized as transfers to local governments for investment. We analyzed all Plan-E projects and confirmed that none of the accepted or rejected neighborhoods considered herein receives investments of any significant quantitative importance in relation to the Neighborhoods Act investments[12].

# 4 Data and variables

We combine official data from the projects accepted and rejected under the Neighborhoods Act with data on population characteristics at the neighborhood level. In the case of the accepted projects, we have scores for all the indicators considered in the selection process (see Table 1), the amount invested, the timing of the execution, as well as the project boundaries and the exact location of all investments within these boundaries. One such project is illustrated in Appendix C, where the solid line depicts the boundaries of the *Santa Caterina & Sant Pere* project, while the colored areas indicate the specific location of all investments. In the case of the rejected projects, we also know the scores for all the selection indicators, the budget proposal as well as the project boundaries.

As for our outcome variables, namely, population characteristics at the neighborhood level, we use yearly data from the municipal population register (*Padrón municipal de habitantes*) and

[12]Typically, Plan-E consists of many small projects scattered around the municipality.

data drawn from the 2001 and 2011 Population Censuses[13]. The population register is a yearly population count (with base date January 1st) containing information on an individual's age, gender and country of birth. The (decennial) population census contains further information, including, the educational level attained by the individual. Both the Census and the population register data are available at the census tract level (*Sección censal*), which is the most disaggregated geographical level existing in Spain. Unfortunately, some information for the Census is not disclosed in all tracts for reasons of confidentiality.

The intervention areas are typically made up of several census tracts. For the 142 treatment and control neighborhoods, the average number of tracts is 7.2, while the average census tract hosts 1,417 inhabitants. Although most project boundaries match the census tract borders, this is not always the case. For example, the dashed lines in Appendix C identify the census tracts in the *Santa Caterina & Sant Pere* project in Barcelona. Note that the project boundaries (solid line) generally follow the census tract borders. However, in the north-eastern corner, there is a census tract that is only partially included in the intervention area. In such instances, to compute the population of the intervened area, we resort to imputations. Specifically, we do so based on the share of developed land of each tract that belongs to the intervention area[14].

In the case of the outcome variables, we are interested in the long-run population dynamics at the neighborhood level. In terms of ethnic composition, we decompose the population into three groups: Natives, non-EU15 immigrants, and EU-15 immigrants. We divide the immigrants into these two groups as the policy goal is to reduce the concentration of non-EU15 immigrants in the treated neighborhoods (Nello, 2009)[15]. For each of these three groups, we examine two outcome variables by tracking changes that occurred between 2004 and 2016. The first of these is the difference between the logged population levels and, thus, it approximates the growth rate of each population group between these two years. The second is the change in the percentage of each group over the same time window. We also study the population dynamics of college graduates as this proxies high income individuals. This information is only available from the Census and, thus, we study the changes occurring between 2001 and 2011. Specifically, we examine differences in the logged stock of college graduates as well as the changes in the percentage of this group in the neighborhood. Since the population by level of education is not disclosed for all tracts in the 2001 and 2011 censuses, in a few cases, the areas of intervention do not coincide exactly with the outcomes measuring changes in the population by ethnic and educational backgrounds.

[13] See Foremny, Jofre-Monseny and Solé-Ollé (2017) for a detailed explanation of the workings of the municipal population register.

[14] To compute these shares, we use the SIOSE 2005 (Sistema de Información sobre Ocupación del Suelo de España).

[15] According to the 2001 Census, immigrants born in EU15 countries have a higher level of education than both non-EU15 migrants and natives. Therefore, individuals from EU15 countries can be seen as natives belonging to the upper tail of the income distribution.

# 5 Empirical approach

The main equation of interest is:

$$\Delta Y_i = \alpha T_i + X_i^{'}\beta + \epsilon_i \tag{1}$$

where $\Delta Y_i$ is a measure of population change in neighborhood $i$, $T_i$ is a treatment indicator while $X_i^{'}$ is a vector containing the neighborhood characteristics used by policy-makers to determine treatment, see Table 1. We focus here on long-differences. Specifically, we examine changes in native, EU15 and non-EU15 populations between 2004 and 2016, although we also report results for other end-of-period years. As for changes in the population of college graduates, we study changes between the censuses of 2001 and 2011.

As reported in Table 1, accepted projects between 2004 and 2007 differ from those that were rejected and those that were accepted in the 2008-2010 calls but that were never executed. In the bottom panel of Table 1, we test if treated and control neighborhoods also differ in pre-treatment trends. Specifically, we check if treatments and controls are balanced in terms of the outcomes of interest measured between 2001 and 2004. Prior to treatment, treated neighborhoods experienced larger increases in the share of non-EU15 immigrants. As a result, treated neighborhoods experienced more marked compositional changes, in which the share of natives (non-EU15 immigrants) decreased (increased) more in the intervention neighborhoods. This implies that the underlying assumption in the differences-in-differences setting, namely, the parallel trends assumption, does not hold in our application.

We address the violation of the parallel trends assumption using two empirical strategies. We first estimate variants of equation 1 in which the vector of control variables, $X$, includes $\Delta Y_i$ measured over the (pre-treatment) 2001-2004 period. Thus, our first strategy is to control linearly for neighborhood pre-treatment trajectories. Our second strategy is to use the Oaxaca-Blinder (OB) approach developed in Kline (2011). This matching approach compares the mean outcome of the treated to the mean outcome of a reweighted control sample, in which greater weights are given to control neighborhoods that are more similar to the treated ones. This approach yields reweighted control samples that satisfy the parallel trends assumption as judged by pre-treatment neighborhood trajectories. This second approach is also useful for assessing the degree to which linear regressions might be biased due to functional form misspecifications. Reassuringly, the qualitative empirical results obtained using these two empirical approaches are similar.

The estimation of the OB approach comprises two steps. In the first step, the control units are used to estimate an auxiliary regression in which the outcome of interest is regressed on the controls, $X_i$. In the second step, the coefficients estimated in the first step, namely $\hat{\beta}$, are used to obtain the average treatment effect which is given $\hat{\mu} - \frac{1}{N_T}\sum^{N_T} X_i^{'}\hat{\beta}$. The first term is the unconditional mean of the treated units while the second term is the counterfactual mean (for the treated units) obtained when using $\hat{\beta}$, while $N_T$ is the number of treated neighborhoods. The counterfactual mean for the treated units is found to be a weighted average of the control outcome, with the weights having two important properties[16]. First, they guarantee that the mean of each and every control variable included in $X$ is exactly the same in both the treated and reweighted control samples, as reflected in the third column of Table 1. Second, the $w$'s can be interpreted as those of a propensity score reweighting estimator in which the weights are proportional to the conditional odds of treatment. This estimator is particularly appropriate in settings, such as ours, in which the number of controls exceeds that of treatments and the vector $X$ contains a large number of variables (Kline, 2011).

# 6 Results

## 6.1 Baseline results

We present the baseline results in Table 2. Columns 1 to 3 show the regression results with different sets of controls while columns 4 to 6 report the corresponding OB estimates. Columns 1 and 4 present the results obtained when all variables shown in the top panel of Table 1 are used as controls. Note that these are all neighborhood characteristics used by policy-makers to select the treated neighborhoods. The estimates for all the outcome variables are small and statistically insignificant. This evidence suggests that, on average, the urban renewal policy had no effects on the population dynamics and educational composition of the intervention areas.

Insert Table 2 here

As detailed in Table 1, the variables used for the treatment selection are drawn from three different sources: 1) the 2001 census; 2) the population registers; and, 3) data provided by the municipalities when completing the project application. The variables corresponding to sources 2) and 3) refer to different points in time depending on the specific call for funding in question. The variables built from annual population registers, including the population level and the share of non-EU15 immigrants in the neighborhood, can be measured prior to 2004 and we do so throughout the analysis. Specifically, we measure these variables in 2003, which correspond to the data used for treatment selection in the first (2004) call of the Neighborhoods Act. The third group of variables cannot be measured at different points in time and, so, we include controls that are not strictly pre-determined with respect to our outcomes. Thus, in columns 2 and 5, we show the results obtained when we re-run the main analysis excluding these controls. Fortunately, the results do not change substantially when these variables are excluded.

[16] Writing the counterfactual mean for treated units in matrix form and replacing the coefficient estimates by the ordinary least squares (OLS) formula yields $\frac{1}{N_T}D'X(X'WX)^{-1}X'WY = wY$, where $D$ is a vector weighting the treated observations while $W$ is a matrix that only weights the control observations. The expression preceding $Y$ is found to be a vector of weights, denoted by $w$.

In columns 3 and 6, we report the results obtained when, in addition to all the variables used in column 1, we add the lagged outcome measured between 2001 and 2004. Although the bottom panel in Table 1 suggests that treatment and the reweighted control groups show similar pre-trends, there might still be efficiency gains by directly matching on pre-treatment trends in the OB approach[17]. This is the most complete and, therefore, our preferred specification. The results are similar to those above, pointing once again to the null effects of the urban renewal policy on neighborhood population dynamics.

The OB results in column 4 for the shares of natives, non-EU15 and EU-15 immigrants are illustrated in panel a) in Figure 1. The solid line represents the evolution of each variable for the treated sample, while the dotted and dashed lines represent the analogous evolutions for the reweighted and the unweighted control samples, respectively. The graphs also indicate that the urban renewal policy had little (if any) effect on population dynamics. In line with the results reported in the bottom part of Table 1, Figure 1(a) clearly indicates that the unweighted control sample presents different neighborhood trajectories before the policy was actually implemented.

Insert Figure 1 here

## 6.2 Robustness checks

In this section we first assess if the baseline results are robust with respect to the time period analyzed. Then, we check that our results are robust with respect to the geographical delimitation of the intervention areas. Finally, we report regression discontinuity design results.

The baseline estimates in Table 2 show the results of long-run specifications that consider neighborhood change between 2004 and 2016. Panel a) in Figure 1 suggests that the finding that the policy did not alter neighborhood population dynamics does not hinge on this particular choice. This is corroborated in panels b) and c) of Figure 1 that show event study graphs where observations have been normalized around the time of treatment[18]. Specifically, the coefficient for each time window is obtained from a separate regression with the control variables that correspond to columns 3 and 6 of Table 2.

In our baseline analysis, the geographical unit is the intervention area as designated in the Neighborhoods Act grant applications. In many cases, however, there is substantial heterogeneity in the amounts invested within these areas. For example, under *Santa Caterina i Sant Pere* project (see map in Appendix B), the work carried out in the *Pou de la Figuera* area (see Figure B.1(a)) was substantial while other parts of the intervention area experienced little or no investment at all. Since we know the exact location of all the investments made, we are able to re-run

[17] Busso, Gregory and Kline (2014) also match on pre-treatment outcomes.

[18] The event study graphs - panels b) and c)- in Figure 1 report estimates of the following equation which captures the impact $t$ years after/before the project starts (with $t = 0$ representing the year a project starts): $\Delta Y_i = Y_{i,t} - Y_{i,0} = \alpha_t T_i + X_i'\beta + \epsilon_i$ with $t = 1, ..., 12$. We plot the $\alpha$'s coefficients and their 95% confidence interval. For instance, $\alpha_{12}$ correspond to the effect of the policy 12 years after its introduction.

the analysis at the tract level (i.e. the areas delineated by dashed lines on the map), which is the finest geographical detail for which our outcome variables are available. The estimates are presented in Table 3. One limitation of undertaking this analysis is that some observations are lost when analyzing the educational composition of neighborhoods, given that for reasons of statistical confidentiality the population by level of education is not disclosed for all census tracts. Since tracts belonging to the same intervention area are not independent observations, we cluster the standard errors at the intervention area level. Moreover, as the number of clusters is low in some of the exercises that we conduct, we supplement the results with p-values obtained using the clustered wild bootstrap procedure developed by Cameron, Gelbach and Miller (2008)[19].

Insert Table 3 here

Columns 1 and 2 report the OLS results while columns 3 and 4 show the corresponding OB estimates. For the baseline analysis (columns 1 and 3), we have 412 treated and 317 non-treated tracts, reflecting the fact that the 39 treated areas are larger than the 103 control areas. In columns 2 and 4 we restrict our attention to the tracts that received the largest investments within the treated areas. Specifically, we focus on tracts receiving investments above 3.5M EUR, which corresponds to percentile 90 of the distribution of expenditure by tracts[20]. The results indicate that the policy did not change the population dynamics of neighborhoods, which implies that the baseline results of Table 2 are robust to using a narrower definition of the treated areas.

As explained in Section 3, the projects proposed in each call were ranked according to a final score. The projects with the highest scores were selected until the sum of the proposed budgets exhausted the budget assigned to that year. This sum represents a call-specific threshold in terms of a final score determining treatment. In turn, this institutional setting generates a regression discontinuity design (RDD). In Figure 2, we show the RDD plots for long-differences (2004-2016) in demographic outcomes and in educational composition (2011-2001) using the final score as the running variable. The final score is standardized to zero at the cut-off, with successful projects having positive scores. Evenly spaced bins (and their respective confidence intervals) are constructed using the optimal data-driven approach developed in Calonico, Cattaneo and Titiunik (2015, 2017), while the fitted line is built using a fourth order polynomial, an Epanechnikov kernel function, controlling for 2001 census variables, 2003 population register variables and year of the call dummies. In line with the baseline results presented in Table 2, we observe no evidence of discontinuities at the threshold, implying that, on average, the policy did not affect the neighborhoods' population dynamics.

Insert Figure 2 here

[19]See Cameron and Miller (2015) for a discussion of standard errors clustering.

[20]The population size of tracts in urban areas is highly concentrated around 1,500 inhabitants. This means the tracts with high total investments are also the ones in which per capita investments are high.

### 6.3 Heterogeneous analyses

Although the baseline results indicate that, on average, the urban renewal policy had no significant effects on the population dynamics of the treated area, it could well be that these results are heterogeneous with respect to the characteristics of projects and neighborhoods. We first focus our attention on project heterogeneity and later turn to examine neighborhood heterogeneity[21]. In the regression analysis, we estimate interactions between treatment and project or neighborhood characteristics. In the OB approach, we explore heterogeneity patterns by splitting the sample according to different project or neighborhood characteristics. By so doing, we compare a particular subset of treated units to a sub-sample of controls that bear a close resemblance to those treated units. Once more, the heterogeneity findings that we obtain using these two alternative approaches are qualitatively similar. The estimates reported throughout this section correspond to the more complete specifications (columns 3 and 6 in Table 2), which includes the 2001-2004 lagged outcome, and, as a result, pre-treatment trends between the treated and the reweighted control samples are exactly matched by construction.

#### 6.3.1 Effects by project size

One prediction of the theoretical framework presented in Section 2 is that, if a neighborhood has gone beyond the tipping point, a marginal investment will have no impact on the neighborhood's population dynamics. In contrast, a big push policy that significantly changes the exogenous amenities of a neighborhood might be able to revert the population dynamics if it brings the neighborhood below the tipping point. To differentiate between marginal investments and more significant changes in neighborhood amenities, in column 1 of Table 4 we present the results of a regression in which we estimate a different treatment effect for projects above and below the median in terms of total investment (14 million EUR). The results indicate that the impact of the urban renewal initiatives on neighborhood population dynamics are null even for the sub-sample of large projects. These results indicate that investments in urban renewal have no effects on population dynamics even in the case of those projects that concentrate the highest sums of money. We find the same results when we separately estimate a treatment effect for investments per capita above and below the median (2,459 EUR) in column 2, and when we separately estimate a coefficient for investments per area above and below the median (0.46 million EUR) in column 3. In Table 5 we report the corresponding OB results where we split the sample by projects with low vs. high investments. The results convey the same message.

Insert Tables 4 and 5 here

[21]As explained in Section 2, there is limited variation in the percentage sums that the different projects spent on different items and, in practice, there is not enough variation to explore heterogeneous impacts according to the type of investment made.

### 6.3.2 Effects by neighborhood type

The results reported in Table 4 are consistent with the hypothesis that investments will have no effect on population dynamics if neighborhoods have exceeded the tipping point. Since neighborhoods are also heterogeneous with respect to the initial minority share, we next test if the policy has been effective in settings where the initial minority share was lower. Since the exact location of the tipping point is empirically unknown, we consider neighborhoods with a low vs. high percentage of immigrants in 2003[22]. The first column of Table 6 reports the results of a regression that estimates the treatment effect for treated neighborhoods with a non-EU15 immigrant share below and above the median (12 percent). The two coefficient estimates are qualitatively similar, corroborating the conclusion that the policy had no effect on neighborhood dynamics. Since the average non-EU15 immigrant share is 6.6 percent for those neighborhoods with a share below the median, the results suggest that a high minority share is unlikely to account for the policy's total lack of impact[23].

Insert Tables 6 and 7 here

Preferences for neighbors might not, however, be restricted to ethnicity. Bayer, Ferreira and McMillan (2007) have shown for the San Francisco Bay area that, besides race, households prefer college-educated and rich neighbors. In columns 2 and 3 in Table 6, we explore heterogeneous patterns with respect to the level of education. Specifically, in column 2, we report results of regressions in which we estimate a coefficient for treated units with a population share (≥10 years of age) without a high-school diploma below and above the median of 76.6%. The coefficient estimates also remain close to zero for the two sub-samples. Finally, in column 3 we estimate different coefficients for treated units with a deprivation index below and above the median (44.4). This index is a function of all the deprivation indicators included in the upper panel of Table 1 and, thus, the highest values indicate the greatest social needs. Again, the results indicate no policy effects for the two groups of neighborhoods.

Table 7 reports the analogous OB estimates when splitting the sample between treated neighborhoods with high vs. low levels of immigration (columns 1 and 2), high vs. low levels of education (columns 3 and 4), and high vs. low deprivation indices (columns 5 and 6). Here, again, the estimates indicate that the interventions did not change the population dynamics in any of the sub-samples analyzed. Note, however, that all the treated neighborhoods score above the deprivation index threshold set by policy-makers for excluding non-deprived neighborhoods. In fact, most of the treated neighborhoods are low-income neighborhoods with a common history marked by poor reputations and negative social stigma (Nello, 2009). Thus, the hypothesis that

[22] Card, Mas and Rothstein (2008) estimate tipping points for US cities and find a large degree of heterogeneity across cities and over time. This finding suggests that tipping points are context specific and that they are not generalizable.

[23] We reach the same conclusion if we consider neighborhoods below and above percentiles 25 and 75.

the ineffectiveness of the policy can be attributed to the unfavorable social mix in the treated neighborhoods does not strike us as being entirely implausible.

#### 6.3.3 Historic versus non-historic districts and Barcelona

The policy guidelines draw a clear distinction between interventions in the suburbs and those made in historic districts. Here, it might be the case that people value more highly investments in the public spaces of historic districts because of their more central location and the (potential) historical-architectural value of the intervention areas (Brueckner, Thisse and Zenou, 1999; García-López, Pasidis and Viladecans-Marsal, 2018). Indeed, Baum-Snow and Hartley (2016) and Couture and Handbury (2017) document that, between 2000 and 2010, city centers in US cities experienced a process of urban revival, with relative increases in income and in the share of college graduates. A similar gentrification process has occurred in Barcelona, the only large metropolitan area in the region. In the historic city center, *Ciutat Vella*, the share of college graduates has increased by more than 16 percentage points between 2001 and 2011, increasing from 13.7 to 30.4%[24]. Hence, one possible hypothesis to emerge is that urban renewal projects in Barcelona's historic districts have had significant impacts as these projects appear to have accelerated the ongoing process of gentrification in the poor districts of central Barcelona. These dimensions of heterogeneity are explored in Tables 8 and 9 that report the OLS and OB results, respectively. Given the small number of treated neighborhoods in the case of some specifications, standard statistical inference could be misleading. Thus, we also provide 95% confidence intervals based on the bootstrap procedure proposed in Gobillon and Magnac (2016)[25].

Insert Tables 8 and 9 here

In contrast to all our previous estimates, the results in column 1 in Table 8 and in columns 1 and 2 in Table 9 suggest that the urban renewal policy did have an impact on the population dynamics of the treated neighborhoods when we distinguish between suburbs and historic districts. For suburban treated neighborhoods, the OLS estimates are counterintuitive and suggest that the policy increased the proportion of non-EU15 residents and decreased that of natives and EU-15 residents. These coefficients are closer to zero in the OB estimates and become statistically insignificant. In contrast, in both empirical approaches, the results suggest that the policy increased the population of EU-15 residents in historic districts.

In column 2 in Table 8 and in columns 3 and 4 in Table 9, we further distinguish between the historic districts in Barcelona (three projects) and all the other historic districts (12 projects)[26].

[24] During the same period, the city-level share of college graduates also increased, but to a lesser extent, rising from 21.2 to 32%.

[25] Specifically, we draw 'n' units from the entire population of treatments and controls and consider them as treated units, while the remaining units correspond to the control group. We then estimate the treatment coefficients and replicate this exercise 1,000 times. The 95% confidence interval is obtained as the 2.5th and 97.5th percentiles of the empirical distribution of these estimates.

[26] The three interventions in Barcelona's historic districts correspond to *Santa Caterina i Sant Pau*, *Poble Sec* and *La Bordeta*.

The estimates suggest that our previous findings regarding the projects of the historic districts were entirely driven by the projects in Barcelona. Both the OLS and OB results indicate that urban renewal projects in Barcelona's historic districts affected the social composition of these areas, with increases in the proportion of EU15 and native residents, and a reduction in the percentage of non-EU15 immigrants of about 4-5%. The results also imply that the policy increased the percentage of the population with a college degree by 12-16%. All in all, this suggests that the urban renewal projects implemented in the city of Barcelona might have accelerated the ongoing gentrification in deprived historic neighborhoods.

One concern is the possibility that Barcelona's low-income, historic districts might have been experiencing shocks in their population dynamics precisely in the same moment as the interventions studied here were being implemented. To address these concerns in part, we conduct a placebo test using Madrid, given that its city center also underwent a process of urban revival in the period studied here. We select the three neighborhoods in Madrid's city center that are most similar to the three treated neighborhoods in Barcelona in terms of their probability of being treated[27]. Figure 3, built without using the pre-treatment outcome as a control, shows the population dynamics of the three treated units in Barcelona's historic districts (left panels) and in the 3 placebo units in Madrid (right panels) together with their respective control units.

Insert Figure 3 here

The neighborhoods selected in Barcelona and Madrid present similar pre-treatment trajectories; however, the share of EU15 immigrants was growing at a faster rate in Barcelona prior to the adoption of the policy. In fact, the share of EU15 immigrants in Barcelona's treated historic districts also seems to have been growing faster in the period 2001-2004 compared to the reweighted control sample. It should be noted though that all the results reported in Table 9 were obtained with specifications that directly control for the pre-treatment change in the outcome of interest. The placebo estimates in column 5 of Table 9 for Madrid indicate no effects associated with the treatment period. This implies that the central areas of Madrid that most closely resemble the treated areas in central Barcelona did not exhibit similar population dynamics to those observed in the treated historic districts of Barcelona at the time of treatment.

# 7 Summary and concluding remarks

This paper has analyzed the impact on the population dynamics at the neighborhood level of a prominent place-based policy (the Neighborhoods Act) implemented in some of the most de-

[27] To identify these three neighborhoods, we pool the sample of (121) controls and all the neighborhoods in (the municipality of) Madrid. With these data, we calculate the Oaxaca-Blinder weights as defined in Kline (2011), reflecting the probability of treatment. The specification used includes the variables considered in columns 2 and 4 of Table 2, as well as an indicator for historic district. The probabilities of receiving treatment are plotted for all the neighborhoods of Madrid in Appendix D. The highest probabilities are those of *Embajadores*, *La Chopera* and *Palos de Moguer* which are the placebo treatments considered here.

prived neighborhoods of the Spanish region of Catalonia in the period 2004-2010. Large investments in public spaces and facilities were made in low-income urban neighborhoods. One objective of the policy was to attract natives and high income individuals to treated neighborhoods and to reduce the concentration of poverty and immigration. The policy has had little (if any) impact on the population composition and dynamics of the treated neighborhoods, although we find some evidence suggesting that interventions in the historic districts of Barcelona might have had some impact. Specifically, the findings indicate that, there, the policy may have accelerated the ongoing process of gentrification that the city center is experiencing.

The results of this paper, when considered in conjunction with the findings of Baum-Snow and Marion (2009) and Diamond and McQuade (2019), suggest that building affordable housing for middle-income families in disadvantaged areas may be a more effective tool for reducing income and ethnic segregation than simply improving the public spaces and facilities of these areas. The fact that the urban renewal policies studied here were unable to change the social mix of the treated neighborhoods - one of the goals set for the policy at the outset - does not necessarily mean that the policy was a failure, as the investments made in public spaces and facilities might have increased the residents' quality of life. Unfortunately, due to data restrictions, we cannot estimate the effect of the policy interventions on housing prices, as this would allow us to quantify these benefits and, so, provide a more complete evaluation of the policy.

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# Tables

Table 1: Sample balance: average of pre-treatment characteristics

| | Treated (1) | Non-treated (2) | Non-treated reweighted (3) | Difference (1) - (2) | Difference (1) - (3) |
|---|---|---|---|---|---|
| **Variables used to determine treatment** | | | | | |
| Property value, relative to municipal average = 100, t-1 | 70.705 | 90.423 | 70.705 | -19.718* | 0.000 |
| % of buildings in poor condition, 2001 | 5.192 | 3.372 | 5.192 | 1.820*** | 0.000 |
| % of buildings without pipe water, 2001 | 0.654 | 0.717 | 0.654 | -0.063 | 0.000 |
| % of buildings without sewerage connection, 2001 | 0.634 | 1.201 | 0.634 | -0.567*** | 0.000 |
| % of >= 4 storey-buildings without elevator, 2001 | 65.507 | 66.038 | 65.507 | -0.531 | 0.000 |
| Density in 2003 (inhabitants per hectare, logged) | 5.482 | 4.194 | 5.482 | 1.288*** | 0.000 |
| Population growth rate (2003 - 2001, %) | 9.978 | 7.038 | 9.978 | 2.940 | 0.000 |
| % of population 0-16 years, 2001 | 15.135 | 14.307 | 15.135 | 0.827 | 0.000 |
| % of population >65 years, 2001 | 17.211 | 20.349 | 17.211 | -3.138*** | 0.000 |
| % of non-EU15 immigrants in 2003 | 13.972 | 6.985 | 13.972 | 6.987*** | 0.000 |
| % of welfare benefits users, t-1 | 1.804 | 1.440 | 1.804 | 0.363 | 0.000 |
| % unemployment, 2001 | 12.784 | 8.953 | 12.784 | 3.831*** | 0.000 |
| % of residents > 10 yrs, without a high-school diploma, 2001 | 75.653 | 73.867 | 75.653 | 1.786 | 0.000 |
| % of people at risk of social exclusion, t-1 | 28.509 | 17.461 | 28.509 | 11.049 | 0.000 |
| Public transportation: Presence, t-1 | 0.769 | 0.388 | 0.769 | 0.381*** | 0.000 |
| Public transportation: Freq. >= 30', working hours, t-1 | 0.308 | 0.398 | 0.308 | -0.090 | 0.000 |
| Presence of public parking lots, t-1 | 0.359 | 0.194 | 0.359 | 0.165* | 0.000 |
| < 50 of buildings with private parking, t-1 | 0.897 | 0.612 | 0.897 | 0.286*** | 0.000 |
| Lack of parks and green areas, t-1 | 58.057 | 46.081 | 58.057 | 11.976** | 0.000 |
| % vacant commercial property, 2001 | 29.207 | 26.271 | 29.207 | 2.936 | 0.000 |
| Population in 2003 (logged) | 8.663 | 6.593 | 8.663 | 2.069*** | 0.000 |
| **Variables not used to-determine treatment** | | | | | |
| $\Delta$ log natives (2004 - 2001) | -0.023 | 0.002 | -0.037 | -0.025 | 0.014 |
| $\Delta$ log non-EU15 immigrants (2004 - 2001) | 1.090 | 0.840 | 1.033 | 0.250*** | 0.057 |
| $\Delta$ log EU15 immigrants (2004 - 2001) | 0.186 | 0.139 | 0.107 | 0.047 | 0.079 |
| $\Delta$ share of natives (2004 - 2001) | -9.700 | -4.580 | -8.320 | -5.120*** | -1.380 |
| $\Delta$ share of non-EU15 immigrants (2004 - 2001) | 8.509 | 3.845 | 7.861 | 4.665*** | 0.648 |
| $\Delta$ share of EU15 immigrants (2004 - 2001) | 0.105 | 0.122 | -0.032 | -0.017 | 0.137 |
| Number of observations | 39 | 103 | | | |

Notes: Variables measured in 2001 drawn from the Census while variables measured in 2003 and 2004 are from population registers. Variables referred to t-1 are provided by local councils through the project's proposal.

Table 2: Impact of the urban renewal policy on ethnic and educational composition

| | OLS | | | Oaxaca-Blinder (OB) | | |
|---|---|---|---|---|---|---|
| | **(1)** | **(2)** | **(3)** | **(4)** | **(5)** | **(6)** |
| **Ethnic composition, 2004-2016** | | | | | | |
| Δ log population | 0.014 | 0.031 | 0.001 | -0.003 | 0.013 | -0.025 |
| | (0.036) | (0.034) | (0.038) | (0.040) | (0.035) | (0.044) |
| Δ log natives | -0.017 | -0.003 | -0.023 | -0.029 | -0.018 | -0.035 |
| | (0.038) | (0.036) | (0.037) | (0.042) | (0.037) | (0.043) |
| Δ log non-EU15 immigrants | 0.079 | 0.093 | 0.053 | 0.035 | 0.064 | 0.027 |
| | (0.077) | (0.073) | (0.075) | (0.092) | (0.085) | (0.091) |
| Δ log EU15 immigrants | -0.045 | 0.021 | -0.018 | -0.035 | 0.024 | 0.031 |
| | (0.102) | (0.098) | (0.099) | (0.117) | (0.110) | (0.109) |
| Δ % of natives | -1.934 | -2.203 | -0.915 | -1.379 | -1.816 | -0.729 |
| | (1.062)* | (1.025)** | (0.996) | (1.212) | (1.205) | (1.223) |
| Δ % of non-EU15 immigrants | 1.468 | 1.549 | 0.673 | 0.735 | 1.163 | 0.103 |
| | (0.963) | (0.937) | (0.851) | (1.124) | (1.110) | (1.036) |
| Δ % of EU15 immigrants | 0.038 | 0.118 | 0.027 | 0.246 | 0.233 | 0.303 |
| | (0.129) | (0.133) | (0.128) | (0.243) | (0.232) | (0.241) |
| **Educational composition, 2001-2011** | | | | | | |
| Δ log pop. with college degree | -0.086 | -0.021 | -0.086 | -0.161 | -0.136 | -0.161 |
| | (0.171) | (0.160) | (0.171) | (0.180) | (0.186) | (0.180) |
| Δ % of pop- with college degree | -0.194 | 0.398 | -0.194 | -0.069 | 0.058 | -0.069 |
| | (1.192) | (1.150) | (1.192) | (1.374) | (1.412) | (1.374) |
| **Control variables** | | | | | | |
| 2001 census variables | Y | Y | Y | Y | Y | Y |
| 2003 population register variables | Y | Y | Y | Y | Y | Y |
| Other controls | Y | N | Y | Y | N | Y |
| Lagged outcome, 2001-2004 | N | N | $Y^{a}$ | N | N | $Y^{a}$ |
| Number of observations | | | 142 | | | |
| Number of treated observations | | | 39 | | | |

Notes: Each entry represents an outcome variable. 2001 census variables, 2003 population register variables and other controls as defined in the top panel of Table 1. *a*) The lagged outcome is not included in the regressions of college-graduates as we do not have this information. Robust standard errors in parenthesis. *** significant at 1% level, ** significant at 5% level, * significant at 10% level.

Table 3: Impact of the urban renewal policy on demographic variables and education. Results at tract level

| | OLS | | Oaxaca-Blinder (OB) | |
|---|---|---|---|---|
| | Baseline | Investment in the tract > 90th pctile 3.5M Euros | Baseline | Investment in the tract > 90th pctile 3.5M Euros |
| | (1) | (2) | (3) | (4) |
| **Ethnic composition, 2004-2016** | | | | |
| Δ log population | -0.011 | -0.073 | 0.039 | -0.048 |
| | (0.028) | (0.050) | (0.030) | (0.049) |
| | [0.708] | [.19] | [0.488] | [.458] |
| Δ log natives | -0.039 | -0.070 | 0.035 | -0.021 |
| | (0.028) | (0.044) | (0.029) | (0.046) |
| | [0.238] | [.118] | [0.692] | [.776] |
| Δ log non-EU15 immigrants | 0.125 | -0.041 | 0.074 | -0.057 |
| | (0.077) | (0.130) | (0.095) | (0.127) |
| | [0.172] | [.762] | [0.554] | [.696] |
| Δ log EU15 immigrants | -0.062 | 0.038 | 0.103 | 0.125 |
| | (0.076) | (0.162) | (0.104) | (0.158) |
| | [0.406] | [.828] | [0.452] | [.488] |
| Δ % of natives | -1.900 | 0.036 | -0.491 | 1.619 |
| | (0.929)* | (1.595) | (1.164) | (1.545) |
| | [0.084] | [.97] | [0.786] | [.304] |
| Δ % of non-EU15 immigrants | 1.221 | -0.523 | -0.559 | -1.921 |
| | (0.753) | (1.522) | (0.944) | (1.488) |
| | [0.136] | [.762] | [0.686] | [.25] |
| Δ % of EU15 immigrants | -0.127 | 0.156 | 0.149 | 0.272 |
| | (0.137) | (0.270) | (0.232) | (0.368) |
| | [0.358] | [.642] | [0.620] | [.574] |
| Number of observations | 729 | 347 | 729 | 347 |
| Number of treated observations | 412 | 30 | 412 | 30 |
| **Education outcomes, 2001-2011** | | | | |
| Δ log pop. with college degree | -0.198 | -0.358 | -0.156 | -0.273 |
| | (0.171) | (0.376) | (0.191) | (0.362) |
| | [0.308] | [.394] | [0.506] | [.448] |
| Δ % pop. with college degree | -0.976 | -0.629 | -1.092 | -0.993 |
| | -1.007 | (2.125) | (1.237) | (2.098) |
| | [0.394] | [.756] | [0.398] | [.65] |
| Number of observations | 609 | 311 | 609 | 311 |
| Number of treated observations | 412 | 30 | 412 | 30 |

Notes: Each entry representing one outcome variable. All controls measured at the area of intervention level. Control variables include all variables in top panel of Table 1, as well as the 2001-2004 lagged outcome for the ethnic composition outcomes. Clustered standard errors at the proposed area of intervention in parenthesis where ***, ** and * denote statistical significance at the 1, 5 and 10% level. Alternatively, p-value in squared brackets from a clustered wild bootstrap procedure (with 1000 replications) developed by (Cameron, Gelbach and Miller, 2008) where $^a$, $^b$ and $^c$ denote statistical significance at the 1, 5 and 10% levels.

Table 4: Impact of the urban renewal policy on demographic variables and education outcomes by level of investment. OLS estimates.

| | $ci$ = Total investment (1) | Investment per capita (2) | Investment per He (3) |
|---|---|---|---|
| **Ethnic composition, 2004-2016** | | | |
| Δ log population | | | |
| $T_i \times c_i < p50$th | -0.019 | -0.003 | -0.071 |
| | (0.053) | (0.050) | (0.058) |
| $T_i \times c_i > p50$th | -0.001 | -0.010 | -0.024 |
| | (0.045) | (0.048) | (0.051) |
| Δ log natives | | | |
| $T_i \times c_i < p50$th | -0.026 | -0.050 | -0.093 |
| | (0.051) | (0.051) | (0.061) |
| $T_i \times c_i > p50$th | -0.045 | -0.021 | -0.019 |
| | (0.044) | (0.046) | (0.047) |
| Δ log non-EU15 immigrants | | | |
| $T_i \times c_i < p50$th | 0.024 | 0.054 | -0.026 |
| | (0.102) | (0.097) | (0.131) |
| $T_i \times c_i > p50$th | 0.061 | 0.057 | 0.003 |
| | (0.096) | (0.093) | (0.096) |
| Δ log EU15 immigrants | | | |
| $T_i \times c_i < p50$th | -0.088 | -0.113 | -0.068 |
| | (0.143) | (0.126) | (0.127) |
| $T_i \times c_i > p50$th | 0.011 | 0.014 | -0.047 |
| | (0.125) | (0.128) | (0.131) |
| Δ % of natives | | | |
| $T_i \times c_i < p50$th | 0.214 | -2.657 | -0.622 |
| | (1.402) | (1.279)** | (1.781) |
| $T_i \times c_i > p50$th | -2.110 | -0.073 | 0.954 |
| | (1.252)* | (1.150) | (1.233) |
| Δ % of non-EU15 immigrants | | | |
| $T_i \times c_i < p50$th | -0.005 | 1.548 | 0.141 |
| | (1.183) | (1.065) | (1.768) |
| $T_i \times c_i > p50$th | 1.434 | 0.494 | -0.261 |
| | (1.106) | (1.058) | (1.121) |
| Δ % of EU15 immigrants | | | |
| $T_i \times c_i < p50$th | -0.198 | 0.129 | 0.105 |
| | (0.181) | (0.211) | (0.236) |
| $T_i \times c_i > p50$th | 0.232 | -0.117 | -0.189 |
| | (0.213) | (0.202) | (0.224) |
| **Educational composition, 2001-2011** | | | |
| Δ log pop. with college degree | | | |
| $T_i \times c_i < p50$th | -0.087 | -0.212 | -0.363 |
| | (0.245) | (0.233) | (0.257) |
| $T_i \times c_i > p50$th | -0.185 | -0.094 | -0.005 |
| | (0.216) | (0.241) | (0.240) |
| Δ % pop. with college degree | | | |
| $T_i \times c_i < p50$th | -0.653 | -1.076 | -0.674 |
| | (1.639) | (1.582) | (1.947) |
| $T_i \times c_i > p50$th | -0.383 | -0.387 | 0.181 |
| | (1.580) | (1.635) | (1.686) |
| Number of observations | | 142 | |
| Number of treated observations | | 39 | |

Notes: OLS estimates. Control variables include all variables in top panel of Table 1, as well as the 2001-2004 lagged outcome for the ethnic composition outcomes. Robust standard errors in parenthesis. *** significant at 1% level, ** significant at 5% level, * significant at 10% level.

Table 5: Impact of the urban renewal policy on ethnic and educational composition by level of investment. OB estimates

| | **Total investment < the median (1)** | **Total investment > the median (2)** | **Investment per capita < the median (3)** | **Investment per capita > the median (4)** | **Investment per He < the median (5)** | **Investment per He > the median (6)** |
|---|---|---|---|---|---|---|
| **Ethnic composition, 2004-2016** | | | | | | |
| Δ log population | -0.034 | -0.026 | -0.061 | -0.037 | -0.060 | -0.019 |
| | (0.060) | (0.053) | (0.080) | (0.052) | (0.083) | (0.052) |
| Δ log natives | -0.028 | -0.053 | -0.047 | -0.031 | -0.092 | -0.002 |
| | (0.059) | (0.051) | (0.081) | (0.053) | (0.083) | (0.053) |
| Δ log non-EU15 immigrants | -0.001 | 0.040 | -0.122 | 0.051 | -0.057 | 0.040 |
| | (0.125) | (0.121) | (0.151) | (0.101) | (0.151) | (0.100) |
| Δ log EU15 immigrants | -0.111 | 0.137 | -0.046 | 0.074 | -0.063 | 0.076 |
| | (0.128) | (0.172) | (0.175) | (0.127) | (0.194) | (0.126) |
| Δ % of natives | 0.382 | -1.734 | 1.084 | 0.241 | -2.279 | 1.042 |
| | (1.506) | (1.611) | (1.731) | (1.431) | (1.612) | (1.356) |
| Δ % of non-EU15 immigrants | -0.288 | 0.464 | -1.643 | 0.004 | 0.498 | -0.554 |
| | (1.288) | (1.426) | (1.624) | (1.317) | (1.447) | (1.249) |
| Δ % of EU15 immigrants | -0.127 | 0.684 | 0.465 | 0.064 | 0.533 | 0.053 |
| | (0.124) | (0.450) | (0.471) | (0.143) | (0.463) | (0.142) |
| **Educational composition, 2001-2011** | | | | | | |
| Δ log pop. with college degree | 0.039 | -0.351 | -0.078 | -0.239 | -0.186 | -0.137 |
| | (0.236) | (0.244) | (0.253) | (0.232) | (0.248) | (0.239) |
| Δ % pop. with college degree | 0.555 | -0.662 | 0.618 | -0.721 | 0.191 | -0.315 |
| | (1.434) | (2.100) | (2.046) | (1.613) | (2.062) | (1.614) |
| Number of observations | 122 | 123 | 122 | 123 | 122 | 123 |
| Number of treated observations | 19 | 20 | 19 | 20 | 19 | 20 |

Notes: OB estimates. Control variables include all variables in the top panel of Table 1, as well as the 2001-2004 lagged outcome for the ethnic composition outcomes. Robust standard errors in parenthesis. *** significant at 1% level, ** significant at 5% level, * significant at 10% level.

Table 6: Impact of the urban renewal policy on demographic variables and education outcomes by neighborhood characteristics. OLS estimates

| | $ci =$ | | |
|---|---|---|---|
| | **Initial % of non-EU15** | **% of low educated residents** | **Deprivation index** |
| | **(1)** | **(2)** | **(3)** |
| **Ethnic composition, 2004-2016** | | | |
| $\Delta$ log population | | | |
| $T_i \times c_i < p50$th | 0.035 | -0.018 | 0.027 |
| | (0.043) | (0.046) | (0.043) |
| $T_i \times c_i > p50$th | -0.053 | 0.017 | -0.059 |
| | (0.056) | (0.051) | (0.051) |
| $\Delta$ log natives | | | |
| $T_i \times c_i < p50$th | 0.011 | -0.050 | 0.000 |
| | (0.043) | (0.047) | (0.042) |
| $T_i \times c_i > p50$th | -0.074 | 0.000 | -0.069 |
| | (0.055) | (0.046) | (0.050) |
| $\Delta$ log non-EU15 immigrants | | | |
| $T_i \times c_i < p50$th | 0.076 | 0.067 | 0.095 |
| | (0.086) | (0.105) | (0.081) |
| $T_i \times c_i > p50$th | 0.019 | 0.043 | -0.033 |
| | (0.115) | (0.092) | (0.108) |
| $\Delta$ log EU15 immigrants | | | |
| $T_i \times c_i < p50$th | -0.017 | -0.159 | 0.014 |
| | (0.119) | (0.125) | (0.113) |
| $T_i \times c_i > p50$th | -0.020 | 0.094 | -0.087 |
| | (0.167) | (0.129) | (0.145) |
| $\Delta$ % of natives | | | |
| $T_i \times c_i < p50$th | -1.449 | -1.316 | -1.633 |
| | (1.132) | (1.191) | (0.956)* |
| $T_i \times c_i > p50$th | -0.049 | -0.630 | 0.758 |
| | (1.460) | (1.422) | (1.615) |
| $\Delta$ % of non-EU15 immigrants | | | |
| $T_i \times c_i < p50$th | 1.359 | 1.277 | 1.163 |
| | (0.877) | (1.083) | (0.841) |
| $T_i \times c_i > p50$th | -0.419 | 0.217 | -0.408 |
| | (1.445) | (1.212) | (1.449) |
| $\Delta$ % of EU15 immigrants | | | |
| $T_i \times c_i < p50$th | -0.036 | -0.084 | 0.079 |
| | (0.134) | (0.168) | (0.162) |
| $T_i \times c_i > p50$th | 0.124 | 0.117 | -0.086 |
| | (0.275) | (0.176) | (0.242) |
| **Educational composition, 2001-2011** | | | |
| $\Delta$ log pop. with college degree | | | |
| $T_i \times c_i < p50$th | 0.113 | -0.055 | -0.055 |
| | (0.183) | (0.231) | (0.197) |
| $T_i \times c_i > p50$th | -0.391 | -0.110 | -0.151 |
| | (0.259) | (0.227) | (0.257) |
| $\Delta$ % of pop- with college degree | | | |
| $T_i \times c_i < p50$th | 0.976 | -0.610 | 0.198 |
| | (1.324) | (1.444) | (1.295) |
| $T_i \times c_i > p50$th | -1.982 | 0.134 | -1.006 |
| | (1.929) | (1.639) | (1.918) |
| Number of observations | | 142 | |
| Number of treated observation | | 39 | |

Notes: OLS estimates. Control variables include all variables in top panel of Table 1, as well as the 2001-2004 lagged outcome in the ethnic composition outcomes. Robust standard errors in parenthesis. *** significant at 1% level, ** significant at 5% level, * significant at 10% level.

Table 7: Impact of the urban renewal policy on ethnic and educational composition by neighborhood characteristics. OB estimates

| | **Initial % of non-EU15 < the median** | **Initial % of non-EU15 > the median** | **% of low educated residents > the median** | **% of low educated residents < the median** | **Treated with deprivation index < the median** | **Treated with deprivation index > the median** |
|---|---|---|---|---|---|---|
| | **(1)** | **(2)** | **(3)** | **(4)** | **(5)** | **(6)** |
| **Ethnic composition, 2004-2016** | | | | | | |
| $\Delta$ log population | 0.045 | -0.064 | -0.022 | -0.040 | 0.033 | -0.071 |
| | (0.049) | (0.087) | (0.056) | (0.066) | (0.045) | (0.107) |
| $\Delta$ log natives | 0.022 | -0.078 | -0.044 | -0.044 | 0.005 | -0.058 |
| | (0.051) | (0.083) | (0.059) | (0.062) | (0.044) | (0.107) |
| $\Delta$ log non-EU15 immigrants | 0.082 | -0.040 | 0.108 | -0.054 | 0.110 | -0.113 |
| | (0.106) | (0.177) | (0.110) | (0.143) | (0.097) | (0.188) |
| $\Delta$ log EU15 immigrants | 0.081 | -0.108 | -0.161 | 0.138 | 0.062 | -0.050 |
| | (0.104) | (0.225) | (0.117) | (0.157) | (0.108) | (0.271) |
| $\Delta$ % of natives | -2.050 | -0.824 | -1.306 | -0.440 | -1.013 | 1.609 |
| | (1.385) | (2.127) | (1.668) | (1.635) | (1.750) | (2.449) |
| $\Delta$ % of non-EU15 immigrants | 1.415 | -0.296 | 0.890 | -0.353 | 1.224 | -2.707 |
| | (1.103) | (2.115) | (1.325) | (1.409) | (0.915) | (2.236) |
| $\Delta$ % of EU15 immigrants | 0.111 | 0.420 | -0.059 | 0.545 | 0.206 | 0.574 |
| | (0.128) | (0.502) | (0.134) | (0.405) | (0.203) | (0.536) |
| **Educational composition, 2001-2011** | | | | | | |
| $\Delta$ log pop. with college degree | 0.193 | -0.277 | -0.267 | -0.049 | 0.140 | -0.446 |
| | (0.155) | (0.320) | (0.232) | (0.262) | (0.183) | (0.273) |
| $\Delta$ % of pop- with college degree | 1.542 | -0.966 | -1.880 | 1.838 | 1.727 | -1.775 |
| | (1.436) | (2.530) | (1.368) | (2.226) | (1.372) | (2.173) |
| Number of observations | 122 | 123 | 123 | 122 | 122 | 123 |
| Number of treated observation | 19 | 20 | 20 | 19 | 19 | 20 |

Notes: OB estimates. Control variables include all variables in top panel of Table 1, as well as the 2001-2004 lagged outcome in the ethnic composition outcomes. Robust standard errors in parenthesis. *** significant at 1% level, ** significant at 5% level, * significant at 10% level.

Table 8: Impact of the urban renewal policy on demographic variables and education outcomes: Suburbs versus historic districts and Barcelona. OLS estimates

| | **(1)** | **(2)** |
|---|---|---|
| **Ethnic composition, 2004-2016** | | |
| Δ log population | | |
| $T_i$ × Deprived Suburbs | -0.020 | -0.007 |
| | (0.046) | (0.045) |
| | [-0.108 ; .052] | [-0.108 ; 0.075] |
| $T_i$ × Historic District | 0.034 | -;- |
| | (0.069) | -;- |
| | [-0.114 ; 0.115] | -;- |
| $T_i$ × Historic District w/o BCN | -;- | 0.013 |
| | -;- | (0.068) |
| | -;- | [-0.137 ; 0.118] |
| $T_i$ × Historic District w/ BCN | -;- | 0.044 |
| | -;- | (0.094) |
| | -;- | [-0.325 ; 0.278] |
| Δ log natives | | |
| $T_i$ × Deprived Suburbs | -0.066 | -0.053 |
| | (0.046) | (0.043) |
| | [-0.161 ; 0.001] | [-.152 ; 0.027] |
| $T_i$ × Historic District | 0.052 | -;- |
| | (0.062) | -;- |
| | [-0.092 ; 0.140] | -;- |
| $T_i$ × Historic District w/o BCN | -;- | 0.036 |
| | -;- | (0.061) |
| | -;- | [-0.108 ; 0.146] |
| $T_i$ × Historic District w/ BCN | -;- | 0.048 |
| | -;- | (0.102) |
| | -;- | [-0.303 ; 0.285] |
| Δ log non-EU15 immigrants | | |
| $T_i$ × Deprived Suburbs | 0.113 | 0.141 |
| | (0.091) | (0.089) |
| | [-0.030 ; 0.299] | [-0.050 ; 0.345] |
| $T_i$ × Historic District | -0.065 | -;- |
| | (0.128) | -;- |
| | [-0.267 ; 0.124] | -;- |
| $T_i$ × Historic District w/o BCN | -;- | -0.102 |
| | -;- | (0.135) |
| | -;- | [-0.405 ; 0.121] |
| $T_i$ × Historic District w/ BCN | -;- | -0.196 |
| | -;- | (0.209) |
| | -;- | [-0.824 ; 0.109] |
| Δ log EU15 immigrants | | |
| $T_i$ × Deprived Suburbs | -0.244 | -0.229 |
| | (0.112)** | (0.104)** |
| | **[-0.491 ; -0.078]** | [-0.491 ; 0.020] |
| $T_i$ × Historic District | 0.382 | -;- |
| | (0.199)* | -;- |
| | **[0.175 ; 0.732]** | -;- |
| $T_i$ × Historic District w/o BCN | -;- | 0.247 |
| | -;- | (0.183) |
| | -;- | [-0.020 ; 0.567] |
| $T_i$ × Historic District w/ BCN | -;- | 0.836 |
| | -;- | (0.249)*** |
| | -;- | **[0.326 ; 1.567]** |
| Δ % of natives | | |
| $T_i$ × Deprived Suburbs | -2.788 | -2.682 |
| | (1.033)*** | (1.004)*** |
| | **[-5.110 ; -1.638]** | **[-4.647 ; -1.110]** |
| $T_i$ × Historic District | 2.252 | -;- |
| | (1.614) | -;- |
| | [-0.018 ; 4.524] | -;- |
| $T_i$ × Historic District w/o BCN | -;- | 2.450 |
| | -;- | (1.765) |
| | -;- | [-0.121 ; 5.011] |
| $T_i$ × Historic District w/ BCN | -;- | 1.273 |
| | -;- | (2.130) |
| | -;- | [-2.629 ; 7.678] |

Table 8 (Continued): Impact of the urban renewal policy on demographic variables and education outcomes: Suburbs versus historic districts and Barcelona. OLS estimates.

| | **(1)** | **(2)** |
|---|---|---|
| Δ % of non-EU15 immigrants | | |
| $T_i$ × Deprived Suburbs | 2.342 | 2.175 |
| | (0.857)*** | (0.836)** |
| | **[1.292 ; 4.341]** | **[0.966 ; 3.887]** |
| $T_i$ × Historic District | -2.206 | -;- |
| | (1.487) | -;- |
| | **[-4.316 ; -0.667]** | -;- |
| $T_i$ × Historic District w/o BCN | -;- | -1.731 |
| | -;- | (1.612) |
| | -;- | [-3.719 ; 0.354] |
| $T_i$ × Historic District w/ BCN | -;- | -4.135 |
| | -;- | (2.043)** |
| | -;- | **[-9.812 ; -0.800]** |
| Δ % of EU15 immigrants | | |
| $T_i$ × Deprived Suburbs | -0.280 | -0.201 |
| | (0.170) | (0.133) |
| | **[-0.626 ; -0.074]** | [-0.512 ; 0.115] |
| $T_i$ × Historic District | 0.549 | -;- |
| | (0.298)* | -;- |
| | **[0.237 ; 1.171]** | -;- |
| $T_i$ × Historic District w/o BCN | -;- | 0.052 |
| | -;- | (0.165) |
| | -;- | [-0.328 ; 0.389] |
| $T_i$ × Historic District w/ BCN | -;- | 3.298 |
| | -;- | (1.219)*** |
| | -;- | **[2.547 ; 5.180]** |
| **Educational composition, 2001-2011** | | |
| Δ log pop. with college degree | | |
| $T_i$ × Deprived Suburbs | -0.192 | -0.086 |
| | (0.199) | (0.208) |
| | [-0.532 ; 0.111] | [-0.449 ; 0.205] |
| $T_i$ × Historic District | 0.130 | -;- |
| | (0.305) | -;- |
| | [-0.205 ; 0.569] | -;- |
| $T_i$ × Historic District w/o BCN | -;- | -0.117 |
| | -;- | (0.339) |
| | -;- | [-0.567 ; 0.276] |
| $T_i$ × Historic District w/ BCN | -;- | 0.746 |
| | -;- | (0.423)* |
| | -;- | [-0.530 ; 1.578] |
| Δ % pop. with college degree | | |
| $T_i$ × Deprived Suburbs | -1.641 | -0.879 |
| | (1.311) | (1.291) |
| | [-4.123 ; 0.492] | [-3.167 ; 1.832] |
| $T_i$ × Historic District | 2.352 | -;- |
| | (2.226) | -;- |
| | [-0.435 ; 5.302] | -;- |
| $T_i$ × Historic District w/o BCN | -;- | -0.337 |
| | -;- | (2.202) |
| | -;- | [-3.579 ; 2.737] |
| $T_i$ × Historic District w/ BCN | -;- | 12.526 |
| | -;- | (4.060)*** |
| | -;- | **[5.449 ; 21.437]** |
| Number of observations | 142 | |
| Number of treated observations | 39 | |

Notes: OLS estimates. Control variables include all variables in top panel of Table 1, as well as the 2001-2004 lagged outcome in the ethnic composition outcomes. Robust standard errors in parenthesis. *** significant at 1% level, ** significant at 5% level, * significant at 10% level. In brackets, bootstrapped 95% confidence intervals as described in the main text.

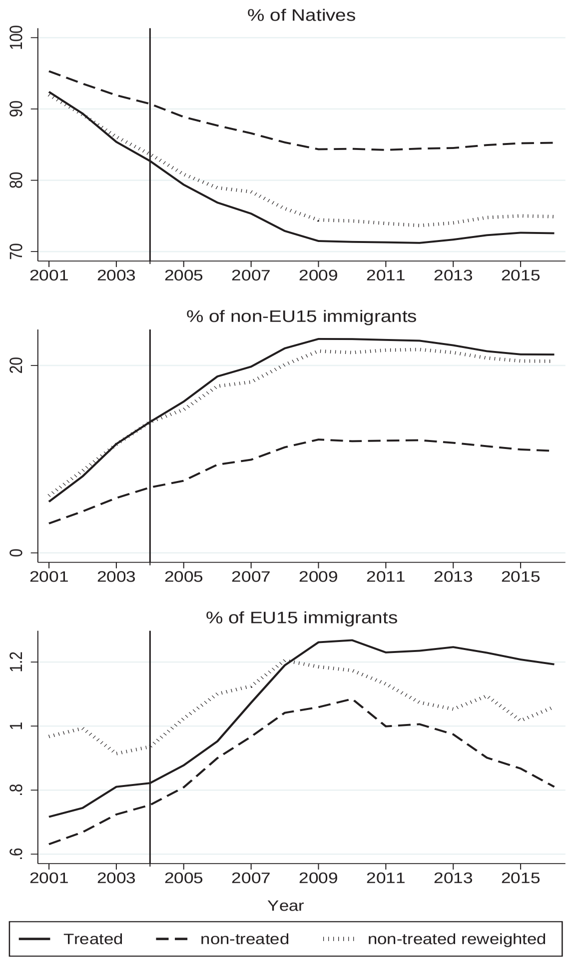
Table 9: Impact of the urban renewal policy on demographic variables and education outcomes: Suburbs, historic districts, Barcelona and Madrid (placebo). OB estimates.

| | **Suburbs (1)** | **Historic districts (2)** | **Historic districts, without Barcelona (3)** | **Historic districts in Barcelona (4)** | **Historic districts, Madrid placebo test (5)** |
|---|---|---|---|---|---|
| 0 **Ethnic composition, 2004-2013** | | | | | |
| Δ log population | -0.013 | -0.027 | -0.037 | 0.030 | -0.076 |
| | (0.046) | (0.067) | (0.066) | (0.121) | (0.059) |
| | [-0.141 ; 0.069] | [-0.200 ; 0.105] | [-0.217 ; 0.104] | [-1.291 ; 0.333] | [-0.334 ; 0.170] |
| Δ log natives | -0.043 | 0.007 | 0.005 | 0.049 | -0.069 |
| | (0.047) | (0.067) | (0.067) | (0.128) | (0.062) |
| | [-0.151 ; 0.023] | [-0.154 ; 0.140] | [-0.158 ; 0.133] | [-0.511 ; 0.339] | [-0.314 ; 0.179] |
| Δ log non-EU15 immigrants | 0.042 | -0.130 | -0.110 | -0.317 | -0.075 |
| | (0.097) | (0.148) | (0.160) | (0.234) | (0.097) |
| | [-0.181 ; 0.249] | [-0.419 ; 0.096] | [-0.421 ; 0.187] | [-1.093 ; 0.294] | [-0.408 ; 0.125] |
| Δ log EU15 immigrants | -0.162 | 0.383 | 0.205 | 0.871 | -0.251 |
| | (0.097)* | (0.201)* | (0.185) | (0.384)** | (0.154) |
| | [-.366 ; 0.029] | **[0.022 ; 0.682]** | [-0.175 ; 0.523] | **[0.135 ; 1.451]** | [-0.586 ; 0.173] |
| Δ % of natives | -2.010 | 2.557 | 2.934 | 2.219 | 0.758 |
| | (1.231) | (2.070) | (2.288) | (2.769) | (0.816) |
| | [-3.634 ; 0.181] | **[0.287 ; 4.954]** | **[0.079 ; 5.541]** | [-2.962 ; 8.596] | [-2.133 ; 3.947] |
| Δ % of non-EU15 immigrants | 0.734 | -2.534 | -2.098 | -5.026 | -0.176 |
| | (0.994) | (1.769) | (2.012) | (2.487)** | (1.733) |
| | [-0.693 ; 2.383] | [-4.292 ; 0.419] | [-4.142 ; 0.588] | **[-8.961 ; -0.265]** | [-3.756 ; 2.509] |
| Δ % of EU15 immigrants | -0.080 | 0.931 | 0.141 | 3.842 | -0.582 |
| | (0.122) | (0.567) | (0.161) | (1.611)** | (0.582) |
| | [-0.334 ; 0.267] | **[0.307 ; 1.536]** | [-0.195 ; 0.474] | **[2.839 ; 4.964]** | [-1.260 ; 0.029] |
| **Educational composition, 2001-2011** | | | | | |
| Δ log pop. with college degree | -0.330 | -0.019 | -0.241 | 0.978 | -0.178 |
| | (0.215) | (0.330) | (0.380) | (0.303)*** | (0.183) |
| | [-0.687 ; -0.003] | [-0.549 ; 0.340] | [-0.976 ; 0.221] | [-1.135 ; 1.580] | [-0.762 ; 0.477] |
| Δ % pop. with college degree | -1.692 | 2.249 | -1.003 | 16.176 | 1.009 |
| | (1.254) | (2.810) | (2.497) | (3.638)*** | (3.765) |
| | [-3.863 ; 0.620] | [-1.980 ; 5.825] | [-5.477 ; 2.939] | **[4.604 ; 25.901]** | [-5.557 ; 9.208] |
| Number of observations | 127 | 118 | 115 | 106 | 128 |
| Number of treated observations | 24 | 15 | 12 | 3 | 3 |

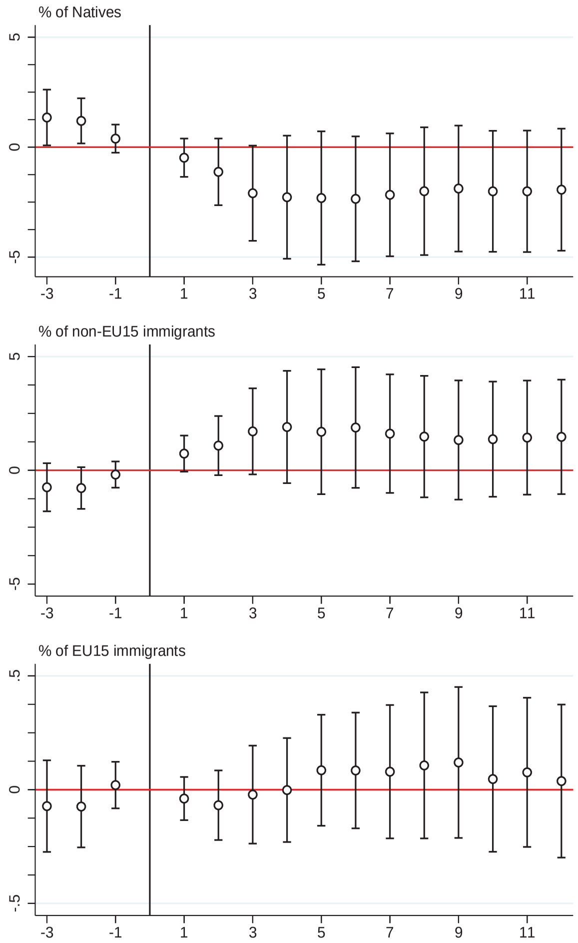
Notes: In columns 1 to 4, control variables include all variables in top panel of Table 1, as well as the 2001-2004 lagged outcome in the ethnic composition outcomes. Furthermore, column 1 includes an indicator for suburbs, columns 2, 3 and 4 an indicator for historic district, and column 4 an indicator for the municipality of Barcelona. In column 5, the controls are those of columns 2 and 5 in Table 2. Analytical robust standard errors in parenthesis where ***, ** and * denote statistical significance at the 1, 5 and 10% level. In brackets, bootstrapped 95% confidence intervals as described in the main text.

Figure 1: Outcome trends & event study graphs

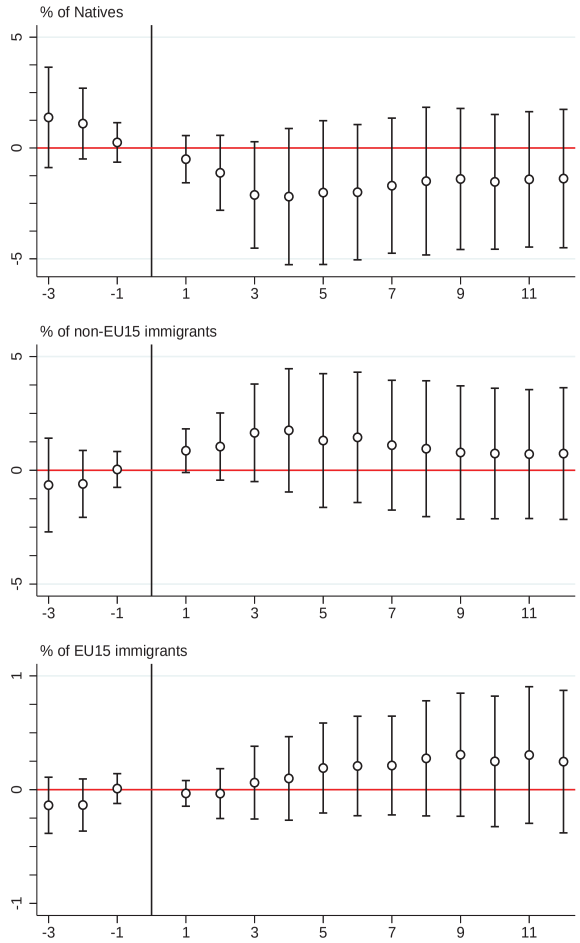
(a) Evolution of demographic outcome variables




(b) Event study: OLS estimates

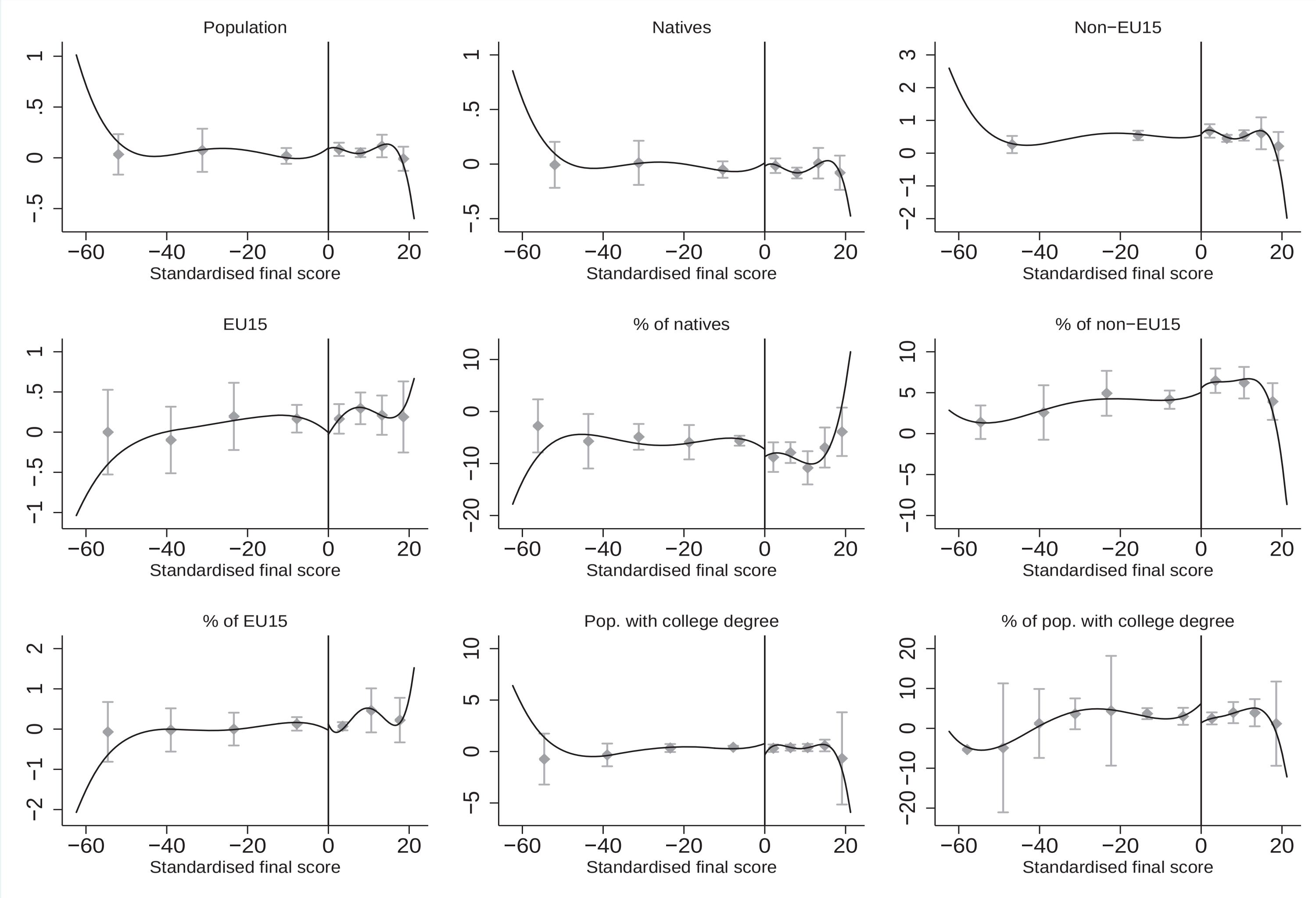



(c) Event study: OB estimates



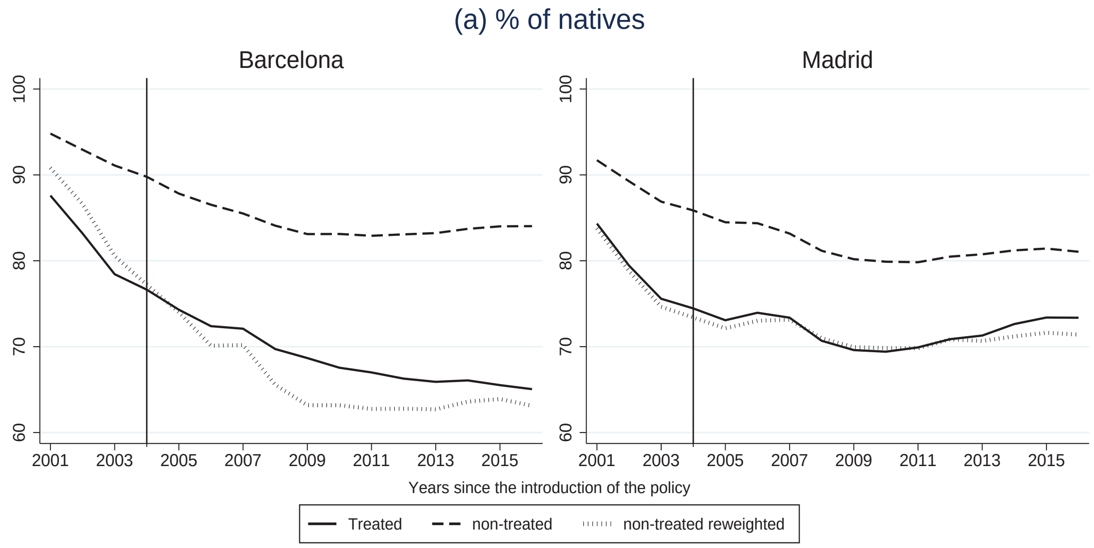

Notes: Figure 1(a) plots the estimates of column 4 in Table 2. The event study graphs (Figure 1(b) and Figure 1(c)) are constructed by estimating the following equation which captures the impact $t$ years after the project started (which is normalized to be at $t = 0$): $\Delta Y_i = Y_{i,t} - Y_{i,0} = \alpha_t T_i + X_i^{'}\beta + \epsilon_i$ with $t = 1, ..., 12$. We plot the $\alpha$'s coefficients and their 95% confidence interval. For instance, $\alpha_{12}$ correspond to the effect of the policy 12 years after the introduction of the policy.

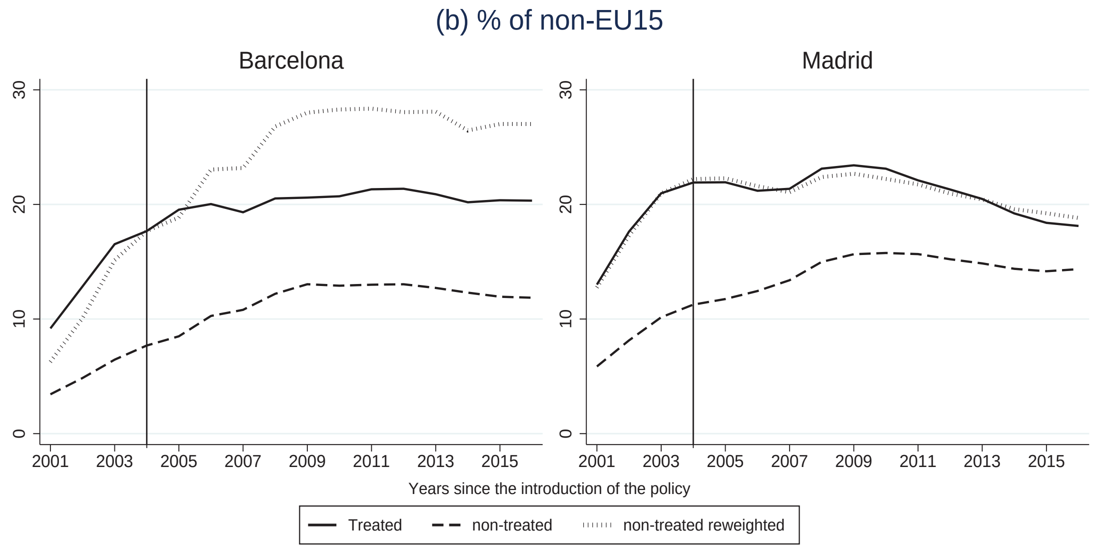
Figure 2: RDD estimates

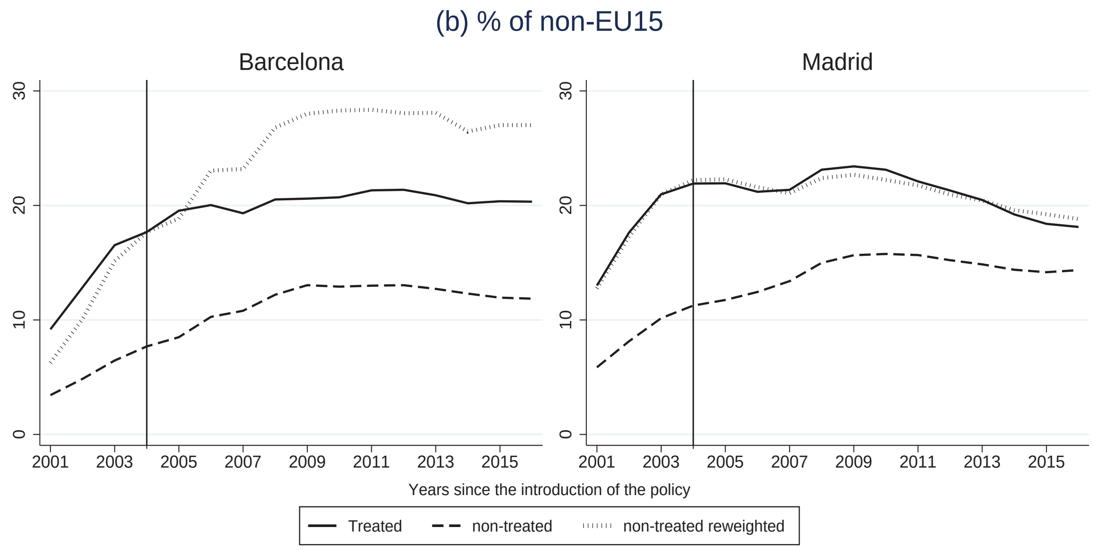



Notes: Outcomes are 2004-2016 changes for demographic variables and 2001-2011 changes in college-educated population. Evenly-spaced bins as well as their 95% confidence intervals are constructed using the optimal data-driven approach developed in Calonico, Cattaneo and Titiunik (2015, 2017). The standardised final score is used as the running variable. Epanechnikov kernel function is used to estimate the local-polynomial of fourth order.

Figure 3: Evolution of demographic outcome variables. Historic districts in Barcelona vs historic districts in Madrid.




Notes: OB estimates with control variables as in columns 2 and 5 in Table 2 as well as an historic district indicator.

# Appendix A A model with social interactions in housing demand

In this appendix we develop a residential choice model with two neighborhoods and two population groups (natives and immigrants). The model is a variant of those developed in Banzhaf and Walsh (2013) and in Glaeser (2008) to examine racial segregation. The model's key elements include idiosyncratic residential preferences for neighborhoods, social interactions in housing demand (endogenous amenities) as well as an exogenous amenity, whose value increases with neighborhood investments. We use the model to study the neighborhood population responses to an urban renewal policy.

## A.1 Model set-up

There are two neighborhoods in the city. The size of neighborhoods 1 and 2 are fixed and given by $S$ and $1-S$, respectively. In turn, there are two population groups, natives ($N$) and immigrants ($I$), respectively. Each individual consumes one unit of housing and overall city population is normalized to one, with $P$ denoting the city-wide immigrant share. $P_1$ and $P_2$ are the immigrant shares in neighborhoods 1 and 2, with $P = SP_1 + (1-S)P_2$. We restrict our analysis to equilibria in which $P_1 \geq P_2$. We further assume that $S \leq P < 0.5$, to allow the possibility that neighborhood 1 becomes a ghetto ($P_1 = 1$).

If residing in community 1, natives' utility is given by $U_1^N = Y^N - Q - \alpha(P_1) + \gamma^N G + a_n$, where $Y^N$ is income and $Q$ is the price of housing in the neighborhood. The term $\alpha(P_1)$ reflects that natives care about the ethnic composition of the neighborhood. We return to the nature of the function $\alpha$ below. Natives also value the exogenous amenity $G$ where $\gamma^N > 0$. The amenity value is assumed to increase as a consequence of urban renewal investments. The only individual-specific utility component is $a_n$, which reflects the attachment of individual $n$ to neighborhood 1, and it is uniformly distributed in the unit interval, i.e. $a_n \sim U(0,1)$. In neighborhood 2, the values of $Q$ and $G$ are normalized to zero, implying that natives' utility in neighborhood 2 is given by $U_2^N = Y^N - \alpha(P_2)$.

Similarly, immigrants' utilities in neighborhoods 1 and 2 are $U_1^I = Y^I - Q + \gamma^I G + a_i$ and $U_2^I = Y^I$, respectively, with $a_i \sim U(0,1)$. Note that unlike natives, immigrants' utility does not depend directly on the neighborhood ethnic composition.[1] This assumption is based on evidence that suggests racial segregation is (largely) driven by the desire of non-minority residents to avoid neighborhoods with a high minority share (Cutler, Glaeser and Vigdor, 1999; Card, Mas and Rothstein, 2008; Boustan, 2011). We further assume that the natives' income is higher than that of immigrants ($Y^N > Y^I$) and that $\gamma^N > \gamma^I \geq 0$, as higher income is associated with a higher willingness to pay for amenities (Kuminoff, Smith and Timmins, 2013; Kahn and Walsh, 2015).

[1] Relaxing this assumption does not change the main predictions of the model. Specifically, assuming that immigrants like neighborhoods with higher immigrant shares lead to an immigrants' willingness to pay curve for neighborhood 1 in panel a) of Figure A.1 that is U-shaped. Therefore, the predictions of the effects of the policy on the neighborhood's minority share remains unchanged.

To study the effects of investment on the population composition of the neighborhoods, we focus on the minority share in neighborhood 1, which fully determines the proportions of both groups in the two neighborhoods[2]. There are two types of equilibrium. In a mixed equilibrium, neighborhood 1 is inhabited by both natives and immigrants ($P_1 < 1$) while in a ghetto, neighborhood 1 only hosts immigrants ($P_1 = 1$).

Note that there are always immigrants in the two neighborhoods, implying that there is an immigrant who is indifferent between neighborhoods, with a willingness to pay for neighborhood 1 given by $Q(a_{i^*}) = \gamma^I G + a_{i^*}$. In a mixed equilibrium, there is also an indifferent native, whose willingness to pay to live in neighborhood 1 amounts to $Q(a_{n^*}) = -\alpha(P_1) + \alpha(P_2) + \gamma^N G + a_{n^*}$. In equilibrium, the two marginal residents' willingness to pay must be equal, i.e. $Q(a_{i^*}) = Q(a_{n^*})$. Solving this equation gives us the equilibrium immigrant share and housing price in neighborhood 1[3]:

$$P_1 = P + \frac{P(1-P)}{S}\left(\alpha(P_1) - \alpha(P_2) + (\gamma^I - \gamma^N)G\right) \tag{A.1}$$

and:

$$Q = 1 - S + (1-P)\left(-\alpha(P_1) + \alpha(P_2) + \gamma^N G\right) + P\gamma^I G \tag{A.2}$$

If we assume that $\alpha$ is a linear function with $\alpha > 0$, then there is a unique mixed equilibrium. This equilibrium will be stable if social interactions are moderate. Specifically, the equilibrium will be stable if $\alpha P(1-P) < S(1-S)$. Otherwise, the mixed equilibrium is unstable and the neighborhood will be either in $P^1 = 0$ or in $P^1 = 1$[4]. If the mixed equilibria is unstable, then the resulting outcome is a two-sided tipping model to the use Card, Mas and Rothstein (2008)'s terminology. In a two-sided model of this type, neighborhoods to the left of the mixed equilibrium evolve towards $P^1 = 0$ while those that to the right of it evolve towards $P^1 = 1$. This type of equilibrium is inconsistent with the neighborhood dynamics documented in Card, Mas and Rothstein (2008) and in Card, Mas and Rothstein (2011). In fact, the evidence supports one-sided tipping models, which predict that mixed neighborhoods are dynamically stable for low minority shares but that they quickly evolve towards a full minority equilibrium ($P^1 = 1$) once they surpass the tipping point.

In order to obtain a one-sided tipping model, we assume that $\alpha$ is quadratic, i.e. $\alpha(P_i) = \alpha {P_i}^2$ with $\alpha > 0$.[5] If social interactions are sufficiently strong, i.e. $\alpha$ is sufficiently large, the model can

[2] Note that $P_2 = (P - S\,P_1)/(1-S)$, while the proportion of natives in neighborhoods 1 and 2 are $N_1 = 1 - P_1$ and $N_2 = 1 - P_2$, respectively.

[3] We have used the fact $a_{i^*} = 1 - S(P_1/P)$, $a_{n^*} = 1 - S((1-P_1)/(1-P))$ and $P_2 = (P - SP_1)/(1-S)$.

[4] Specifically, if $\alpha$ is a linear function it turns out that

$$P_1 = P + \left(\frac{(1-S)P(1-P)}{S(1-S) - \alpha P(1-P)}\right)(\gamma^I - \gamma^N)\,G$$

[5] We obtain the same qualitative results if instead we assume that natives prefer to live in neighborhoods with a minority share that is not too different from that of the city-average, i.e. $\alpha(P_i) = \alpha(P_i - P)^2$.

present two mixed equilibria. Then, the first of these (with the lower minority share) will be stable while the second will be unstable, as illustrated in panel a) of Figure A.1[6]. The solid line is the natives' willingness to pay curve. When the minority share is low, the willingness to pay increases with $P_1$ as preference heterogeneity dominates the social interaction effect. However, for higher minority shares, the social interaction becomes relatively more important and the curve slopes downwards. Since immigrants' willingness to pay curve (dashed line) slopes downwards due to preference heterogeneity, two mixed equilibria arise. Consider the low minority share equilibrium depicted in point A. If a shock decreases the minority share, the immigrants' willingness to pay curve exceeds that of natives and equilibrium is restored. Similarly, if there is a shock that increases the minority share, the natives' willingness to pay curve exceeds that of immigrants, subsequently reducing the minority share. Hence, point A equilibrium is stable. The opposite is true in the second equilibrium (point B), where any shock takes the minority share away from the initial equilibrium.

Models that feature social interactions in housing demand typically exhibit multiple equilibria. Here, note that point C in panel a) of Figure A.1 is also a stable equilibrium in which neighborhood 1 only hosts immigrants ($P_1 = 1$). In such an equilibrium, no native wants to enter the neighborhood, which is guaranteed by the following condition:

$$\frac{S}{P} - \alpha(1) + \alpha(P_2) + (\gamma^N - \gamma^I)G < 0 \tag{A.3}$$

The housing price is determined by the marginal immigrant. Specifically:

$$Q = 1 - \frac{S}{P} + \gamma^I G \tag{A.4}$$

Finally, point D in Figure A.1 is the model's tipping point, which is the highest minority share that can sustain a stable equilibrium[7]. With $\alpha$ quadratic, the tipping point (${P^t}_1$) is:

$${P^t}_1 = \frac{1}{1-2S}\left(\frac{S(1-S)^2}{2\alpha P(1-P)} - SP\right) \tag{A.5}$$

No stable neighborhood can exist between point D (the tipping point) and $P_1 = 1$, implying that neighborhoods to the left of the tipping point are transitioning towards the ghetto equilibrium.

[6] Formally, note that expression A.1 is a function that maps into itself, i.e. $P_1 = H(P_1)$, where mixed equilibria are the values of $P_1$ in which $H$ intersects the 45 degree line. If $H$ crosses the 45 degrees line from above (below), then $H' < 1$ ($H' > 1$) and the equilibrium is stable (unstable). If $\alpha(P_i)$ is quadratic, then $H$ is an increasing and convex function of $P_1$. If $\alpha$ is sufficiently low, the model has one mixed (and stable) equilibrium. If $\alpha$ is sufficiently high, then two mixed equilibria arise with the first (second) equilibrium being stable (unstable). The stability condition, i.e. $H' < 1$, implies $S/(P(1-P)) > (2\alpha P_1 + 2\alpha P_2(S/(1-S)))$.

[7] Formally, the tipping point satisfies $H' = 1$.

## A.2 Impact of urban renewal policy on neighborhood ethnic composition

An urban renewal policy increases the neighborhood amenity level $G$; however, the effects of the policy will differ depending on the nature of the equilibrium considered. We first study the policy effects in a mixed (and stable equilibrium). Then, we study the impacts of investing in a ghetto. Finally, we discuss the role of the urban renewal policy as a "big push" policy that might reverse the dynamics of neighborhoods that are tipping.

In a mixed (and stable equilibrium), the effects of increasing $G$ on the minority share and housing price of neighborhood 1 are given by:

$$\frac{dP_1}{dG} = \frac{\gamma^I - \gamma^N}{\frac{S}{P(1-P)} - \left(2\alpha P_1 + 2\alpha P_2 \frac{S}{1-S}\right)} < 0 \tag{A.6}$$

and

$$\frac{dQ}{dG} = \left((1-P)\gamma^N + P\gamma^I\right) - (1-P)\left(2\alpha P_1 + 2\alpha P_2 \frac{S}{1-S}\right)\frac{dP_1}{dG} > 0 \tag{A.7}$$

Expression A.6 indicates that investments in the neighborhood decrease the neighborhood minority share. To see this, note that the numerator is a negative term as the natives' willingness to pay for $G$ exceeds that of immigrants ($\gamma^I < \gamma^N$). In turn, the denominator is a positive term. In fact, this is the same condition that guarantees that the mixed equilibrium is stable (see footnote 6). In terms of the housing price, expression A.7 shows that investing in the neighborhood increases it. The first part of the expression is the city-level (weighted) average willingness to pay for $G$, i.e. $(1-P)\gamma^N + P\gamma^I$. The second part indicates that higher $G$ decreases the proportion of immigrants in the neighborhood, which further contributes to the increase in the price of housing. Hence, the housing price increase exceeds the willingness to pay for $G$ as it also incorporates the value that natives attach to the shift in the neighborhood's ethnic composition.

Panel a) of Figure A.1 illustrates the effects of such an intervention in the specific case where $\gamma^I = 0$[8]. Starting from a stable mixed equilibrium (point A), investing in the neighborhood increases the natives' willingness to pay to live in neighborhood 1, which shifts from the dashed to the dotted curve. In the new equilibrium (point B), the minority share is lower and the price of housing is higher. The arrival of native residents and the increase in housing prices in the intervened neighborhoods are actually among the policy's stated goals. This is also why income mixing policies are controversial. Investments in the neighborhood might eventually harm the low income residents of the treated neighborhoods. Note that higher amenities generate a price increase that exceeds the immigrants' willingness to pay. In our model, increasing $G$ reduces immigrants' welfare as inframarginal immigrants in neighborhood 1 experience a housing price increase that exceeds the direct utility gain of higher amenities[9].

[8] If $\gamma^I = 0$, then increasing $G$ does not affect the immigrants' willingness to pay.

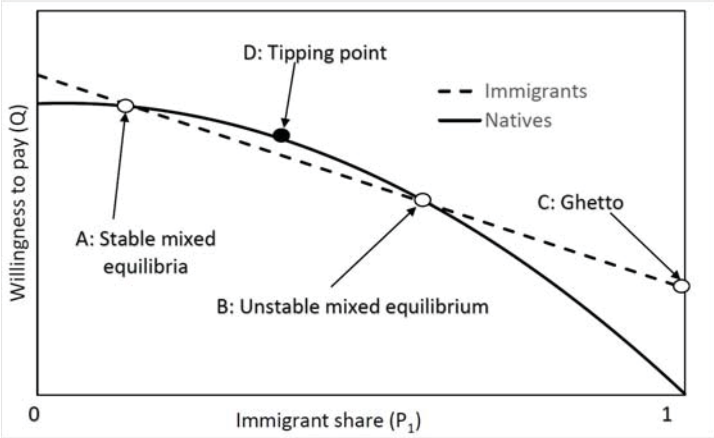
[9] Of course, this model overstates the negative welfare effects of the policy since homeowners in the neighborhood would be protected from the housing price increase.

The effects of the policy, however, may differ greatly if the minority share is very high in the first place. In fact, in a ghetto equilibrium, small increases in $G$ have no impact on the minority share in the neighborhood as long as condition A.3 continues to hold. This suggests that once a neighborhood minority share is high, investments in the neighborhood are unlikely to attract natives since the value that they attach to a high immigrant share offsets any utility gain from a higher $G$. Despite there being no change in the ethnic composition of the neighborhood, the fact that there is a marginal immigrant implies that higher $G$ increases the price of housing. Specifically, inspecting A.7 reveals that rasing $G$ by one unit increases the price of housing by $\gamma^I$ units, which is the immigrants' willingness to pay for $G$.

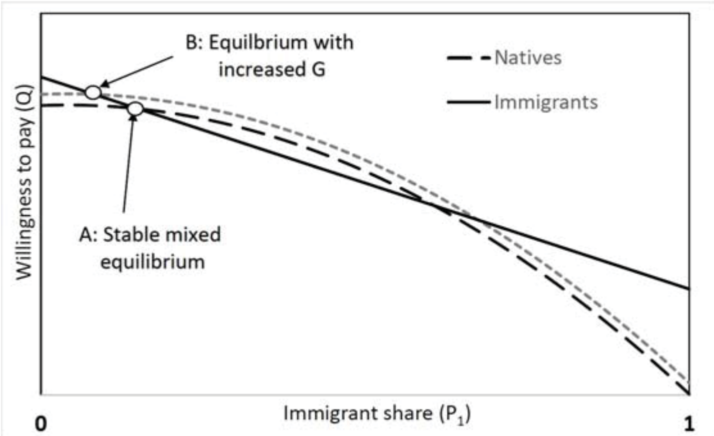
An important feature of urban renewal policies is that they are not intended to be marginal interventions. Rather, the purpose of such policies is to bring about substantial changes in targeted neighborhoods. Consider a neighborhood that is in a stable mixed equilibrium such as point A in panel c) of Figure A.1 where, again, we have assumed $\gamma^I = 0$. Suppose that there is an increase in the city-level minority share ($P$ increases), which reflects the context in which the Neighborhoods act was passed. As a consequence, the immigrants' willingness to pay curve moves upwards (solid gray line) and, as a result, this curve (solid line) exceeds that of the natives for all values of $P_1$. This neighborhood has tipped, and starts to lose natives until it reaches point B where $P_1 = 1$. Card, Mas and Rothstein (2008) have shown that unstable neighborhood dynamics are not rapid. Hence, urban renewal policies that are implemented when tipping has already started but has not yet been finalized can restore the neighborhood's stability. Specifically, investing in the neighborhood will shift the natives' willingness to pay curve upwards (gray dashed line). Hence, the policy might bring the neighborhood back to the left of the tipping point (equilibrium C in this example). This seems to be the rationale underpinning the Neighborhoods Act, as the policy's goal was to deconcentrate poverty and immigration in a context where the immigrant share in deprived areas was growing rapidly.

Figure A.1: Model illustrations

(a) Immigrant share equilibria

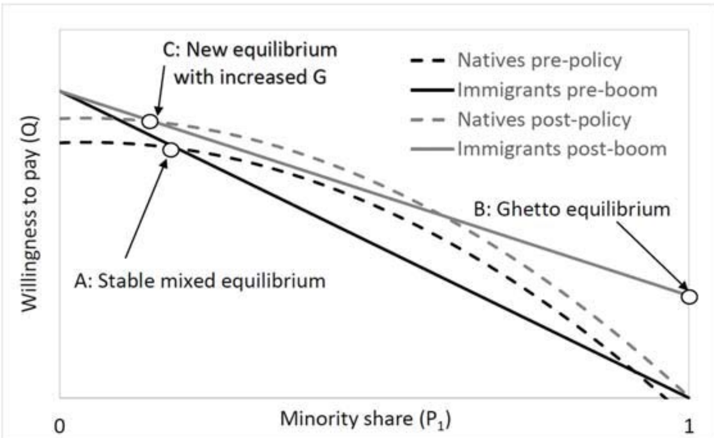



(b) The effect of the urban renewal policy on the minority share




The urban renewal policy is modelled as an increase in the neighborhood's amenity ($\uparrow G$). In this illustration, we assume that $\gamma^I = 0$, implying that increasing $G$ does not affect the immigrants' willingness to pay. B is the post-intervention new minority share.

(c) Urban renewal policy and tipping reversal




Starting from A, there is an increase in the city-wide minority share $P$, shifting immigrants' willingness to pay upwards (gray solid line). As a result, B is the new ghetto equilibrium. The urban renewal policy is then implemented ($\uparrow G$) which shifts natives' willingness to pay upwards (gray dashed line). In this illustration, we assume $\gamma^I = 0$, implying that higher $G$ does not shift immigrants' willingness to pay. Hence, the post intervention equilibrium is point C.

# Appendix B Example of an urban renewal policy

Figure B.1: Santa Caterina i Sant Pere, Barcelona, 15MER

(a) Public spaces: *Pou de la Figuera*

(b) Public facilities: *Convent de Sant Agustí*

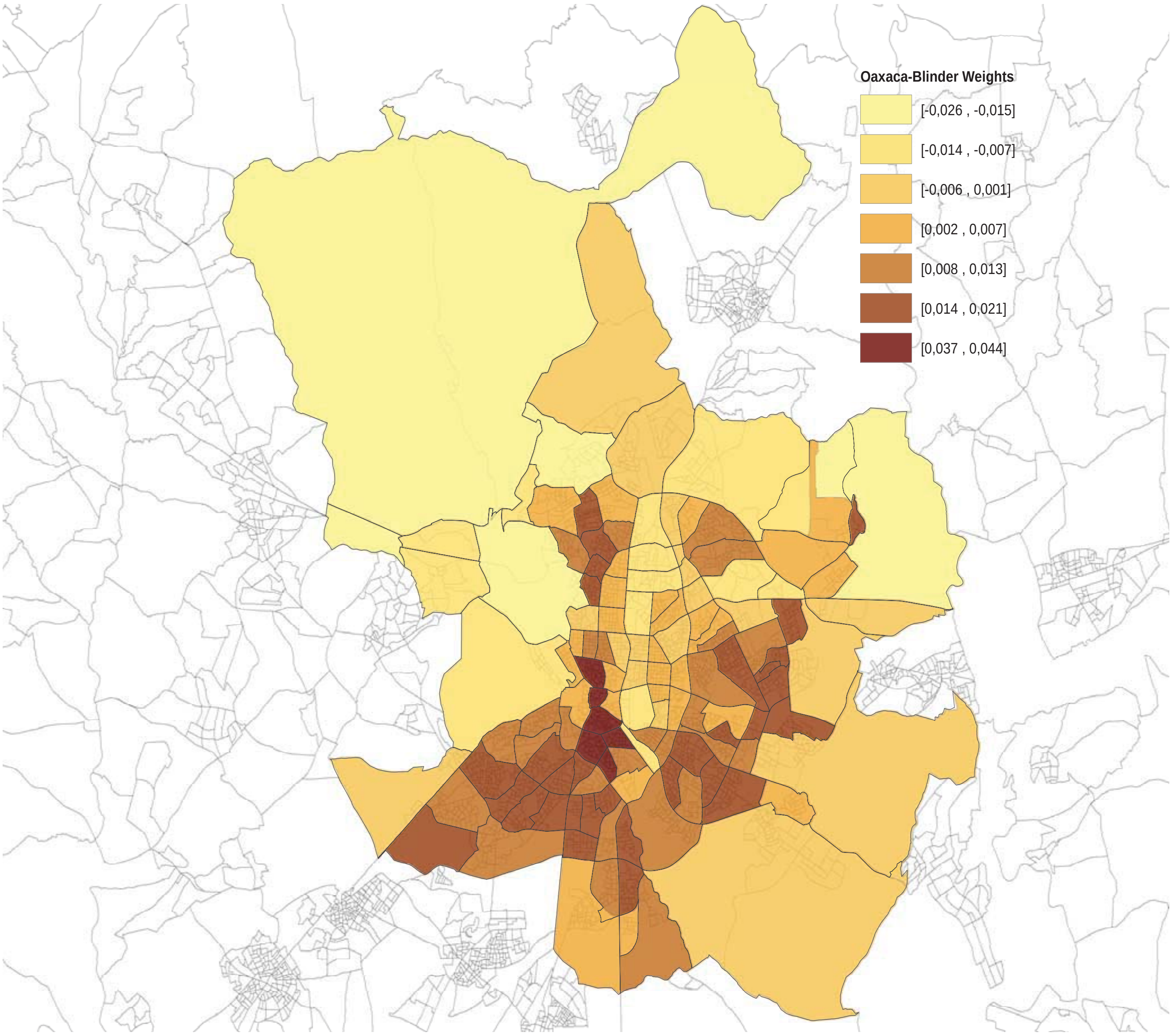
# Appendix C Consolidating intervention areas with census tracts: An example

Figure C.1: Santa Caterina i Sant Pere, Barcelona


Dashed lines indicate census tracts boundaries while the solid line delineates the intervention area. The colored areas indicate the exact location of all investments.

# Appendix D  Placebo analysis for Madrid

Figure D.1: Probability of treatment (Oaxaca-Blinder weights)




Neighborhoods (barrios) as defined by the Madrid's city council. Oaxaca-Blinder weights as defined in Kline (2011) reflect the probability of treatment. The specification used includes the variables considered in columns 2 and 5 of Table 2, as well as an indicator for historic districts. The highest 3 values are *Embajadores*, *La Chopera* and *Palos de Moguer*.