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DISTRIBUTIVE POLITICS INSIDE THE CITY? THE POLITICAL ECONOMY OF SPAIN'S PLAN E [*]

Felipe Carozzi, Luca Repetto

ABSTRACT: We study distributive politics inside cities by analysing how local governments allocate investment projects to voters across neighbourhoods. In particular, we ask whether politicians use investment to target their own supporters. To this aim, we use detailed geo-located investment data from Plan E, a large fiscal stimulus program carried out in Spain in 2009-2011. Our empirical strategy is based on a close-elections regression-discontinuity design. In contrast to previous studies – which use aggregate data at the district or municipal level – we exploit spatial variation in both investment and voter support within municipalities and find no evidence of supporter targeting. Complementary results indicate that voters may be responding to investment by increasing turnout. Overall, our findings suggest that distributive politics only play a minor role inside the city.

JEL Codes: H70, R53, D72

Keywords: Political economy, distributive politics, partisan alignment, local governments

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1. Introduction

The concern that politicians may divert public resources to specific groups for their own electoral benefit has generated substantial discussion both academically and in the public debate. Voters have been shown to reward incumbents for spending, be it in the form of a specific program targeted to individuals (like an anti-poverty cash transfer, see e.g. Manacorda, Miguel and Vigorito 2011; Pop-Eleches and Pop-Eleches 2012; Baez et al. 2012), or public infrastructure projects (such as a nation-wide road network as in Voigtlaender and Voth 2014). While this literature convincingly shows that voters respond to spending in the polls, it is generally silent on whether and how politicians allocate this spending across voters for electoral purposes.

There is pervasive evidence that national or regional level politicians favour local governments that are ruled by their own party in the allocation of transfers or investment projects (e.g. Solé-Ollé and Sorribas-Navarro 2008; Bracco et al. 2015). However, this behaviour could be the consequence of politicians trying to support other elected party members rather than a strategic targeting of voters. In the absence of data at the intra-municipal (or individual) level, distinguishing whether spending is meant to target voters for electoral reasons or to help the local mayor is challenging.

In this paper we use finely disaggregated data to study whether politicians allocate spending in space in response to the spatial distribution of voters. In particular, we ask if investment spending goes disproportionately to areas of strong support for the incumbent. For this purpose, we use data from *Plan E*, a large stimulus program that, between 2009 and 2011, endowed Spanish municipalities with 12 billion Euros to fund municipal investment projects, ranging from sport facilities to provision of urban amenities. This program provides an excellent setting to study distributive politics for several reasons. Firstly, municipal governments had substantial discretion in the use of funds with respect to both the type and location of investment projects. Given the urgency to implement this fiscal stimulus, the national government quickly processed the applications for funding, approving in full over 99% of them (Montolio, 2016). Secondly, the program had a substantial impact on municipal investment. Virtually all municipalities applied, and the amount they received was three times as large as their infrastructures spending in an average year. Finally, all *Plan E* investment projects were geo-located by the municipal authorities. These characteristics of *Plan E* allow us to exploit within-municipal variation in spending to study distributional politics.[1]

Sub-national governments carry out two-thirds of all public investment in developed countries (OECD, 2013), yet distributive politics studies usually focus on national or, at most, regional level decisions. For this reason, we have an incomplete understanding of whether the welfare distortions that often have been associated with distributive politics (Weingast, Shepsle and Johnsen, 1981) operate at the local level. To our knowledge, we are the first to study the geography of distributive politics *inside* cities. What enables us to do this is the combination of finely disaggregated data on electoral outcomes and investment projects.[2] The most impor-

[1] Throughout the paper, we will sometimes also refer to municipalities as "cities" or "towns".

[2] Our unit of analysis is the census area. Spain has over 35,000 census areas that have no electoral representation and are defined for merely statistical purposes. In 2009 there were a total of 8,114 municipalities in Spain and

tant empirical challenge we face when conducting our analysis arises because the geographical distribution of voter preferences is endogenous to economic, social and cultural factors. These factors may, in turn, also affect investment decisions (for example, see Brollo and Nannicini 2012). This identification problem is also shared by much of the literature studying the electoral determinants of spending across *core* and *swing* voters. We overcome this issue by exploiting as-good-as-random variation in the identity of the incumbent party in a close-election regression-discontinuity design. To implement this strategy, we rely on intra-municipal variation in *Plan E* spending and in the incumbents' electoral support.

We construct two different measures of party "supporter bias" at the census area level (our unit of analysis), which will serve as dependent variables in our RDD estimation. A good measure of the extent to which the incumbent targets its supporters should have the following properties. First, it should be large both when a census area with relatively strong incumbent support is favoured disproportionately in the allocation of projects, and when areas of low support receive little investment. Second, it should indicate a low level of bias in cases of little support and high investment, or strong support and little investment.

Our resulting RDD estimates show that there is no supporter bias in the allocation of projects within municipalities. Specifically, using variation induced by elections won by a small margin, we show that incumbents do not favour areas of strong electoral support. When using our extensive margin measure, point estimates are very small, with our preferred specification yielding a positive and insignificant effect of 1.5% of a standard deviation of the dependent variable. Estimates using the intensive margin measure, which captures both the amount of investment and the strength of voter support are also small and statistically indistinguishable from zero. Our results stand in contrast to previous studies which use aggregate data at the district or county level and find a positive association between expenditures and incumbent support (Levitt and Snyder, Jr., 1995; Ansolabehere and Snyder, 2006). Furthermore, we note that the partisan bias identified in the alignment literature is entirely absent within cities.

We explore several possible explanations for our findings. To start, our result could be the consequence of two implicit assumptions in our main empirical analysis: first, that only voters in the census area that receive a project can benefit from it; second, that all different types of *Plan E* projects have the same effect on voters. We relax these assumptions in two ways. First, we allow investment projects to have spillover effects to neighbouring areas by creating circular buffer areas around each of them. In this way, a project carried out close to the border of two census areas is counted as having taken place in both. Alternatively, we restrict our sample by concentrating only on those categories of projects that are most likely to have localised benefits. Results from these two additional specifications are in line with our main findings and show that there is no effect of electoral support on investment decisions. On the other hand, we observe that political participation appears to respond to investment: conditional on initial levels, areas that receive a *Plan E* project experience an increase in turnout. This result has two implications. First, it indicates that projects have a localised effect on voters. Secondly, it suggests that, rather that favouring supporters, politicians may be targeting inactive voters

roughly one in four had more than one census area.

with spending to foster mobilization.

This paper studies the distribution of public money within the city, hence it lies at the intersection between political economy and urban economics. An important strand of this literature asks if political factors can shape local policies. Ferreira and Gyourko (2009) and Pettersson-Lidbom (2008) study how parties differ in implementing policies in the US and Sweden, respectively, using a regression-discontinuity design. Along the same lines, Solé-Ollé and Viladecans-Marsal (2013) show that centre-right municipal governments in Spain have more expansive zoning policies. This literature treats municipalities as units of observation and therefore abstracts from variation within the city boundaries in both the intensity of policy intervention and the geographic distribution of electoral support. Our paper contributes to this literature by investigating partisan differences in policies *inside* the city.

Our paper also relates to a critique raised by Cox (2009) regarding a frequent mismatch between the theory and the empirics of distributional politics studies. Specifically, while several studies document whether parties target swing or core *districts*, they are not informative about how resources are distributed across groups of *voters*.[3] Most of these papers analyse the allocation of government funds across municipalities, districts or states (see Wright 1974; Strömberg 2004).[4] Ansolabehere and Snyder (2006) use data on US state expenditures across counties and find evidence in favour of the core voters hypothesis but no evidence of swing voter targeting. By studying allocations across geographical areas within municipalities, our paper avoids the problem highlighted by Cox (2009). Census areas are not districts, counties or municipalities and have no institutional entity of their own, hence can be treated as an aggregation of voters. This allows for a more direct mapping between the predictions of these models and the empirical analysis. Overall, our results show that, when studying allocations within the city, there is little evidence of core voter targeting.

A growing literature shows evidence of an alignment effect in the allocation of national transfers to local governments. For example, Solé-Ollé and Sorribas-Navarro (2008) and Curto-Grau, Solé-Ollé and Sorribas-Navarro (2017) show that Spanish municipalities aligned with upper tier governments are favoured in the allocation of transfers. Using different research designs, this effect has been documented for several countries, such as Albania (Case, 2001), Italy (Bracco et al., 2015), Portugal (Migueis, 2013), and the United States (Levitt and Snyder, Jr., 1995). We distinguish ourselves from this literature because, in our context, there are no local administrative units or electoral districts between the allocating body and the spatial voter groups that constitute our unit of observation.

[3] A similar point is made in the review by Golden and Min (2013): "The weakness [of these studies] is that results accord poorly with the individual-level theory that is usually held to be relevant."

[4] An exception, using data on city-level budget allocations is found in Trounstine (2006). This is, however, largely descriptive and does not investigate the spatial distribution of resources within the city.

2. Institutional Setting

2.1. Plan E

Plan E was announced in November 2008 in Spain by the *PSOE* (centre-left) national government of José Luis Rodríguez Zapatero.[5] It was a large, urgent, stimulus plan aimed at boosting economic activity and fostering employment growth in the midst of the economic crisis. The plan was carried out in two parts, starting in 2009 with *FEIL* – which provided municipalities with roughly 8,000 million Euros – and following with the smaller *FEESL* program in 2010 – accounting for over 4,000 millions Euros. There was an additional and much smaller plan affecting province-level bodies called *CN* over this period. In total, *Plan E* transferred public funds to local government for about 0.8% of the 2009 Spanish GDP.

The actual investment and spending decisions were carried out by municipalities. Each municipality was eligible to an amount proportional to its population and had to submit projects to the central government for approval. More than 99% of municipalities decided to apply. Over 99% of the submitted projects – each of which could not exceed 5 million Euros – was approved and received full funding (see Montolio 2016).[6]

The nearly universal approval rate reflects the fact that criteria to obtain funding were very lax. A subsequent report from the *Tribunal de Cuentas* (National Audit Office) found that these criteria were generic, imprecise and weakly enforced. This gave local governments ample scope for discretionary use of resources, even allowing several municipalities to use funds for investments that did not fulfil the legal requirements (Tribunal de Cuentas, 2013).[7] Municipalities had a short window of time to present applications (45 days for *FEIL* and 90 for *FEESL*), which essentially consisted of a description of the project and a budget. In order to be eligible for funding, projects had to be new, in the sense that they could not be projects already included in the previous budget, and works had to start within one month from approval.

A total of 57,850 investment projects were carried out by municipal governments using *Plan E* funding between 2009 and 2011. The most common projects, as shown in table 1, were related to "rehabilitation and improvement of public spaces", which refers to refurbishment of parks, plazas and pedestrian walkways (see Figure B.9 in the appendix for an example). The second most common type was "equipment and service infrastructure" which is a much more heterogeneous category encompassing street lighting, improvement of transport infrastructure, occasionally refurbishment of parks and sport facilities as well as water works. The average cost of each project was slightly above 210,000 Euros, indicating that small and middle-scale projects were common. The *Plan E* program had a large impact on local government endowments, roughly tripling the pre-crisis amount of yearly resources spent on municipal investment.

Projects had to be clearly advertised by installing a large signboard containing information on the amount spent, the contractor and the expected completion time. The layout, size and

[5] Formally, the name of the policy was *Plan Español para el Estímulo de la Economía y el Empleo* (Spanish Plan for Employment and Economic Stimulus).

[6] A total of 19 municipalities did not carry out directly any *Plan E* project. In all these cases, *Plan E* funding was allocated to the association of municipalities instead of the municipalities themselves.

[7] The lax criteria of the national government in the approval of projects was motivated by the aim to initiate spending as quickly as possible to attenuate the impact of the crisis.

TABLE 1

DESCRIPTIVES - SUMMARY OF PROJECT TYPES

	N. of projects	Frequency
Rehabilitation of public space	7107	18.53
Basic services infrastructure	5924	15.45
Construction and improvement of social and cultural facilities	5819	15.17
Cultural and sport related buildings and equipment	3946	10.29
Energy efficiency and conservation	3813	9.94
Improvement in public spaces and road networks	2423	6.32
Social buildings and equipment	1718	4.48
Construction and upgrading of education centres	1385	3.61
Urban sustainability and pollution control	875	2.28
Promoting mobility and safety	853	2.22
Protection of historical and landscape heritage	767	2
Conservation of historical and municipal sites	569	1.48
Other	3154	8.22

Notes: Number and relative frequency for all the investment projects, by project type. Sample restricted to projects which have correct geocoding information. All municipalities.

content of these signboards was regulated by law. As shown in figure B.10 in the appendix, signboard's headlines indicated that the project in question was promoted by the municipal government. Given the national coverage received by *Plan E*, the role of the socialist central government was also quite salient. However, this saliency did not appear to influence project allocations. On the first place, there were no differences between parties in the allocation of *Plan E* funding per capita. Secondly, it did not lead to local electoral rewards for the Zapatero government. Finally, take-up was generally high and anecdotal evidence suggests that municipal governments were eager to receive the funds regardless of their partisan affiliation.[8] Detailed evidence on these matters will be presented in section 5.

As table 1 shows, most of the public works executed with *Plan E* financing are likely to have geographically localised effects, therefore benefiting voters who live close to the site of the project. Anecdotal evidence indicates that local politicians are aware of this.[9] This notion motivates our use of the census area, a small area within the municipality, as unit of analysis. When discussing our results in section 4, we will relax the assumption that the benefits of a project accrue only within the census area.

2.2. Municipalities and Local Elections

Spain had 8,114 municipalities in 2009. Municipalities are the lowest level of territorial administration of the Spanish state and have autonomy in managing their interests as recog-

[8] A centre-right politician from *Partido Popular* we interviewed said: "It was an enormous grant, which many interpreted as a letter to the three kings" (our translation), referring to the biblical Magi bringing gifts to the newborn Jesus.

[9] An interviewed local official responsible for urban planning declared that projects were assigned "[...] so that they had high visibility in the neighbourhood". A prominent politician from Madrid, referring to the beneficiaries of investment projects, added "evidently, carrying out a project entails benefits for the neighbours in the area." (our translation).

nized in the Spanish constitution. Their functions are partly dependent on size and encompass lighting, transport network upkeep, public parks, local services (e.g. sports facilities, public libraries), waste disposal, water and sewage services.[10] Municipal financing is based on municipal taxes (the largest of which are a property tax and a tax on firms) and transfers from the national and regional governments. Note that *Plan E* project financing was not part of these regular transfers.

The governing body is the municipal council and its members are directly elected by residents. Municipal elections are held every four years under a single-district, closed list, proportional electoral system.[11] The single-district electoral rule is important for our analysis as it allows us to treat spatial units within the municipalities as voter groups rather than electoral districts. It also grounds the notion that all votes for a party contribute the same towards the goal of winning government (something that does not apply in multi-district constituencies).

Municipal council seats are assigned following the D'Hondt rule. The average size of councils elected under the closed list system is roughly 10, with the number of members ranging from 7 in the smaller towns up to a maximum of 57 in Madrid. The municipal mayor is elected by the council under a majority rule and in general this majority is obtained through coalition building after elections. The council votes proposals by the mayor, who acts mainly as an the agenda-setter. Given the strong discipline enforced by parties in Spain and the impossibility of calling early elections, local governments are usually stable. Below, the *ruling party* refers to the party of the mayor.

For data collection and voting purposes, the National Statistical Institute (*INE*) divides the Spanish territory into roughly 35,000 census areas (also referred to as electoral areas) with no administrative powers. These areas are defined as a function of municipal boundaries and population. Census areas are the smallest spatial unit for which we can obtain electoral results from Ministry of Internal Affairs (*Ministerio del Interior*). Given that many municipalities are small, only 2,278 of them had more than one census area within their boundaries in 2007.

2.3. Political Parties in 2007 and 2011

The socialist party (*PSOE*) held the national government between 2004 and 2011 under two terms of President Zapatero. At the national level, the centre-right Popular Party (*PP*) was the main opposition party and eventually took power from the socialists in 2011.

The municipal elections before and after *Plan E* took place in 2007 and 2011, respectively. In the 2007 election, the two main parties, Zapatero's *PSOE* and the centre-right *PP*, obtained comparable results. A total of 36% of all municipalities were ruled by *PSOE* in 2007, while 39% were ruled by *PP*. In 2011, almost three years into the financial crisis, these figures changed to 27.6% and 46.5% respectively. In both terms, the third party with most appointed mayors was the nationalist Catalan party *Convergència i Unió* which ruled 5.2% and 6.3% of municipalities, respectively. In total, the 9 most important national level parties in Spain ruled 89% of

[10] See details in law number 7/1985 (2 of April 1985, *Ley Reguladora de las Bases del Régimen Local).*

[11] See Chapter IV of *Ley Orgánica del Régimen Electoral General.* Municipalities with populations under 250 inhabitants have an open list system with voters able to express multiple preferences for different candidates. These municipalities will not be used in our analysis.

municipalities in 2007.[12] A number of smaller, local parties, rule the remaining municipalities.

3. Data and Descriptive Statistics

In order to study how the geography of voter support shapes public spending allocations we need disaggregated data on electoral outcomes and geo-located data on *Plan E* investment projects. Data on individual projects were obtained directly from the *Plan E* website, and include the coordinates of projects (as geo-located by the municipal authorities), a short description, a classification in terms of project types and the cost of each project.

The raw data contain a total of 57,850 projects. Some categories correspond to investments that clearly yield no differential geographical benefit to voters. For example, spending on technological upgrading of the public administration is usually geo-located in the city hall but does not only benefit people living next to the city hall. We identify and exclude a total of 6,574 projects which correspond to these categories.[13] In addition, for a subset of projects, the geo-location data on latitude and longitude is incorrect or missing. When possible, we geo-located these projects manually using address or other location information from the short project description. In total, we were able to hand code 3,065 projects ourselves. Our final sample therefore contains a total of 38,353 projects (for details on these restrictions see table B.2 in the appendix). Project types in this sample and their frequencies are displayed in table 1.

We combine information on *Plan E* investment projects with data on municipal and national elections. Data on electoral outcomes at the census area level are obtained from the Ministry of Internal Affairs, the body responsible for collecting and disseminating information on electoral results. We complement it with information on mayors and their political party of affiliation from the same source. Figure 1 plots results of the 2007 municipal elections for each of the census areas of Sevilla and Madrid, together with the distribution of *Plan E* projects. Red areas are those where left-wing *PSOE* was the most voted party while blue indicates areas of *PP* majority. We can see that the support for both parties varies significantly across neighbourhoods. This within-city variation in electoral support will be instrumental to study the link between the geography of voter support and the allocation of *Plan E* projects in the following sections.

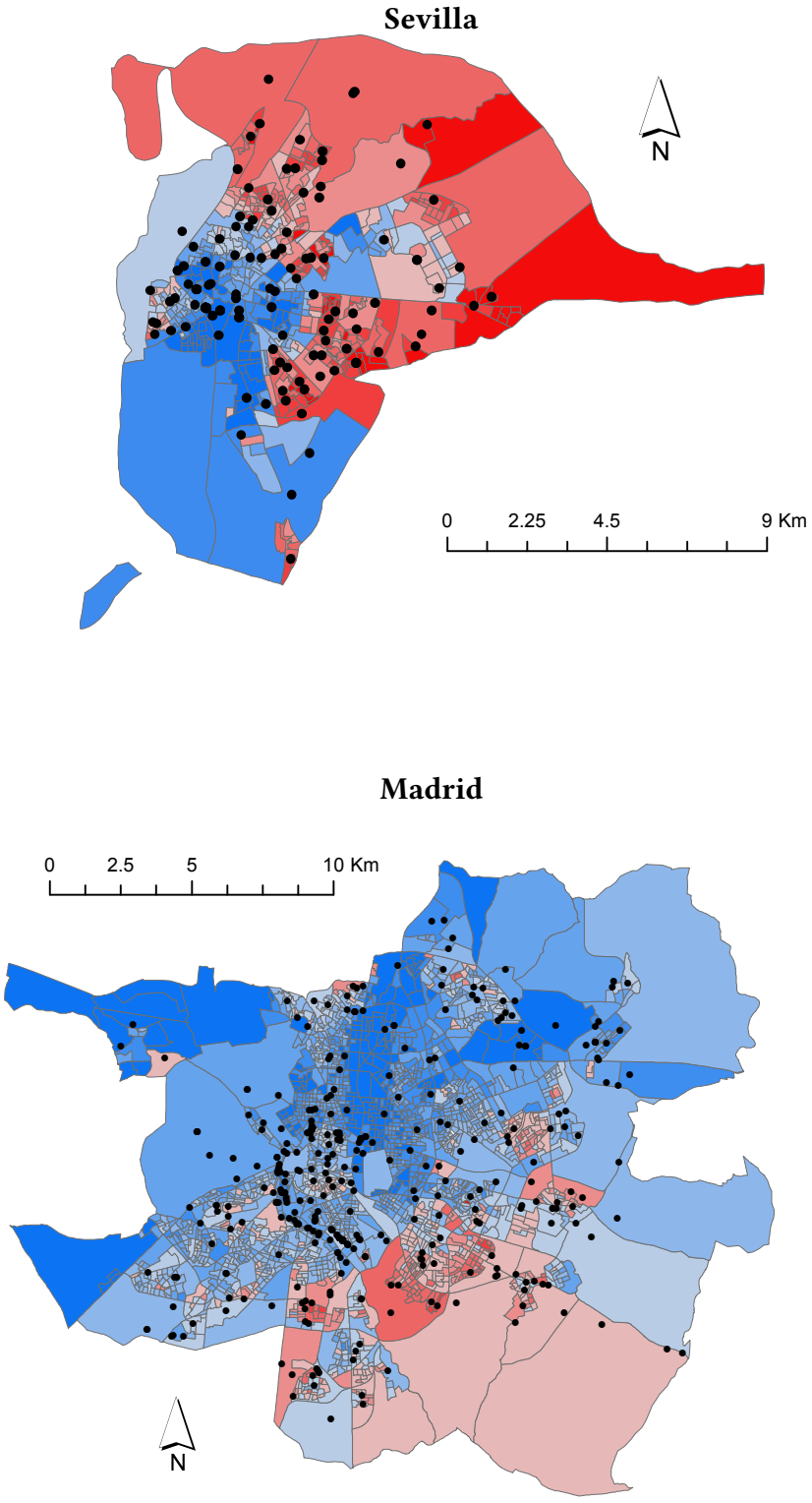
Finally, we integrate our dataset with municipal and census area level information from *INE* (the national statistical office) and from the 2001 Population Census. Census data includes characteristics at the census areas level such as population and density, together with the fractions of college graduates, unemployed, home-owners, foreigners, the number of children, and elderly residents. To control for possible factors affecting the local demand for investment, we also use information on the number of households that reported the presence of crime and a lack of green areas in the neighbourhood. Lastly, we also include the fraction of urban discontinuous terrain at the census area level (obtained from Corine Land Cover).

[12] These are *PP*, *PSOE*, *CIU*, *IU*, *CC*, *ERC*, *PNV*, *PAR* and *BNG*. By national level parties we mean parties that also run in national elections.

[13] The categories in question are: technological upgrading of the public administration, electronic management, industrial rehabilitation, efficiency in the management of water sources, management and treatment of urban waste, repairs in water supply systems and repairs in sewage outlet systems.

Figure 1

Plan E Projects and political support for *PSOE* (red) and *PP* (blue)



Notes: Points correspond to *Plan E* projects located in the municipalities of Sevilla (top panel) and Madrid (bottom panel). Census areas are coloured in red if the socialist party *PSOE* received the majority of votes in the 2007 municipal election, with the intensity of the shade varying with the vote share. Similarly, blue areas correspond to areas where the right-wing *PP* obtained the majority of votes.

We limit our analysis to municipalities having at least two census areas. This is essential in order to have variation in vote shares within each municipality. By doing so, we exclude small towns, restricting our sample to 2,278 municipalities. We will further restrict our analysis to municipalities ruled in 2007 by one of the 9 national level parties with most mayors. We impose this restriction in order to ensure we can correctly match the party names in the census area electoral data with those appearing in the data on mayors. Our final sample is composed of 2,046 municipalities which include a total of 28,083 census areas.

Table 2 includes some descriptive statistics for the census areas in our our sample. As Panel A shows, the average census area has a surface area of about 8 squared kilometres, and 1,400 inhabitants, of which 1,100 are eligible to vote. Given that these areas are designed to contain comparable numbers of voters, there is substantial variation in their physical size, matching the variation in densities, from large cities with small census areas to sparsely populated and extended countryside villages with large ones. Panel B indicates that 40% of census areas received at least one *Plan E* project, with a corresponding average investment per capita of 215 Euros. Finally, the last panel of table 2 shows some average figures from the 2001 Population Census variables that will be used as controls in our main specification. Descriptives at the municipal level are reported in table B.1 in the appendix.

4. Empirical Analysis

In this section we test whether incumbent local politicians target their own supporters in the allocation of *Plan E* investment projects. To understand our empirical strategy, consider the following thought experiment. There are several cities, each ruled by either party A or party B. Each city is composed of neighbourhoods, which can support party A or B. We define a local government as favouring its supporters if it disproportionately allocates investment to its neighbourhoods, neglecting neighbourhoods of the opposing party.

If parties are not assigned randomly, observing that certain areas are favoured may be the result of inherent differences between cities beyond the identity of the ruling party. For example, suppose cities ruled by party A are more likely to have parks and that party A supporters prefer to live close to parks. If parks need recurring investments, we would observe a spending bias towards party A neighbourhoods even if these local governments had no intention to favour their supporters. The randomisation of the party in office would instead guarantee that all municipal characteristics are balanced. In this case, a comparison of the allocations between municipalities would be free of the bias induced by omitted variables correlated with the location of voters. This comparison could then be used to detect the presence of supporter bias.

Let us translate this thought experiment into our context. In the first place, our "neighbourhoods" will be census areas and we will use previous votes shares at the census area level as a measure of support for different parties within cities. Secondly, the assignment of *Plan E* projects in space will be used to determine which census areas receive more resources. Finally, we exploit quasi-random variation in the identity of the ruling party by implementing a close-election regression-discontinuity design (or RDD, see Lee 2008). For this purpose we need to select a reference party and measure to what extent areas supporting this party are favoured

TABLE 2

DESCRIPTIVES - CENSUS AREA LEVEL DATA

	Mean	Std. dev.	Min	Max
A. General information				
Surface (2007, km2)	8.41	34.69	0.004	1125.112
Density (2007, 1000 inh./km2)	19.86	21.55	0.001	349.804
Population (2007)	1,423	563.75	294	12,859
Eligible voters (2007)	1,100	441.03	226	10,881
Turnout (2007)	0.61	0.12	0.085	0.922
Turnout (2011)	0.62	0.10	0.157	1.000
B. Plan E projects				
Indicator for receiving 1+ projects	0.40	0.49	0.00	1.00
N. of projects received	0.91	1.72	0.00	49.00
Investment in projects (Euros per capita)	214.76	713.16	0.00	33420.26
C. Population Census information (2001)				
Higher education	0.12	0.10	0.000	0.556
Home owners	0.84	0.12	0.004	1.000
Foreigners	0.04	0.05	0.000	0.811
Households with 1+ unemployed	0.16	0.07	0.003	0.730
Households reporting not enough green areas	0.38	0.24	0.000	0.993
Households reporting crime is high	0.24	0.19	0.000	0.977
People 0-16 yrs.	0.15	0.05	0.031	0.394
People 16-64 yrs.	0.67	0.05	0.280	0.927
People 65+ yrs.	0.17	0.08	0.006	0.654
Observations		28,083		

Notes: Panel A reports averages for some characteristics of interest for the 28,083 census areas in the sample (2,046 municipalities). Turnout figures refer to the 2007 and 2011 municipal elections, respectively. Panel B shows descriptives for the *Plan E* investment program, and panel C shows data from the 2001 Population Census. These variables measure, for a given census area, the fraction of people with a particular characteristic at the time of the Census. In some categories – explicitly indicated – the unit of observation is the household and not the individual.

in the allocation of resources when this party wins an election by a narrow margin. We select the center-left *PSOE* as our reference party because this was the party with most mayors in our 2007 sample.[14]

To implement a regression-discontinuity design, we need to define both a running variable and a census-area level variable measuring whether *PSOE* voters are favoured in the allocation of investment. Regarding the former, the standard used in the literature is the margin of victory of the reference party (e.g., Lee 2008; Beland 2015). This would be appropriate in the context of direct election of mayors. However, in a multi-party system with indirect election of mayors,

[14]Note that the choice of the reference party is somewhat arbitrary and should only have a minor effect in estimation. In a two party system, this choice is without loss of generality as the estimated effects are obtained from differences between the two parties (for example, in US studies such as Beland 2015, the reference party is usually the Democratic party). Unreported estimates using right-wing *PP* as the reference party yield similar results.

the margin of victory is not an appropriate measure of closeness of an election. Instead, we follow Folke (2014) (as implemented by Fiva, Folke and Sorensen 2016) and construct our running variable by computing the vote share distance to a *PSOE* seats majority in the local council. To measure favouritism towards *PSOE* voters, we construct two different measures combining information on *Plan E* investments and the *PSOE* vote share. These will be designed to capture both intensive and extensive margins in allocations and voter preferences. We turn to these issues in the following.

4.1. Close-Elections Regression-Discontinuity Design

The first step to implement our RD strategy is to construct a running variable that measures the closeness of the municipal election. Given the electoral system prevailing in Spain, we adapt the method described in Fiva, Folke and Sorensen (2016). As an illustration of the procedure, assume that, after the election, *PSOE* obtained the majority of seats in a given municipality.[15] The running variable is constructed using an iterative procedure as follows. First, we reduce the vote share of *PSOE* by a small amount (in our case we used 0.25%), and redistribute the corresponding votes among the other parties, proportionally to their vote shares. Then, we calculate the new distribution of seats using the D'Hondt rule. If the seats majority did not change, we decrease the vote share by an additional 0.25%, iterating the procedure until a change in the majority is reached. The change in the vote share needed to reach a majority change is the value of our running variable for the municipality in question, henceforth simply the *PSOE winning margin*. In this particular example, the winning margin is positive because *PSOE* started with a seat majority. In municipalities where *PSOE* did not have a majority to start with, we proceed in the opposite way, adding votes until a majority is reached. In these cases the winning margin variable is negative. We perform these calculations for all municipalities in our sample.

Figure 2 shows that, as expected, the winning margin ranges from -0.5 to 0.5. Furthermore, it does not appear to jump discontinuously around zero, suggesting that there is no systematic manipulation around the threshold where the seats majority change. The absence of a discontinuity in the distribution of the running variable is evidence in support of one of the fundamental RDD assumptions, namely that parties are unable to perfectly manipulate electoral outcomes (Lee, 2008; McCrary, 2008). A formal McCrary test for the absence of a discontinuity yields a p-value of 0.16. Using Cattaneo, Jansson and Ma (2016)'s RD manipulation test, however, we fail to reject the null with a p-value of 0.51. Both provide formal grounding to the assumption of absence of manipulation at the threshold.

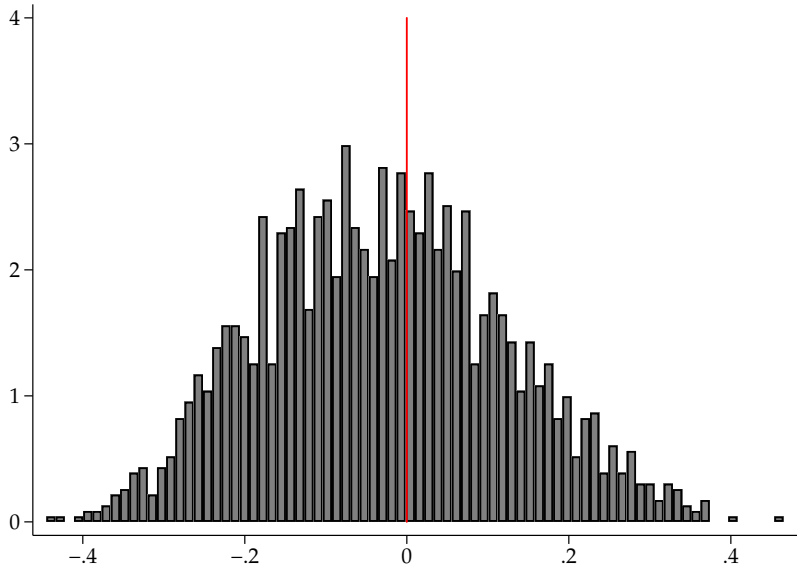
Because of the indirect election of mayors in Spain, obtaining the majority of seats does not necessarily lead to mayoralty. Therefore we need to implement a fuzzy RDD, in which the indicator for a *PSOE* mayor is instrumented by an indicator for the winning margin being positive (Imbens and Lemieux, 2008). The corresponding first stage is as follows:

$$PSOE_m = \pi_0 + \pi_1 \mathbf{1}(PSOE\ WinMargin_m > 0) + f(PSOE\ WinMargin_m) + \gamma' X_{cm} + u_{cm}, \tag{1}$$

[15] We say *PSOE* has a majority when it has strictly more seats than any other party in the municipal council.

Figure 2

Histogram of the density of the winning margin variable



Notes: Histogram of municipal level *PSOE* winning margin for all municipalities in the sample, defined as the *PSOE* vote share change necessary for *PSOE* to win (lose) the seat majority in the municipal council (details in the text). Positive values correspond to municipalities in which *PSOE* obtained the majority of seats in the 2007 elections. Negative values correspond to municipalities in which *PSOE* did not obtain the majority in 2007. Test of no perfect manipulation as in McCrary (2008) leads to a p-value of 0.16. Alternatively, the test proposed in Cattaneo, Jansson and Ma (2016) yields a p-value of 0.51.

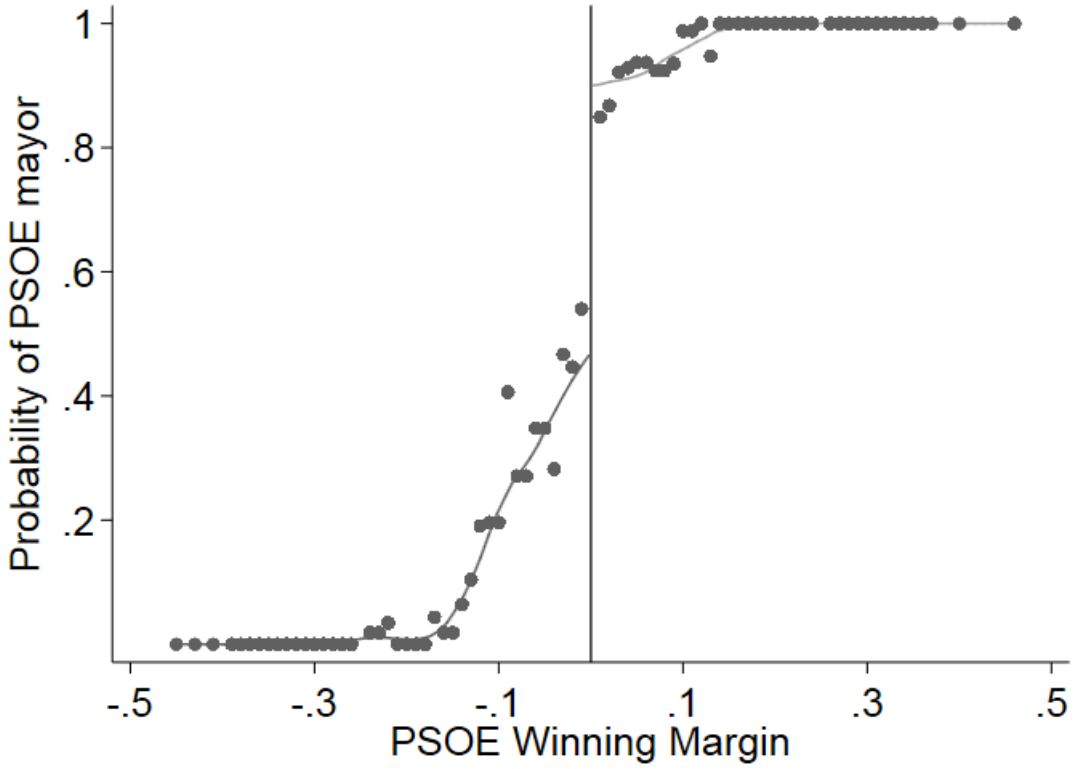
where $PSOE_m$ is a dummy taking value 1 if *PSOE* is in power in municipality m by the time *Plan E* was carried out, $WinMarginPSOE_m > 0$ is a dummy taking value 1 if *PSOE* obtained the majority of seats in the 2007 municipal elections and $f(PSOE\ WinMargin_m)$ is a polynomial in the winning margin. X_{cm} is a vector of census-area level controls including the logarithm of population, census area density and surface, the fraction of urban discontinuous terrain, the distance from the municipal centroid, and a series of 8 control variables from the 2001 Census.[16] We will report estimates of two types. In the first place we use the full sample with third degree global polynomials in the running variable as controls on either side of the threshold. Secondly, we apply the optimal bandwidth selector by Calonico, Cattaneo and Titiunik (2014) (henceforth CCT) to restrict the sample to observations close to the threshold, and use linear control functions in the forcing variable on either side. Given that linear control functions have more attractive properties for discontinuity estimates, this is our preferred specification (Gelman and Imbens, 2014). In all specifications in this section, we weight each observation by the inverse of the number of census areas so that each municipality has the same weight.[17] Figure 3 shows that the probability of a *PSOE* government jumps discontinu-

[16] Specifically, the fraction of individuals who are unemployed, foreign-born, college-educated, aged 0-16, aged 16-64; the fraction of households reporting crime is an issue, lack of green areas, or owning a home.

[17] In practice the weighting is implemented using the inverse of the number of census areas as "analytical weights" in STATA 14, the software used in estimation. The *rdbwselect* command that calculates the Calonico, Cattaneo and Titiunik (2014) optimal bandwidth also allows for weights. Weighting observations by the ratio of

ously around the winning margin threshold. First-stage regressions using different bandwidths are provided in table B.3 in the appendix and confirm our instrument is strong, with F-statistics above 30 in all cases.

FIGURE 3
FIRST STAGE DISCONTINUITY



Notes: The vertical axis measures the probability of having a *PSOE* mayor and horizontal axis measures the winning margin of *PSOE* in the 2007 municipal elections, as defined in the text. Positive values indicate the municipality had a *PSOE* seat majority and negative values indicate it did not. Solid lines represent fitted values from a local polynomial smooth regression estimated with an Epanechnikov kernel and bandwidth calculated using Silverman's rule-of-thumb.

Before moving on to the definition of the dependent variable, we present some evidence in favour of the continuity assumption required for the validity of RDD in figure B.6 in the appendix. This figure shows the averages for several census area characteristics calculated in bins of 1% of the winning margin, together with fitted values from a local polynomial regression. None of the averages jump at the threshold, suggesting that municipalities where *PSOE* barely won the elections are comparable, in terms of observables characteristics, to those where *PSOE* barely lost. Table B.4 shows discontinuity estimates for each covariate using our main specification, which uses a local linear regression allowing for a different slope at either side of the threshold. The bandwidth is calculated using the CCT method on our main specification (of equation 2 below) and is equal to 9.6%. Finally, the standard errors are clustered at the municipal level. Regression estimates are entirely consistent with the graphical evidence. The estimated discontinuities are small and in 11 out of 12 cases not statistically significant at any

the population in the census area and the municipal population yields very similar results.

conventional level.

To implement the RDD design, we need to construct a measure of "supporter bias" at the census area level. A good measure of the extent to which *PSOE* mayors target their supporters should have the following properties. First, it should be large both when a census area with relatively strong *PSOE* support is favoured disproportionately in the allocation of projects and when areas of low support receive little investment. Second, it should indicate a low level of bias in cases of little support and high investment, or strong support and little investment. A variable with these properties would pick up the disproportionate allocation of projects to (or away from) *PSOE* areas.

We consider two alternatives. The first measure is meant to capture the *extensive* margin of investment, that is, the discrete decision of whether to invest or not in areas with many supporters. This measure, which we denote as $ExtensiveBias_{cm}$, is defined as the interaction of a variable that equals one if census area c in municipality m received at least one *Plan E* project (and -1 otherwise) and a variable that equals one if the *PSOE* vote share in this area is higher that the *PSOE* vote share in the municipality (and -1 otherwise). Using a negative number instead of the zero in the definition of these two indicator variables allows the resulting bias measure to be symmetric, being positive when a supporter bias exists and negative when it does not.

Because it is the interaction of two binary variables, however, this measure can only take on two values. As such, it can only measure the extensive margin of supporter bias because it does not capture differences in the *amount* of investment received by different areas or in the strength of the electoral support. To incorporate intensive margin variation, we construct another measure of supporter bias, $IntensiveBias_{cm}$, as the interaction of the difference between the *Plan E* investment (in per capita terms) carried out in the census area and the municipal average investment, and the difference between the *PSOE* vote shares at the census area level and the municipal aggregate vote share. This variable is able to capture, at the same time, differences in the intensity of investment and in the presence of more or less supporters across census areas. To have scale-free measures of bias and facilitate the interpretation of the results, we standardize both variables using their overall mean and standard deviation.

We specify the structural equation that completes our fuzzy-RD model as

$$Bias_{cm} = \alpha + f(PSOE\ WinMargin_m) + \delta PSOE_m + \gamma' X_{cm} + \epsilon_{cm}, \tag{2}$$

where, as above, c indexes census areas and m indexes municipalities. The outcome variable $Bias_{cm}$ can be either $ExtensiveBias_{cm}$ or $IntensiveBias_{cm}$, vector X_{cm} include controls as defined above, and $PSOE_m$ is an indicator for *PSOE* being in charge of the municipal government.

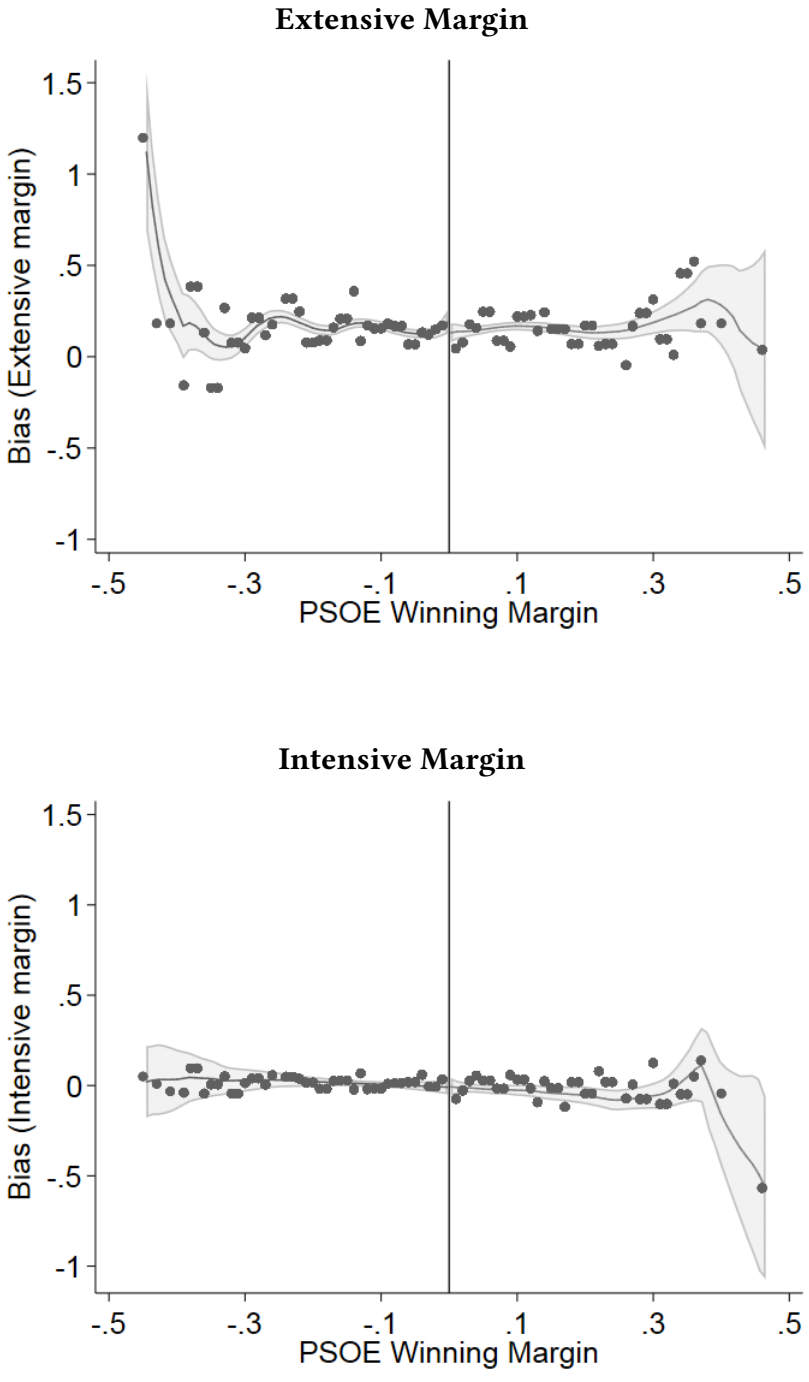
4.2. Estimation Results

Before moving to a formal estimation of the RD model, in figure 4 we show how these two bias measures behave as a function of the *PSOE* winning margin, with dots representing weighted averages in bins of size 1% and lines being local linear regression estimates. Because both measures are standardized, the effect at the discontinuity can be interpreted in terms

of standard deviations of the dependent variable. The graphical evidence indicates that the reduced-form effect of a *PSOE* mayor on both supporter bias measures is modest, and well below one-tenth of a standard deviation.

FIGURE 4

REDUCED-FORM EFFECT OF *PSOE* GOVERNMENT ON SUPPORTER BIAS MEASURES



Notes: The vertical axis shows different measures of bias in the allocation of *Plan E* projects towards *PSOE* voters. The horizontal axis shows the *PSOE* winning margin, defined as the vote share distance to a seat majority change. Dots are averages in 1% bins of the winning margin, with each observation being weighted by the inverse of the number of census area in the municipality, so that all municipalities have the same weight. The lines are local linear regression estimates using the Epanechnikov kernel and a bandwidth calculated using Silverman's rule-of-thumb.

Fuzzy RD estimates of equation 2 are reported in table 3 for both the extensive and intensive margin measures and including or excluding controls. In the first two columns we use the whole sample and include in estimation a third-degree polynomial in the winning margin, while in the last two we restrict the sample to observations within the CCT optimal bandwidth, using a linear control function. Given the standardization, estimates are interpreted in terms of standard deviations of the dependent variable.

TABLE 3
RDD RESULTS - SUPPORTER BIAS IN ALLOCATION OF INVESTMENT

	Full sample		CCT bandwidth	
A. Extensive Margin Measure				
PSOE mayor	0.047	0.050	0.032	0.015
	(0.200)	(0.203)	(0.153)	(0.157)
Bandwidth	0.500	0.500	0.096	0.096
Controls	N	Y	N	Y
Obs.	27897	27885	13246	13245
B. Intensive Margin Measure				
PSOE mayor	-0.119	-0.129	-0.123	-0.127
	(0.108)	(0.110)	(0.100)	(0.102)
Bandwidth	0.500	0.500	0.076	0.076
Controls	N	Y	N	Y
Obs.	27527	27517	10816	10816

Notes: RDD results for the extensive and intensive margin measures of *PSOE* supporter bias. Both variables are normalized to have zero mean and standard deviation equal to 1. Estimates obtained by two-stage least squares using an indicator for *PSOE* having the seats majority as an instrument for the indicator for *PSOE* being in power, while controlling for the winning margin in the 2007 municipal elections as defined in the text. Columns 1 and 2 use the full sample and third-degree polynomials in the winning margin, allowed to differ on either side of the threshold. Columns 3 and 4 restrict the sample to observations within the Calonico, Cattaneo and Titiunik (2014) optimal bandwidth around the threshold, with a linear control function of the winning margin with possibly different slopes on either side. All estimates are obtained by weighting each census area by the inverse of the number of sections in its municipality. Standard errors clustered at the municipal level.

Our estimates show that *PSOE* mayors who won the election by a small margin do not favour areas where relatively more of their supporters live. When using the extensive margin measure, point estimates are very small, with the largest suggesting a positive effect of 4.7% of a standard deviation. When using the Calonico, Cattaneo and Titiunik (2014) optimal bandwidth, the magnitude decreases to 1.5% with a corresponding 95% confidence interval of $[-0.29, 0.32]$. While the clustered standard errors are relatively large, the confidence intervals allow us to rule out effects larger that one-third of a standard deviation in either direction.

Panel B shows similar estimates using the intensive margin measure, which captures both the amount of investment and the strength of voter support dimensions. Taking as a reference the specification with controls and optimal bandwidth of column 4, again we observe a small (in this case negative) effect, with a 95% confidence interval of $[-0.33, 0.07]$, again confirming that *PSOE* does not appear to significantly target its voters with the allocation of investment

projects. Even if estimates are larger in absolute value than those obtained using the intensive bias measure, they are more precise, probably owing to the fact that we also exploit variation in the size of investment and electoral support.

In figure 5 we explore the sensitivity of the results to different bandwidth choices by estimating the model restricting the sample to smaller and smaller bandwidths in increments of 1% of the winning margin. The CCT optimal bandwidth is reported for reference as a vertical line. As the graphs show, point estimates are small for most magnitudes and smaller than 1/10 of a standard deviation at the CCT bandwidth for either measure. As we narrow down the bandwidth around the majority threshold, the estimates become less precise – as shown by the widening of confidence intervals – but remain statistically insignificant. Given that the increase in the standard errors is due to the sample size reduction and that point estimates oscillate tightly around zero without a clear pattern, we infer that our baseline estimates are not driven by our particular choice of bandwidth but, instead, reflect the lack of any appreciable effect in data. Collectively, all results in this section lead us to conclude that there was no favouring of supporters in the allocation of *Plan E* projects. If distributive politics play a role inside cities in our context, then this does not operate through the targeting of supporters' neighbourhoods.

A final note is due about the interpretation of our results. RDD estimates are obtained using local variation coming from close elections. Hence, the group of municipalities that we use for identification are electorally competitive by construction. If supporter targeting were a specific feature of electorally uncompetitive environments (as suggested, for example, in Trounstine 2006), then it might be problematic to extrapolate our local result to the rest of the population. Therefore, our results are especially informative about distributive politics in competitive electoral contexts.

5. Discussion

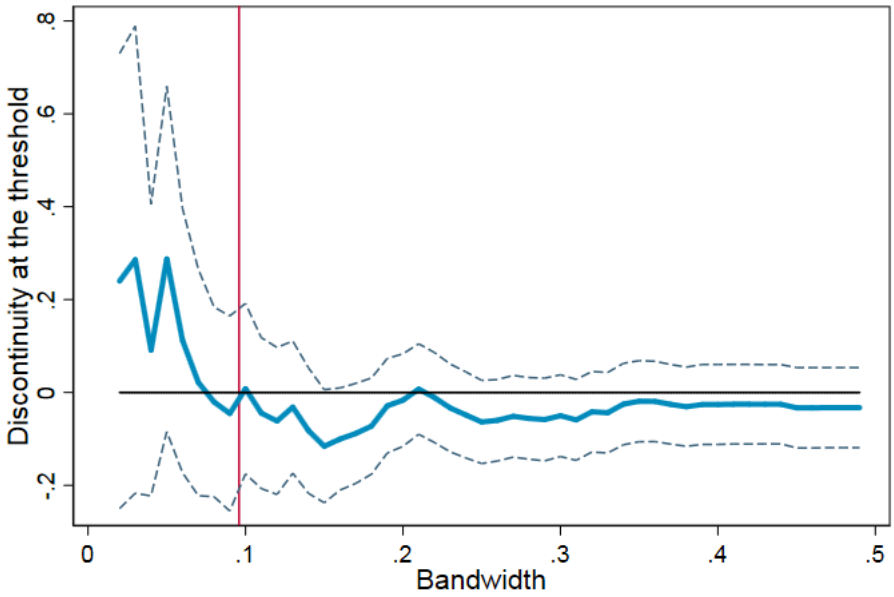
As reported in the previous section, we find than incumbent's supporters were not favoured in the allocation of *Plan E* projects within cities. Alternative empirical strategies based on within-city regressions, reported in a previous version of this paper, also lead to the same qualitative findings (see Carozzi and Repetto 2017). This result stands in contrast to the large body of empirical evidence showing that being aligned with the national government's party positively affects local finances, and with local-level evidence on politicians targeting core supporters (e.g. Ansolabehere and Snyder 2006). How can we reconcile these apparently contradictory results? There are several candidate explanations.

A possible concern is that the investment plan carried out under *Plan E* is somehow ill-suited to answer our research question. To start, the national government could have used the formal approval process to favour certain municipalities or even to affect the distribution of investment within the municipality. As discussed in section 2, however, the vast majority of municipalities received the full amount they applied for (see also Montolio 2016; Tribunal de Cuentas 2013), suggesting that the approval process was *de facto* not imposing any substantial constraints or limitations on the choice of projects. One might still be concerned that the national-level *PSOE* government favoured aligned municipalities, either to benefit fellow party members or to

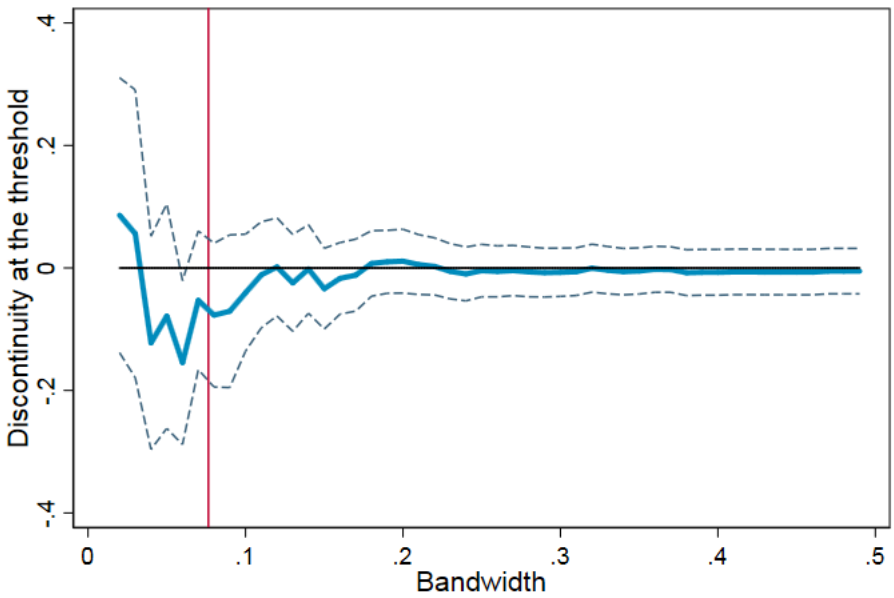
Figure 5

Baseline Estimates for Different Bandwidths

Extensive Margin



Intensive Margin



Notes: RDD results for the extensive and intensive margin measures of *PSOE* supporter bias. Both outcome variables are normalized to have zero mean and standard deviation equal to one. The solid lines report point estimates using different bandwidth values as specified in the horizontal axis. 95% confidence intervals based on clustered s.e. displayed as dashed lines. Vertical lines correspond to Calonico, Cattaneo and Titiunik (2014) optimal bandwidths.

Table 4

RDD Additional Results

	Extensive Margin		Intensive Margin	
	(1)	(2)	(3)	(4)
A. Projects with Localized Benefits				
PSOE mayor	0.050	0.015	-0.156	-0.105
	(0.203)	(0.157)	(0.096)	(0.083)
F-Stat	35.2	49.4	35.2	39.8
Bandwidth	0.50	0.10	0.50	0.08
Obs.	27885	13245	27517	12048
B. 100 Metre Buffers				
PSOE mayor	-0.049	-0.042	0.042	-0.008
	(0.183)	(0.131)	(0.061)	(0.043)
F-Stat	35.2	55.8	35.2	49.4
Bandwidth	0.50	0.11	0.50	0.10
Obs.	27885	14687	27522	13079
C. Large Municipalities				
PSOE mayor	0.007	0.008	-0.058	-0.094
	(0.319)	(0.250)	(0.184)	(0.163)
F-Stat	10.0	14.9	10.0	11.5
Bandwidth	0.50	0.09	0.50	0.08
Obs.	26927	12166	26559	10923
D. Small Municipalities				
PSOE mayor	0.143	0.033	-0.163	-0.162
	(0.266)	(0.239)	(0.112)	(0.105)
F-Stat	63.8	70.0	63.8	67.4
Bandwidth	0.50	0.12	0.50	0.11
Obs.	958	492	958	459

Notes: RDD results for the extensive and intensive margin measures of *PSOE* supporter bias. Both variables are normalized to have zero mean and standard deviation equal to 1. Estimates obtained by two-stage least squares using an indicator for *PSOE* having the seats majority as an instrument for the indicator for *PSOE* being in power, while controlling for the winning margin in the 2007 municipal elections as defined in the text. Columns 1 and 2 use the full sample and third-degree polynomials in the winning margin, allowed to differ on either side of the threshold. Columns 3 and 4 restrict the sample to observations within the Calonico, Cattaneo and Titiunik (2014)'s optimal bandwidth around the threshold, with a linear control function of the winning margin with possibly different slopes on either side. Panel A uses only project types considered to have strongly localised geographical benefits (see text). Panel B uses, as outcome variables, measures obtained assuming that investment projects affect census areas within 100 metres of the geo-coded location. Panel C and D restrict the sample to municipalities larger or smaller than 3,000 inhabitants (respectively). First-stage F-statistics and bandwidth around the threshold are indicated alongside observations in the table foot. All estimates are obtained by weighting each census area by the inverse of the number of sections in its municipality. Standard errors clustered at the municipal level.

directly gain votes at the local level. This could give the national government some ownership in the allocation process within cities even if this rested nominally with local authorities. In order to exclude this possibility, we modify our RDD analysis to study whether *PSOE* local governments received more total *Plan E* funding (in per capita terms). Reduced-form results are illustrated in figure B.8 in the appendix. We see that *Plan E* investment at the municipal level does not vary significantly when crossing the threshold where *PSOE* wins the election, suggesting that *PSOE* municipalities were not given any special treatment in the allocation of funds.

Another potential issue regarding *Plan E* and the partisan alignment of the national government relates to the electoral return of *Plan E*. Insofar as *Plan E* was a national government initiative we could be concerned that its electoral effects operated through changes in vote shares in *national* (rather than municipal) elections. If this were the case, then it would be unsurprising that we find no targeting of supporters, because municipalities would simply be unable to claim credit for the *Plan E* projects. However, census-area level regression results reported in table B.5 show that areas receiving *Plan E* investment do not experience an appreciable increase in the vote share of *PSOE* in the following election.[18] All specifications control for the *PSOE* vote share in the previous 2008 national election and the set of controls used in equation 1. Estimates of the effect of investments on subsequent electoral results are negative and small. Receiving a projects is associated with a decrease of 0.25-0.38 percentage points in the *PSOE* vote share in the following national elections. These estimates are extremely small and statistically insignificant at conventional levels, and are evidence against the existence of electoral returns accruing to the national government.

An additional explanation for not finding any supporter bias in the data could stem from the difficulty in measuring who directly benefits from investment and to what extent they do so. Because distances within cities are much smaller that distances between cities, benefits arising from investment projects allocated to a given neighbourhood may spill-over to other areas. The existence of these spillovers is arguably a less severe problem in between-city studies. In our analysis we have implicitly assumed that that the benefits of receiving a *Plan E* project are limited to the census area that receives it, hence ruling out spillovers to neighbouring areas. However, it seems reasonable that at least some kinds of investments – such as gymnasiums, cultural centres, or sports facilities – provide services that are enjoyed by a larger constituency. Other investments, like a new sewage system, might even have negative externalities for the closest neighbours but benefiting the municipality as a whole.

To ensure that our results are robust to different assumptions regarding the localisation of project benefits are, we conduct two complementary robustness checks. To start, we perform our analysis again by restricting our attention to types of projects for which benefits can be considered to be "strictly" localised, in the sense that these projects are more likely to benefit their immediate neighbours the most. To classify projects into this category, we use the descriptions included in the original *Plan E* data source.[19] Although this definition is somewhat

[18] Vote shares are in percentage points to facilitate the interpretation of the coefficients.

[19] We specifically restrict our attention to i) rehabilitation of public space and ii) improvement in public spaces and road networks.

arbitrary, some guidance on the selection of projects with localised benefits is offered by the literature on political budget cycles, which suggests that spending in parks and roads is very prone to strategic manipulation because of its visibility among voters (see for example Kneebone and McKenzie 2001; Drazen and Eslava 2010; and Repetto 2017). Secondly, we retain our initial catch-all definition of projects but we now allow benefits to extend to 100 metre radius circular buffers around the actual project locations. Hence, if a project falls within a specific census area A but less than 100 metres away from the boundary with another census area B we consider both A and B to benefit from this investment.

We then create our extensive and intensive bias measure using each of these alternative definitions and use them as dependent variables in an RDD analysis analogous to the one carried out in section 4. Estimates for the bias measures created using the localised project benefits definition and the 100 metre buffers are presented in table 4 in panels A and B, respectively. Columns 1 and 2 report results for the extensive margin bias measure while columns 3 and 4 report the intensive margin. Following the approach in the previous section, we include both full-sample results using third degree polynomials in the running variable (columns 1 and 3) alongside local linear regressions with sample restricted to CCT bandwidths around the threshold (columns 2 and 4), our preferred specification. We continue to find small and insignificant coefficients. Most point estimates indicate effects of less than 1/20 of a standard deviation in the bias measure in absolute values except in columns 3 and 4 of panel A, with slightly larger but still insignificant coefficients. Alternative specifications using more lax definitions of localised benefits or narrower buffer sizes (such as 25 or 50 metres) yield analogous conclusions and are not reported for brevity. We interpret these estimates as showing that our main result is robust to different assumptions about the reach of spatial benefits of local investment.

An alternative explanation for finding no supporter bias is related to whether investment projects are relevant to voters at the local level. If voters do not associate projects with the municipal government, or are simply unaffected by them, local politicians would have little incentive to favour their supporters. As a consequence, we should observe no response of voters to investment in the ballot box. However, we find that there is at least one margin through which voters respond to project allocations. Specifically, there is at least suggestive evidence that voters respond to projects in terms of an increase in turnout, as shown in panel B of table B.5 in the appendix. Results are obtained by estimating census-area level regressions of 2011 municipal election turnout on a measure of investment, 2007 turnout, municipal fixed effects, and the same set of controls used in our baseline specification. Investment is either measured as a project indicator, taking value 1 if a section received a *Plan E* project, or as total project cost per capita, measured at the census area level and standardized. For both investment measure we find a positive effect on turnout in response to *Plan E* investments. The coefficients are relatively small but strongly significant, with receiving a project being associated with an increase in turnout of almost 0.4 percentage points. We interpret this result as suggesting that voters become more sensitive to the local level political agenda when observing the actual policies taking place. It is also evidence that projects have local electoral effects. Placebo estimates reported in figure B.7 in the appendix validate the empirical strategy pursued to obtain these estimates by showing that there is no effect of investment on previous municipal elections'

turnout.

A complementary result shows further evidence of local benefits of *Plan E* investments. Table B.6 in the appendix reports results regressing, respectively, a project indicator and the total project cost per capita (in logarithms to facilitate interpretation) on the log of census area population.[20] We find a strong and statistically significant correlation between population and allocation decisions. While this may seem obvious at first glance, it illustrates that local politicians are mindful of allocating projects to populated areas, presumably to maximize visibility and impact of these forms of spending. Recall that residential density, the pattern of urban development (obtained from remote-sensing from Corine land cover) and distance to the municipal centroid are included as controls. Hence, we are, at least partially, accounting for differences in the built environment that could influence investment demand and bias our estimates.

Another possible mechanism behind our result is that local politicians may lack the sophistication or the knowledge needed to use investment strategically. National-level politicians, who typically handle larger budgets and more professionalized bureaucracies, may be more experienced and skilled, and hence more aware of the possible benefits of engaging in distributive politics. This could explain why previous research found alignment effects between the national and municipal government but we find no effect within the municipality. While we cannot directly rule out this possibility, under the assumption that politicians are more sophisticated in larger municipalities, we can use a sample split to further investigate this hypothesis. Panels C and D of table 4 replicate our RDD analysis splitting the sample between large and small municipalities, respectively. In order to preserve the significance of the first stage, we split the sample at the relatively low threshold of 3,000 inhabitants, which roughly corresponds to the first quartile of the municipal population distribution. Interestingly, the estimates remain small and indistinguishably different from zero both in large and in small municipalities. One could be concerned that our sample split fails to properly sort municipalities with respect to the sophistication of their local politicians. However, alternative empirical analyses using census-area regressions including the incumbent's vote share and focusing on province capitals also lead to similar qualitative results.[21]

A final possibility relates to different theories on the targets of distributive policies. Our hypothesis that politicians disproportionately target their supporters with investment is closely related to the *core voters* hypothesis in the political economy and political science literature (Cox and McCubbins, 1986). An alternative hypothesis poses that politicians should instead target swing voters, that is, voters with weak party preferences who may be willing to "switch sides" in response to economic favours (Lindbeck and Weibull, 1987; Dixit and Londregan, 1995). However, it is generally difficult to identify swing voters from electoral data alone.[22] While we show that local governments are not targeting their supporters, we cannot rule out that they target swing voters instead.

[20] As before, we include the same controls used in the baseline specification and municipal fixed effects.

[21] The interested reader can refer to Table B.11 of the previous working paper version of this paper (Carozzi and Repetto 2017).

[22] For an exception in this regard see Dahlberg and Johansson (2002).

6. Conclusions

Local governments carry out a large share of public investment which, in turn, has long-standing effects on our cities and towns. In this paper we study whether the allocation of investment within cities is affected by the spatial distribution of voter support. Between 2009 and 2011, the Spanish government carried out a large scale stimulus program that transferred 12 billion Euros to municipalities to increase infrastructure spending and foster employment. This policy is well-suited to analyse how local politicians distribute resources inside municipalities.

We find that the spatial allocation of spending within municipalities is not affected by the geography of political support. This result is robust to allowing investment to have a disperse spatial impact, to focusing only on those investment projects that are more likely to yield localised benefits, and to different ways of measuring supporter bias. We therefore conclude that previous evidence of tactical distribution of resources between levels of government does not carry over when translating the analysis to groups of voters. Our finding is consistent with the notion that alignment effects are more closely related with targeting of aligned institutions (municipalities, states, districts) rather than aligned voters or supporters. Complementary results show that areas receiving an investment project experience an increase in turnout, suggesting that spending might be a way to persuade voters to participate in local elections.

Our results contribute to the still very incomplete understanding of how electoral conditions and incentives shape the allocation of investments within the city. Despite the importance of local investment on national spending, the lack of data at a sufficiently disaggregated level has hampered the study of these issues. Our paper is a first step towards uncovering how distributive politics operate at the very local level. Further understanding of the determinants of local investment decisions remains an open topic for future research.

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Appendix

Appendix A. Data sources

Municipality codes and names; population

To have a reliable list of municipality names and official municipality and province codes, we use the *INE* list of all Spanish municipalities for the years 2001-2011.

URL: http://www.ine.es/daco/daco42/codmun/codmun11/11codmunmapa.htm

Population data at the municipal level is available from 1996 onwards at the *Padrón continuo municipal de habitantes*:

URL: http://www.ine.es/dynt3/inebase/es/index.html?padre=517&dh=1

Census area maps (shapefiles)

To be able to connect electoral data (available at the census area level) and the investment projects (geolocated with latitude and longitude), we need shapefiles with the borders of each census area. Since boundaries usually change over time, we need to have updated maps for each municipal election year (2007 and 2011) before and after the *Plan E* investment program. The 2011 shapefile with all census areas is freely available at the following url:

URL: http://www.ine.es/censos2011_datos/cen11_datos_resultados_seccen.htm

We also purchased the map for 2007 directly from *INE*, which we use as a reference in all the empirical analysis. In order to be able to assign the data from the 2001 Census to the 2007 census areas, we also bought the shapefile map for 2001 from the same source.

***Plan E* Investment data**

The *Plan E* data on investment projects with geographical coordinates and amount were downloaded by hand from:

URL: http://www.seap.minhap.gob.es/fondosinversionlocal/utilidades/geolocalizacion-de-proyectos.html

and saved as a .csv directly. Each investment project comes with, among other variables, the geographical coordinates. Those coordinates are then used, together with the 2007 shapefile, in ArcGIS to overlay the investment project data (as a "point layer") with the census area polygons as described below.

Electoral data

The electoral data are at the "Mesa" level (= polling stations, within-municipality) for several municipal and national elections. Data are then aggregated at the census area level in order to have the same level of aggregation of the shapefiles and the Census data. Each census area usually contains just a handful of polling stations, so the amount of aggregation is minimal.

URL: http://www.infoelectoral.interior.es/min/areaDescarga.html?method=search

There, we downloaded electoral results for the 1999, 2003, 2007 and 2011 municipal election, plus the 2000, 2004 and 2008 national elections, both at the disaggregated "mesa" level and at the municipal level.

Those data lack information on the identity of the mayor in each year and on the corresponding party in power, so we obtain such information using data from

URL: http://www.seap.minhap.gob.es/en/web/areas/politica_local/sistema_de_informacion_local_-SIL-/datos_legislaturas_1979_2015.html

Census area data We downloaded some variables, used as controls in the empirical analysis, from the 2001 Population census directly from the *INE* website:

URL: http://www.ine.es/censo/es/inicio.jsp

We obtain population data at the census area level for 2007 and 2011 from:

URL: http://www.ine.es/jaxi/menu.do?type=pcaxis&path=/t20/e245/&file=inebase&L=0

Finally, we obtain information from Corine Land cover on the fraction of urban discontinuous terrain from:

URL: http://www.eea.europa.eu/data-and-maps/data/clc-2006-vector-data-version-6

Data restrictions

Our final dataset is based on the 2007 census areas for which we have information on the geographical boundaries (and coordinates). These areas are those that appear in the 2007 shapefile from *INE*. Of the 35,323 census areas in this dataset, we drop 5,833 belonging to municipalities with only one census area. Then, we drop municipalities where the mayor does not belong to any of the 9 largest parties, as defined in section 3 in the main text. By doing this, we lose 1,405 additional areas. Finally, we drop the municipality of “"Mañón”, because there is a conflict between the map – which has it divided in two census areas – and the electoral data, where it appears as having just one.

Regarding the projects data, the original data has 57,850 of them but 15,682 of them are incorrectly geo-located. We drop 6,574 projects that have no localised benefits, such as those related to modernization of the electronic equipment of municipal buildings or to sewage works. With the help of a research assistant, we went through all the remaining projects with incorrect geo-coding and we were able to hand-code roughly one-fifth of them. ArcGIS is used to assign all the 38,353 correctly geo-localised projects (which are points with geographical coordinates) to census areas (areas with polygon boundaries).

After this step, we have a dataset at the census area level. We replace all the *Plan E* variables (such as the dummy for receiving at least one project) with zeros if a given census area did not receive any project. In the special case in which we observe, in our sample, that the whole municipality carried out no investment projects at all, we replace all variables as missing instead. This is the case for only 28 municipalities. Given that the cost per capita variable has some large outliers, we replace as missing all observations in the top 1% of the cost per capita distribution when constructing our extensive bias measure.

Construction of the final dataset

The basis of our dataset are the 35,323 census areas in which Spain was divided as of 2007, as they appear in the INE shapefile. To assign investment projects – which come with latitude and longitude – to census areas we need information on the exact boundaries of each area, obtained from a shapefile for all 2007 census areas. Using ArcGIS 10.3.1, we overlay the point layer (that is, the dataset of geolocated project points) to the map of census areas. ArcGIS then calculates how many project points fall into each census areas, and the total cost. Finally, it saves the resulting dataset as a comma-separated values file that can be read by STATA.

The electoral data for 2007 are then directly merged using a unique census area identifier (labelled *CUSEC* in the raw data) to the main dataset. A slight complication arises when one tries to merge information for other years (such as, for instance, the 2001 Population Census data or electoral data for other years) to the 2007 census area dataset, because the boundaries of the census areas change over time. To be able to merge data from other years with the 2007 dataset, we create, for each year in which a map shapefile is available (2001 and 2011), a dataset that links the census areas boundaries to the 2007 ones. These two datasets allow us to directly link data for 2001 and 2011 to the 2007 census areas.

As an illustration on how census areas are linked across different years, consider the case in which the 2001 census area *A* is divided in two areas in 2007, *B* with surface 9/10 of the original one, and *C* with surface 1/10. Imagine that we want to have the variable "number of foreigners", only available for 2001, for all the 2007 census areas. Assume, for the sake of the example, that the number of foreigners living in area A was 100 in 2001. To assign this number to the new 2007 boundaries, we simply assume that those people are uniformly located in space. Hence, we assign 90 of them to area B and the remaining 10 to area C.[23] This simple procedure allows us to obtain a single cross-section for the 2007 census areas with several variables from other years, with the advantage of having kept the geographical boundaries fixed.

[23]For the years in which no shapefile is available, we first merge to the closest year available and then apply the described procedure.

Appendix B. Additional results

This appendix includes a set of descriptives and complementary results - in the forms of figures, tables and images - which we are referred to in the paper. Table B.1 shows descriptive statistics at the municipal level.

TABLE B.1
DESCRIPTIVE STATISTICS - MUNICIPAL LEVEL

	Mean	Std. dev.	Min	Max
PSOE mayor	0.50	0.50	0.000	1.000
PP mayor	0.33	0.47	0.000	1.000
N. of census areas	13.72	70.29	2.000	2381.000
Seats in the municipal council	14.25	4.74	9.000	57.000
Plan E spending, per capita	207.05	71.42	0.000	303.681
Unemployment in 2007	0.07	0.03	0.012	0.228
Unemployment in 2008	0.10	0.03	0.020	0.280
Unemployment in 2009	0.12	0.04	0.017	0.309
Unemployment in 2010	0.12	0.04	0.022	0.332
Unemployment in 2011	0.14	0.05	0.027	0.349
Population	19,527	89852	1099	3132463
Observations	2046			

Notes: Averages for some municipal-level characteristics of interest for the 2,046 municipalities in the sample. Electoral figures refer to the 2007 municipal election. Due to lack of municipal information on active population at the municipal level, unemployment is calculated as number of registered unemployed divided by the population aged 15-65.

TABLE B.2
DESCRIPTIVES STATISTICS FOR INVESTMENT PROJECTS

	All	FEIL	FEESL	CN
A. All projects				
Cost in million euros	12308	7933	4232	143
Participating municipalities	8097	8058	8067	713
Average cost of a project (thousand EUR)	213	260	168	69
N. of projects	57850	30566	25214	2070
B. Only correctly geocoded projects				
Cost in million euros	9376	6270	3106	
Participating municipalities	7210	6879	8023	
Average cost of a project (thousand EUR)	244	292	184	
N. of projects	38353	21460	16893	

Notes: Descriptive statistics for investment projects. Panel A uses the universe of *Plan E* projects and Panel B restricts attention to projects with correct geo-location in our sample.

Table B.2 presents descriptives for all projects and projects in our sample, respectively. The difference between the two samples corresponds to projects for which geo-coding is not available and projects which we exclude because they clearly yield no geographically precise effect

on voters (for instance, improvements to the city hall internet connection, etc.). In our sample we also drop all projects of the *CN* investment program, because it was a plan meant to distribute resources to provincial rather than municipal authorities. Likewise, we exclude projects executed by associations of municipalities as we cannot attribute a single incumbent party to these associations. We have a total of 38,353 correctly geocoded projects roughly equally divided between the two *Plan E* programs (*FEIL* and *FEESL*). Our sample of correctly geocoded projects covers 7,210 municipalities (90% of the total). The average project costs 244 thousand Euros, with projects being more costly in *FEIL* than *FEESL*. Comparing panels A and B of Table B.2 we can note that projects that are not in our sample are slightly cheaper on average.

Table B.3 presents first-stage estimates corresponding to equation 1. In the first two columns we use the whole sample and include in estimation a third-degree polynomial in the winning margin, while in the last two we restrict the sample to observations within the Calonico, Cattaneo and Titiunik (2014) optimal bandwidth and use a linear control function. Each observation is weighted by the inverse of the number of census areas in the municipality so that all municipalities have the same weight. Columns 2 and 4 also include the set of controls outlined in section 4. We observe in all columns that when *PSOE* wins a seat majority by a narrow margin there is a 30 - 38% increase in the probability of having a *PSOE* mayor. Note that this jump is similar to the one observed in figure 3 in the paper.

TABLE B.3
FIRST-STAGE REGRESSIONS

	Full sample		CCT bandwidth	
PSOE seats majority	0.312***	0.307***	0.380***	0.372***
	(0.052)	(0.052)	(0.053)	(0.053)
Controls	N	Y	N	Y
F-statistic	36.11	35.15	50.90	49.42
Obs.	28043	28031	13315	13314

Notes: The dependent variable is an indicator taking value 1 if a municipality has a *PSOE* mayor. Main independent variable of interest is a dummy taking value 1 if the *PSOE* winning margin is positive. All specifications control for the vote share distance to *PSOE* seat majority in the 2007 municipal elections. Columns 1 and 2 use the full sample and third degree polynomials, allowed to differ at either side of the threshold. Columns 3 and 4 restrict the sample to a bandwidth around the threshold estimated as in Calonico, Cattaneo and Titiunik (2014) and includes a linear control function in the winning margin, with slope allowed to differ on either side of the threshold.

Figure B.6 and table B.4 present the balance on covariates results as discussed in section 4.

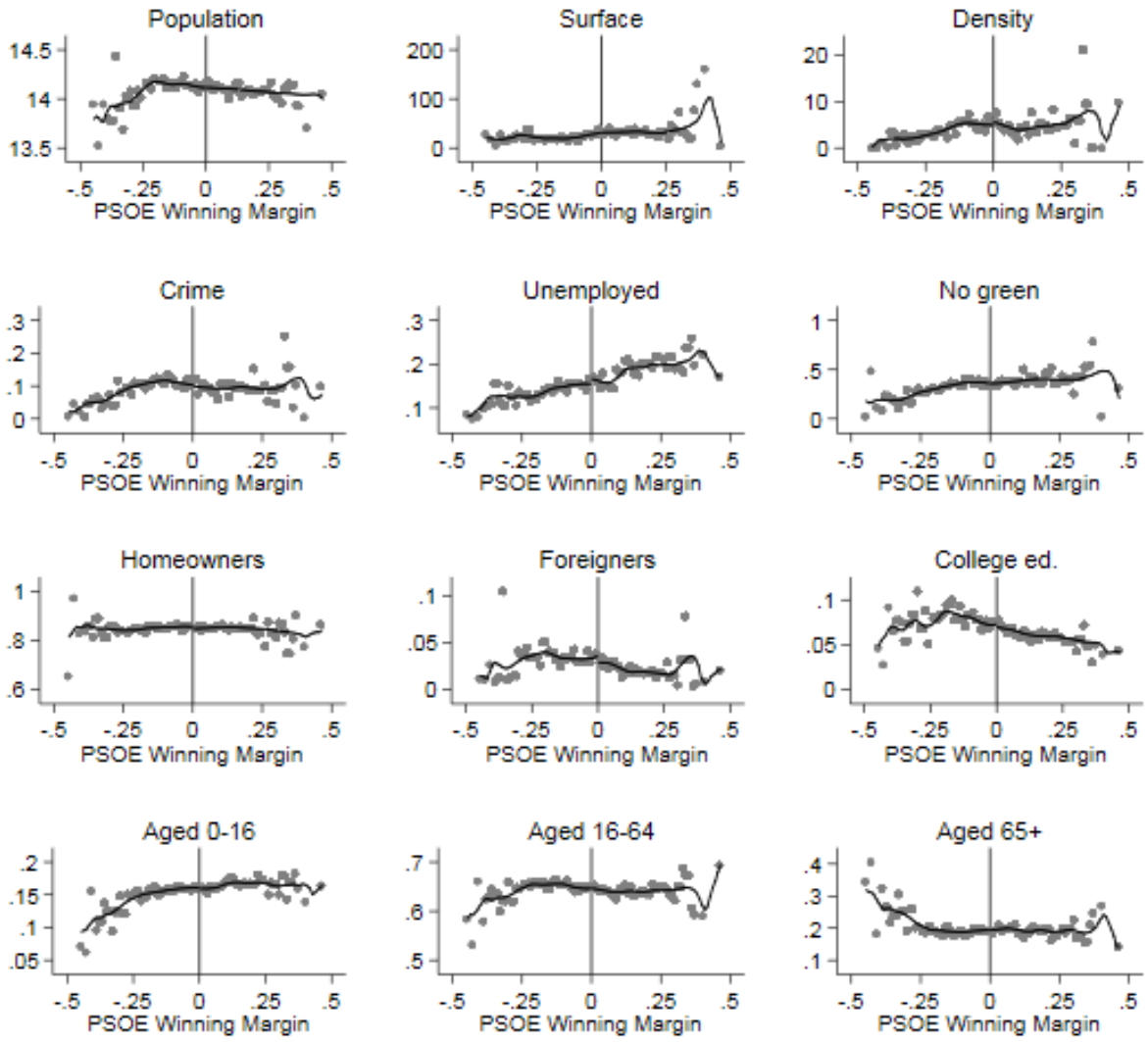
Table B.5 presents estimates regarding the electoral impact of *Plan E* projects. These are obtained using census area level regressions with municipal fixed effects. For example, Panel A presents estimates for the following OLS regression:

$$PSOEVsh_{cm}^{2011} = \beta I_{cm} + PSOEVsh_{cm}^{2008} + \alpha_m + \gamma' X_{cm} + \epsilon_{cm}$$

where c indicates census areas and m indexes municipalities. $PSOEVsh_{cm}^{yr}$ is the vote share of *PSOE* in the national elections in census area c and municipality m, measured in percentage points. I_{cm} is a measure of *Plan E* investment which can be either a project dummy

Figure B.6

Balance of covariates checks



Notes: Balancing checks for each covariate used in the RDD estimation. Dots are averages within intervals of 1% of the winning margin, calculated weighting each observation by the inverse of the number of sections in each municipality. Solid lines represent fitted values from a local polynomial smooth regression estimated with an Epanechnikov kernel and bandwidth calculated using Silverman's rule-of-thumb.

(column 1) or investment per capita (column 2), both measured at the census area level. The fixed effect α_m controls for municipal characteristics. The set of controls X_{cm} is the same as the one used in equation 2 of section 4. Finally ϵ_{cm} is an error term potentially correlated within municipalities. In this way we investigate the electoral effects of *Plan E* investments by using within municipal variation and previous electoral results. The estimates reported in panel B of table B.5 are obtained from a similar regression replacing $PSOEVsh^{yr}_{cm}$ with $Turnout^{yr}_{cm}$ which measures turnout in the corresponding municipal election (in this case 2011 and 2007, respectively). Results indicate a small but positive and significant effect of projects on electoral turnout. Figure B.7 presents these estimates alongside placebos obtained from replacing the original outcome variable $Turnout^{2011}_{cm}$ with turnout levels before the onset of *Plan E*. We find

Table B.4

Regression results for the balance of covariates

	Population	Surface	Density	Crime	Unemployed	No green
PSOE mayor	0.050	-2.386	1.864*	0.013	0.008	-0.018
	(0.040)	(5.737)	(1.090)	(0.013)	(0.012)	(0.025)
R^2	0.00	0.00	0.01	0.01	0.00	0.00
Observations	13314	13315	13314	13315	13315	13315
	Homeowners	Foreigners	College ed.	Aged 0-16	Aged 16-64	Aged 65+
PSOE mayor	-0.014	-0.003	0.004	-0.002	0.008	-0.006
	(0.010)	(0.006)	(0.005)	(0.004)	(0.006)	(0.008)
R^2	0.00	0.01	0.01	0.00	0.01	0.00
Observations	13315	13315	13315	13315	13315	13315

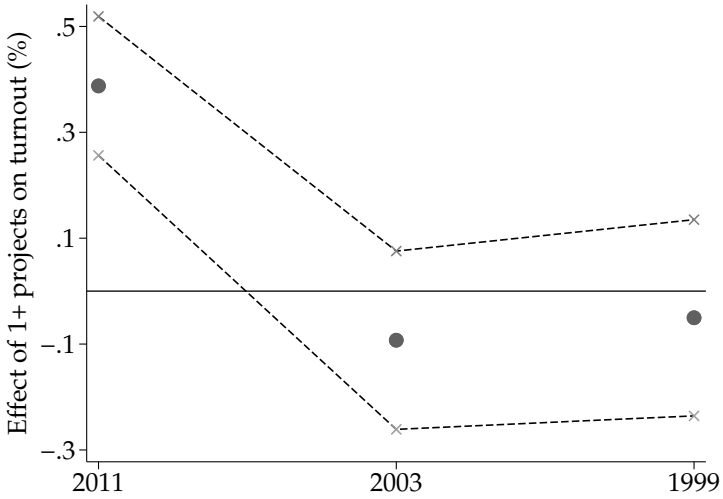
Notes: Coefficients are the estimated jumps in each covariate at the threshold of winning margin equal to zero, using a local linear regression with bandwidth equal to 9.6% at each side, chosen applying the Calonico, Cattaneo and Titiunik (2014) method on equation 2 using the extensive bias measure. Population is in logarithms, surface in km^2, density in thousands of inhabitants/km^2, and the rest of the variables are fractions at the census area level. Results using different bandwidths are analogous. S.e. clustered at the municipality level.

that in these cases the estimates are smaller in absolute value and statistically indistinguishable from 0, as expected.

Results reported in table B.6 indicate that more populated areas within a municipality receive more projects. To show this, we estimate census area level regressions of measures of investment (a project dummy and log total investment, respectively) on a municipal fixed effect, the log of population and our set of controls. The table reports the log population coefficients. For both investment measures we find strong and significant effects of population on the probability of receiving a project (column 1) and on total investment (column 2). Column 1 indicates that areas with 1% larger populations have 0.18% more probability of receiving a project. The estimate in column 2, obtained using only census areas receiving projects, show that a 1% increase in population is associated with 0.33% more spending.

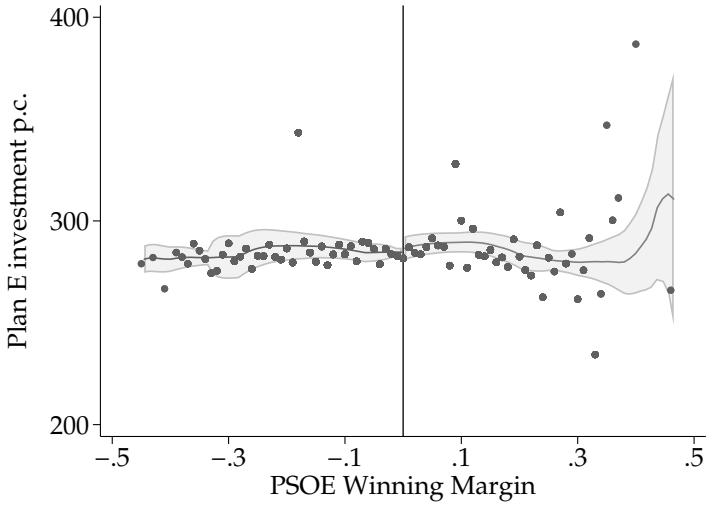
Finally, figure B.8 displays a reduced-form RDD plot using municipal *Plan E* funds per capita as our outcome variable. We can observe from the graph that there is no discontinuity in the amount of received *Plan E* funds when comparing municipalities where *PSOE* narrowly lost a majority with municipalities where *PSOE* narrowly won. We only report this reduced form graph for ease of exposition but fuzzy-RD estimates adjusting for the jump in the first stage also lead to very small and insignificant coefficients.

Figure B.7
Turnout Effect and Placebos



Notes: The figure plots the coefficients and confidence intervals of a census area level regression of turnout in the different municipal elections on a project dummy, alongside a set of controls including 2007 turnout and a municipal level fixed effect. Standard errors used to create confidence intervals are clustered at the municipal level.

Figure B.8
No Difference in *Plan E* Take-up



Notes: The vertical axis measures the amount of *Plan E* funding per capita received by a municipality. Horizontal axis measures *PSOE* Winning Margin calculated following the method outlined in section 4.1. Dots represent averages within 1% bins of the winning margin. The lines are local linear regression estimates obtained using an Epanechnikov kernel with bandwidth calculated using Silverman's rule-of-thumb.

Table B.5

Complementary Results

	(1) PSOE share 2011	(2) PSOE share 2011
A. National PSOE Vote Share		
Project 1/0	-0.038	
	(0.048)	
Inv. p.c.		-0.025
		(0.018)
PSOE share 2008	0.729***	0.729***
	(0.016)	(0.016)
Controls	FE + ctrls.	FE + ctrls.
R^2	0.94	0.94
Observations	27823	27487
	Turnout 2011	Turnout 2011
B. Turnout Effects		
Project 1/0	0.388***	
	(0.07)	
Inv. p.c.		0.113***
		(0.03)
Turnout 2007	0.309***	0.312***
	(0.02)	(0.02)
Controls	FE + ctrls.	FE + ctrls.
R^2	0.88	0.88
Observations	27880	27544

Notes: Census area level regressions including municipal fixed effects in all columns. In panel A, the outcome variable is the vote share of *PSOE* in the 2011 national elections and all specifications control for *PSOE* vote shares in the 2008 national elections (before *Plan E* took place). In panel B, the outcome variable is 2011 municipal election turnout and all specifications control for the 2007 turnout in municipal elections. Standard errors clustered at the municipal level in all specifications.

Table B.6

Project Allocation & Census Area Population

	Project 1/0	Log(Investment)
Log population (2007)	0.185***	0.334***
	(0.014)	(0.049)
Controls	FE + ctrls.	FE + ctrls.
R^2	0.33	0.26
Observations	27925	11268

Notes: Census area level regressions including municipal fixed effects in all specifications. In column 1 the dependent variable is a dummy taking value 1 if the census area received a *Plan E* project. In column 2 the dependent variable is the log of the total investment received, excluding census areas receiving no projects. Both columns include the set of controls described in section 4. Standard errors clustered at the municipal level.

Figure B.9
Examples of *Plan E* Investments

Restoration and accessibility improvement in nearby streets in the urban spaces around Eresma, Toro and Tormes streets in the municipality of Leganés, south of Madrid. The total cost of this project was € 3,200,000, financed by *Plan E* through FEIL.

Environmental adaptation and improvement in the low areas of Barrio del Villablanca, in the municipality of Almería, in Southern Spain. The total cost of this project was € 4,864,380 financed by *Plan E* through FEESL.

Figure B.10

Plan E Signboard template

Notes: Signboard template for *Plan E* projects. From top to bottom, the signboard must contain: name of the municipality, the contractor, and the project; the amount spent and the expected completion time; a *Plan E* logo; the government logo.

2013

2013/1, Sánchez-Vidal, M.; González-Val, R.; Viladecans-Marsal, E.: "Sequential city growth in the US: does age matter?"
2013/2, Hortas Rico, M.: "Sprawl, blight and the role of urban containment policies. Evidence from US cities"
2013/3, Lampón, J.F.; Cabanelas-Lorenzo, P-; Lago-Peñas, S.: "Why firms relocate their production overseas? The answer lies inside: corporate, logistic and technological determinants"
2013/4, Montolio, D.; Planells, S.: "Does tourism boost criminal activity? Evidence from a top touristic country"
2013/5, Garcia-López, M.A.; Holl, A.; Viladecans-Marsal, E.: "Suburbanization and highways: when the Romans, the Bourbons and the first cars still shape Spanish cities"
2013/6, Bosch, N.; Espasa, M.; Montolio, D.: "Should large Spanish municipalities be financially compensated? Costs and benefits of being a capital/central municipality"
2013/7, Escardíbul, J.O.; Mora, T.: "Teacher gender and student performance in mathematics. Evidence from Catalonia"
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