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Do Political Parties Matter for Local Land Use Policies?

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What is European Integration Really About? A Political Guide for Economists

Abstract

Despite interest in the impact of land use regulations on housing construction and housing prices, little is known about the drivers of these policies. The conventional wisdom holds that homeowners have an influence on restrictive local zoning. In this paper, we contend that the party controlling local government might make a major difference. We draw on data from a large sample of Spanish cities for the 2003-2007 political term and employ a regression discontinuity design to document that cities controlled by left-wing parties convert much less land from rural to urban uses than is the case in similar cities controlled by the right. The differences between governments on the two sides of the political spectrum are more pronounced in places with greater population heterogeneity and in those facing higher housing demand. We also present some results suggesting these partisan differences might ultimately impact on housing construction and housing price growth.

JEL-Code: R520.

Keywords: land use regulations, urban growth controls, political economy.

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1. Introduction

Housing construction grew at an extraordinary pace during the last economic boom. In the period 2003-2007 more than 18 million housing units were built in the US, roughly 15% of its historical record (American Housing Survey, 2009). In Spain, our case of study, growth was of a similar magnitude, with 4.3 million new housing units being built during the same period, representing 17% of the housing stock. In both cases, such growth markedly increased the area of land under development while reducing overall urban density. For instance, in the US, 80% of the units built were single-family homes. In Spain, the amount of developed land rose by more than 30%, whereas the population grew by just 12% (see www.catastro.es and www.ine.es), gradually changing the landscape to one characterized by low-density sprawl as in many areas of the US.

The acceptance or otherwise of such development varies from one stakeholder to another. Homeowners, it is claimed, dislike development because of its impact on the quality of life in the community and/or on housing values (see, for example, Brueckner and Lai, 1996; Ortalo-Magne and Prat, 2011). Environmentally sensitive citizens worry about the loss of valuable open spaces (European Environmental Agency, 2006) and about the impact of pollution and increased resource consumption (see, for example, Kahn, 2000). Renters and potential new home-buyers welcome the improvement to housing affordability brought about by such developments (Glaeser and Gyourko, 2003). Developers and/or owners of undeveloped land see development as an opportunity to increase their profits (Glaeser *et al*., 2005a; Hilber and Robert-Nicoud, 2013). The unemployed and employed in the construction and tourism industries see their possibilities of finding or retaining a job enhanced.

Little is known about how governments take into consideration this wide array of interests when determining their land use regulations. Most of the zoning literature holds to the view that it is the homeowners that control the political process (Fischel, 1985 and 2001). However, this narrow view is probably a reflection of the almost exclusive focus in the literature on zoning policies in the suburbs of US cities, where the median voter is a homeowner that commutes to work (and who, therefore, sees no job gains from such development), where population is highly homogenous, and where direct democracy regarding such issues is common. Yet, any empirical evidence in favor of this hypothesis is scarce (Dhering *et al*., 2008), suggesting the need to look elsewhere for a fuller picture. Indeed, various authors have recently provided evidence that interest groups, comprising both developers and environmentalists, might also be fairly influential (Glaeser *et al*., 2005a; Hilber and Robert-Nicoud, 2013; Solé-Ollé and Viladecans-Marsal, 2012). The role played by pro-growth coalitions was also highlighted in Molotch's classical study (1976), in which

the term 'urban growth machine' was first coined. Fischel (2001, ch.5) also recognizes the relevance of job creation motives for the zoning policies of rural areas and large cities. In these more heterogeneous communities, the role for groups other than homeowners might acquire greater importance, since political parties – known to have preferences regarding land use policies that are more closely in line with those of some of the aforementioned groups– might find it more difficult to commit themselves to the policies desired by the median voter (Ferreira and Gyourko, 2009). Such effects might be further enhanced in places where decisions depend on representative democracy, above all in multiparty systems employing proportional representation[1].In such situations, party platforms and policies can be more extreme, catering to interests regarding land use regulations that differ from those of the median voter (Schofield, 2007). Thus, eventually, the local land use regulations that are introduced might well depend on the party (or coalition) controlling local government – and, hence, on the social groups that wield most influence over them.

To the best of our knowledge, no previous studies have been undertaken to ascertain the role that political parties play in local land use regulations[2], albeit that a few do document the relevance of voter ideology for local land use policy (see, for example, Dubin *et al*., 1992; Gerber and Phillips, 2003). In a recent paper, Kahn (2011) reports that the liberal cities of California (i.e., those with a high percentage of voters registered as Democrats, or as supporters of the Green Party or the Peace and Freedom Party) do not grant as many building permits as their non-liberal counterparts. However, it should be borne in mind that these studies do not address exactly the same issue as the one that concerns us here. For instance, the finding that liberal communities impose strict regulations informs us about the preferences of the median voter, but tells us little about the specific influence of a political party. If electoral competition is strong, parties with disparate views in relation to their devising of land use policies might be forced to adapt their platforms to the preferences of the median voter. Were this to be the case, it might be that the party brand does not matter at all in the case of land use policies or, should it be found to matter, it could simply be because certain policy drivers (including voter preferences and demand shocks) are correlated with

[1] The influence of the particular institutions determining land use policies has been studied in Lubell *et al.* (2009) and Gerber and Phillips (2004 and 2005).

[2] Many papers do, of course, analyze the effects of parties on policies at the federal (e.g., Lee *et al*., 2004, Lee, 2008) and state levels (e.g., Plotnick and Winters, 1985, Garand, 1988, and Erickson *et al*., 1989), while there are just a few recent papers on local fiscal policies (see Ferreira and Gyourko, 2009, and Gerber and Hopkins, 2011, for the US, and Pettersson-Lidbom, 2008, and Folke, 2011, for Sweden, and Freier and Odendahl, 2011, for Germany). The conclusion of the US studies is that parties do not matter greatly at the local level, although they might have a more prominent role in more heterogeneous places (Ferreira and Gyourko, 2009) and as regards spending on services for which responsibilities do not overlap with the state (Gerber and Hopkins, 2011). The European studies report a more relevant role for parties, both as regards local fiscal policy in general and other local policies (including, for example, environmental protection and immigration policy).

party brand (e.g., left-wing controlled local governments tend to have a higher percentage of left-wing core supporters that have more extreme preferences regarding land use policies).

This makes the identification of the effects of a particular political party on land use policies a far from straightforward task. To tackle the problem we follow a number of recent studies that adopt a regression discontinuity design to identify the effects of political parties on policies (see, for example, Lee *et al.*, 2004; Lee, 2008). Intuitively, the method consists of regressing the outcome variable of interest on a dummy indicating whether a given party won more than 50% of the vote (and therefore holds incumbency) controlling for a flexible function of the vote share. Pettersson-Lidbom (2008), Ferreira and Gyourko (2009) and Gerber and Hopkins (2011) use this methodology to analyze the effect on a broad range of local fiscal policies, although they do not specifically study land use regulations[3].

Here, we adapt this methodology to the peculiarities of the representative democratic system used at the local level in Spain. We have to deal with the fact that many local governments in Spain are coalitions and with the peculiarity of the method used to allocate seats (namely, the d'Hondt rule), which generates many possible thresholds at which one more vote can give a party an additional seat. Specifically, we use the discontinuity at the 50% seat threshold and focus on close elections, defined as those in which the left-wing ideological bloc (i.e., the groups of parties classified as left-wing) just won/lost in terms of the number of votes needed to secure a majority of seats in the local council. In justifying this procedure we show that most government coalitions in Spain are formed along ideological lines – i.e., majorities secured by a left-wing ideological bloc tend to generate left-wing controlled governments, defined as those led by a left-wing mayor. This method is then used to estimate the effect of left-wing controlled local governments on the amount of new land assigned for development during a term-of-office, which is the primary land use policy decision that can be taken by Spanish local governments (see also Solé-Ollé and Viladecans-Marsal, 2012). The decision (and our variable) is entirely at the discretion of the local government team in office and does not reflect policy decisions taken by previous administrations. The use of this variable overcomes many problems encountered in earlier analyses, which were unable to match a land use policy variable with the political traits of a given government (Bates and Santerre, 1994 and 2001; Evenson and Wheaton, 2003).

Our main result suggests that party brand is relevant. During the 2003-2007 term-of-office, the amount of land assigned for development by left-wing governments was approximately 65% less than that assigned by right-wing governments. In order to shed

[3] Regression discontinuity design has been used in evaluating a wide range of policies (see Imbens and Lemieux, 2008, and Lee and Lemieux, 2010, for recent surveys). Recently, it has also been applied to the evaluation of the effects of land use policies (see Turner *et al*., 2011, and Cyrus *et al*., 2011).

further light on this finding, we repeated the analysis by sub-samples and found that the effects were most marked in places in which population heterogeneity was greatest. For instance, the percentage was higher in less fragmented local areas (i.e., those with few municipalities relative to the population they hold) and in places with a high level of social fragmentation (i.e., where neither pro-growth nor anti-growth social groups represent the bulk of the population). We also found that the differences between right- and left-wing land-use policies were more marked in areas with a high construction growth rate.

These results might also be relevant to the literature studying the impact of land use regulations on housing construction (see, e.g., Cunningham, 2007), housing prices (Glaeser *et al*., 2005b; Glaeser and Ward, 2006), and the size of the housing bubble (Glaeser *et al*., 2008; Huang and Tang, 2012)[4]. We also show in the paper that partisan differences in land use policies ultimately translate into differences housing construction and in housing price growth. In this case, however, the effects are materialized with some delay: partisan control of a local government during a given term-of-office produces no statistically-significant contemporaneous effects on construction and prices, the effect materializing during the following term. In any case, the results do show that policy decisions arising from ideological differences might have effects on housing market outcomes.

The rest of the paper is organized as follows. In the next section we briefly discuss why, and under which particular circumstances, different political parties can be expected to implement different land use policies. In section three, we present institutional details about our case study area, Spain: the organization of local government, the system of land use regulation, and the position adopted by Spain's political parties on this issue. The empirical methodology and the data used are outlined in section four. Section five presents the results and section six concludes.

2. Theoretical discussion: why and when should parties matter?

In this section we discuss under which conditions we should expect land use policies (and in particular, the amount of land converted from rural to urban uses, which we argue is the main policy decision in Spain) to depend on party brand . The setting we have in mind is one of a municipality whose citizen-voters have preferences regarding the expansion of the amount of developable land (which we label as Δv) distributed on a line that goes from zero (Δv=0) to a maximum value needed to accommodate all future housing projects (Δv=Δv^{Max})[5]. To simplify,

[4] Other papers have recently focused on the effects of land-use regulations on urban sprawl (see Brueckner and Helsey, 2011) and on the pattern of land uses (e.g., Konishi, 2013).

[5] Citizens do not care for this policy variable per se, but just because they think they have an impact on outcomes that affect their utility level, as housing prices, environmental quality, taxes or jobs.

we can assume that there are two political parties, left-wing vs. right-wing, representing voters that dislike/like growth. The left-wing/right-wing party prefers an amount of development lower/higher than the one preferred by the median voter ($0<\Delta v^{Left}<\Delta v^{\text{Med}}<\Delta v^{\text{Right}}<\Delta v^{\text{Max}}$). These two parties concur to the election with a platform promising to allow a given amount of development during the next term-of-office.

Dating back to Black (1958) and Downs (1957), many formal models of two-party electoral competition have predicted convergence towards the policy desired by the median voter or, more generally, towards the center of the political spectrum. In our context, these models would thus suggest that the amount of land allowed to be developed by the left- and right-wing parties (which we label as Δu) would be the same and equal to the amount preferred by the median voters ($\Delta u^{Left}=\Delta v^{\text{Med}}=\Delta u^{\text{Right}}$). As this prediction has been contested by many empirical studies[6] (for policies other than land-use regulations), recent theoretical work has tried to reconcile these findings. First, Alesina (1988) and Besley and Coate (1997) suggest that the lack of credibility of campaign promises accounts for the discrepancies between a party's platform and the policies it subsequently implements. Second, strategic extremism might also generate divergent policies (e.g., Glaeser *et al.,* 2005b) with a party proposing more extreme platforms in order to obtain more voters among its core supporters, either through an increase in turnout or through resource mobilization. These models would predict that the amount of land allowed to be developed would lie in between the one preferred by the party and the one preferred by the median voter ($\Delta v^{Left}<\Delta u^{Left}<\Delta v^{\text{Med}}$ & $\Delta v^{\text{Med}}<\Delta u^{\text{Right}}<\Delta v^{\text{Right}}$). Similar or even stronger divergence of policy platforms could result in the context of multi-party elections with voters caring about the quality of candidates, divergence in policy platforms can occur whenever there are relevant centrifugal forces (e.g., Schofield, 2007)[7]. This is the institutional setting that most resembles the Spanish case.

Some authors are skeptical about the relevance of the policy-divergence prediction at the local level. First, in line with Tiebout (1956), individuals could be assumed to choose their municipality of residence according to their preferences for local public goods, at least within a local labor market. The outcome of this process would be a sorting of individuals into more homogeneous communities. Then, with lower intra-municipal demand heterogeneity, political discrepancies should be much smaller. Similarly, with less heterogeneity, the

[6] Many papers report partisan policy differences at the federal (e.g., Lee *et al*., 2004, and Lee, 2008) and state levels (e.g., Plotnick and Winters, 1985, Garand, 1988, and Erickson *et al*., 1989).

[7] For instance, these centrifugal forces increase in strength as voters' preferred policies become more heterogeneous and the differences between the perceived qualities of the candidates become more marked. These models clearly predict that party positions during the campaign can disseminate along a principal policy axis. Post-election coalition bargaining between the parties determines the final policy implemented, lying at some point between the positions of the parties forming the coalition. Several empirical analyses corroborate this theory, especially in the case of proportional electoral laws (see, e.g., Schofield and Sened, 2006).

promises of politicians should be more credible and the ability to target core supporters with extreme preferences should be lower (see, for example, Ferreira and Gyourko, 2009). The relevance of this line of reasoning might be limited by the (relatively) low degree of residential mobility in Spain, by the fact that the majority of people in certain areas lives and works in the same place, and by the substantial intra-city heterogeneity in our sample.

Second, it could also be argued that decisions related to the provision of local public services are of a largely technical nature and do not involve policy preferences (i.e., 'there is no right- or left-wing way of picking up garbage') and that policy differences are more likely to be found in areas related to redistribution or to moral issues, which are the responsibility of higher tiers of government (see Gerber and Hopkins, 2011). Moreover, the claim might be made that local land use policies are not (or, at least, should not be) a partisan issue, since with proper side payments the policy would provide benefits for all social groups (see Fischel, 1985). However, once again, heterogeneity hinders the achievement of such deals. Informal evidence suggests that in Spain there is a great deal of ideological controversy over these policies (see next section). So, in these two cases, parties would not matter simply because there are no discrepancies in the desired amount of development ($\Delta v^{Left}=\Delta v^{\text{Med}}=\Delta v^{\text{Right}}$).

Third, any partisan discrepancy between land use policies in a specific municipality might depend on whether the issue acquires relevance during the electoral campaign. Unlike fiscal matters, which are always important, the salience of local land use policies and, especially, the amendment of land use plans to allow for more development (the policy instrument we focus on here) depend on the situation in which the housing market finds itself. Consider, for example, a situation in which a municipality is undergoing a substantial demand shock, with the possibility that the amount of land made available for development will not be enough to accommodate the portfolio of existing housing projects. In this case, the platforms of the different parties *could* be very different, the left-wing party opposing and the right favoring the amendment of the plan in order to convert more land for development[8]. However, in a municipality with low housing demand (i.e., when $\Delta v^{\text{Max}}<\Delta v^{\text{Right}}$), the right-wing party will have to adhere to a policy platform that proposes much less development than it would have preferred in an unconstrained situation. This would move the platform of the right-wing party to the center, thereby attracting many votes while forcing the left-wing party to converge to the center too. High housing demand can thus be expected to lead to a higher degree of divergence in the policies of left- and right-wing parties.

This revision of the aforementioned theories generates expectations as to the possible partisan differences that might appear in relation to Spain's local land use policies. First,

[8] Next section explains why these might be the preferences of the left- and right-wing parties in Spain.

there are expectations that partisan differences might be stronger in Spain than in the US, given the country's electoral institutions (i.e., multiparty proportional elections) and the lower degree of residential mobility. Second, in municipalities located in fragmented local labor markets (where residential choice is enhanced) and/or with lower population heterogeneity, partisan differences should be smaller. Finally, differences should be greater in periods and/or areas undergoing strong housing demand shocks.

3. Institutional setting

3.1. Spain's local government

Municipalities are the main tier of local government in Spain, there being more than 8,000 local government authorities, most of which are quite small. Since 1979, the members of these municipal councils (comprising between 9 and 57 representatives in our sample, depending on population size) have been elected. Elections are now held every four years simultaneously throughout all the municipalities. Voters choose between various party lists, which being closed means that no preferences regarding the ranking of the names on these lists can be expressed. The electoral system is proportional and seats are allocated according to the d'Hondt rule (more details in section 4.1). In most municipalities, several right- and left-wing parties run separately, with pre-election coalitions being very rare. Some of these parties adopt more central platforms while others are more extreme, particularly in the case of land use regulations (see section 3.2 for details). Most of the candidates run under regional or national party brands. Local parties are also abundant, although they get the mayoralty in just a handful of cases. Many of these local parties define themselves as 'green' or progressive, meaning that it will be possible to classify them according to ideology. Others define themselves as 'independents' or 'citizen's groups', being probably more centrists (see section 4.3).

The mayor is then elected by a majority of the council (see Colomer, 1995). A substantial proportion of governments are coalitions (around 30% during the term we analyze here), formed most of the times along ideological lines. This rule, however, is not always respected, especially in small municipalities, where other considerations (e.g., popular demand to replace bad incumbents, personal relationships between party bosses) might matter more than ideological closeness. The council operates as a small representative democracy, and has to reach a majority vote to pass the initiatives and regulations proposed by the mayor, who acts as the agenda-setter. The discipline enforced by Spain's party system means that the chances of amending the mayor's proposals are quite low for mayors controlling a majority of the seats. In the case of multi-party coalitions, the impossibility of calling an election before the end of the term provides an incentive to adhere to the initial coalition agreement.

3.2. Local land use policies

Land use regulations in Spain are controlled by a very detailed, rigid system (Riera *et al*., 1991), although they do not differ greatly from the zoning regulations operating in various parts of the US A key characteristic of the Spanish system is that, although an individual might own the land, the government is empowered to control and implement all processes of urban development. Landowners are not permitted to develop their land without the prior agreement of the local administration. It is not simply that they need a building license: before reaching this step, the government must have declared the land 'developable' and have precisely defined the conditions for such development. The main tool that the government uses to do this is its urban plan. Thus, land use planning in Spain is essentially a municipal responsibility. There are more than 8,000 municipalities, so the system is highly fragmented.

Municipalities draw up a 'General Plan', which provides a three-way land classification: *built-up land*, *developable land* (the areas of the community where future development is allowed), and *non-developable land* (the rest of the territory – agrarian and other uses, where the development process is strictly prohibited, at least until a new plan is approved). In theory, the 'General Plan' has to be updated every eight years, but the land classification can be quite easily modified before that date. The amendment plan, known as a 'Partial Plan', is also a legally binding document. The amount of *developable land* can be considered the main land use policy instrument in the hands of the local government, and is the variable we will analyze in the paper. Of course, the plan includes very detailed regulations regarding many other aspects: land zoning (residential, commercial, industrial), floor-to-area ratios, setting aside of land for streets, green spaces and public facilities, etc. While it would be of great interest to analyze these other regulatory dimensions, no data are available to measure them.

3.3. Political parties and land use

Most of the elected members of Spain's local councils run as members of either national or regional parties. During the 2003-2007 term (the focus of our empirical analysis), in our sample (see next section), just 7% of the seats and 5% of the mayoral offices were held by local parties. The two main national parties (i.e., the left-wing 'Partido Socialista Obrero Español', PSOE, and the right-wing 'Partido Popular', PP) accounted for 71% and 76% of the mayoral offices and seats, respectively. The main party was the PSOE, providing 46% of the mayors and occupying 41% of the seats. The PP provided 34% of mayors and 35% of seats. Other left-wing parties accounted for 7% of mayors and 10% of seats and several regionally based right-wing parties provided the remaining mayors (13%) and seats (14%).[9]

[9] On the left, the other main party is the former communists, 'Izquierda Unida', IU, but there are also some

The parties on the left and right of the political spectrum hold very different views as to how land use policies should be designed. These differences can be documented by looking at the party manifestos of these parties. Before the local elections, all nationally or regionally based parties launch a common party manifesto for the whole country (or region), which presents the guidelines of the party programs in each municipality (the so-called 'Programa Marco'). In recent elections, much attention has been devoted to environmental and other problems caused by excessive growth and urban sprawl. The proposals included in the manifestos of the main national left-wing parties (PSOE and IU) are illustrative of the emphasis placed on restricting urban growth. For example, the PSOE program proposes[10]:

> "To establish limits to urban growth (…) based on the real and potential economic and demographic demand in the city, on the capacity to absorb growth, on the stock and capacity of existing infrastructure, and on the natural environment."
>
> "To shift some land-use responsibilities to the regional government, which should introduce supra-municipal zoning plans, establishing criteria and reasonable limits to the urban development conducted by local governments."

The program of the former communist party, IU, likewise includes a number of proposals related to land use policies, concerned primarily with the protection of the environment[11]:

> "To promote a compact city as opposed to a diffuse city. To avoid the generation of isolated areas of development. Any new developments must be adjacent to urban areas that are already well consolidated."
>
> "To preserve non-developable land in order to protect the environment."
>
> "To create green belts surrounding the city, combining parks and agricultural lands."

The programs of both parties include many other proposals related to urban regulation in specific sections concerning environmental issues and public transportation. It should be noted that green parties are marginal to Spanish politics, and that left-wing parties (and especially IU) tend to monopolize this issue. The programs of these two parties also include several proposals for dealing with the housing affordability crisis. For example, the PSOE proposed the reservation of 25% of all developed land for social housing while IU proposed the public provision of rental social housing, contrasting this solution to affordability with the alternative route of providing housing through the market. Note that these parties never propose to make housing more affordable by allowing more land to be developed. The programs of the other left-wing parties include similar proposals, lying somewhere between those of the PSOE and IU. In general, it could be said that that the discourse of Spain's left-

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minor left-wing regional parties. On the right the most important party is 'Convergencia i Unió', CiU, in Catalonia.

[10] PSOE (2006): "Para una nueva política urbanística y del territorio", Programa Marco Elecciones Municipales 2007, http://www.psoe.es/organizacion/docs/454856/page/programa-marco-elecciones-municipales-2007.html

[11] http://izquierdaa-unida.es/sites/default/files/doc/Programa_Marco_Municipal.pdf

wing parties tend to vilify urban growth while ruling out any relationship between an increased provision of urban land (or the easing of regulatory constraints, in general) and housing affordability. This discussion suggests that it is quite reasonable to expect that these parties will tend to restrict the growth in the amount of *developable land*, the variable we use, and that parties located far on the left-wing of the political arena (i.e., IU) will enact even more restrictive land use policies than more moderate left-wing parties (i.e., PSOE).

This is in marked contrast with the position taken by right-wing parties and, especially, with that adopted by the PP. The local manifesto of the country's leading right-wing party does not include any specific proposals related to the containment of urban growth. It does, however, include a couple of proposals (and it is the only big party to do so) related to easing regulatory constraints[12]:

> "To improve and simplify the process of urban development."
>
> "To promote the speedy completion of urban developments."

When the PP was elected to lead the central government (1996-2004), it made several attempts at liberalizing the regional regulatory framework. Although it is debatable whether this legislation had any influence on local land use policies, its mere existence should be seen as evidence of the attitude of this party to this issue. In general, therefore, the discourse of the PP emphasizes the virtues of the deregulation of the land market as a means of improving housing affordability. Some of the other right-wing parties also adhere to this view, while others are more moderate, but they are generally in favor of urban planning in order to minimize the adverse impacts of growth[13]. Politically, therefore, this group can be considered as lying somewhere between the PP and the PSOE. Therefore, according to this description, we expect that parties located farther on the right (i.e., the PP) will tend to expand more the amount of developable land, while centrist right-wing parties will be moderately expansionist.

4. Empirical analysis

4.1. Empirical design

OLS *with controls*. As a first approach, we estimate the effect of left-wing governments on land policies using OLS, controlling for a set of covariates and including area fixed effects:

$$\Delta u_{ij} = \alpha\, dLeft_i + X_i^{'}\,\beta + f_j + \varepsilon_{ij} \qquad (1)$$

where Δu is the increase in the amount of land placed under development during the term-of-office (i.e. the amount of land converted from rural to urban uses) in municipality *i* located in

[12] http://www.elpais.com/elpaismedia/ultimahora/media/201105/05/espana/elpepunac_7_Pes_PDF.pdf

[13] See, e.g. the local manifesto of the main right-wing party in Catalonia, CiU, http://ciu.cat/ media/55510.pdf.

area *j*. The dummy *dLeft* is equal to one in the case of a left-wing government and zero in the case of a right-wing government. The vector X includes control variables measuring influences on local land use decisions, related either to the intensity of the housing demand shock experienced by each municipality during the period or to the preferences of the resident population for (or against) growth. We describe these variables in detail in the next section. f_j are local area fixed effects, one for each of the urban areas identified and also one for each of the rural sections in each Spanish province. These fixed effects control for any omitted influences on land policies (e.g., economic cycle, area-wide amenities) that are common to the municipalities located in the same local area.

One advantage of this approach over previous methods reported in the literature (see, for example, Bates and Santerre, 1994 and 2001, Evenson and Wheaton, 2003) is that the dependent variable can be precisely matched to the particular government responsible for the policy at that time. Its drawback, however, is the possibility that certain influences on land policy that are correlated with the partisan identity of the local government remain omitted. For instance, it might well be the case that pro-growth residents are concentrated in certain municipalities of the urban area and so tend to vote for right-leaning parties. It might also be the case that places affected by municipality-specific demand shocks during the period analyzed turn to the right in order to facilitate the development projects being implemented. In both instances, failure to account appropriately for the residents' ideology (or for the intensity of the housing demand shock) would bias the *dLeft* coefficient.

Regression discontinuity. To deal with the omitted variables problem a number of papers have recently adopted the close-race regression discontinuity (RD) design framework (e.g. Lee *et al*., 2004; Lee, 2008; Pettersson-Lidbom, 2008; Ferreira and Gyourko, 2009; Albouy, 2013; Folke, 2011; Gerber and Hopkins, 2011). The idea underpinning this methodology is that elections won by a given party by a narrow margin are very similar to the elections lost by that party by a narrow margin. Thus, by focusing on close-races, the RD design generates quasi-experimental estimates of the effects of interest (see Hahn *et al.*, 2001). In a recent survey, Green *et al.* (2009) show that RD designs are comparable in their accuracy to experimental studies.

However, the application of this methodology is not straightforward in our case. In Spain, the proportional representation system used at local elections means that it is less evident that the partisan control of the government changes at a given vote threshold. Firstly, the rule used to allocate seats generates many possible thresholds at which an additional vote can bring a party one more seat. Briefly, for each party obtaining more than 5% of the vote, the d'Hondt rule computes a series of 'comparison numbers' by successively dividing its

votes by 1, 2, 3, 4, etc. The 'comparison numbers' of all parties are then ranked and a given number of seats allocated to the parties on the basis of this ranking (see the Appendix for an example illustrating the application of the d'Hondt rule). For each party's marginal seat, there are an additional number of votes that need to be won in order to gain an extra seat (or which must not be lost in order to hold on to this seat). As such, each party and each seat has a specific vote threshold. Secondly, in a non-trivial proportion of municipalities no party has more than 50% of the seats, the mayor being elected by a coalition of parties. There is thus no straight relationship between the number of seats held by a party or group of parties and their control of local government.

To deal with these difficulties we proceed in two steps. Firstly, we are able to document that most government coalitions (although not all of them) are formed along ideological lines: majorities of seats held by left-wing parties tend to generate left-wing controlled governments. This allows us to use the discontinuity at the 50% seat threshold, and so consider as close elections those in which the left-wing ideological bloc has won/lost by just one seat. By so doing, we are comparing two potential ideologically connected coalitions (i.e., left-wing vs. right-wing) with a seat difference of just one seat[14]. For this procedure to be appropriate it must be true that ideology is a powerful driver of coalition formation at the local level. Empirically, this seems to be the case, since having a majority of seats by one ideological bloc of parties is a very strong predictor of the ideological placement of the mayor (see section 5.1). Also, anecdotal evidence on coalition formation in Spain seems to support this claim. As we explained, most of the candidates run under regional or national party brands, and so there is a tendency of ideological coalitions holding at the regional level to reproduce at the lower level. National and regional politics in Spain is highly ideologically polarized, meaning that coalitions supporting the central or the regional president are most of the time formed along ideological lines. It is true, however, that at the local level, other more idiosyncratic factors might be important enough to impede the formation of an ideologically-connected coalition (e.g., personal relationships, historical disagreements, need to replace a bad incumbent, etc.).

In any case, these departures form the ideological motive of coalition formation can be handled by our empirical methodology. We will use a 'fuzzy' RD design, allowing the jump in the probability of having a left-wing government at the 50% seat threshold to be lower than one (see Van der Klauw, 2002, and Lee and Lemieux, 2011). Since the probability of treatment jumps by less than one at the threshold, the jump in the outcome variable (e.g., Δu)

[14] Although in theory we might compare the actual governing coalition with a hypothetical one, this procedure could be problematic as the formation of a coalition might become more plausible closer to the threshold. This could generate a discontinuity in the forcing variable that could invalidate the design.

at this point can no longer be interpreted as an average treatment effect. However, the treatment effect can be recovered either by dividing the jump in the outcome variable by the jump in the probability of treatment or by estimating the effect of party control by 2SLS, using the threshold dummy as an instrument for party control. As in any 2SLS, it is crucial a powerful first-stage, something that in our cases requires that having a majority of left-wing seats is a good predictor of having a left-wing mayor. As we already said, we will show that this is the case.

Secondly, note that elections which are close in terms of seats (-1 or +1 seats from a seat majority) are not necessarily that close in terms of number of votes. It can happen either that the ideological bloc holding the majority of seats get this last seat (the +1 one) either by just a few votes or by many more, being even close to get an additional seat (the +2 one). This means that we should take into account how many votes the party holding this marginal seat would need to lose it. In our context, close-elections will be precisely those in which a few votes are needed to move this marginal seat from one bloc to the other. Whether that marginal party had one vote more or less can be considered a random event, and this is why municipalities located close to each side of this threshold can be treated as being similar. The difference with a standard RDD is that this vote distance has to be computed. In the paper we develop method for computing such number this distance which takes into account the specificities of the 'd'Hondt' rule. The details of the method and the assumptions underlying the calculation are provided in section 4.3 and in the Appendix. This vote distance variable is then used as the forcing variable in our RDD analysis. So, instead of controlling for the non-linear distance in seats to the seat majority threshold, we are to control for the distance in votes to seat majority.

Once this distance has been computed, the reduced-form equation used to estimate the effect of party identity on local land supply can be expressed as:

$$\Delta u_i = \lambda\, d(\textit{Left seats} > \textit{Right seats})_i + f(\%\,\textit{Votes to left - wing majority})_i + \upsilon_i \qquad (2)$$

where *d*(*Left seats > Right seats*) is a dummy equal to one if the left-wing bloc has more seats than its right-wing counterpart and, thus, defines the threshold, and *f*(% *Votes to left-wing majority*) is a non-linear function (e.g., a polynomial or a locally weighted regression) of the distance in votes to the change to a left-wing bloc seat majority, fitted separately to both sides of the threshold. Alternatively, the following equation could be estimated by 2SLS:

$$\Delta u_i = \delta\, dLeft_i + g(\%\,\textit{Votes to left - wing majority})_i + \xi_i \qquad (3)$$

using *d*(*Left seats > Right seats*) as the instrument for *dLeft.* The δ coefficient is a 'Local Average Treatment Effect' (LATE). The first-stage equation is as follows:

$$dLeft_i = \gamma\, d(Left\ seats > Right\ seats)_i + h(\%\ Votes\ to\ left\text{ - }wing\ majority)_i + \omega_i \qquad (4)$$

where $g(\bullet)$ and $h(\bullet)$ are also non-linear functions of the distance in votes to seat majority. If the order of the polynomials used is the same, then the LATE can also be obtained as the ratio between the reduced form coefficient and the discontinuity estimated in the first-stage (i.e., $\delta=\lambda/\gamma$).

4.2. Econometrics

The estimation of the OLS equation with controls is straightforward. The estimation of the RD equation with close elections requires the taking of various methodological decisions into account. First, our main estimates use the whole sample and controls for a flexible polynomial. We explicitly test for the optimal order of the polynomial using the Akaike information criteria. This method has the advantage of using all the observations and, thus, of improving the efficiency of the estimator. However, by not restricting the bandwidth to a vicinity of the threshold we run the risk that some extreme observations may have an influence on the estimated effect. In our case, moreover, there is an additional problem. As we show in the next section, besides the vote discontinuity that determines that gaining the last seat gives a majority, there are also the discontinuities that determine the allocation of the infra-marginal seats. By using the whole sample, the estimated polynomial relies on information that overlaps with the areas surrounding these other discontinuities. We consider this not to be an excessively grave problem since, as we show below, the increase in the number of seats below the one which finally gives the majority of seats has a very small impact on the probability of controlling government. Despite this, we also present results for a restricted bandwidth. The optimal bandwidth – computed following the procedure proposed in Imbens and Kalyanaraman (2009) – was found to be around 25%. So, following the recommendation made by Lee and Lemieux (2010), we also present the results for the optimal and half optimal bandwidth, using in this case a locally weighted regression as a control. The half optimal bandwidth is somewhat smaller than the maximum vote distance for the sample of close elections (i.e., where the distance to seat majority in terms of seats is either -1 or +1). This constitutes, therefore, a way of checking that our results are not influenced by the use of a bandwidth that overlaps with other (minor) discontinuities.

Second, in order to show that there is a valid case for the RD design proposed, we verify the discontinuity in the treatment probability. We examine the discontinuity graphically and we estimate the jump in the probability of treatment using the whole sample and a flexible polynomial and the reduced bandwidths with a locally weighted regression. Third, we also check the continuity of the forcing variable around the threshold by looking at

the histogram, as well as by using a more formal test (see McCrary, 2008). The continuity test is a means of discarding the manipulation of the forcing variable, a problem that some authors suggest can occur in close-election RD designs (Caughey and Sekhon, 2011). With the same purpose in mind, we also test for the continuity of the pre-determined covariates. Finally, we present the results both without controls and controlling for the same covariates as those used in the OLS analysis.

4.3.- Data

Sample. We carried out our main analysis using data from a sample of 2112 Spanish municipalities for the 2003-07 term-of-office. These years coincided with the peak in the last housing boom, a period in which the conflict between pro- and anti-growth groups was particularly intense and, hence, the perfect setting for the testing of our hypothesis[15]. Although our land use data are available on a yearly basis, we decided to use a long time difference. The dependent variable is, therefore, the increase in developable land between 2003 and 2007, and the control variables refer to the beginning of the period. There are several reasons for this choice. First, political variables (e.g., *dLeft*) can only be measured once, which is when an election takes place. This means that there is no real statistical gain to be made in using yearly data. Second, the dependent variable does not change every year; developable land only changes when a new urban plan is passed, and this is a fairly rare occurrence, happening more frequently when the real estate sector is booming. Thus, by aggregating the data over the term we considerably reduce the number of censored observations in our sample. This helps to reduce the volatility of the data, which is crucial for improving the efficiency of the estimates.

[Table 1 about here]

The eventual sample of 2,112 municipalities reflects the availability of our data. Spain has about 8,000 municipalities, but most of them are small (i.e., 90% have fewer than 1,000 residents). The database providing information on land use categories covers the whole of Spain, but some of the other databases used are restricted to municipalities with over 1,000 inhabitants, which means that the smallest municipalities have been eliminated from our sample. We have also eliminated from our sample those municipalities for which we either lacked political data or for which the data were not reliable. We believe the final sample to be

[15] As was explained in section two, when housing demand is low, right-wing parties end up presenting platforms proposing less development than perhaps they would prefer (and so their policy is more in line with the preferences of the median voter). This forces left-wing parties to converge to the position held by the median voter. As such, differences in the policies implemented by right- and left-wing parties are expected to occur only when demand shocks are sufficiently high.

representative of the whole population[16]. Eventually, because of lack of data, we will use also the subsample of 252 municipalities larger than 25,000 residents. This subsample is obviously different in many dimensions to the whole population and thus we can not claim that the results can be generalized.

Land policies. The data used to measure the amount of developable land are taken from the Spanish property assessment agency (*Dirección General del Catastro*) and are derived as a by-product of the assessment process that this agency undertakes on all properties in the country. Although the values of properties are only reassessed from time to time, the up-date in the traits of each property (and so its classification as developed, developable but vacant, or non-developable) is conducted yearly. This is the only statistical source of data covering the whole of Spain that can be used to measure the land use category of undeveloped land plots. Note that GIS data (e.g., coming from the *Corine Land Cover* project, Ministerio de Fomento, 2006) do not help much in this respect, because they only measure what can be seen (already developed land) not what has been approved by the local government but does not yet physically exist (land which may be developed).

We will also present some results using other dependent variables: the growth in developed land and in housing prices over the same period. Data on developed land comes also from the Spanish property assessment agency, and is available for the same sample of municipalities. Data on housing prices is provided by the Spanish government (Ministerio de Fomento) and comes from private assessment firms. The main drawback is that the government only discloses the information for the municipalities larger than 25,000 residents. Another problem is that the information provided is just the average price per m^2 for all the transactions, making thus impossible to account for any kind of heterogeneity. All of this means that the results on housing prices should be taken very cautiously.

Party classification. We have information on the number of votes and seats obtained by each party at the 2003 local elections. We also know the party identity of the mayor during the 2003-2007 political term. We classified the parties in five groups: Left-Left, Center-Left, Center-Right and Right-Right and Local parties. Based on informal evidence regarding the position adopted by each party on matters relating to land use regulations (see section 3.3), we classified the main left-wing party (PSOE) as Center-Left and the main right-wing one (PP) as Right-Right. The former communist party (IU) was classified as Left-Left; also in this group we included many small or even local extreme left-wing and green parties and some of

[16] In the Appendix we provide descriptive statistics for the whole population of Spanish municipalities and for different subsamples (municipalities larger than 1,000 residents, larger than 1,000 and with all information available). The restricted sample with more than 1,000 inhabitants ends up being very similar to the unrestricted one.

the left-wing regional parties (e.g., BNG, ERC). The Center-Right group includes the right-wing regional parties (e.g., CiU, UV). Local independent parties were either included in the Center-Right group or excluded from the analysis. The justification for this decision is that we know that local left-wing parties tend to identify themselves as such (by choosing labels as 'green' or 'progressive'), so local independents are probably centrists or right-wing. In any case, note that we have just 78 observations (from a total of 2,112) of mayors representing Local parties and the results are unaffected by their exclusion.

Overall, the proportions of municipalities allocated to the four groups are 6.7%, 44.3%, 14.9% and 33.9%, for Left-Left, Center-Left, Center-Right and Right-Right, respectively. If we consider just the close-election sample (one seat from a majority) the proportions are more or less the same: 3.6%, 42.5%, 16.2% and 37.5%, respectively. The *dLeft* dummy is equal to one for mayors from the parties in the Left-Left and Centre-Left groups. The *d*(*Left seats > Right seats*) is equal to one for municipalities where the seats from parties in the first two groups are higher than those from the last two groups. We also use this information to obtain the results when restricting the sample to pairs of ideological groups: Center-Left vs Center-Right, Center-Left vs. Right-Right, Left-Left vs. Center-Right and Left-Left vs. Right-Right. Although the classification of parties into these groups could seem a bit ad hoc, we have to say that the results are robust to displacements of the minor parties to adjacent groups (results available upon request). The reason is that each of the groups is basically dominated by one big party. Moreover, we will also provide results comparing municipalities controlled by one of the two big national parties (PP vs. PSOE). These results are very similar to the ones that use the broad left vs right categories.

Vote distance measures. To compute the distance in votes to a change in a majority of the seats (% *Votes to left-wing majority*) we develop an algebraic formulation based on the 'd'Hondt' rule, which is the one used in Spain's local elections to translate votes into seats. The easiest way to perform such calculation would be simply to look at the cases where the incumbents' ideological bloc won by one seat (the +1 cases), identify which is the party holding this last seat and count how many votes one should detract to this party to make it lose that seat. Under the 'd'Hondt' rule, the formula for such calculation is relatively straight-forward. To simplify the problem, let's assume that the party that gets assigned the last seat is in the ideological bloc of the incumbent and that the party that was competing for this seat (i.e., that would have gotten this seat in the event the other party lost some votes) belongs to the oppositions' ideological bloc. In this case, the calculation of the number of votes needed to lose the marginal seat is simply the difference in the comparison number for the last seat

gotten by the party in the incumbent's bloc and the comparison number of the next seat to be gained by the party in the opposition's bloc, each one divided by each seat's rank order.[17]

This way of computing the vote distance is based on some implicit assumptions. Note for instance that the procedure implicitly assumes that the votes detracted to the party holding the marginal seat are going only to the abstention. It also assumes that shocks affecting one party are independent of shocks affecting other parties in the same bloc. Clearly, there is no exact procedure to deal with these issues, since it would require information on the migration of votes to the abstention and/or to parties in the other bloc, and on the co-movement between shocks affecting parties in the same bloc. This would be really complicated in the case of local elections. In this paper we proceed in a more feasible way, computing this vote distance under different assumptions regarding these aspects and then looking at whether the results are robust to method used[18].

In our preferred method –which is the one for which we will present the main results– we stick with the assumption that the votes detracted from the party holding the marginal seat go only to the abstention but not to parties in the other bloc. We think this assumption is plausible in Spain, given the well documented importance of vote transfers from/to the abstention[19]. We also assume that negative vote shocks affect all the parties in the ideological bloc of the incumbent at the same time, so we detract votes not just from the party holding the marginal seat but from all parties in the bloc in proportion to the initial votes of each party. The high correlation between the vote outcomes of the two main left-wing groups of parties supports this assumption[20,21]. In the Appendix we provide a numerical example that helps understanding how this procedure works. We also refer to the Appendix for the formal development of the algebraic formulation used to compute this quantity[22]. Intuitively, our method works as if we were giving small quantities of votes to one of the blocs, distributing these votes between the parties of that bloc according to their vote share, while keeping the

[17] Remember that a comparison number is the number of votes for a party divided by 1,2, 3, etc. The comparison number of a party and a given seat is the number of votes divided by the rank order of that seat (i.e., by whether the seat is the first one, the second one, etc., assigned to the party).

[18] There are already some papers implementing Regression Discontinuity with proportional elections (see, for instance, Folke (2010) for Sweden or Freier and Odendahl (2011) for Germany). These papers face the same kinds of difficulties than us and their computations bear on specific assumptions.

[19] A stylized fact of electoral politics in Spain is the strong correlation between turnout and left-wing vote share. Using national elections district-level data Lago (2010) reports a statistically significant correlation of approximately 0.5 between the increase in turnout between two consecutive elections and the increase in the socialist (i.e. PSOE) vote share. Using our municipal-level the data we find roughly the same number.

[20] Again, using our municipal level data we find a statistically significant correlation of 0.37 between the increases in the socialist vote share (PSOE) an in the vote share of more extreme left-wing parties.

[21] This assumption is irrelevant in the right-wing bloc, since most of the times there is only one dominant party.

[22] The formulation is in essence very similar to the simpler procedure explained above, but the technical developments are more complex, since it has to deal with many special cases (e.g., the marginal seat is lost to another party in the same bloc, municipalities with majorities larger than just one seat, etc.); dealing with these situations require additional iterations of the method. The Appendix provides more details on this.

number of votes for the parties of the other bloc constant. As we supply more votes, seats start shifting from one bloc to the other. We stop giving votes when we observe a shift in seat majority from one bloc to the other (i.e., when the last seat giving the majority to one bloc moves to the other bloc). The number of votes needed to reach this stage, divided by the total number of votes, is our measure of vote distance.

Then, we also compute other vote measures using other assumptions about vote migration: all votes lost go to the other bloc (and votes are distributed to parties in the other bloc in proportion of the initial vote share of each party in the bloc), and votes lost go both to the abstention and to the other bloc. The Appendix provides some robustness checks using these other vote distance measures. The results are not affected at all, suggesting that the specific measure used does not matter.

Control variables. We use the following control variables (data sources provided in Table 1). Firstly, the amount of land assigned for development that remains vacant at the beginning of the period as a proportion of the previous built-up land (%*Vacant Land*). The argument here is that if a lot of land assigned for development remains undeveloped, there will be no immediate need to alter regulations assigning more land for development. Similarly, if there is no vacant land at all, there will be considerable pressure to release more land for development in order to accommodate possible future demands. Secondly, the amount of open land at the beginning of the period as a proportion of previous built-up land (*Open Land*), i.e. the land under the jurisdiction of the municipality which was neither build on nor assigned for development but vacant. If there is a shortage of open land –either because the town grew a lot in the past, or it has a small jurisdiction – the government might opt to preserve scarce open space or postpone development decisions until a later date.

Thirdly, a basic set of control variables *Z*, measuring the main traits that account for recent urban growth in Spain, and which includes the *Urban*, *Suburb* and *Beach* dummies. The European Environmental Agency (2006) notes that most of the recent housing growth in Spain has been concentrated in these places, so we expect them to capture a large share of the spatial variation in the demand for land. Fourthly, a full set of local area dummies f_j. These effects are included because the size of the increase in demand depends to a great extent on certain geographical traits (e.g., weather, proximity to the coast, regional regulatory framework, and major infrastructure such as ports or airports) that are common to municipalities located near one another. We use 109 urban area and 50 provincial dummies[23,24].

[23] Since both sets of dummies are introduced simultaneously, the provincial dummies account for the effects common to all municipalities in the non-urban portion of a province.

[24] The urban areas are those identified by the AUDES project using geographic contiguity criteria (see www.audes.es). Alternatively, we could have used local labor markets (LLM) as defined using commuting

Finally, we also use a set of additional control variables, *W*, measuring either the size of the demand increase or the pro- or anti- growth preferences of the residents. This set includes: (a) Exogenous measures of local demographic shocks: % *Aged* 25-40, which measures the number of potential new families at the beginning of the period, % *Immigrants* (i.e. those that arrived during the period, expressed as % of residents at the beginning of the period); (b) Variables that account for the amenity and productivity factors deemed important for location decisions (i.e., an *Amenity index* and a measure of *Road accessibility*); (c) Variables more closely related to a resident's preferences for development, but also arguably correlated to 'demand pressures' (i.e. %*Out-commuters*, %*Homeowners*, %*Unemployed*, %*Graduate*, *Population size*, *Density* and *Income per capita*).

5. Results

5.1. OLS with controls

Table 2 presents the results of the estimation of equation 1 by OLS. Column (i) presents the results without controls. Column (ii) introduces the main set of controls (i.e., the amount of vacant and open land, and the dummies identifying whether the municipality is located in an urban area, whether it constitutes a suburb or it is on the coast). Column (iii) introduces the full set of local area dummies, and Column (iv) controls for a large set of additional covariates. The results indicate that left-wing governments convert less land from urban to rural uses than is the case with right-wing governments. The effect increases as the different sets of controls are added, but it is qualitatively the same in each case. The results of Column (iii), our preferred specification, indicate that the new land that was allowed to be developed during the term (as a proportion of the built-up area at the beginning of the term) is 0.175 less under a left-wing government. That the average value of this variable for the municipalities controlled by the right is approximately 0.55 means that, on average, left-wing governments develop 32% less land than that developed by right-wing governments (0.319=0.175/0.55). In other words, while the average right-wing government permitted an increase in the developable area of the city equivalent to 55% of the initial built-up area, a typical left-wing government only permitted an increase of around 37% (=0.55-0.175).

Although this result is of quantitative importance, we cannot be sure of its meaning, since there may well be many influences on urban growth that we are unable to measure but which are potentially correlated with the partisan identity of the government. Note for

patterns. According to Boix and Galletto (2006), there are 802 local labor markets in Spain, defined so as to guarantee that at least 75% of the employees work inside this area. The drawback of using this definition of local area is that outside urban areas the number of municipalities per labor market is very low (e.g., 208 of these local labor markets have just 1 or 2 municipalities), meaning that in our restricted sample we will have many areas with just one.

instance that, although the equation does identify some of the drivers of growth (i.e., more land is put on the market when there is a shortage at the beginning of the period and where there is plenty of open land, in urban areas, suburbs and on the coast), the explanatory capacity of the model stands at around just 15%[25].

[Insert Table 2]

5.2. Regression Discontinuity

Exploring the discontinuity. In order to verify the robustness of these results we employ a more demanding identification strategy, comparing left- and right-wing governments involved in close elections. As explained in the previous section, this is not an easy task in the Spanish case, given the system of proportional representation used and the existence of many coalition governments. To overcome these difficulties we started by looking at close elections in terms of the number of seats won. For this exercise to be relevant, having one more seat should be essential for the partisan identity of the government. Figure 1 plots the percentage of left-wing governments against the distance in terms of seats between the left- and right-wing blocs: negative numbers indicate the number of seats that the left-wing bloc would need to obtain so as to gain a majority of seats (i.e., to have one more seat than the right-wing bloc), while positive numbers indicate the number of seats the left-wing bloc would have to lose in order to relinquish this majority. Note that the proportion of left-wing governments jumps considerably between -1 and +1 (i.e., after the left-wing bloc wins a majority of seats). The probability of having a left-wing government jumps by approximately 70% at that threshold. This probability also increases when gaining other seats, but the jump in these other cases is much smaller. This suggests that a close-race RD design can be applied in our case by comparing the municipalities in the vicinity of the 50% seat threshold.

[Insert Figure 1]

However, the fact that under the d'Hondt rule seats are won after only a discrete change in the number of votes means that some of the municipalities in the –1 seats group might be much closer than others –in terms of the number of votes– to gaining the additional seat required to secure a majority (and also that some of the municipalities in the +1 groups are closer than others to losing this). We can use that distance (% *Votes to left-wing seat majority*) to identify a sample of left- and right-wing municipalities that are not only close in terms of seats but also in terms of the number votes needed to lose or win these marginal seats.

[25] None of the additional controls proved, individually, to be statistically significant at conventional levels, although some did present the expected signs and t-statistics above one (e.g., growth seems to be lower in places with a large proportion of homeowners and commuters and higher in places with high rates of unemployment). However, the explanatory capacity of this group of variables is very low, as the F-statistics demonstrate.

[Insert Table 3]

However, before reporting the results obtained when using this approach, we should first show that the proportion of left-wing governments also jumps at the 50% seat threshold when we control for the vote distance variable. This is necessary in order to demonstrate that behind the seat discontinuity there is also a genuine vote discontinuity. Figure 2 reveals this to be the case. The dots are bin averages of the proportion of left-wing governments. The size of the bin is 2.5% of the vote distance and has been selected using the 'bin test' (see Lee and Lemieux, 2011). The black line is a flexible second-order polynomial, fitted separately on each side of the threshold. It is apparent from the graph that the proportion of left-wing governments increases with the vote for the left bloc and that the jump identified in the probability of having a left-government is of the same magnitude as that reported in Figure 2. The existence of this discontinuity is formally tested in Table 3. Here we present the results of the test when controlling for a two-sided polynomial (using the whole sample) and also when using a locally weighted regression (with the sample corresponding to a restricted bandwidth of 25 and 12.5% of the vote). Note that in any case, the estimated size of the discontinuity is very similar and statistically significant at the 99% level. The results with the optimal polynomial (that of the second order, as indicated by the AIC) and with a locally weighted regression are similar, identifying a jump of 70-75% around the threshold.

[Insert Figure 2 & Table 4]

Main results. Table 4 presents the RD estimates of the effect of left-wing governments on urban land growth. Panels (a) and (b) display the results with and without the covariates. The first five columns present the results obtained when using the full sample and a two-sided polynomial. The first four columns present the results of the estimation of the reduced form (equation 2) by OLS when controlling for polynomials of different orders. The optimal polynomial order is two, as indicated by the AIC criterion (see Lee and Lemieux, 2011). The size of the effect changes when moving from a polynomial of order zero and one to a second order polynomial, but very little thereafter. The fifth column displays the results of the 2SLS estimation when using the optimal polynomial. The results change little when adding the covariates. The last two columns report the reduced form estimates when controlling for a locally weighted regression. In this case, the impact is also of a similar magnitude independent of the bandwidth, although the level of precision is lower for the smaller sample.

As regards the results, note first that the size of the effect obtained when estimating the reduced form with either the optimal polynomial or the locally weighted regression is of a similar magnitude, around 0.2. The 2SLS coefficient is higher, around 0.3, closely reflecting

the fact that it should be equal to the ratio between the reduced form coefficient and the size of the discontinuity estimated in the first stage (i.e., -0.315= -0.222/ 0.704). This effect is much greater than that of the OLS one presented in Table 2. This means that a left-wing government would, on average, develop 65% less land than a right-wing government (0.654= 0.315/ 0.481)[26]. This effect is even more marked than that recorded previously using OLS.

[Insert Figure 3]

This effect is displayed graphically in Figure 3. The graph shows 2.5% bin averages and a flexible polynomial fitted to the whole sample. The size of the discontinuity is apparent from the graph. The graph also shows that the slope of the plot is in general negative, suggesting that governments tend to put more land on the market as they move further from the seat majority threshold. This result is consistent with our previous results that suggest that both left- and right-wing local governments develop more land as local elections become less competitive (see Solé-Ollé and Viladecans-Marsal, 2012). This result, however, should be interpreted with caution, since in a RD design the shape of the non-linear function fitted at both sides of the threshold does not have a causal interpretation. It might l be simply that there are some omitted variables correlated with vote margin, although close-elections don't seem to be that different in terms of observables (see Table A.1 in the Appendix).

Additional results: population heterogeneity. In the first four columns of Table 5 we present the results when dividing the sample according to two proxies of population heterogeneity[27]. The first is an indicator of social polarization in terms of anti- (or pro-) development preferences. We proxy the size of the anti-development group by summing the respective proportions of homeowners, out-commuters and graduates, and that of the pro-development group by summing the proportions of renters, unemployed, and workers in the construction industry. These two variables are expressed in relation to the sample average (=100) and our indicator of social polarization is the absolute value of the difference between them. The higher the index the more dominant is one of the groups (either the anti- or the pro- growth one) and the more homogeneous is the population. Our expectation (recall the discussion in section two) is that the more homogeneous the population the more credible will be the promises the parties make to the median voter, fostering the convergence of policies enacted by right- and left-wing parties. Then, we repeat the RD analysis for the sub-samples of municipalities with social polarization indexes higher and lower than the median.

[26] To make this calculation we compared the 2SLS results with the % growth of developable land for a right-wing government located closest to the threshold, which in this case was 0.481.
[27] The RD graphs are not included here to save space but can be found in the Appendix.

The results are displayed in the first two columns of Table 5 and suggest that partisan policy differences are much greater in more polarized places, left-wing governments allowing 85% less land to be developed than right-wing parties (recall that this figure stood at 60% for the whole sample). In less polarized communities, the figure is around 35%, but it should be noted that the coefficient is not statistically significant.

[Insert Table 5]

The second proxy of social heterogeneity is a measure of the fragmentation of the population between municipalities belonging to the same local area. For each local area we have computed a Hirschman-Herfindhal index of municipal population concentration[28]. A low index value is indicative of a high level of fragmentation, meaning that (for a given population size) the pool of municipalities from which to choose is larger. Our argument here is that fragmentation enhances residential choice facilitating the clustering of population groups with similar tastes, some of which create more homogeneous communities that in turn facilitate policy convergence. Thus, in this case, we expect that the greater the area's fragmentation, the smaller the differences will be between the policies enacted by right- and left-wing parties. The results obtained when dividing the sample between municipalities with values above and below the median value of this index are presented in the third and fourth columns of Table 5. We find that partisan differences are restricted to local areas displaying a low level of fragmentation. In this case, left-wing parties allow 81% less land to be developed than the amount developed by right-wing parties. The differences are much lower (around 30%) in the most fragmented areas but, again, the coefficients are not statistically significant. The results of this analysis suggest that partisan differences in the drawing up of local land use policies tend to occur mainly in the more heterogeneous communities. This finding is similar to that reported by Ferreira and Gyourko (2009) who conclude that (in the case of fiscal policy) there are no partisan differences in suburban US communities.

Additional results: housing demand. As was argued in section two, in the case of land use policies, we expect partisan differences to occur only when there is some controversy regarding the desirability of allowing or preventing additional development. Clearly, this only occurs when a municipality experiences a substantial housing demand shock. To verify this intuition we divided our sample in two according to the housing construction growth rate experienced by the local area (here again we draw on the 109 AUDES urban areas plus the 50 provinces) during the previous term-of-office. It is our contention that if the area has grown

[28] In this case, the definition of local area is the Local Labor Market (LLM), defined using commuting patterns. According to Boix and Galletto (2006), there are 802 LLMs. We computed the Hirschman-Herfindahl index for each of them. We did not use the 109 AUDES urban areas because they do not cover the whole of Spain.

considerably in the near past, local governments may well forecast that it is likely to grow in the future and, thus, start contemplating the expansion of the amount of developable land to accommodate their forecasts. Our results are presented in the last two columns of Table 5. Indeed, we find that the differences between left- and right-wing governments are more pronounced in rapidly growing areas. A left-wing government in one such area will allow 83% more development than a right-wing government located in a similar municipality. In slow-growing areas this number falls to around 37%. The coefficient for this group is statistically significant at the 90% level.

Obviously, the doubt remains as to whether this result is simply a reflection of the previous one regarding the effects of population heterogeneity. We believe this not to be the case as the correlation between the heterogeneity of the housing demand dummies is quite low (less than 5%, in absolute terms) and not statistically significant at any reasonable level[29]. Yet, we must admit that the results obtained when replicating the RD analysis across subsamples should not be extended far. Even if the dummies used to divide the sample in different ways do not appear to be correlated, a correlation might exist with any other variable having an effect on the differences in the behavior of right- and left-wing parties. Thus, the results of the heterogeneity analysis may reflect the explanation we have invoked or many other causes. However, the fact that the three analyses performed point in the expected direction is encouraging.

Additional results: housing market outcomes. So far we have shown that the identity of the party controlling the local governments does matter for the restrictiveness of land use policies. Left-wing governments –we have shown– allow a lower amount of land to be converted from rural to urban uses. Starting from here, it would be natural to ask whether this reduced supply of urban land had an impact on housing market outcomes, as e.g. housing construction or housing price growth. To bring some evidence on this we have assembled also data on the amount of developed for the same period and sample than before, and data on the growth rate of housing prices for the municipalities larger than 25,000 residents (see Table 1 for further details). The reduced sample size when using price data is obviously a concern, for several reasons. First, the reliability of the RDD could be affected by the existence of a lower number of observations around the threshold. Regarding this problem not much can be done, since the Spanish government doesn't disclose information on housing prices for smaller municipalities. We have to say, however, that the performance of the RDD when using this reduced sample is similar than with the larger one. Second, the fact that the

[29] The two heterogeneity variables are negatively correlated; thus, there is greater polarization where there is less fragmentation. The correlation coefficient is around -0.05, although it is not statistically significant.

analysis is restricted to municipalities larger than 25,000 residents makes difficult to generalize the results to the smaller ones[30].

In any case, however, identifying the effect of partisan control on housing market outcomes is quite a difficult task, at least for two reasons. Firstly, and especially in the case of housing prices, the effect of partisan control might go beyond its impact through land supply. Left-wing governments, for example, might also adopt different fiscal policies and this might also have an effect over the demand for locating in the municipality. There is no solution for this, so one must interpret the results on housing prices with real care. Secondly, land supply decisions have a delayed impact real development. This means that although it is natural to assume that a given government is able to modify land use policies during a term-of-office (e.g., convert more land to urban uses) it is more difficult to assume that the effects of this policy on construction and prices will show during this short period of time. To deal with this difficulty we use a dynamic version of the RDD (see Ferreira *et al*., 2010). The specification relates the outcome variable of interest in term-of-office *t* to the discontinuity in both *t* and *t*-1. In the case of growth in developable land we have:

$$\begin{aligned}\Delta u_{i,t} = {} & \lambda_t \, d(Left\ seats > Right\ seats)_{i,t} + \lambda_{t-1} \, d(Left\ seats > Right\ seats)_{i,t-1} + \\ & + f(\%\,Votes\ to\ left\text{-}wing\ majority)_{i,t} + f(\%\,Votes\ to\ left\text{-}wing\ majority)_{i,t-1} + \upsilon_{i,t}\end{aligned} \quad (5)$$

As we have already argued, a given government should be fully able to adapt its land use policies during a term, so we expect that in the case of developable land λ_t should be negative and λ_{t+1} should be zero. In the cases of developed land and housing prices the prediction is less clear and it could well be that $\lambda_{t+1}<0$ or even that $\lambda_t=0$.

[Insert Table 6]

The results found when estimating this equation for the three variables of interest are presented in Table 6[31]. Columns (i), (iii) and (v) show the static analyses while columns (ii), (iv) and (vi) present the dynamic ones. The results for developable land are presented in columns (i) and (ii) and show that the effect is exclusively contemporaneous. The results in columns (iii) and (iv) show that partisan effects are statistically significant at the 90% level in the static model (column (iii)), while lagged partisan effects are significant in the dynamic one (iv) although the size of the coefficient is similar than the contemporaneous one (which is not statistically significant). The effect of parties over housing prices has a similar profile:

[30] In any case, however, the results can always be compared to what the effect of parties on developable land for the same sample (municipalities larger than 25,000 residents). In results not shown to save space we also found that the main results also hold for these larger municipalities, and that the estimate of the % reduction in the amount of developable land due to a shift from a right to a left-wing government are of a similar magnitude.

[31] The RD graphs are not presented here to save space but are included in the Appendix.

left-wing parties make housing prices to growth more, and the lagged effect is stronger (and the only one statistically significant). In both cases, the effects are substantial: having a left-wing party in control of local government is associated with a 15% less development in the current term and 20% less development in the future, and with 22% higher growth in housing prices in the current term and 30% higher growth in the future.

Validity and robustness. The validity of the RD design depends on certain assumptions. Firstly, agents should not be able to manipulate the forcing variable. There has been some concern in the literature about this possibility (see Caughey and Sekhon, 2011). Several factors might be behind this result: electoral fraud, differences in the capacity to mobilize resources during a closely contested campaign and, in our case, differences in the capacity to broker coalition deals, either before or after the elections. The first factor can be completely dismissed in Spain, since there are no grounds whatsoever for concern about the possibility of electoral fraud in local elections. The second is equally implausible given the low amount of resources required to run a local campaign. Moreover, as Caughey and Sekhon (2011) note, the manipulation of the forcing variable is more feasible in a two-party system with very sophisticated polling systems, where the level of uncertainty regarding the election is greatly reduced. However, they claim that manipulation is less feasible in proportional electoral systems and in places where campaigning is not especially sophisticated. This description matches Spain's local elections perfectly. As for the last factor, we should stress that pre-electoral coalitions are extremely rare in Spain, as a result of the incentives generated by a system based on proportional representation. Post-electoral coalitions do constitute a potential threat to our empirical strategy, but to avoid it we have worked with ideologically linked blocs of parties rather than with actual coalitions. In any case, we have performed several checks to discard the possibility of manipulation (see the Appendix). The histogram of the vote distance and a more formal test (McCrary, 2008) show that the density of the forcing variable is continuous at the threshold. We also report discontinuity tests showing that none of the pre-determined covariates is affected by the discontinuity.

We performed a number of additional analyses in order to demonstrate that our findings are not influenced by any particular methodological decision (see also the Appendix). Firsly, we repeated the analysis but this time we eliminated from the sample those municipalities with at least one seat allocated to a local party. The results were virtually unchanged. Secondly, we undertook the analysis using only those municipalities in which the two main parties obtained most of the votes, i.e., a situation that resembled a bipartisan system. Here, the discontinuity was greater than before, but the estimated effect was very similar. Thirdly, we restricted the sample to include just coalition governments, so as to show that the

discontinuity is not an artifact created by the fact that our sample contains more majority governments than coalitions. Here the jump was around 50%, which is lower than the 70% reported for the whole sample. However, the treatment effect is of the same magnitude. Fourthly, we repeated the analysis using an alternative measure for the voting distance needed to win or lose a majority of seats. So far the distance used has been computed on the assumption that the votes won/lost come/go from/to abstentions. Now we adopt a measure that assumes that these votes might come/go not only from abstentions but also from the other ideological bloc. The results were again unchanged.

Finally, we also present results when comparing subsets of left- and right-wing governments. So far in the discussion we have implicitly considered all parties in one ideological bloc as being equivalent. However, the discussion in section 3 suggests that some left-wing parties are more anti-growth than others (e.g., IU, the former communists, closely linked in Spain with the environmental movement), and also that some right-wing parties are more pro-growth (e.g., PP, closely linked with the complete deregulation of the land market). The results show that there are no differences between Center-Left (CL) and Center-Right (CR) parties, but that the differences between Center-Left (CL) parties (the main left-wing party, PSOE, in most instances) and Right-Right (RR) parties (the right-wing party, PP in most instances) are larger than those presented before (see Table 4).

6. Conclusion

This paper has analyzed whether the ideology of the party controlling the local government has an influence on a municipality's land use policies. In so doing, we have drawn on a new database containing information about the amount of land converted from a rural to urban use by Spanish municipalities in the period 2003-2007. To identify the effect of the country's political parties we have used a close-election regression discontinuity design, amended to account for the specific institutional traits of Spain's local political system. Our method has involved the comparison of governments controlled by left-wing and right-wing parties that are close to holding a one seat majority in the council, while controlling for a function of the distance in terms of number of votes to losing or winning a majority. Our results suggest that left-wing governments have a considerable influence on land use policies. Left-wing governments that are close to winning-losing power allow 65% less land to be developed than comparable right-wing governments. The effects of left-wing parties are particularly pronounced in more heterogeneous communities and in places facing greater housing construction growth rates. It would seem to be the case that it was in these places that the conflict between pro- and anti-growth groups was most pronounced during this period and the consensus regarding the desirability of urban development most difficult to achieve.

Additionally, we have also shown that municipalities controlled by left-wing parties' do also build less and have higher housing price growth rates. These effects persist into future terms of office and are also substantial. We admit that the results on housing prices have to be taken with a pinch of salt given the small number of observations and the fact that they come from the sample of big cities. However, when considered together with the results on land development, they are highly suggestive of being caused by overly restrictive land policies. Note, for instance, that the effects of left-wing parties on both developed land and prices are of a similar magnitude. Also, the effect on prices is positive, something that rules out the possibility that the effect through supply restriction is undue by a demand effect (e.g., left-wing government setting fiscal policies that appeal to low income households). Further research is needed to assess whether the social benefits provided by these land use constraints (or the careful design of social housing) is actually able to undue or compensate for the housing affordability problems generated by these price increases.

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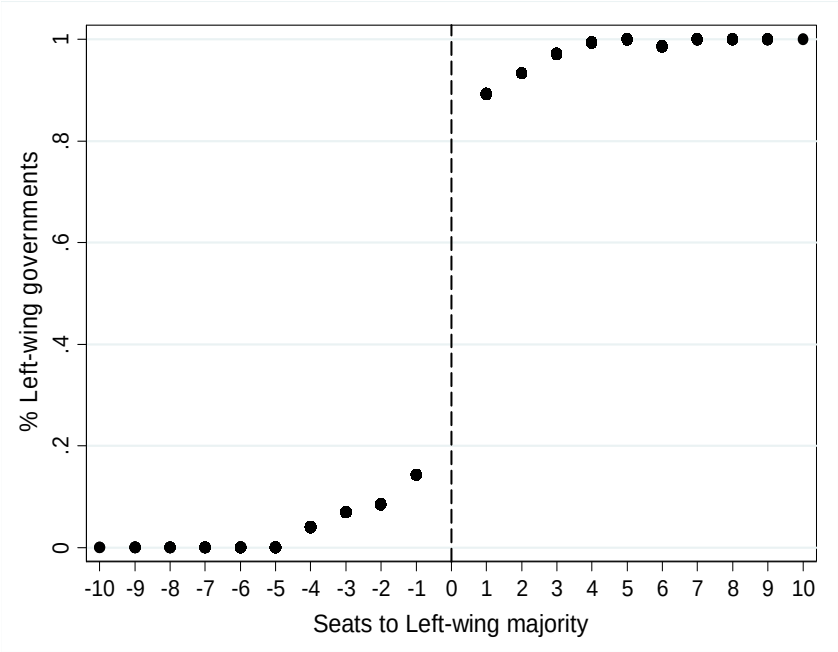
Figure 1

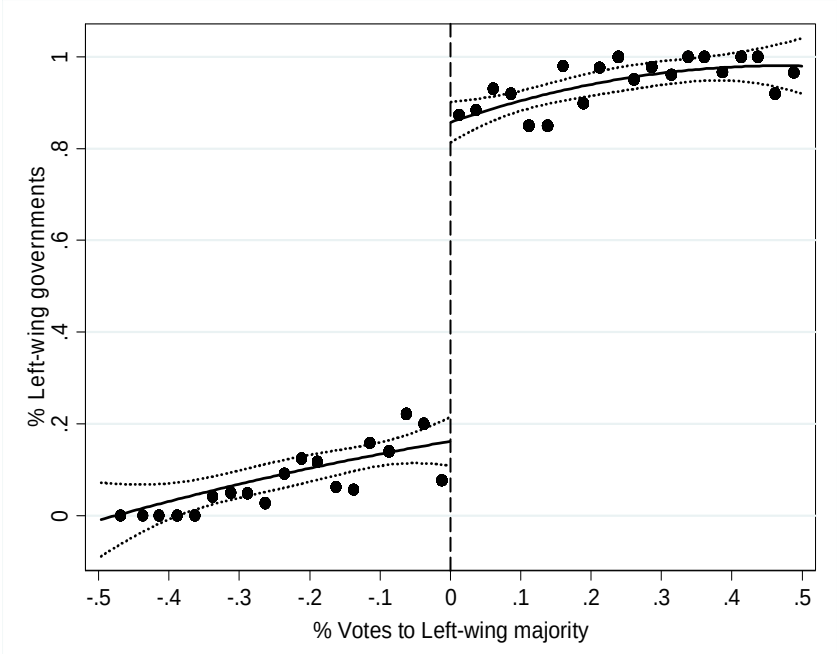
% Left-wing governments vs. Seats to left-wing majority.



Notes: (1) % Left-wing government = proportion of local governments with a left-wing mayor. Seats to left-wing majority = number of seats needed for the left-wing bloc to win (if -) or lose a majority of seats (if +).

Figure 2

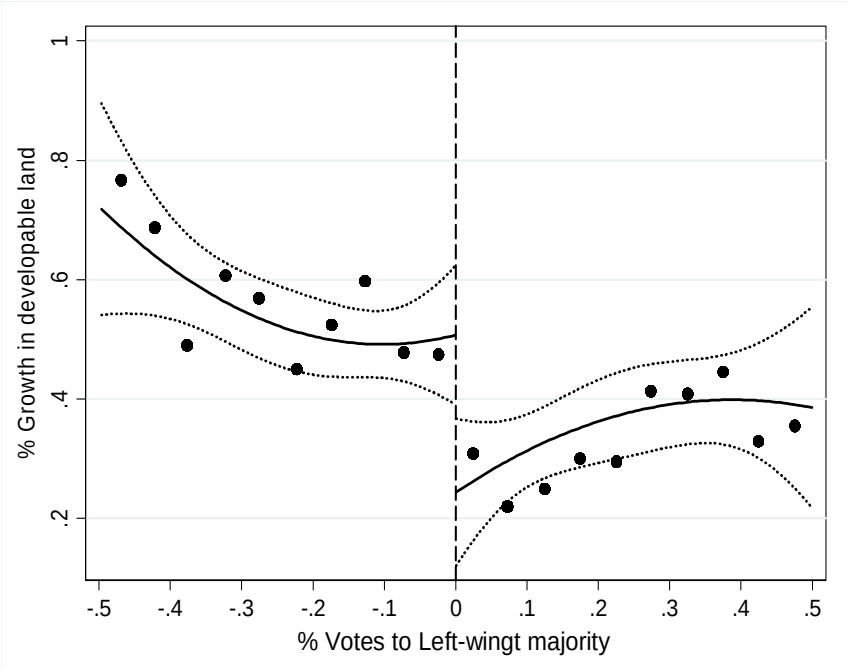
% Left-wing governments vs. % Votes to left-wing majority.



Notes: (1) % Votes to left-wing majority = % of votes that the left-wing bloc should lose (if +) or win (if -) to obtain one seat less or more than the right-wing bloc. (2) Dots = Bin averages. Bin size = 0.025 (2.5% of the vote), selected using the bin test (Lee and Lemieux, 2011). (3) Black line = 2nd order polynomial. (4) Dotted lines = 95% confidence interval.

Figure 3

% Growth in developable land vs. % Votes to left-wing majority.



Notes: (1) Dots = Bin averages; Bin size = 0.025 (2.5% of the vote), selected using the bin test (Lee and Lemieux, 2011). (2) Black line = 2nd order polynomial. (3) Dotted lines = 95% confidence interval.

Table 1: *Definitions and sources of the variables*

	Definition	*Sources*
% *Growth in developable land*	[(Built-up land + Vacant land, end of term) – (Built-up + Vacant land, beginning of term) / Built-up land, beginning of term]	DCG, Dirección General del Catastro (2007): "Estadísticas sobre ordenanzas fiscales del Impuesto sobre Bienes Inmuebles", http://www. catastro.meh.es / esp/estadisticas1. asp#menu1. (Built-up land = 'superficie edificada', Vacant land = 'superficie de solares')
% *Growth in developed land*	[(Built-up land – Built-up beginning of term) / Built-up land, beginning of term]	
% Vacant land	[Vacant land, beginning of term) / Built-up land, beginning of term]	
% Open Land	[Total land area of the municipality - Built-up land beginning of term/ Built-up land, beg. term]	INE (www.ine.es) & DCG, Dirección General del Catastro (2007)
%Growth in housing prices	Average annual growth rate in price per m2 of old and new housing units during term	"Precios de vivienda libre en los municipios de más de 25,000 habitantes", Ministerio de Fomento, http://www.fomento.gob.es/
d*Left*	Dummy = 1 if the mayor belongs to a party classified as left-wing	Ministerio del Interior, *Base Histórica de Resultados Electorales*, http://www. elecciones.mir.es/MIR/jsp /resultados index.htm. & El País (1999 & 2003): 'Anuario Estadístico'
d(*Left>Right*)	Dummy = 1 if the parties classified as left-wing have more seats in the local council than those classified as right-wing	
% Votes to left-wing majority	% of Votes needed by the left-wing bloc to either lose the last seat they hold or to win an additional seat (see Appendix for a details of the method used in the computation)	
d*Urban*	Dummy = 1 if municipality belongs to an urban area	AUDES project: 109 urban areas defined using aerial photographs on the basis of geographical continuity (see www. audes.es),
d*Suburb*	Dummy = 1 if municipality belongs to an urban area but it is not the central city	
Amenity index	[Houses with problems related to: noise, dirt, crime, pollution, or lack of green space, as of 2001/ Houses in 2001]	INE (www.ine.es), 2001 Census of Buildings
Road accessibility	[Houses with poor accessibility to roads, as of 2001/ Houses in 2001]	
% *Aged* 25-40	[Residents aged 25 to 40 beginning of term/ Resident population beginning of term]	INE (www.ine.es), 2001 Census of Population & 'Estadística de Variaciones Residenciales' (several years) La Caixa (2001): 'Anuario Económico de España'
% *Immigrants*	[Immigrants arrived during the term / Resident population beginning of term]	
% *Out-commuters*	[Commuters in 2001/ Resident population in 2001]	
% *Homeowners*	[Houses occupied by owner in 2001/ Houses in 2001]	
% *Graduate*	[Residents with a higher education degree in 2001/ Resident population in 2001]	
% *Unemployed*	[Residents which were unemployed, beginning of term/ Resident population, beginning of term]	
Population size	Resident population, beginning of term	
Income per capita	Personal income, beginning of term / Resident population, beginning of term.	

Table 2: OLS *results*

	(i)	(ii)	(iii)	(iv)
d*Left*	-0.121 (0.044)***	-0.146 (0.045)***	-0.175 (0.067)***	-0.171 (0.085)**
% Vacant land	--.--	-0.632 (0.133)***	-0.655 (0.137)***	-0.674 (0.159)***
% Open land	--.--	0.075 (0.014)***	0.076 (0.013)***	0.079 (0.011)***
d*Urban*	--.--	0.081 (0.039)**	--.--	--.--
d*Suburb*	--.--	0.092 (0.041)***	0.163 (0.070)***	0.091 (0.035)***
d*Beach*	--.--	0.134 (0.050)***	0.126 (0.047)***	0.113 (0.046)**
Adj-R^2	0.043	0.092	0.148	0.142
F-est. (*all var.*)	7.33	19.57	4.96	3.93
[*p-value*]	[0.001]	[0.000]	[0.000]	[0.000]
F-est. (*main controls*)	--.--	23.09	21.32	16.44
[*p-value*]		[0.000]	[0.000]	[0.000]
F-est (*area effects*)	--.--	--.--	4.44	3.09
[*p-value*]			[0.000]	[0.000]
F-est (*additional controls*)	--.--	--.--	--.--	0.30
[*p-value*]				[0.112]
Main controls	NO	YES	YES	YES
Area effects	NO	NO	YES	YES
Additional controls	NO	NO	NO	YES
Num. Obs.	2,112	2,112	2,112	2,112

Notes: (1) Dependent variable: Δ*u*, % increase in developable land over the term. (2) Robust standard errors in parenthesis, p-values in brackets; ***, ** & * = statistically significant at the 99%, 95% and 90% levels. (3) Additional controls: % *Aged* 25-40, %*Immigrants*, *Amenity index*, *Road accessibility*, %*Out-commuters*, %*Homeowners*, %*Unemployed*, %*Graduate*, *Population size*, *Density* and *Income per capita.* (4) Area effects: dummies for each of the 109 AUDES urban areas and for each of Spain's 50 provinces.

Table 3:
Discontinuity in the probability of having a left-wing Government

	Two-sided polynomial				*Local regression*	
	(i)	(ii)	(iii)	(iv)	(v)	(vi)
d(*Left>Right*)	0.793***	0.754***	0.705***	0.694***	0.755***	0.727***
	(0.013)	(0.024)	(0.030)	(0.038)	(0.014)	(0.022)
AIC	970.36	647.39	640.95	649.77	--.--	--.--
Pol. Order	0	1	2	3	1	1
Bandwidth	100%	100%	100%	100%	25%	12.5%
Obs.	2,112	2,112	2,112	2,112	993	536

Notes: (1) Dependent variable is *dLeft*=1 if the mayor belongs to a left-wing party and 0 otherwise. (2) Explanatory variables: dummy equal to one if the left-wing bloc has more seats than the right-wing bloc (*d*(*Left>Right*)), and two-sided polynomial (or locally weighted regression) in the % *Votes to left-wing majority*. (3) Robust standard errors in parenthesis; ***= statistically significant at the 99% level. (4) AIC: Akaike information criterion.

Table 4:
Regression Discontinuity: main results

	Two-sided polynomial					*Local regression* (*Reduced form*)	
	Reduced form				2SLS		
	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)
Panel (a): *Without controls*							
d(*Left>Right*)	-0.191*	-0.214**	-0.222***	-0.201***	--.--	-0.204***	-0.210*
	(0.103)	(0.087)	(0.103)	(0.104)		(0.094)	(0.109)
d*Left*	--.--	--.--	--.--	--.--	-0.315**	--.--	--.--
					(0.146)		
AIC	7492.93	6870.61	6873.74	6876.73	--.--	--.--	--.--
Panel (b): *With controls*							
d(*Left>Right*)	-0.187***	-0.224***	-0.241***	-0.225***	--.--	-0.254***	-0.230**
	(0.061)	(0.085)	(0.102)	(0.067)		(0.093)	(0.107)
d*Left*	--.--	--.--	--.--	--.--	-0.349***	--.--	--.--
					(0.115)		
AIC	7382.42	6772.67	6769.79	6775.33	--.--	--.--	--.--
Pol. Order	0	1	2	3	2	1	1
Bandwidth	100%	100%	100%	100%	100%	25%	12.5%
Obs.	2,112	2,112	2,112	2,112	2,112	993	536

Notes: (1) Dependent variable: Δu, % increase in developable land over the term. (2) 2SLS: *dLeft* as explanatory variable and *d*(*Left>Right*) as instrument. (3) Robust standard errors in parenthesis; ***= statistically significant at the 99% level. (4) AIC: Akaike information criterion.

Table 5:
Regression Discontinuity: population heterogeneity and housing demand

	(i)	(ii)	(iii)	(iv)	(v)	(vi)
	(a) *Social polarization*		(b) *Area fragmentation*		(c) *Housing demand*	
	Low	*High*	*Low*	*High*	*Low*	*High*
RD-OLS	-0.062	-0.498***	-0.951***	-0.174	-0.088*	-0.362***
	(0.057)	(0.122)	(0.241)	(0.187)	(0.047)	(0.109)
RD-2SLS	-0.088	-0.681***	-1.219***	-0.223	-0.132*	-0.514***
	(0.076)	(0.104)	(0.358)	(0.259)	(0.075)	(0.155)
% *Decrease*	35.22	85.86	81.27	36.17	38.01	83.25

Notes: (1) *Demand shock:* % growth in housing construction in the area during the previous four years. (2) *Social fragmentation*: absolute value of the difference between per capita indexes (sample average = 100) of anti-growth population groups (Homeowners + Out-commuters + Graduates) and pro-growth groups (Renters +Aged25-40 + Unemployed + Construction workers). (3) *Area fragmentation*: normalized Hirschman-Herfindhal index of population concentration across municipalities of the urban area. (5) See Table 4.

Table 6:
Regression discontinuity: additional outcomes & dynamic effects

	(i)	(ii)	(iii)	(iv)	(v)	(vi)
	(*a*) *Growth in developable land*		(*b*) *Growth in developed land*		(*c*) *Growth in housing prices*	
	Static	*Dynamic*	*Static*	*Dynamic*	*Static*	*Dynamic*
d*Left* (*t*)	-0.315	-0.278	-0.071	-0.027	0.026	0.024
	(0.146)***	(0.139)**	(0.047)*	(0.017)	(0.017)	(0.013)
d*Left* (*t*-1)	--.--	-0.011	--.--	-0.035	--.--	0.033
		(0.364)		(0.015)**		(0.014)**
% *Decrease* (*t*)	65.40	57.72	40.01	15.50	32.08	22.02
% *Decrease* (*t*-1)	--.--	2.28	--.--	20.10	--.--	30.28
Pol. Order	2	2	3	3	4	4
Obs.	2,112	2,112	2,112	2,112	252	252

Notes: (1) See Tables 3 & 4. (2) 2SLS estimates. (3) All equations have been estimated with the 100% bandwidth, and the same controls as before. (4) Columns (v) and (vi) estimated for the sample of municipalities larger than 25000; column (vi) estimated for the sample of municipalities larger than 25000. (5) % Decrease (*t*) and % Decrease (*t*+1) refer to the difference due to contemporaneous and lagged partisan control.

Appendix

A1: Descriptive statistics

Table A.1:
Variable means for the different sub-samples

	Sample			
	> 1,000 residents	>1,000 res. - adjust.	Close elections	25,000 residents
Observations	3,157	2,112	536	252
% *Growth in developable land*	0.429	0.435	0.407	0.224
% *Growth in developed land*	0.182	0.176	0.166	0.119
% Vacant land	0.731	0.720	0.697	0.560
% Open Land	150.23	150.68	157.68	31.25
%Growth in housing prices	--.--	--.--	--.--	0.506
d*Left*	--.--	0.516	0.490	0.516
d(*Left*>*Right*)	--.--	0.554	0.586	0.569
% Votes to left-wing majority	--.--	0.092	0.002	0.099
d*Urban*	0.380	0.371	0.390	0.462
d*Suburb*	0.292	0.283	0.279	0.319
d*Beach*	0.139	0.136	0.118	0.248
Amenity index	0.850	0.856	0.851	0.859
Road accessibility	0.797	0.795	0.794	0.799
% *Immigrants*	0.035	0.035	0.037	0.051
% *Out-commuters*	0.502	0.513	0.511	0.523
% *Homeowners*	0.835	0.829	0.815	0.841
% *Graduate*	0.070	0.071	0.072	0.105
% *Unemployed*	0.035	0.034	0.033	0.036
Population size	16,544	16,956	18,683	106,159
Income per capita	10,152	10,177	10,330	10,927

Notes: (1) Population thresholds defined using the Population figures from the 2001 Census. (2) Mean and standard deviation (in parenthesis). (3) Close elections defined as those for which % Vote to Left-wing parties is lower than 12.5%.

A2: Validity and robustness checks

Figure A.1
Discontinuity in the forcing variable. Vote histogram.

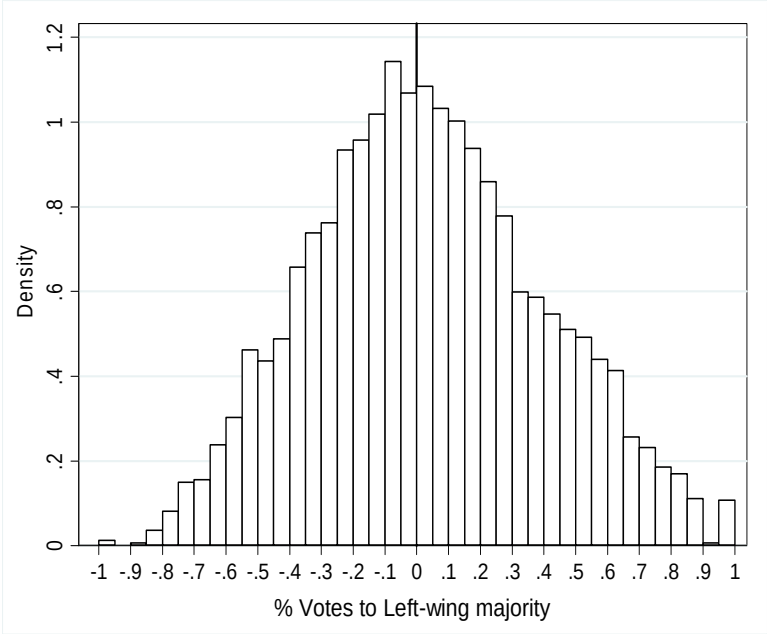
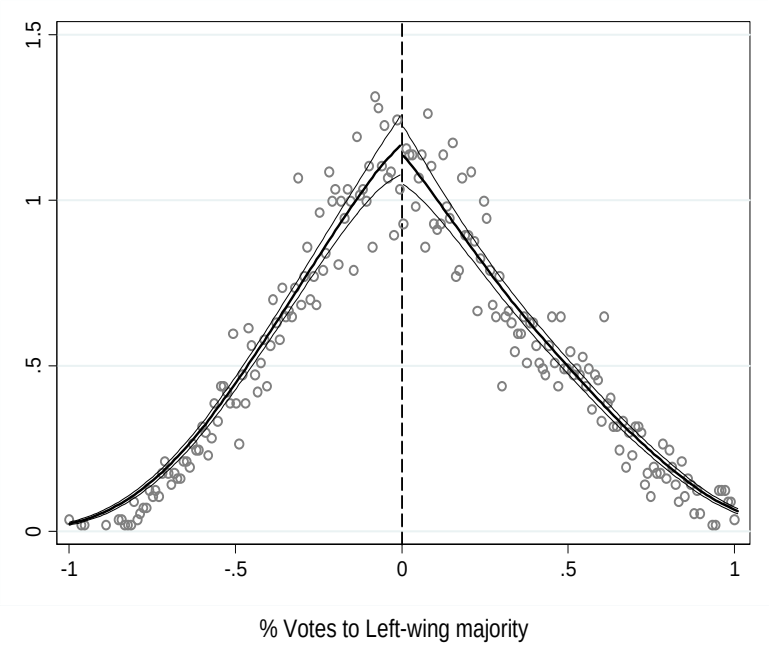


Figure A.2
Discontinuity in the forcing variable. McCrary test.



Notes: (1) Dots: Bin averages of the density of the forcing variable (% *Votes to left-wing majority*). (2) Lines: Weighted kernel estimation of the log density, performed separately on either side of the zero threshold. Optimal binwidth and binsize as in McCrary (2008)

Table A.2:
Discontinuity tests for the control variables

	Two-sided polynomial	*Local regression*		*Two-sided polynomial*	*Local regression*
Vacant land	-0.011 (0.053)	-0.008 (0.055)	*Road accessibility*	0.001 (0.023)	0.001 (0.031)
Open Land	0.003 (0.009)	0.005 (0.012)	% *Out-commuters*	0.021 (0.034)	0.025 (0.0.41)
Urban	0.008 (0.012)	0.008 (0.029)	% *Homeowners*	-0.011 (0.030)	-0.010 (0.051)
Suburb	0.003 (0.045)	0.004 (0.014)	% *Graduate*	-0.032 (0.130)	-0.040 (0.156)
% *Aged* 25-40	0.056 (0.066)	0.048 (0.110)	% *Unemployed*	0.015 (0.124)	0.017 (0.165)
% *Immigrants*	0.021 (0.070)	0.012 (0.081)	Log*(Population size*)	0.008 (0.012)	0.008 (0.029)
Amenity index	-0.112 (0.324)	-0.145 (0.521)	log(*Income per capita*)	-0.112 (0.212)	-0.192 (0.329)

Notes: (1) Two-sided polynomial: Optimal polynomial order selected with the AIC criterion with full sample bandwidth. (2) Local regression: locally weighted regression with optimal bandwidth (3). Robust standard errors.

Table A.3: *Robustness checks: alternative coalition definitions and vote distance measures*

	No local parties	*Two parties*	*Coalition governments*	*Alternative vote distance measure*
	(i)	(ii)	(iii)	(iv)
	Panel (a): *Reduced form*			
d(*Left*>*Right*)	-0.248 (0.105)***	-0.312 (0.110)***	-0.178 (0.085)**	-0.228 (0.089)***
	Panel (b): 2SLS			
d*Left*	-0.331 (0.135)***	-0.374 (0.152)***	-0.356 (0.175)**	-0.311 (0.114)***
Obs.	1436	980	774	2112
	Panel (c): *First stage*			
d(*Left*>*Right*)	0.749 (0.025)***	0.834 (0.031)***	0.501 (0.089)**	0.734 (0.031)***
Obs.	1436	980	774	2112

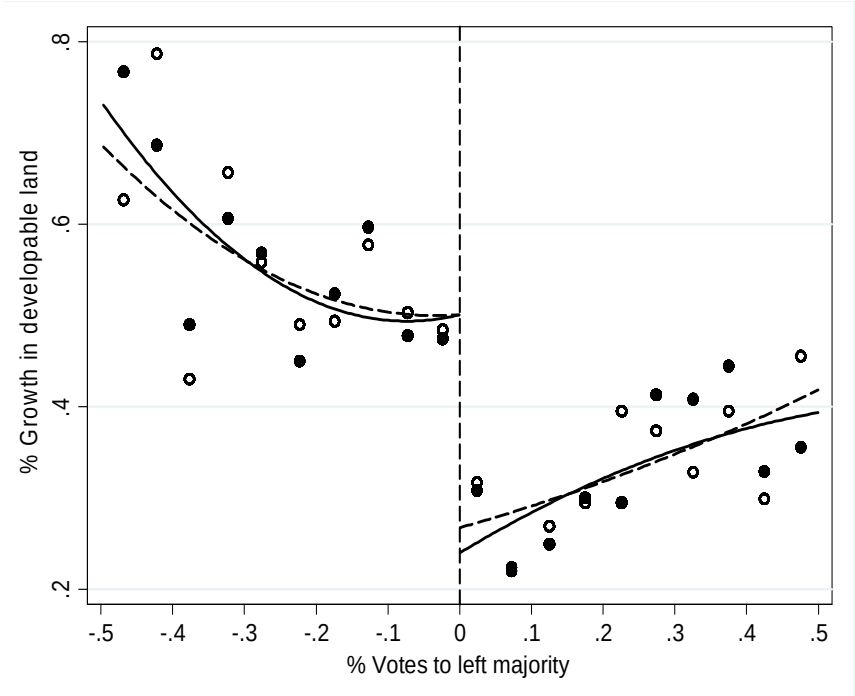
Notes: (1) See Tables 3 & 4. (2) All equations have been estimated with the 100% bandwidth, a second-order polynomial and the same controls as before. (2) No local parties = municipalities in which local parties hold seats are excluded from the analysis; Two parties = sample includes only municipalities in which the two main parties obtain more than 80% of the vote; Alternative distance = vote distance computed assuming vote migration towards both abstention and opposition's ideological bloc.

Table A.4:
Robustness checks: within bloc differences

	(i) *CL vs. RR*	(ii) *CL vs. CR*	(iii) *LL vs. RR*	(iv) *LL vs. CR*	(v) *PSOE vs. PP*
RD-OLS	-0.326**	-0.043	-0.400**	-0.089*	-0.350**
	(0.153)	(0.226)	(0.189)	(0.055)	(0.141)
RD-2SLS	-0.403**	-0.054	-0.501**	-0.104*	-0.380**
	(0.198)	(0.257)	(0.244)	(0.058)	(0.184)
% *Decrease*	68.04	32.84	71.29	34.82	70.33
Obs.	913	502	450	245	880

Notes: (1) Dependent variable: *% Growth in developable land* (Δu). (2) RD estimates. 2nd order polynomial of votes to seat majority fitted at both sides of the threshold, with a 100% sample bandwidth. Main control variables included. (3) CL=Center-Left, RR=Right-Right, LL=Left-Left, and CR=Center-Right. (4) % Decrease = 2SLS coefficient divided by the value of the dependent variable at the -0.05 bin.

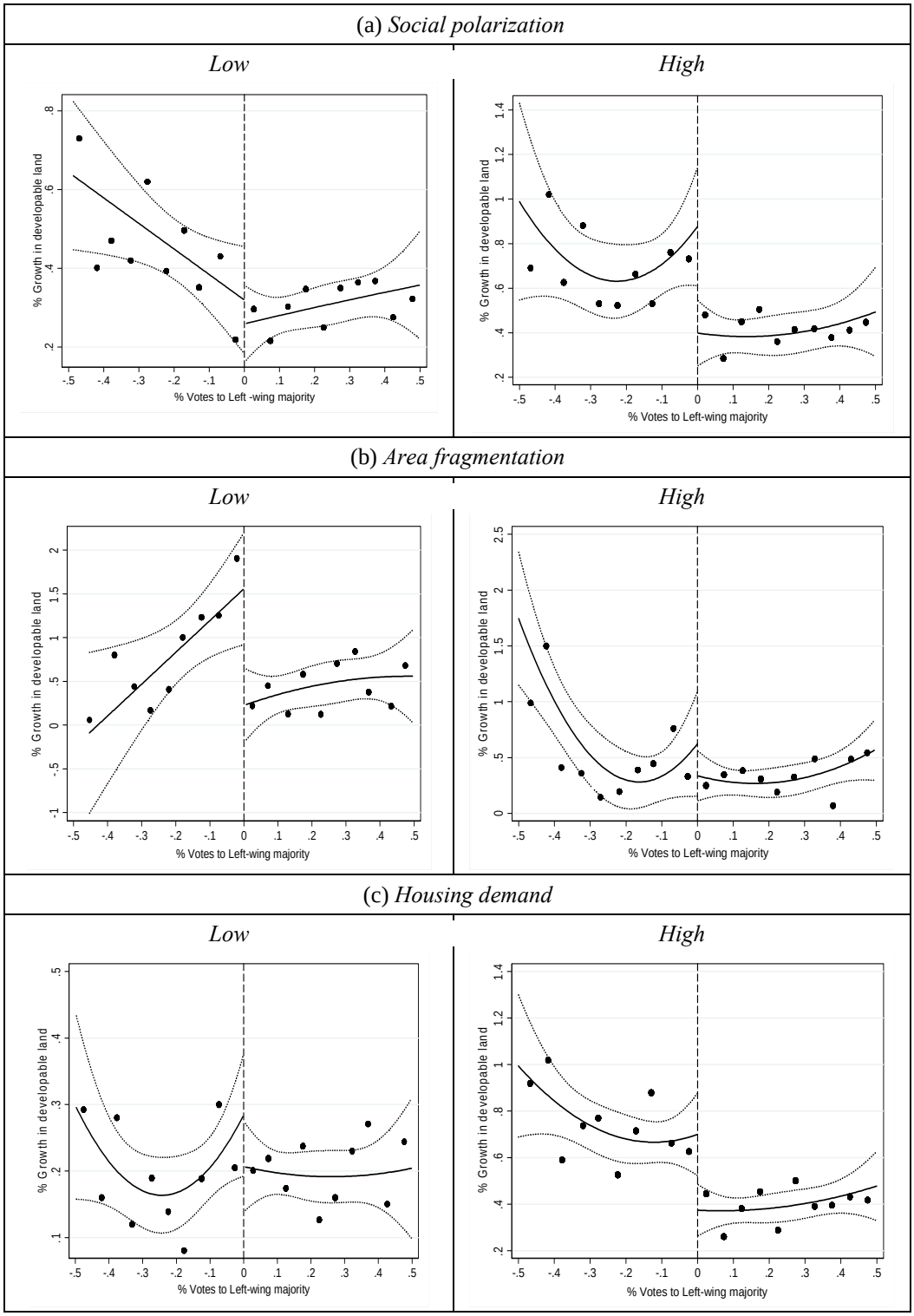
Figure A.3
RDD *with alternative vote distance measures.*
Dep. Variable: *% Growth in developable land:*



Notes: (1) Black circles and solid line = vote distance computed assuming vote migration towards abstention; (2) Hollow circles and dashed line = vote distance computed assuming vote migration towards both abstention and opposition's ideological bloc. (3) Polynomial of order two is the optimal one in both cases.

A3: RD graphs for the different sub-samples and outcomes

Figure A.4
% Growth in developable land vs. % Votes to left-wing majority: Population heterogeneity and housing demand

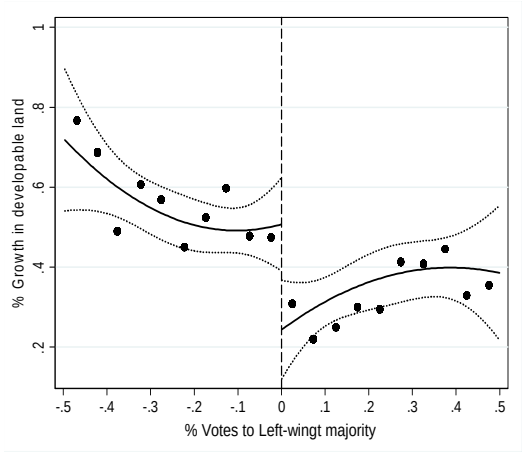


Notes: See Figure 3 and Table 6.

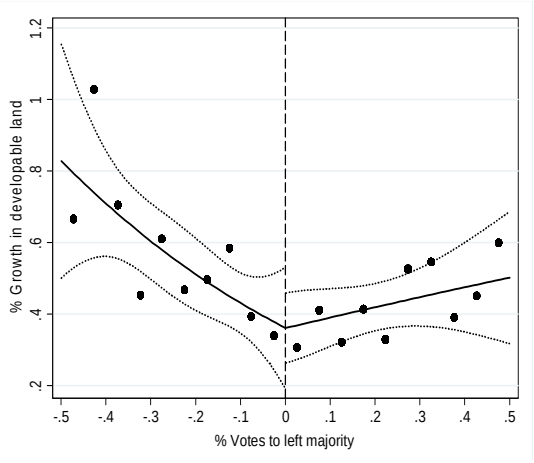
Figure A.5:
RDD *graphs for additional outcomes and dynamic results*

(i) *% Growth in developable land*

(i.a) *Contemporaneous effect*

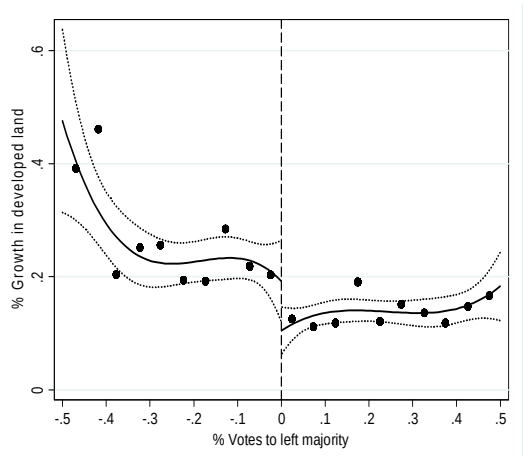


(i.b) *Lagged effect*

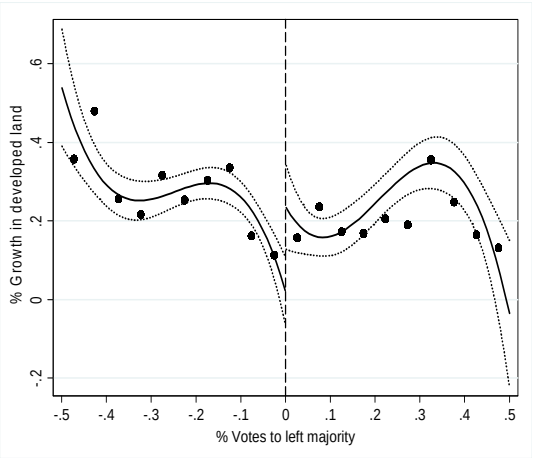


% Growth in developed land

(ii.a) *Contemporaneous effect*

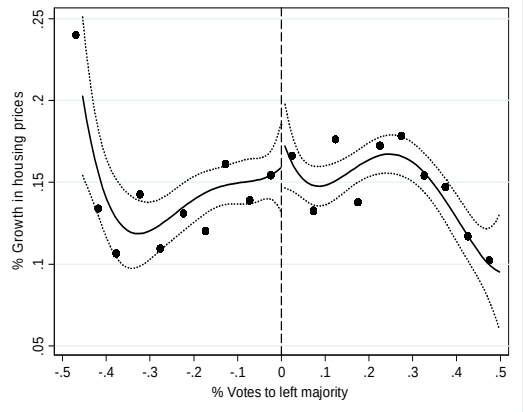


(ii.b) *Lagged effect*

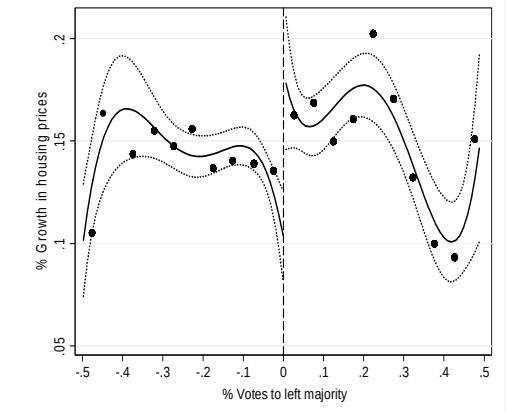


(iii) *% Growth in housing prices*

(iii.a) *Contemporaneous effect*



(iii.b) *Lagged effect*



Notes: (1) See Figure 3 and Table 7. (2) Contemporaneous effect: effect of party in term 2003-07 on outcome during the same term. Lagged effect: effect of party in term 1999-2003 on outcome during term 2003-07.

A4: Computing the % *Votes to Left-wing majority*

An example. The forcing variable for our RD design is the % *Votes to Left-wing majority*, defined as the minimum number of votes (expressed as a % of the total votes cast at the local elections) that needs to be subtracted from/added to left-wing parties in order for the left-wing bloc to lose/win a majority of seats in the local council. To compute this number we proceed in the following way. First, we assume that all parties can be classified into two ideological groups (left- or right-wing). Second, we identify the ideological bloc to which the incumbent belongs as the one which contains the party that holds the mayoralty. Third, we define a *Vote distance* variable (henceforth labeled as υ) as the minimum number of votes that needs to be subtracted from the incumbent's ideological bloc for that bloc to lose the majority of seats. We express this quantity as a % of the total votes cast at the local elections and call it % *Vote distance* (which is equal to υ/V, V being the total number of votes). Fourth, the % *Votes to Left-wing majority* is equal to this amount if the incumbent belongs to the left-wing bloc or equal to minus this amount if the incumbent belongs to the right-wing bloc.

Table A.5:
Example of how the vote distance is computed

	Panel a) *Initial seat allocation*				*Panel b*) *Final seat allocation*			
Ideological blocs	*Opposition's bloc* (e.g., Right-wing)		*Incumbent's bloc* (e.g., Left-wing)		*Opposition's bloc* (e.g., Right-wing)		*Incumbent's bloc* (e.g., Left-wing)	
Parties)	P1	P2	P3	P4	P1	P2	P3	P4
Votes (v^i)	95	957	207	1116	95	957	152	820
Vote share (v^i/V)	0.04	0.40	0.09	0.47	0.05	0.47	0.08	0.41
Seats (s^i)	0	6	1	6	0	7	1	5
Seat share (α_i)			0.16	0.84				
Panel c) *Seat allocation*								
Divisors	*Comparison numbers*							
1	95.00	957.00	207.00	1116.00	95.00	957.00	152.00	820.00
2	47.50	478.50	103.50	558.00	47.50	478.50	76.00	410.00
3	31.67	319.00	69.00	372.00	31.67	319.00	50.67	273.33
4	23.75	239.25	51.75	279.00	23.75	239.25	38.00	205.00
5	19.00	191.40	41.40	223.20	19.00	191.40	30.40	164.00
6	15.83	159.50	34.50	186.00	15.83	159.50	25.33	136.67
7	13.57	136.71	29.57	159.43	13.57	136.71	21.71	117.14
8	11.88	119.63	25.88	139.50	11.88	119.63	19.00	102.50
9	10.56	106.33	23.00	124.00	10.56	106.33	16.89	91.11
10	9.50	95.70	20.70	111.60	9.50	95.70	15.20	82.00
11	8.64	87.00	18.82	101.45	8.64	87.00	13.82	74.55
12	7.92	79.75	17.25	93.00	7.92	79.75	12.67	68.33
13	7.31	73.62	15.92	85.85	7.31	73.62	11.69	63.08
υ_i			55	296				
Vote distance (υ)			351					
% Vote dist. (υ/V)			14.67%					

The computation of the quantity υ is not straightforward. It requires studying the workings of the procedure used to allocate seats, the 'd'Hondt' rule. As explained, under

this rule the votes for each party are divided by 1, 2, 3, 4, etc. The resulting quotas or 'comparison numbers' are ranked and a fixed number of seats are then allocated on the basis of this ranking. Panel (a) in Table A.5 illustrates how the d'Hondt rule works with a hypothetical example comprising four parties (i=1 to 4), two from the incumbent's bloc (P3 and P4; let's assume they are left-wing parties) and two from the opposition bloc (P1 and P2; let's assume they are right-wing parties). The ideological bloc in control of the local government received 1,323 votes, that is 56% of the votes cast at the municipal elections, and obtained 7 out of 13 seats (6 were won by P4 and 1 by P3), and so it holds the mayoralty. On the opposition side, all 6 seats went to party P2. In Panel c) we detail the procedure followed to allocate seats, showing the comparison numbers obtained after dividing the votes of each party by each divisor. The first seat is allocated to P4 with a comparison number of 1,116, the second to P2 with a comparison number of 957, the third again to P4 with a comparison number of 558, and so on. The last seat to be allocated is the sixth seat to P2 (that is to the opposition bloc) with a comparison number of 159.50, which is slightly higher than the comparison number of the seventh seat of P4 (which would have been the eighth seat of the regional incumbent's bloc). Note that the seventh comparison number of P2 (the next seat that P2 and the opposition bloc would win) is 136.71, which is lower than the quotient of the sixth seat of P4, which is 186. Intuitively, in order for the opposition bloc to have a majority of seats, votes have to be added to the parties in this bloc (or subtracted from parties in the other bloc) to raise the first of these comparison numbers above the second one. In Panel (b) of Table A.5 we show a situation where this does in fact occur (the comparison numbers now being 136.71 vs 136.67). To move from the initial seat allocation in Panel (a), with the majority being held by the regional incumbent's ideological bloc, to the final seat allocation in Panel (b), with the majority now corresponding to the regional opposition, we have subtracted 351 votes from the incumbent's bloc, taking these votes from the parties in the bloc in proportion to their initial vote share (i.e., 55 are subtracted from P3 and 296 from P4). The *Vote distance* is thus 351 and the % *Vote distance* is the ratio between this number and the total number of votes, i.e., 14.67%. Since we have assumed that the incumbent belongs to the left-wing bloc this is also the value of our forcing variable, the % *Votes to Left-wing majority*.

Algebraic formulation. We have developed a procedure to compute the *Vote distance* (υ) for each of the municipalities in the sample. The Stata code is available upon request. Here is a simplified presentation of our formulation. Our procedure works (as in the above example) by subtracting votes from the parties belonging to the incumbent's ideological bloc. We start by making various assumptions regarding the migration of

these votes. First, we assume that the votes lost by the incumbent's bloc are allocated amongst the parties belonging to this bloc in proportion to their initial vote share. Second, we assume that these votes either go: (i) to abstentions or (ii) both to abstentions and to the parties in the opposition bloc. We present the formulation for the first approach (votes going only to abstentions), but the formula used in the other approach is available upon request. Below we present the formulation used for the close election cases – i.e., cases where the seat margin is –1 or +1.[32]

Some notation and definitions are needed:

v_I^j & v_O^k:	Votes for parties *j* and *k* from the incumbent's (*I*) and opposition (*O*) blocs, respectively.
α_I^j & α_O^k:	Share of votes for the *I* and *O* blocs going to parties *j* and *k*.
s_I^j & s_O^k:	Seats for parties *j* and *k* from the *I* and *O* blocs.
$c_I^j(s_I^j) = v_I^j / s_I^j$:	Comparison number for the 'last seat' won by party *j* from the *I* bloc.
$c_I^j(s_I^j + 1) = v_I^j / (s_I^j + 1)$:	Comparison number for the 'next seat' to be won by party *j* from the *I* bloc.
$c_I^{\min}(s_I) = \min_j \{c_I^j(s_I^j)\}$:	Smallest comparison number for the 'last seat' won by any party from the *I* bloc
$c_I^{\max}(s_I + 1) = \max_I \{c_I^j(s_I^j + 1)\}$:	Largest comparison number for the 'next seat' to be won by any party from the *I* bloc.
$c_O^k(s_O^k)$, $c_O^k(s_O^k + 1)$, $c_O^{\min}(s_O)$ and $c_O^{\max}(s_O + 1)$:	Corresponding comparison numbers for the opposition bloc.

If a party belonging to the incumbent's bloc is to lose a seat and a party from the opposition bloc is to gain a seat, the comparison number of the party in the opposition bloc with respect to the next seat to be gained must be larger than the one for the last seat assigned to a party of the incumbent's bloc, once υ votes are subtracted from this party. The condition for the party of the opposition bloc winning a seat is:

$$c_I^{\min^*}(s_I) < c_O^{\max}(s_O + 1) \qquad \text{[A.1]}$$

where $c_I^{\min^*}(s_I)$ is the smallest comparison number for the last seat originally won by a party among the parties from the incumbent's bloc once υ votes have been subtracted to the party holding this last seat. Note that [A.1] can be rewritten as:

$$\frac{v_I^x - \upsilon^x}{s_I^x} < \frac{v_O^z}{s_O^z + 1} \qquad \text{[A.2]}$$

[32]In the cases with a seat margin larger than one, the implementation of the formula follows several steps. Intuitively, we need to compute the number of votes required for the mayor's bloc to lose the last seat obtained, then the number of votes needed to lose the following seat, and so on until we reach the last seat to be lost after losing the majority. The total number of votes is the summation of the votes that have to be lost so as to lose each of the seats. The algebraic formulation of this more complex case is also available upon request.

where party *x* is the one with the smallest comparison number for the last seat won by any party from the *I* bloc (i.e., $c_I^x(s_I) = v_I^x / s_I^x = c_I^{\min}(s_I)$) and party *z* is the one with the largest comparison number for the next seat to be won by any party from the opposition bloc (i.e., $c_O^z(s_O^z + 1) = v_O^z / (s_O^z + 1) = c_O^{\max}(s_O + 1)$). The votes to be subtracted from party *x* are indicated with υ^x and can be computed as:

$$\upsilon^x = (c_I^{\min}(s_I) - c_O^{\max}(s_O + 1))s_I^x = ((v_I^x / s_I^x) - (v_O^z / s_O^z + 1))s_I^x \qquad [A.3]$$

Intuitively, the number of votes that has to be subtracted to a party to lose the last seat won depends on the difference between the comparison number of this last seat and the comparison number of the seat to be won next by the opposition bloc. This difference is multiplied by the actual number of seats won by this party, which was the divisor number used to obtain that comparison number.

Now, if we assume that all the parties from the incumbent's bloc lose votes according to the votes originally obtained, the number of votes to be subtracted to the whole incumbent's bloc can be expressed as[33]:

$$\upsilon = \frac{\upsilon^x}{\alpha_I^x} + 1 \qquad [A.4]$$

where we have divided the quantity υ^x by the vote share of this party in its bloc (α_I^x). The intuitive idea here is that if the marginal party obtains a given extra number of votes the other parties in the bloc also obtain a vote increase, and the total vote increase for the ideological bloc should sum all these quantities. The +1 added to the formula is simply to ensure that we obtain a non-zero quantity.

[33] This is in fact a simplified version of the formula, since we need to verify that the seat lost by a party in the bloc in power really goes to a party in the other bloc and not to another party in the same bloc. If the seat goes to a party in the same bloc, an additional iteration is needed. Intuitively, we need to add the number of votes that have to be subtracted to move the seat from one party to another in the same bloc plus the votes needed to move the seat to the other bloc. This problem only affects a very small proportion of cases, but the algorithm needs to take it into account so as to fit all possible cases. The exact formulation is quite cumbersome and is not included here, but it is available upon request from the authors together with the Stata code.