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Abstract

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JEL Classification: D72, H70, R52

Keywords: Local government, Land use policy, Political parties

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The Political Economy of Coastal Development*

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ABSTRACT: Coastal amenities are common goods. When deciding on the amount of coastal development, local governments might not internalize the impact of their decision on non-residents' welfare. We contend that political alignment between neighboring local governments facilitates cooperation, helping restrain coastal overdevelopment. We leverage causal effects by applying a close-elections Regression Discontinuity Design to the universe of buildings in Spain. We find that municipalities with mayors belonging to the party controlling most municipalities in the same coastal area develop 32% less land than politically isolated municipalities. We also show that politically homogeneous coastal areas develop less than their fragmented counterparts. Both effects are larger for land closest to shore and in municipalities and coastal areas with a large share of land included in nature preservation zones.

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1. Introduction

In Spain, 20 million people, or 44 percent of the population, live less than 5 km from the seashore. In 2019, the country received 84 million tourists, often drawn by the attractive, sunny beaches.[1] As a result, the Spanish coast is heavily developed, with artificial land covering 36.5 percent of the first 500 meters fringe from shore. Land development is particularly large in tourist hotspots such as in the region of Valencia (74.3 percent) or the city of Marbella (90 percent), indicating that coastal development is significantly related to the construction of hotels and vacation homes. Excessive shoreline development is responsible for shrinking forests, wetlands, dunes, and beaches. It affects the beauty of the landscape, reduces biodiversity, increases flood and forest fire risks, and brings about congestion and water pollution (Greenpeace, 2019). As a result, overdevelopment also negatively impacts tourism activity, given the effect of environmental quality on tourists' willingness to pay (Mieczkowski, 1995), which drives down the quality of the tourist destination and the industry's profits (Pintassilgo and Silva, 2007).

Could this overexploitation of coastal resources be related to their common pool characteristics (Hardin, 1968)? Agents with open access to coastal land (e.g., hotels, developers) might not account for the effects of their decisions on environmental quality or the profits of other agents. This might justify government intervention through limits on building permits, accommodation industry taxes, or direct restrictions on the number of visitors. However, these policy decisions are often the responsibility of local governments, which may also fail to account for the effects of their decisions on neighboring jurisdictions. That is, granting more building permits affects the environment's quality and the industry's profits in both the town and the surrounding areas. As a result, local governments may allow too much development close to shore. A possible solution to this problem is to transfer the decision-making authority to a higher-level government or agency that encompasses all towns in the coastal area.[2]

But how to solve this collective action problem in the absence of a central planner? Some authors suggest that, as an alternative, local governments could negotiate develop-

[1] Population figures are for 2020 and have been computed from the gridded world population (https://sedac.ciesin.columbia.edu/data/set/gpw-v4-population-countrev11). Tourism data is from Turespaña (http://estadisticas.tourspain.es). Data on land development is from the Corine Land Cover Project (https://land.copernicus.eu/ pan-european/ corine-land-cover).
[2] A good example is the California Coastal Commission, a state agency with quasi-judicial control of land use along the California coastline (https://www.coastal.ca.gov).

ment levels jointly and generate outcomes close to the centralized one (Ostrom, 1990, Lubell et al., 2002, Feiock, 2007). However, voluntary cooperation among local governments is difficult since they have a limited ability to design common rules and might find it hard to monitor and sanction one another (Ostrom, 2000). In this paper, we investigate the role of co-partisanship as a facilitator of voluntary cooperation. We expect mayors belonging to the same party to have more incentives to cooperate than mayors from different parties. For instance, politically aligned mayors often share the same electoral fate, interact more frequently, need to agree on common policy positions, have to rely on mutual support to build alliances, and can be disciplined by higher party ranks. We develop a theoretical framework that allows us to pose two distinct but complementary hypotheses regarding the role of parties in fostering cooperation. First, cooperation should be more intense in areas with less party fragmentation (most mayors belong to the same political party), leading to less development. Second, a town ruled by a mayor aligned with the party controlling most towns in the area should have more incentives to cooperate –and should allow for less development– than a town controlled by a minority party.

To test these hypotheses, we focus on the development of the Spanish coast over the last four decades. For our analysis, we rely on high-quality administrative data on the amount of built land along the Spanish coast. The main data source is the Cadaster, which provides geocoded information for the universe of buildings in Spain, including the year construction of each building began. This information allows us to measure the amount of land that has been built up at a short distance from shore during each local term of office. We then use a new database on all local elections held in Spanish municipalities since the re-establishment of democracy in 1979. This allows us to identify the mayor's party and measure fragmentation at the coastal area level with a Herfindahl index that uses either shares of municipalities controlled by the same party or shares of municipalities controlled by the same ideology (that is, left-wing vs. right-wing parties).

We perform three different analyses. First of all, we document the positive association between the increase in the level of fragmentation and coastal development. Second, we rely on a close-elections Regression Discontinuity Design (RDD) to estimate the causal effect of political alignment on development[3]. The RDD compares municipalities

[3] This approach was used previously by Durante and Gutierrez (2015). To account for the specific characteristics of Spain's proportional representation system, we follow the RDD method pioneered by Folke (2014) and described in detail in Curto *et al.* (2018).

that elected an aligned mayor (i.e., belonging to the ideology ruling in most municipalities in the coastal area) to an unaligned one. In close elections, both municipality types are identical except for their alignment status, so the treatment assignment is as-good-as random at the threshold. Third, we use the same RDD to identify the effect of fragmentation on development at the coastal area level.

Our results are striking. First, the RDD results indicate that aligned municipalities develop around 32% less land than their unaligned counterparts. This effect is larger when the size of the majority is larger (i.e., the number of aligned municipalities in the area is higher). Second, coastal areas with high fragmentation develop more than areas with low fragmentation. An increase of one standard deviation in the Herfindahl index (that point to less fragmentation) generates a drop of around 17% in shoreline development in the entire coastal area. Third, we also find that both effects (at the municipal and the coastal area level) decrease with distance to shore and increase with environmental value as proxied by the share of protected land. This latter result suggests that cooperation is to some degree motivated by a desire to preserve environmental amenities.

This paper contributes to multiple strands of the literature. First, while we abstract from general equilibrium considerations (e.g., Faber and Gaubert, 2019), our work endogenizes the variation in local amenity spillovers through an often-neglected political economy mechanism. In doing so, we emphasize the importance of the political economy forces for the spatial distribution of urban development, particularly in contexts of high environmental amenity spillovers. Several papers also study the effect of local governments' fragmentation or decentralization reforms on environmental outcomes. For instance, Hatfield and Kosec (2019) show that environmental quality in the US is lower in metro areas with more local governments[4]. Their identification uses the 'number of small streams' as an instrument (Hoxby, 2000). Burges et al. (2012) and Lipscomb and Mobarak (2016) study the effect of decentralization on deforestation and river pollution, respectively. Both papers find evidence of negative externalities and suggest decentralization might have been detrimental. Their identification strategy exploits decentralization or redistricting reforms that alter the number of local governments. We depart from their approach by exploiting the partisan fragmentation of local governments rather

[4] This literature started with the seminal contribution of Oates (1972) on the suboptimal local provision of public goods with spillovers. Papers assessing the magnitude of externalities in a decentralized setting include those by Knight (2013) and Knight and Schiff (2019).

than the fragmentation in the overall number of local governments. Doing so allows us to examine spatial variation in cooperation incentives within local coastal areas and the subsequent development responses.

Second, the political science and political economy literature suggest that centralized parties can solve the collective action problem that affects federations (Riker, 1964; Filippov et al., 2004; Wibbels, 2006). The work by Rodden (2003) and Enikolopov and Zhuravskaya (2007) provides empirical evidence that party centralization enhances fiscal discipline and the provision of other national public goods. Nearly no papers are looking at the effect of political partisanship on inter-municipal cooperation. A notable exception is the work of Durante and Gutierrez (2015), who study police cooperation among Mexican municipalities.

Third, a related literature in public administration emphasizes the importance of political homophily (i.e., similarity in political traits of local jurisdictions) for participation in cooperation networks (Clingermayer and Feiock, 2001; Feiock, 2007). Political homophily reduces transaction costs and enhances cooperation due to the similarities in political attitudes and the higher levels of trust in the relationship. Empirical papers in this strand focus on the similarity of economic and political characteristics of voters (Gerber et al., 2013) while we focus on similarity among political leaders and, specifically, on whether they belong to the same political party or have a similar ideology.

Finally, this paper also contributes to the literature on strategic local land-use regulations. Fischel (2008) studies the role of jurisdictional fragmentation on land-use decisions, and Helsey and Strange (1995) and Brueckner (1995, 1998) show that cities deciding in isolation on the use of 'urban growth controls' do not account for the externalities they impose on one another. Suburban governments might constrain residential development too much, creating a housing affordability problem in the whole area. Tricaud (2021) provides evidence that cooperation among suburban municipalities in France contributes to internalizing positive externalities and increasing housing supply. The idea is similar here, but not the externality. While most of this literature focuses on positive externalities and land undersupply, we focus on negative externalities and oversupply, which we believe is more relevant for coastal areas specialized in recreation.

The paper is organized as follows. In the next section, we develop a model that formalizes the idea that alignment matters for cooperation in local land development decisions. In section three, we provide some details on the Spanish context. Section four introduces the data used in our empirical application and describes our research strategy. Section five presents the results. The last section concludes.

2. Theoretical framework

In this section, we develop a stylized model of cooperation in land development between neighboring local governments controlled by different political parties. The model aims to clarify the empirical predictions regarding the effect of party fragmentation on the amount of development and help us derive our identification strategy.

Model layout. We focus on a coastal area with N beach municipalities located along the coastline. Each municipality's government has full control over land development within its jurisdiction. We consider a fixed number of projects that developers want to execute in the coastal area, which depends on exogenous traits such as the number of sunny days and accessibility. The number of projects is high, so the only limit to development is the unwillingness of the local government to authorize it.

We consider that each local government maximizes the utility of a representative voter living in the municipality. We express voters' utility, $V(a_i, y_i)$, as a function of the value of environmental amenities, a_i, and the level of economic development, y_i. This utility function has the usual properties: $V_a \geq 0, V_y \geq 0, V_{aa} \leq 0$ and $V_{yy} \leq 0$. Amenities depend on the amount of land kept undeveloped in the municipality, u_i, and in the rest of the municipalities in the coastal area, u_{-i}:

$$a_i = u_i + \theta(N-1)u_{-i} \quad (1)$$

where parameter $\theta \in (0,1]$ measures the strength of the externality. Residents only care about amenities located in the municipality where they live when θ=0, and amenities in the municipality and in the rest of the coastal area are equally valued when θ=1.

We assume that each municipality is endowed with a unit of land, which means that developed land can be written as:

$$d_i = 1 - u_i \qquad \& \qquad d_{-i} = 1 - u_{-i} \quad (2)$$

If (2) is plugged into (1), the level of amenities can then be rewritten as:

$$a_i = 1 - d_i + \theta(N-1)(1 - d_{-i}) \quad (3)$$

Economic development is expressed as $y_i = d_i$, which means that income and economic opportunities in *i* grow with the amount of land developed.

Main Results. We now assume, for the sake of simplicity, that there are only two political parties, which are labeled *j* and *-j*. We define N_j and $N_{-j} = N - N_j$ as the number of municipalities controlled by each party. We further assume perfect within-party cooperation, which means that a local government will account for the effect of development on residents in all municipalities controlled by the same party[5]. Given that all municipalities are identical except for the fact that some are controlled by one party and some by the other, and expressing the utility function as $V(a_j, y_j) = a_j^{\alpha} {y_j}^{1-\alpha}$ with $\alpha \in (0,1)$, we can write the objective function of a local government controlled by party *j* as:

$$V(a_j, y_j) = \left[1 - d_j + \theta(N_j - 1)(1 - d_j) + \theta N_{-j}(1 - d_{-j})\right]^{\alpha} {d_j}^{1-\alpha}$$

where d_j and d_{-j} are the average development in a *j* and a *-j* municipality, respectively. Taking the derivative of this expression w.r.t. d_j we obtain the F.O.C.:

$$\frac{\partial V(a_j, y_j)}{\partial d_j} = -\alpha(1 - \theta + \theta N_j)[\,\cdot\,]^{\alpha-1} {d_j}^{1-\alpha} + (1-\alpha) {d_j}^{-\alpha} [\,\cdot\,]^{\alpha} = 0$$

Solving the system for d_j and d_{-j}, we get:

$$(4a) \qquad d_j = \frac{(1-\alpha)(1-\theta+\theta N)}{\Lambda}\left[1 + \theta(\alpha N_{-j} - 1)\right] \geq 0$$

$$(4b) \qquad d_{-j} = \frac{(1-\alpha)(1-\theta+\theta N)}{\Lambda}\left[1 + \theta(\alpha N_j - 1)\right] \geq 0$$

where

$$\Lambda \equiv \left(1 + \theta(N_j - 1)\right)\left(1 + \theta(N_{-j} - 1)\right) - (1-\alpha)^2 \theta^2 N_j N_{-j}$$

is positive given the values assumed for α and θ. Working with expressions (4a) and (4b), we obtain the following result for d , the total amount of land developed in a coastal area:

$$(5) \qquad d = \frac{(1-\alpha)(1-\theta+\theta N)}{\Lambda}\left(N(1-\theta) + 2\theta\alpha N_j N_{-j}\right)$$

PROPOSITION 1. *Aggregate Effect: The total amount of land developed in a coastal area controlled by politically fragmented municipalities is higher than the total amount of land developed in an (identical) coastal area controlled by politically homogeneous municipalities.*

This result arises directly from expression (5). Define the degree of fragmentation $\zeta \equiv N_j N_{-j}$. The larger ζ, the more politically fragmented is the coastal area. For example,

[5] Of course, in practice, cooperation between mayors belonging to the same party might also be imperfect. Moreover, in a setting with many political parties the incentives to cooperate might depend on the ideological distance between parties.

consider the case of a coastal area with seven municipalities; when all municipalities are controlled by the same political party, ζ=0, while if four of them are controlled by one party (the majority party) and three by the other party (the minority party) then ζ=12. The marginal impact of political fragmentation (ζ) on aggregate development (d), holding the total number of municipalities in the area (N) fixed, is:

$$(6) \qquad \frac{\partial d}{\partial \zeta} = \frac{(1-\alpha)(1-\theta+\theta N)}{\Lambda^2}\alpha\theta[(1-\theta)(N\alpha-2)\theta+2] \geq 0$$

Such that overall development in a coastal area increases with the degree of political fragmentation.

PROPOSITION 2. *Local Effect: A municipality ruled by the political party which controls the majority of municipalities in the coastal area allows for less development than an (identical) municipality ruled by a party that does not control the majority of municipalities in the coastal area.*

Assuming that *j* and *-j* are the parties ruling in the majority and in the minority of municipalities, respectively, we take the difference between expressions (4a) and (4b):

$$(7) \qquad d_j - d_{-j} = -\frac{(1-\alpha)(1-\theta+\theta N)}{\Lambda}\alpha\theta\left(N_j - N_{-j}\right) \leq 0$$

The negative effect of being in the majority arises from our assumption that *j* is the majority party, which guarantees that the $N_j > N_{-j}$ condition holds. This result happens because a municipality in the majority accounts for what happens in a larger number of municipalities than a municipality in the minority, and so internalizes the effect of the externality to a greater extent. Note that a consequence of this result is that the difference in the level of development between a municipality ruled by the party in the majority and an (identical) municipality ruled by a party in the minority increases with majority size, $N_j - N_{-j}$. Importantly, it is clear from both equations (6) and (7) that in the absence of amenity spillovers, θ, the impact of political fragmentation on development is null both in the aggregate and in the local case. Intuitively, this indicates that the size of amenity spillovers conditions the reaction to the level of political fragmentation in a coastal area.

Key predictions. Together, these two propositions help clarify that cooperation, proxied by partisan homogeneity or political alignment, will curb development at the aggregate and at the local level. The aggregate prediction is the most interesting since it illustrates the effect of cooperation on development at the coastal area level. The local effect does not convey information about the aggregate response because a local mayor's alignment status impacts both the municipality's and the surrounding area's development. This local effect is nonetheless interesting for two reasons. First, it provides a way of testing our theory since the prediction that alignment matters for local development only holds in the presence of spillovers. [6] Second, it helps to devise a causal estimation method for the effect of both alignment and fragmentation on development. Notice that the prediction of Proposition 2 regarding the effect of alignment is conditional on holding all other municipality traits constant. A way to ensure that the characteristics of treated and control municipalities are equal is to use a close-elections regression discontinuity design. Moreover, besides estimating the local effect, this method will also allow us to causally evaluate the aggregate impact of fragmentation on coastal area development. The reason is that when a municipality in a coastal area switches from unaligned to aligned, the Herfindahl index of the whole area decreases.[7] We can then use the discontinuity in alignment to identify the impact of the Herfindahl index on land development in the whole coastal area.

3. The Spanish context

Spain is an extraordinarily well-suited case study to investigate collective action problems as local urban development responsibilities fall on a myriad of politically fragmented local governments, and a coastline subject to enormous tourism pressure. In this section, we provide details about the economic and institutional background in which Spanish coastal areas were built-up.

3.1 Coastal development

The Spanish coast underwent a development boom that started in the early 1960s when the Franco regime decided to open the country to international tourism and foreign investment. These years are known as the *desarrollismo* period, a concept that implied that development was the only priority and that the collateral effects, in terms of loss of open space and of cultural character, were sidelined.

[6] Other authors have recently suggested that one can use the effect of individual-level randomized treatments to infer market level aggregate effects. See, for example, the work by Casaburi and Reed (2022) in the context of an RCT evaluation of a subsidy to cocoa farmers.

[7] Notice that ζ can also be expressed as $\zeta = NN_j - {N_j}^2$. This expression indicates that an increase in the number of aligned municipalities, N_j, has a non-positive marginal impact on ζ (that is, $\partial\zeta/\partial N_j = N - 2N_j$, which is non-positive because we have defined N_j as the number of towns ruled by the majority).

The Spanish coast continued to undergo development at more or less the same pace after the arrival of democracy. Decades of tourist development have left their mark on the Spanish coast. Figure A.1 of the Appendix shows aerial photos from 1956 and 2012 as two examples of extreme development close to shore. The photos depict a completely undeveloped strip of white sand and of farmland in 1956, both of which had been completely developed by 2012. The Spanish coastline is now heavily built-up: 36.5% of the coastline has been developed, and this figure is as high as 74.3% in the region of Valencia and 90% in the city of Marbella (Greenpeace, 2010). Coastal development has continued at a fast rate in recent years (see Figure A.2 in the Online Appendix for the period under study). For example, in the 1987-2005 period, Spain developed 7.7 Ha of coastal land per day, equivalent to eight soccer fields. [8]

The consequences of this development on coastal amenities in Spain are harmful in terms of landscape quality, water resources, pollution, and biodiversity (Greenpeace, 2019). Some of these risks are becoming increasingly difficult to manage in light of climate change. These concerns have been gaining ground in the Spanish political debate on the need to preserve the remaining undeveloped coastal land. [9] However, economic benefits also feature prominently in the discussion. For example, recently, a conflict emerged regarding a huge hotel's construction in a protected area. The mayor argued its development would generate jobs needed to fight the high local unemployment rate.[10]

3.2 Coastal land-use policies

In Spain, decision-making on coastal land-use policies is highly fragmented. The country has more than 8,000 municipalities and 455 of which are located on the coast. Land-use planning is the responsibility of these local governments (see Solé-Ollé and Viladecans-Marsal, 2013). Municipalities have to draw up a Master Plan, which divides land into three categories (built-up, developable, and non-developable land) and includes detailed regulations regarding other aspects: zoning (residential, commercial, industrial), floor-to-area ratios, and reservation of land for streets, green spaces and public amenities. The

[8]See the newspaper report "Spain destroys an area of coastal land equivalent to eight soccer fields every day," *El Mundo*, 18/07/2010.

[9] This is evidenced by the rise in the number of conflicts between local environmental groups and local governments with development plans. See, for example: "A new platform emerges to protect the Costa Brava from new construction," *La Vanguardia*, 4/8/2018.

[10] See "The mayor of…in favor of opening 'El Algarrobico' because 'it will bring jobs'," *El Mundo*, 11/10/2011; the mayor mentions the very high unemployment rate in the municipality.

plan is updated periodically, usually after one decade, although the exact timing depends on the amount of growth experienced and, therefore, on the scarcity of developable land.

Local incumbents can use local planning to leave their mark on development in various ways. First of all, they may accelerate the update of the Master Plan. Second, they can exert influence on the granting permit process. Finally, they can also be more or less active in enforcing planning regulations (e.g., stopping projects without permit or not complaying with the permit's specifications) or in litigating against real estate developers. The decisions that will probably have the largest effect during the first term of office (four years) are those delaying or speeding the permitting process or intensifying enforcement and litigation. Modification of planning documents might take more time to materialize.

Higher layers of government also play some role in coastal protection. Regional governments are responsible for approving and overseeing local plans. They can veto them if they do not comply with basic laws, regional infrastructure plans (e.g., roads, water systems, energy supply), or regionally protected land (e.g., regional parks). The central government is responsible for protecting the coast and maritime space. In Spain, the strip of land closest to the coast is a national public good, and the central government regulates its use. This strip of coastline has always been subject to special protection, especially since the so-called Coastal Protection Law of 1988. This law banned all development on land less than 100 meters from the shore and heavily regulated development within 100-200 meters of the shore. However, both NGOs and experts questioned this law's enforcement (Greenpeace, 2010; Torres, 2010).

3.3 Local politics

Local elections are held simultaneously every four years in all municipalities. Voters choose between several closed party lists. The electoral system follows a proportional representation, and seats in the municipal council are allocated among party lists according to the d'Hondt method. Several left-wing and right-wing parties run separately in most municipalities, and pre-election coalitions are very rare.

Most of these parties run under national or regional party brands. There are also many local parties (e.g., independent candidates), but these win the mayoralty in just a handful of cases. In practice, most mayors belong to the main two parties, representing

69.9% of the mayors in the whole sample and 83.7% of close elections (Table A.2 in the Online Appendix)[11]. Local parties hold around 6% of mayors (2% in close elections).

A majority of the council elects the mayor. In about two-thirds of cases, the mayor's party has a majority in the council. A legislative coalition backs the remaining mayors, usually formed along ideological lines. The chances of the mayor's proposals being amended are very low for mayors controlling a majority of seats. Coalition-backed mayors are also powerful due to their procedural powers.[12] This gives the mayor extraordinary powers over the design and execution of land use planning. Scholars usually classify Spanish mayors as 'strong' (Mouritzen and Svara, 2002).

4. Data and Research Design

To test the predictions of Section 2, we build a database with information on land development close to shore for Spanish municipalities and coastal areas during a period spanning several decades. With this data, we will study the effect of area-level party fragmentation on aggregate coastal development close to shore and the alignment between the mayor and the majority party (the one controlling more municipalities in the area) on local (municipality-level) development close to shore. Below we describe how we select the municipalities and coastal areas we study, how we measure development close to shore, fragmentation, and alignment, and the other variables we use in our analysis. After that, we describe our identification strategy based on a Regression Discontinuity Design.

4.1 Municipalities and coastal areas

There are 455 coastal municipalities in Spain, defined as a jurisdiction including some portion of the coast (see Figure A.3 in the Online Appendix). Because of a lack of information on the Cadaster (which is our source of information on land use), we have to exclude the 30 coastal municipalities in the Basque Country. This leaves us with a final sample of 425 municipalities. The analysis period spans nine terms of office separated by ten local elections held every four years during the 1979-2015 period. These municipalities are distributed among 109 *counties*.

[11] Of these, 36.45% of mayors belong PSOE (the main party on the left) and 33.46% to PP (the main party on the right). These numbers are 45.23% and 38.47% in the close elections sample.
[12] For example, for the mayor to be unseated in a censure motion, another candidate must be backed by an alternative majority. Moreover, the mayor may call a motion of no confidence linked to specific policies that require the approval of the council (e.g., budget and Master Plan).

This is the preferred definition of the coastal area used in the paper. *Counties*, called 'comarcas' in Spain, are not administrative units per se but groups of municipalities defined by common geographical and historical traits that share a widely known place name. Along the coast, mountain ranges, river mouths, or coastal orientation draw the 'comarcas' borders. Coastal municipalities within a 'comarca' have a similar landscape and are affected by the same microclimate. An issue with 'comarcas' is that there is no official list since they are not administrative units. Fortunately, we can piggyback on synthesis work carried out by geographers. According to this source, Spain is divided into 526 *counties*, 109 on the coast. The median number of municipalities per *county* is 5.6, and the interquartile range is 4-7.[13]

As robustness checks, we will also report results for *coastal denominations*. These are larger geographical units with names corresponding to internationally recognized tourist brands (e.g., Costa Brava and Costa del Sol). See Figure A.4 for an illustration. These units are much larger than the *counties*: there are 29 of them, the median number of municipalities is 17.6, and the interquartile range is 11-24. The average distance between municipalities is relatively large, and their interests are more heterogeneous, so cooperation might be more difficult to sustain in this case.

4.2 Coastal land development

Our dependent variable is the amount of new developed land, either for each municipality or for each *county*, during a specific time period. The main results are presented for a full term of office (four years), but we also show results for longer time horizons. The land development data comes from the Spanish cadaster (Dirección General del Catastro, http://www.catastro.meh.es), which describes all buildings in Spain. Importantly for our goal, the database includes information regarding the geolocation, area, and starting and final year of construction of each building. We assign each building to a term of office using the starting date, which is the one that should be closest to the issuance of the building permit. We want to emphasize the high reliability of this information. The Cadaster is an administrative register overseen by the Ministry of Finance, whose primary purpose is to support tax administration. For example, the Cadaster is used to create tax

[13] See Figure A.5 in the Online Appendix. These numbers refer only to coastal municipalities (i.e., those with a portion of shore in their jurisdiction). We focus only on coastal municipalities because these are the municipalities that can make decisions regarding construction close to shore.

rolls for the local property tax. Registering a building in the Cadaster is free of charge and compulsory, and failure to do so can result in a fine.

We use this information to compute the amount of newly developed land for each coastal municipality and each coastal *county* at a specific distance from the shore. We focus on buildings less than 1 km from the shore for the main analysis. At this distance, locations are within walking distance of the shore, so they benefit most from coastal amenities. This is also the distance used in the Greenpeace reports on the destruction of the Spanish coastline (Greenpeace, 2010). However, we also look at shorter distance bands (100, 200, and 500 meters). Studying construction very close to shore is important because amenities are more valuable there and because higher layer regulations may interact with the incentives of municipalities to cooperate among them. Figure 1 shows an example of the kind of information provided by the Cadaster. The figure displays (in different colors) the amount of land built up in each term. The dashed lines indicate some of the distance bands used in the analysis.

[Insert Figure 1]

Two issues must be addressed when measuring this variable at the micro-level (i.e., for a specific distance band and geographical unit). First, the variable is highly skewed, suggesting the need for a log transformation. Second, the variable has zeros, especially when measured at the municipality level. [14] The solution adopted here is the *inverse hyperbolic sine* transformation (i.e., $\widetilde{\mathcal{B}uilt}_{it} = \log\left(\mathcal{B}uilt_{it} + \sqrt{(\mathcal{B}uilt_{it})^2 + 1}\right)$), which deals with the zeros and provides a coefficient that can still be interpreted as a semi-elasticity. Recent studies have shown that this option is preferable to using logs after adding a small constant (Bellemare and Wichman, 2020).

4.3 Fragmentation and alignment

We measure the level of fragmentation of each coastal area (e.g., defined by a *county*) *k* in term *t* with the following Herfindahl concentration index, H_{kt}:

$$H_{kt} = \sum_j \left(\frac{N_{jkt}}{N_{kt}}\right)^2$$

where N_{jkt} stands for the number of municipalities whose mayor belongs to party *j* in coastal area *k* and term *t*, and N_{kt} is the total number of municipalities in the area *k* at

[14] The proportion of zeros is 3.98% in the 1 km band. This number rises to 6.14% in the 500 m band, 9.62% in the 250 m band and 23.93% in the 100 m band.

term t. This index goes from zero to one. The value of one corresponds to a situation where the same party holds all the mayors in the coastal area, and so with a minimum possible level of fragmentation. The index goes towards zero as more parties have mayors in the coastal area. We also compute this index at the ideological block level (that is, left vs. right -wing parties).[15] This second measure allows cooperation to be influenced by ideological similarity and not only by strictly belonging to the same political party. The mean value of the county-level Herfindahl index is 0.536, with a standard deviation of 0.258.

We measure the alignment of a municipality, a_i, as a dummy equal to one when the mayor of that municipality belongs to the ideological party bloc (either left-wing or right-wing) that holds more mayoralties in the coastal area and equal to zero otherwise. Recall that, in section 2, we assumed $N_j > N_{-j}$. On average 61% of the municipalities in our sample are aligned.

To compute both the Herfindahl index and the alignment dummy, we need information on the mayor's party by term of office. This data comes from the local electoral database of the Spanish Ministry of Interior. To compute the alignment dummy and the version of the Herfindahl index that uses the two categories, we need to classify all parties standing in local elections into two main groups: left and right.[16] The classification of parties is based on information from party statutes or newspaper reports. This is a straightforward task for national parties and the most relevant regional parties. For minor regional parties and local parties, we also rely on the party brand, which is quite informative for left-wing parties (e.g., typical leftist names include words such as 'socialist,' 'communist,' 'green', or 'progressive').[17]

4.4 <u>Covariates</u>

We also use a variety of covariates, measured both at the municipality and the coastal area level (see Table A.1 in the Online Appendix). These variables are used in the validity checks and in subgroup analyses.

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[15] This index correlates very well with the $\zeta = N_j N_{-j}$ concentration index arising from the theoretical model. We use the Herfindahl index because it can be computed with two categories (left vs. right-wing blocs) and with more than two categories (full list of political parties).

[16] See Tables A.2 and A.3 in the Online Appendix for basic statistical information on the composition of the two blocs and for a list of the most relevant party names.

[17]The few remaining local parties whose names offer no clues as to their connection to a left-wing ideology (e.g., 'civic list', 'neighborhood association', 'independent,') are either classified as right wing or included in a residual category. The results using an index computed using the other approach are similar. The alignment results are also robust to this issue.

First of all, we gather information on local political characteristics. We collect data on the votes and seats for each party and municipal election. Later, we use these variables to implement the Regression Discontinuity Design. Other municipality-level political variables include dummies for Left-wing mayor, Local-regional alignment (if the mayor and the regional president have the same ideology), Local-central alignment (if the mayor and the national president have the same ideology), and Council majority (if a single party has a majority of seats in the local council). We also use the vote margin (i.e., the number of votes for the ideological block of the mayor minus that of the opposition as a percentage of total votes). Finally, these variables are also computed at the coastal area level. For example, we measure the share of left-wing mayors in the *county*, the share of mayors which are aligned with the region, and so on. The data used to compute all these variables comes from the Spanish Ministry of the Interior electoral database.

Second, we gather information on geographic features. These include the Coast length, the ratio of Beach to Coast length, and the amount of land in each distance band. We compute the latter by subtracting the amount of land already built in the past (data from the Cadaster) from the total land area in each coastal band. Our database also includes the number of rainy days and the average temperatures from the State Meteorological Agency, a dummy identifying ocean or sea (Mediterranean vs. Atlantic/Cantabrian seafront), a dummy for island status (e.g., the Balearic Islands and the Canary Islands), and the share of environmentally valuable land, according to the European Union's Natura 2000 network.

Finally, we have information on socio-economic variables from the 1981, 1991, 2001, and 2011 censuses, referring to employment shares by education level and sector. These data are interpolated for the years between censuses. We also have data on unemployment and the number of tourists from the Anuario Económico La Caixa, which is available biannually.

4.5 Regression Discontinuity Design

As explained in Section 2, our conjecture that political heterogeneity spurs development at the coastal area level directly relates to Proposition 1. The panel structure of the database allows us to look at the association between variation over time in the Herfindahl index and the variation over time in developed land at the coastal area level. We investigate this relation in Section 5.1. However, this association could be confounded by any number of time-varying factors. For instance, changes over time in political fragmentation could correlate with changes in other political variables affecting land development.[18] This association might also be the result of reverse causality. For example, there might be building shocks specific to some coastal areas and periods that remain unobserved but that are known by voters and politicians and might, in turn, affect the outcome of local elections and the degree of political fragmentation. Therefore, to identify the causal effect of political fragmentation on coastal land development, we rely on a close-elections Regression Discontinuity Design (RDD). We first discuss how one can apply this methodology to estimate the effect of alignment on local development (the prediction for which the use of an RDD seems more feasible). After that, we show how one can also use this RDD to estimate the effect of fragmentation on aggregate coastal area development.

Regression Discontinuity: Municipal alignment. Proposition 2 predicts that a municipality controlled by the majority party should develop less land than one controlled by the minority party. This prediction is conditional on these municipalities being identical in every aspect except for the identity of the mayor's party. One can guarantee this condition by comparing municipalities where the majority party won the local election by a narrow margin of votes to municipalities where the majority party also lost by a narrow margin. In this RDD setting, since winning and losing come down to a small number of votes, the treatment assignment around the threshold is as good as random, and municipalities on each side of the threshold should be comparable. For this reason, this identification method is considered the closest to an experiment and has recently been used by economists and political scientists to study the effects of party identity (see, e.g., Lee et al., 2004; Lee, 2008; Pettersson-Lidbom, 2008; Ferreira and Gyourko, 2009, Gerber and Hopkins, 2011, and de Benedictis-Kessner and Warshaw, 2016).

There are, however, several specificities to the Spanish system we should account for to implement the RDD in our case. First, we should guarantee that the counterfactual of an aligned municipality is always an unaligned one (and vice versa). This will not happen if a newly elected mayor's party modifies the identity of the majority party at the coastal area level. Take the example of an area with seven municipalities, three on the

[18]As, for example, the share of municipalities controlled by the left, the share of coalition governments, the share of municipalities aligned with higher layer governments, or the degree of electoral competition. See, Solé-Ollé and Viladecans (2012 and 2013) for evidence on the effect of electoral competition and ideology, respectively, on land development.

left and four on the right (which we label 3L/4R). The party controlling a majority of municipalities in the area is the right-wing one; the municipalities with a right-wing mayor are aligned, and those with a left-wing one are unaligned. Now assume that one of the right-wing municipalities switches to the left (i.e., to 4L/ 3R). This municipality would still be aligned (before it was with the right, and now it is with the left), meaning that this observation is unsuitable for our analysis. To deal with this issue, we exclude from our sample all the elections where the switch from one party to another would not imply a switch from aligned to unaligned with the party controlling a majority of municipalities in the coastal area.[19]

Second, the implementation of a RDD is complicated by the specific institutional features of Spanish local politics. The fact that local councils in Spain are elected using party-list proportional representation (PR) precludes the use of a traditional RDD. In PR systems, voters can vote for one of many party lists, and these votes are transformed into seats in the local council using a specific conversion method (i.e., the d'Hondt method in Spain). City council members then elect the mayor. The first challenge posed by such an institutional setting is that sometimes no single party holds a majority of seats in the council, which means that the mayor has to be supported by a coalition of parties. The second challenge concerns the difficulties in identifying the vote threshold at which an additional vote switches a seat from one party to another (and, thus, from the coalition that supports the mayor to the one that supports the opposition's candidate). Here, we apply the solution proposed for Spain by Curto et al. (2018), which closely followed other studies that had adapted the close-elections RDD to a PR system for other countries (see Folke, 2014; Ade and Freier, 2013; Fiva *et al.*, 2015; Fiva and Halse, 2016).

The method consists of two steps. First, in Spain, ideology represents a powerful driver for creating coalitions of parties that support the mayor. This allows us to define our treatment as a situation in which the ideological bloc of parties (i.e., left-wing or right-wing) holding most mayoralties in the coastal area also has a majority of seats in a particular local council. However, the fact that centrist or local parties sometimes support both right- and left-wing coalitions means that the ideological factor is not a perfect predictor of mayors' partisanship. We then use a 'fuzzy' RDD, as in Fiva and Halse (2016). Second, we compute the forcing variable as the percentage of votes that the majority

[19] In practice, this means that we start with 3,825 elections (of which 1,147 are close), but we only use 3,298 (of which 1,085 are close).

ideological bloc (the one with most mayors in the coastal area) must lose to lose the majority of municipal council seats, or win to obtain that majority, respectively. To do so, we first identify the last seat won by the ideological bloc holding a majority of seats in the municipal council. We then compute how many votes the parties in that bloc would have to lose for that seat to be transferred to a party in the other bloc. The computation uses the formulas developed by Curto et al. (2018).

Our RDD can be summarized by the following two-equation model:

$$\text{(8)} \qquad \mathcal{B}uilt_{it} = \alpha . a_{it} + g(v_{it}^0) + \beta . \mathcal{V}acant_{it} + X_{it}'\gamma + f_k + f_t + \varepsilon_{it}$$

$$\text{(9)} \qquad a_{it} = \delta . \mathbb{I}(v_{it}^0 > 0) + q(v_{it}^0) + \mu . \mathcal{V}acant_{it} + X_{it}'\eta + f_k + f_t + \epsilon_{it}$$

where $\mathcal{B}uilt_{it}$ is the amount of land surface that has been built on during the term of office t by local government i at a given distance from the coast (e.g., 1 km), and a_{it} is equal to one if there is *Alignment* and zero otherwise. The forcing variable is v_{it}^0 (which we call *Vote margin*). It is the percentage of votes that the parties belonging to the coastal area majoritarian ideology should lose in the local elections in municipality i to lose the majority of the seats in that municipal council. Respectively, when this ideological bloc does not control the majority of seats in municipality i's council, the variable is defined as the share of votes that the parties in this bloc would have to win to get the majority of the seats. The variable $\mathbb{I}(v_{it}^0 > 0)_{it}$ is a dummy equal to one if the vote margin is positive and zero otherwise. The terms $g(v_{it}^0)$ and $q(v_{it}^0)$ are local polynomials in v_{it}^0, fitted separately at each side of the threshold using observations in a neighborhood around the threshold. The variable $\mathcal{V}acant_{it}$ is the amount of undeveloped land at the start of the term in the distance band of interest and accounts for differences in municipal scale. f_k and f_t are region and term-of-office fixed effects, and X is a vector of covariates. Control variables are not strictly needed to ensure consistency in this setting, but we include them in some specifications because they improve the precision of the estimates.

Equation (9) is the first stage and gives us the discontinuity in *Alignment* that we use for identification. In Figure 2 we show this relationship: at the right of the threshold the percentage of aligned municipalities is about 65 points larger than at its left. The fact that the majoritarian ideology in the coastal area gets a majority of seats in a municipal council increases enormously the chances that the mayor will have that same ideology.

[Insert Figure 2]

Equation (8) is used to estimate the effect of *Alignment* on coastal development. We estimate (8) by 2SLS, using $\mathbb{1}(v_{it}^0 > 0)_{it}$ as an instrument for a_{it}. The coefficient of interest is α, which can be interpreted as the 'treatment on the treated' (TOT). This is a local treatment effect: the coefficient identifies the effect for units that are located near the cutoff. Additionally, since the design is 'fuzzy,' the effect is identified for the 'compliers,' i.e., municipalities switching from unaligned to aligned when there is a change in the identity of the ideological bloc holding a majority of seats in the council. By plugging (9) into (8), we obtain the reduced form equation. The coefficient $\rho = \alpha.\delta$ can be interpreted as the 'intent to treat,' or ITT. This analysis relies on all randomized units, including non-compliers. Therefore, the estimates can be considered more conservative.

Regression Discontinuity: Estimation and validity. The main RD results presented in the paper fit a local linear regression on a bandwidth around the close-elections threshold. This is convenient because it eases the implementation of some additional analyses (e.g., subgroup analyses) and performs as well as other alternatives. We used this approach throughout the presentation of the main results and discussed the other options in the robustness checks. The bandwidth is chosen as per Calonico et al. (2014) and is the one minimizing the mean squared error. Standard errors are clustered at the coastal area level (i.e., *county*, in the main tables) because the treatment is partly determined at this geographical level.[20]

We perform the classic robustness checks on the validity of the RDD. First, we show that the forcing variable is continuous around the threshold. Neither the histogram nor the formal test proposed by Cattaneo et al. (2018) suggests any evidence of manipulation (see Figure 3). We also run placebo tests to verify the continuity of some variables at the threshold. The most obvious placebo choices are the lagged values of both the dependent variables and the treatment. Table 1 presents these discontinuity tests. The results indicate no discontinuities in lagged built land measured at the municipal and *county* levels. The same table shows no effect on lagged alignment or the lagged value of the Herfindahl index. In Table A.4 and A.5 in the Online Appendix, we repeat the exercise for a larger group of variables, none of which is discontinuous at the threshold.

[20] In some specifications we will control for regional and term fixed effects, which capture important drivers of development. In the robustness checks section, we present results for combinations of clustering and fixed effects specified at different geographical scales.

[Insert Figure 3 and Table 1]

Regression Discontinuity: Coastal area fragmentation. We also use the same RDD to identify the effect of fragmentation on development at the coastal area level. Intuitively, when a municipality switches its status, from unaligned to aligned, the value of the Herfindahl index of the coastal area increases. For example, take the case again of a coastal area of size seven, with two municipalities on the left and five on the right. The value of the Herfindahl index for this coastal area is 0.59 (i.e., $(2/7)^2+(5/7)^2=0.59$). If one of the municipalities controlled by the left switches to the right, the Herfindahl takes the value 0.75, for an increase of 0.16. If another leftist municipality switches to the right the index takes the value of 1, for an increase of 0.25.

We rely on this fact to justify the use of of the $\mathbb{1}(v_{it}^{0} > 0)$ dummy as an instrument of the Herfindahl index in a RD-2SLS setting. The average jump of the Herfindahl index at the threshold in our sample is around 0.2 and the first-stage F is around 40, which suggests that the instrument is strong. We implement this estimator by replicating the procedure we used before to estimate the local effect. Consequently, we have as many observations per county as the municipalities it contains. Moreover, the value of the dependent variable (developed land during a municipal term) and the treatment (Herfindahl index) is the same for all the municipalities within a county. In contrast, the instrument and the forcing variable vary by municipality. Standard errors are clustered at the county level.[21]

5. Results

The results of our empirical analysis are as follow. First, we document the descriptive association between variation over time in political fragmentation and development at the coastal area level. Second, we use a RDD to identify the causal effect of electing an aligned mayor rather than an unaligned one on local development. Third, we use the same RDD to provide causal evidence on the impact of fragmentation on development at the coastal area level. The three analytical strategies yield similar results, indicating that political heterogeneity of mayoral control of local governments has a significant effect on development. Finally, we explore whether these results are related to the mechanism suggested by our story, that is, the presence of environmental amenities.

[21] This is similar to the method used in Bhalotra et al. (2022), which estimate the effect of the state share of Muslim legislators on abortion in India by leveraging information on close local legislative races.

5.1. *Fragmentation vs. Coastal development*

As explained in Section 2, our conjecture that political heterogeneity spurs development directly relates to the coastal area level prediction. As a first, naive approach to this aggregate conjecture, we can look at the descriptive association between variation over time in the Herfindahl index and developed land at the coastal area level. This relationship is plotted in Figure 4. The circles indicate binned means of the Herfindahl index, computed using ideological blocs (in the horizontal axis) and binned means of developed land at the *county* level (in the vertical axis). Both variables have been transformed to get rid of the fixed effects, meaning that the analysis controls for many potential confounders. The negative slope indicates that the amount of development substantially drops as *counties* become less fragmented. [22]

[Insert Figure 4]

Of course, this association could be confounded by time-varying omitted variables. Tables A.6 in the Online Appendix report the estimation results adding different sets of time-varying controls. We include coastal area time trends. We control for political confoundders, such as the share of left-wing mayors in the coastal area, the share of mayors aligned with the region, the share of coalitions, the average margin of victory, or the average turnout. We also include time-varying socio-economic controls (coastal area averages of population, unemployment, etc.). Finally, we re-estimate the equation using a matching method for continuous treatments (see Tübbicke, 2020). The results are qualitatively similar, but the coefficients are much larger when we introduce the time-varying controls, suggesting their omission indeed biases the estimate.

5.2. *Regression Discontinuity: Municipal alignment*

We use a RDD in close-elections to determine the causal relationship between political heterogeneity and development. We start by examining the relationship at the municipality level. This allows us to test Proposition 2 and set the stage for the identification of the effect of fragmentation at the aggregate level. The municipality-level RDD enables us to isolate the causal impact of electing an aligned mayor (that belongs to the ideology ruling in most municipalities in the area) instead of an unaligned mayor. This section

[22] This relationship holds for different measures of fragmentation (parties instead of ideological blocs) and different coastal area definitions (see Figures A.7 in the Online Appendix).

presents the alignment results for the average municipality, some subgroup analyses that help us validate the model, and robustness checks.

Main results. Figure 5 illustrates the average alignment effect using the same approach as in Figure 2 previously. The estimated margin of victory of the majority bloc is plotted along the horizontal axis, and the Built-up land area at the municipality level is plotted on the vertical axis. The trend lines are local linear regressions within the bandwidth selected to minimize mean-squared error (Calonico et al., 2014).

[Insert Figure 5]

The large vertical jump between the two lines at the threshold value of zero along the horizontal axis indicates the local effect of a victory of the ideology controlling the majority of municipalities in the coastal area. This is the reduced form or 'intent to treat' effect and is presented in Panel A of Table 2. Indeed, one can interpret this estimate as the impact on all units potentially treated and is, therefore, a conservative estimate of the effect of alignment. The value of the estimated ITT coefficient is around -0.25. However, to interpret this coefficient as a semi-elasticity, it should be transformed as $\exp(\hat{\alpha} - 0.5.\widehat{Var(\hat{\alpha})}) - 1$ (Bellemare and Wichman, 2020). The transformed coefficient takes the value of -0.23. Thus, according to these results, municipalities where the ruling ideological bloc has a majority in the council develop on average around 23% less land than municipalities where this bloc does not hold a majority of seats in the council.

[Insert Table 2]

Panel B of Table 2 presents the 2SLS estimates corresponding to the 'treatment on the treated' (TOT) effect. These results should be interpreted as the effect on units where the mayor is aligned with the ideological bloc ruling in the coastal area. Note that the coefficient obtained is equal to the one presented in Panel A divided by the size of the same table's first-stage coefficient, shown in Panel C. The coefficient value is around -0.38, and the semi-elasticity (Bellemare and Wichman, 2020) is -0.32. Thus, according to these results, a municipality with a mayor that belongs to the ideological bloc ruling in most municipalities in the coastal area will develop around 32% less than other municipalities during a term of office.

Table 2 presents different specifications. The first column shows the raw estimates without any control. The point estimates are very similar in these three specifications.

The estimates are, however, more efficient when we control for scale and fixed effects (see columns 2 and 3). In column 4, we use the optimal bandwidth that minimizes the coverage error probability (CER), which Calonico et al. (2020) suggest using to check the sensitivity to bandwidth choice, and the results are similar. In column 5, we introduce a complete set of pre-determined covariates with no discernible effect on the results. Finally, column 6 shows that our results do not change when we include municipality fixed-effects. This specification, however, is more demanding, as we only use the information for municipalities whose alignment status changes over time.

Majority size. Panel A of Figure 6 presents sub-group results splitting the sample according to whether the percentage of aligned neighboring municipalities is higher or lower than the sample median. We implement this subgroup analysis as follows. We estimate a single equation using a parametric local linear regression with our preferred specification (i.e., which controls for the amount of vacant land and fixed effects) and allow for different RD coefficients in each subgroup. This enables us to test the equality of the treatment effects across subgroups. An issue with this approach is that the number of aligned neighbors might be correlated with other municipality traits. For example, these units might be located in *counties* where a particular ideology is highly dominant or where most mayors belong to the same party of the regional government. To address this issue, we reweight our data using the method proposed by Carril et al. (2019). First, we estimate a logit model using a High/Low dummy as the dependent variable and a set of variables plausibly correlated with both the majority size and the intensity of the alignment effect.[23] Then, we use the results to obtain the inverse propensity score weights used as explanatory variables to re-estimate the RD equation.

[Figure 6]

The results indicate that the effect of cooperation is driven by municipalities located in coastal areas where the size of the majority is large. The High coefficient is -0.67 and is estimated precisely, while the low coefficient is small and not statistically significant. Moreover, the two coefficients are statistically different from one another. Therefore, the results suggest that the effect of cooperation grows with the size of the majority – as predicted by our simple theoretical framework. In the same panel, we also look at the

[23] The variables include %*Party aligned,* %*Environmentally valuable land*, %*Unemployed*, *Left-wing mayor* dummy, and *Local-regional* alignment dummy.

related hypothesis of whether the intensity of the alignment effect depends on the share of neighbors that belong to the same party (and not just the same ideology). For this purpose, we divide the sample into two subgroups, depending on whether the share of municipal partisan alignment is higher or lower than the sample median. The results indicate that the coefficient of the High subgroup is large and statistically significant, while the coefficient of the Low one is smaller and not significant. However, this time, the difference between the two coefficients is not statistically significant. This suggests that the evidence regarding the number of aligned neighbors is more conclusive than the evidence regarding the specific type of alignment (ideology or party).

Political confounders. A possible concern with these results is that they may not be genuinely caused by alignment with neighbors but by other political traits correlated with it, such as, for example, the alignment with the regional government. Panel B of Figure 6 helps discard this possibility by showing that the effect of alignment with neighbors does not go away when we estimate its coefficient separately for samples of municipalities that are either aligned or unaligned with the regional government. Interestingly, the effect is large and statistically significant for both subgroups (of vertically aligned and vertically unaligned municipalities). Hence, it seems that alignment has a genuine and independent impact on land development. Theoretically, the alignment effect should be stronger when vertical alignment occurs because the party has more instruments to reward or punish non-compliant municipalities. Figure 6 suggests this is the case since the coefficient is larger for unaligned than for aligned municipalities. However, the difference between both coefficients is not statistically different from zero.

Finally, we present a subgroup analysis for the left and right-wing municipalities in the same panel. The estimated RDD coefficient for alignment is negative, large, and statistically significant both for the left and right-wing subgroups. It seems that the alignment impact on development is not confounded by the effect of the ideology of the mayor. Again, theoretically, left-wing mayors are expected to care more about preserving environmental amenities and tend to develop less (Solé-Ollé and Viladecans, 2013). Our results also support this expectation, as the coefficient for the left is -0.65 and that for the right -0.39. However, the difference between both coefficients is not statistically significant.

Robustness. Here, we check that our results are also robust to variations in key aspects of the methodology. First, regarding the RD methods, Figure A.8 in the Online Appendix shows the TOT effects for different bandwidth values. The estimated coefficients are similar but less precisely estimated, as expected. The coefficient is still statistically significant but smaller for larger bandwidths suggesting an increase in the bias. In Figure A.9, we show that very similar results are obtained when we use the bias-corrected estimator suggested by Calonico et al. (2014) instead of the conventional one. The bias-corrected estimator is a bit larger, which would indicate that our estimates might be a lower bound. Notably, the estimates remain statistically significant when robust standard errors are used. The same figure shows that the results are very similar when a non-parametric analysis with a triangular or Epanechnikov kernel is used. The figure also shows that the results do not change when using a polynomial of order two (Panel B).

Second, regarding our close-elections design for proportional elections, Figure A.10 in the Online Appendix presents robustness results to alternative party classification. As discussed, some doubts exist regarding the ideology of a residual category of local parties. Also, it is not clear how the existence of regional and centrist parties affects the performance of the RDD. The table reports the results obtained after excluding from the analysis municipalities with a mayor belonging to Local, Regional and Centrist parties, and when we restrict the analysis to municipalities where the mayor belongs to one of the two main parties (i.e., PSOE and PP). The 2SLS results (Panel A) are similar to those obtained with the whole sample. The table also reports the first stage coefficient and shows that the instrument's strength does not change (Panel B).

Third, Figure A.11 reports the results obtained with different definitions of coastal area. The first two coefficients reported on the left are those for fixed area definitions (i.e., *county*, and *coastal denomination*). The 2SLS coefficient is smaller and less precisely estimated for the *coastal denomination* definition. The other five coefficients on the right refer to 'nearest-neighbor' (NN) definitions. For example, NN(1) indicates that we take into account the first order neighbors (one at each side). Here again, the largest coefficients are for definitions that imply shorter distances: the effects are larger and more precisely estimated for NN(1) and NN(2) than for NN(3) to NN(5). These results suggest that cooperation mainly occurs at short distances and involves quite a small number of municipalities.

Finally, regarding other estimation issues, Table A.7 in the Online Appendix explores what happens when we deal with the zeros in the dependent variable in different ways. The first column repeats the results obtained with the *inverse hyperbolic sine* transformation. The second column drops the zeros; the results hold, but the coefficient is larger. The third and fourth columns report estimates from IV-Poisson and negative binomial specifications. The results are similar to the main ones. Additionally, in this vein, Table A.8 repeats the estimation using different combinations of fixed effects and clustering options. The results are not sensitive to these choices.

5.3. *Regression Discontinuity: Coastal area fragmentation*

Having shown that the RDD works at the municipality level, we can exploit it also to identify the effect of political fragmentation on development at the coastal area level. Table 3 and Figure A.12 in the Online Appendix report the main results.

[Table 3]

Table 3 presents the results of the estimation. Panels A, B, and C report the reduced form, 2SLS, and first-stage coefficients. We control for regional and term fixed effects (columns 1 and 4), pre-determined controls (columns 2 and 5), and county-level fixed effects (columns 3 and 6). The use of county-level fixed effects intends to make our specification comparable to the panel estimates of Section 5.1. We present results without weights (columns 1 to 3) and with weights equal to the inverse of the number of municipalities in the county (columns 4 to 6). The results do not depend much on the use of weights or on the specific controls we use. The reduced form coefficient is about -0.15, and the 2SLS coefficient is -0.68 (column 6) and is statistically significant at the 10% level. Together, these results indicate that moving from the minimum to the maximum level of the Herfindahl index decreases development by -0.54 log points or -40%. The effect of an increase of one s.d. in the index is equal to -0.14 log points or -13%.

[Figure 7]

The results presented so far indicate that alignment does impact local development and that political fragmentation affects aggregate development at the coastal area level. These results correspond to the effect that materialized during one term of office. We conclude this passage by investigating whether this effect extends over a longer horizon. This could happen, for example, if new development requires changes in the master plan or if there are delays in permitting. To explore this possibility, in Figure 7, we report the estimated effects of alignment (Panel A) and fragmentation (Panel B) on local and aggregate development, respectively, in future terms. Both figures suggest that the effects in the second term are large, smaller in the third term, and vanish after that.

5.4. *Mechanism: Environmental amenities*

In our theoretical framework, positive spillovers from the consumption of environmental amenities generate three different predictions. The first two predictions say that alignment should reduce development at the municipality level and that political fragmentation (a smaller Herfindahl index) should generate more development at the coastal area level. The results shown above go in that direction.[24] The third prediction implied by our model results is that this negative coefficient should be larger where the environmental value of land is larger. Intuitively, this value would be larger where land preservation would generate larger utility gains for residents in a neighboring jurisdiction. In this section, we present two different pieces of evidence regarding this prediction.

The first piece of evidence is presented in Figure 8. Here we show the 2SLS-RD coefficient estimated for different distance bands from shore. The difference between the effect estimated at several distance bands talks only about the intensity of the amenity effect generated by being closer or farther away from shore. The only potential confounders here are the regulations established by higher layers of government. As explained in section three, central regulations make development difficult in the first 100 meters fringe and, to a lesser extent, also in the 100-200 meters one. We will consider this when interpreting the results for the different bands.

[Figure 8]

The figure reports the results for several non-overlapping bands (0 to 100m, 100 to 200m, 200 to 500m, and so on). We present the results at the municipal level (alignment effect, in Panel A) and the coastal area level (effect of the Herfindahl index, in Panel B). The results show that both effects are small and not statistically significant for land less than 100m from shore, but statistically significant and large for greater distances. The size of the effect is maximal at the 200-500m distance band and small and not statistically significant for bands above 500m.

[24] Notice this rules out the possibility that the effects are due to a negative externality (for example, the development in one municipality could create jobs in the rest of the coastal area).

This pattern can be interpreted as follows. At short distances, the regulations established by the central government might be effective at curbing development. The first 100m band is subject to some special protection. There is also some milder protection in the 100-200m band. Between 200 and 500 meters is the first coastal band without protection from the central government. The reduction in the alignment effect at distances greater than 500m is probably the result of a reduction in the amenity value of these locations, making cooperation less necessary. Therefore, the results presented in Figure 7 seem to align with our model's implications.

The second piece of evidence regarding the role of environmental amenities is presented Figure 9, which displays estimates of RD coefficients for two subgroups defined according to the share of municipal land deemed environmentally valuable.The intuition is that the preservation of this land will have a larger impact on the utility of non-residents than the decision to keep undeveloped land that is not so valuable. This variable has been defined as the land included in a European Union's network of protected spaces called Natura2000. The inadequate enforcement of this policy in Spain suggests this European initiative resulted in quantifying the lands to be protected rather than effectively protecting them. As a result, local development should not be affected by this decision of national authorities, and we expect that voluntary cooperation among municipalities would be needed to preserve this land. Of course, the share of environmentally valuable land may be correlated with other variables. In this case, we also use the Carril et al. (2018) method, which controls interactions with other potential confounders.

[Figure 9]

The results suggest that the effect of alignment on land development (Panel A) is indeed much larger in municipalities with a high share of environmentally valuable land. The coefficient for the High subgroup is around -0.58 and statistically significant at the one percent level. The coefficient of the low subgroup is -0.13 and is not statistically significant. Importantly, however, the two coefficients are statistically different at the 10% level. Similarly, the effect of political fragmentation (Panel B) is also larger in coastal areas with a high share of environmentally valuable land. The coefficients are -0.97 and statistically significant for the High group and very close to zero for the Low group; the two coefficients are statistically different. Therefore, these results seem to suggest that preserving coastal amenities is one of the reasons for cooperation among aligned local governments.

6. Conclusion

In this paper, we contend that politicians belonging to the same political party or sharing the same ideology better internalize the welfare of non-residents and may be more willing to coordinate their coastal development policies. This assertion implies that coastal areas with more political heterogeneity should experience more shoreline development.

We provide several pieces of evidence suggesting this is the case in Spain. First, we construct a Herfindahl index of political fragmentation at the coastal area level; we report that the increase over time in this index is negatively associated with the construction at the coastal area level. Second, we use a close-elections regression discontinuity design to provide causal evidence on the prediction that aligned mayors (belonging to the ideology of most mayors in the coastal area) allow for less construction than unaligned mayors. Third, using the same method, we provide causal evidence on the effect of fragmentation on development at the coastal area level. Both results confirm the prediction of a simple model where development decisions negatively affect neighboring jurisdictions through a reduction in environmental amenities. Third, we show that these effects are stronger when the environmental value of the land is larger, which is in line with the mechanism pointed by our story.

The negative effect of alignment and fragmentation on development at the local and the aggregate levels, respectively, indicate that municipalities fail to account for negative externalities fully. Co-partisanship improves the incentives to cooperate and might help mitigate this problem.

These results have important implications for the design of coastal preservation policies. They signal the need to reconsider the benefits of keeping coastal land-use regulations in the hands of local governments. They also highlight the difficulties of relying on voluntary cooperation between local governments to deal with spatial externalities. In Spain, attempts at local government amalgamation have so far failed. Nonetheless, this paper suggests that voluntary cooperation incentives are fragile and could also be fraught with difficulties, given that ideological differences between local politicians might hinder these cooperation efforts.

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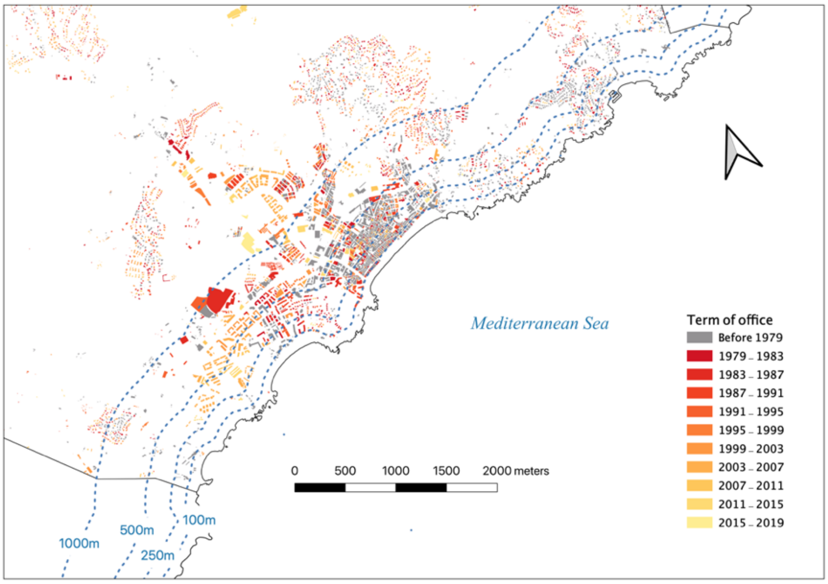
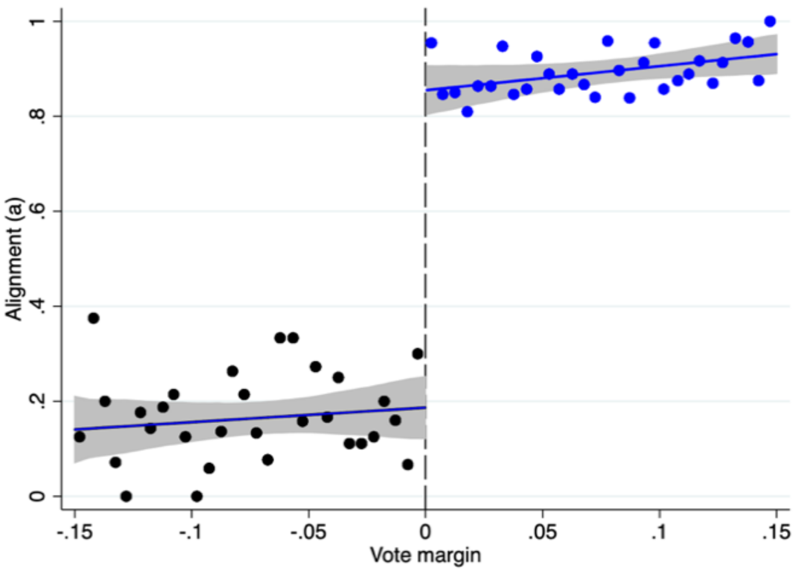
Tables and figures

Figure 1:
Built land. Data from the cadaster. Lloret de Mar (Costa Brava, Girona).



Notes: (1) Built-up land during each term of office, depicted in different colors. The graph also indicates the location of some of the distance bands used in the analysis. (2) The example is for a municipality called Lloret de Mar, which is one of the main tourist hot spots on the Costa Brava (north of Barcelona, close to the French border). (2) Source: Spanish cadaster (Dir. Gal. del Catastro).

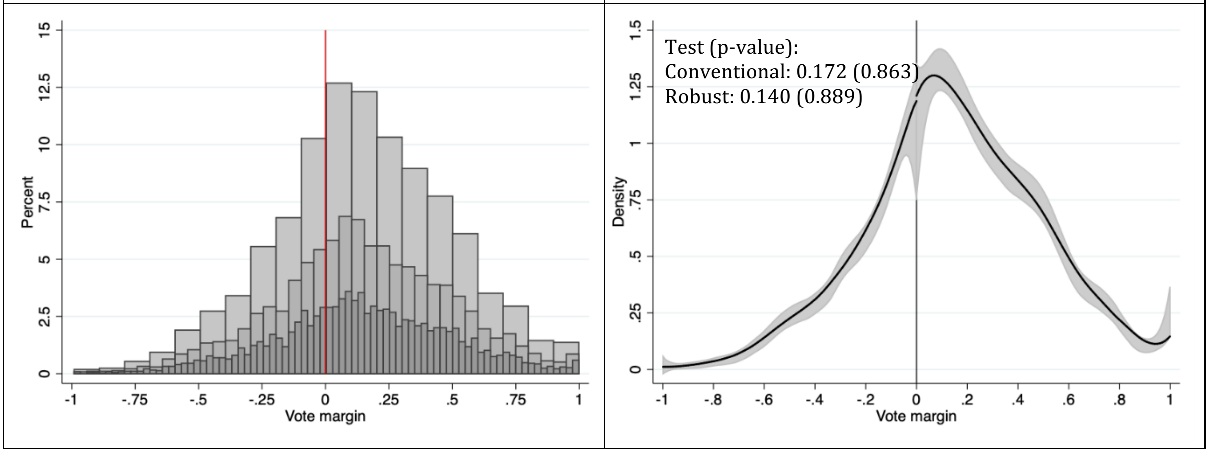
Figure 2: *Regression Discontinuity Design. Municipality First-stage. Dependent variable: alignment (a)*



Notes: (1) The dots are 0.5% bin averages of the Alignment dummy. (2) The blue line is a local linear regression fit on the optimal bandwidth used in the main analysis (computed as per Calonico *et al.*, 2014). (3) The grey area depicts the 95% c.i.

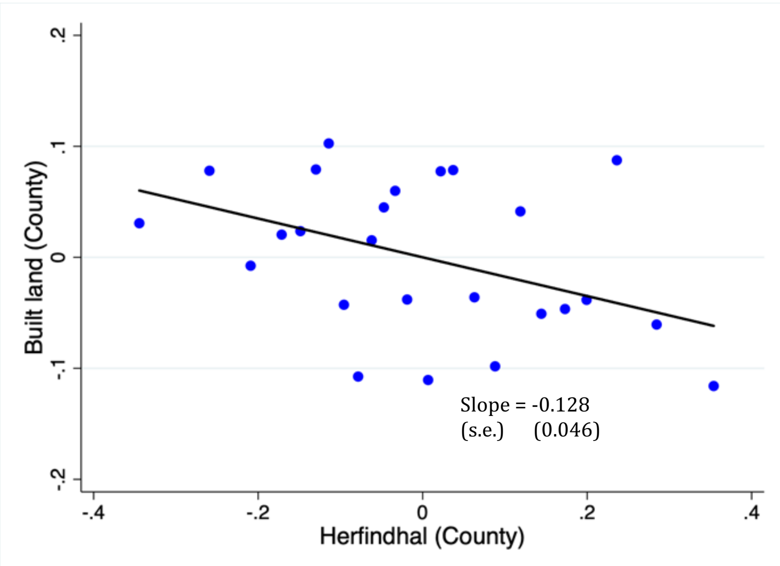
Figure 3: *Continuity of the forcing variable.*

(A) Histogram	(B) Manipulation test



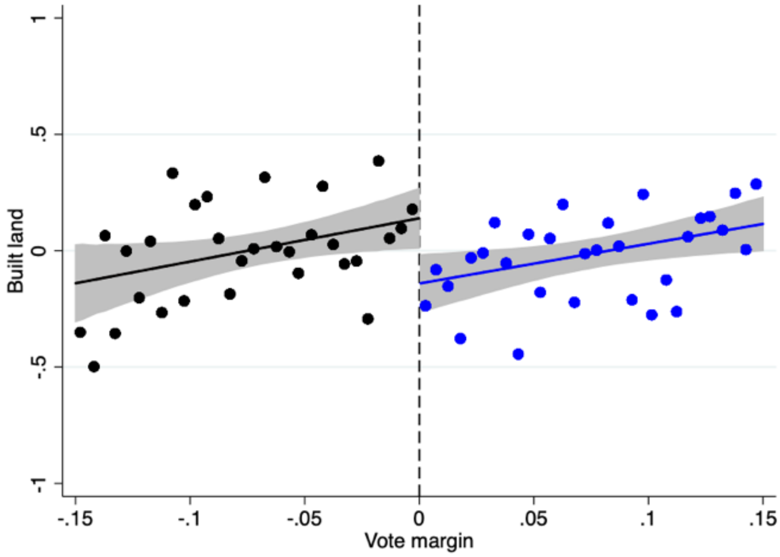
Notes: The left-hand panel shows the histogram of the forcing variable using 5%, 2.5% and 1.25% bins. The right-hand panel shows the Cattaneo *et al.* (2018) manipulation test; we report both the conventional and robust versions of the test; for each, we report the test and the p-value (in parentheses).

Figure 4
Fragmentation and Coastal area development.
Counties and Ideological blocs.



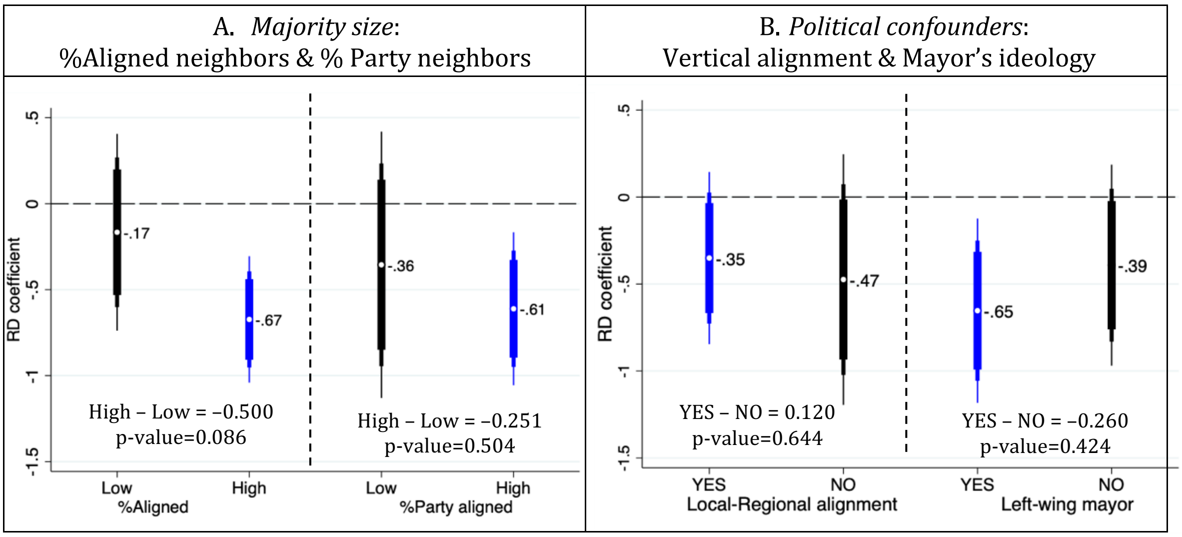
Note: (1) Two-way relationship between logged *Built land* and the Herfindahl, both computed at the *County* level for the period 1979-2015; larger values of the index mean less fragmentation. (2) The Herfindahl index is computed with data on the *Ideological bloc* of the mayor (left-wing, right-wing, and local party). (3) We have residualized this variable on county and term fixed effects. (4) The dots are the means of equally spaced 5% bins. (6) The estimated slope (and standard error) are reported in the figure.

Figure 5: *Regression Discontinuity Design. Municipality Reduced form. Dependent variable: Built land*



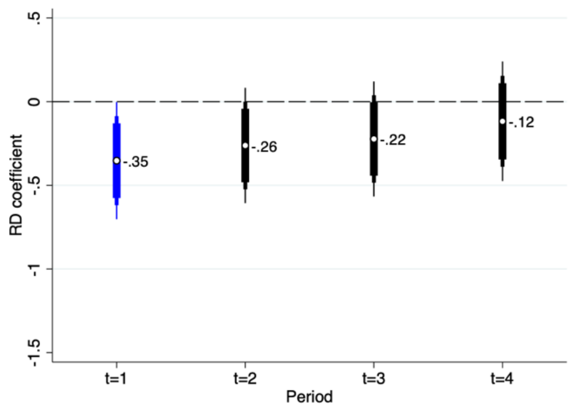
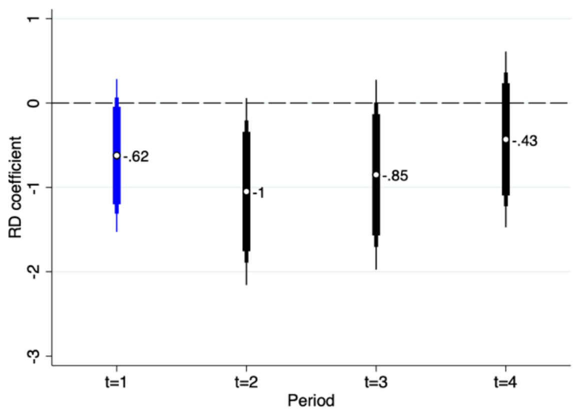
Notes: (1) The dots are 0.5% bin averages of the residual of a regression between $\widetilde{Built}$ and $\log(\widetilde{Vacant})$. The dependent variable is measured as $\widetilde{Built} = \log\left(Built + \sqrt{Built^2 + 1}\right)$. (2) The blue line is a local linear regression fitted on the optimal bandwidth used in the main analysis (computed as per Calonico *et al.*, 2014). (3) The grey area depicts the 95% c.i.

Figure 6: *Regression Discontinuity Design: Model validation*



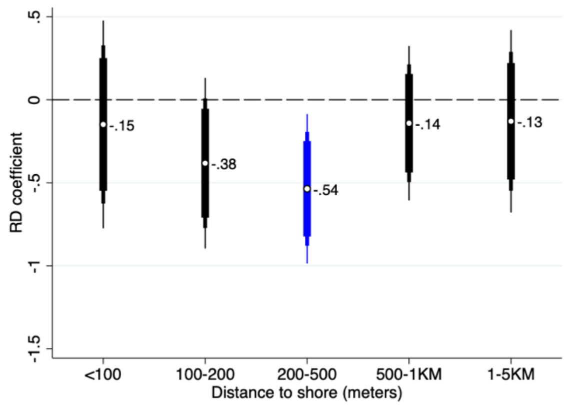
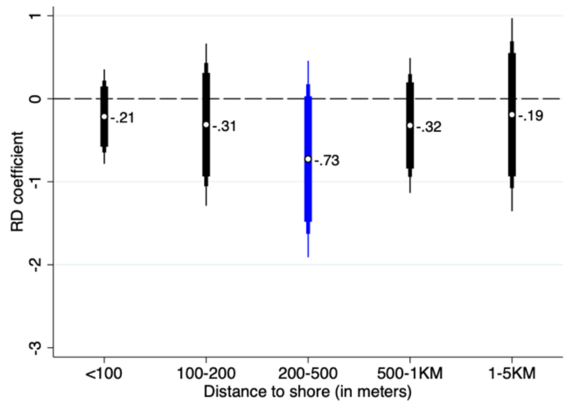
Notes: (1) %Aligned = share of neighbors belonging to the same ideological bloc as the mayor; High (Low): dummy higher (lower) than the median; %Party aligned = share of aligned neighbors belonging to the exact same party as the mayor; High (Low): dummy higher (lower) than the median. Local-Regional alignment = dummy equal to one (YES) if the mayor and the regional president belong to the same ideological bloc and zero (NO) if not; Left-wing mayor = dummy equal to one is the party of the mayor has been classified in the left-wing ideological bloc (YES) and zero if it has been classified in the right-wing bloc (NO). (3) Dependent variable is Built land, measured as $\widetilde{Built} = \log\left(Built + \sqrt{Built^2 + 1}\right)$. (4) Estimation using a single parametric local linear regression fully interacted with the subgroup dummy (High/Low); optimal bandwidth selected as per Calonico *et al.* (2014) using the whole sample; controls included: $\log(Vacant)$ and year and region fixed effects, and interactions with other variables using *inverse propensity score weights* as proposed by Carril *et al.* (2019). (5) The point estimate and the 90, 95 and 99% c.i. are shown. Standard errors are clustered at the county level. (6) The table also displays a test of equality of the coefficients in the two subgroups and the p-value.

Figure 7: *Regression Discontinuity Design: Dynamic effects.*

A. Municipality: Alignment	B. Coastal Area: Fragmentation
	

Notes: (1) Dependent variable: Built land at the municipal or at the Coastal area level, . (2) 2SLS-RD using as treatment the Alignment dummy in the municipal level analysis and the Herfindahl index in the county level analysis; parametric estimation using a polynomial of order one and the bandwidth selected as per Calonico *et al.* (2014). (3) We control for log($Vacant$), region and year fixed effects (see Table 1).

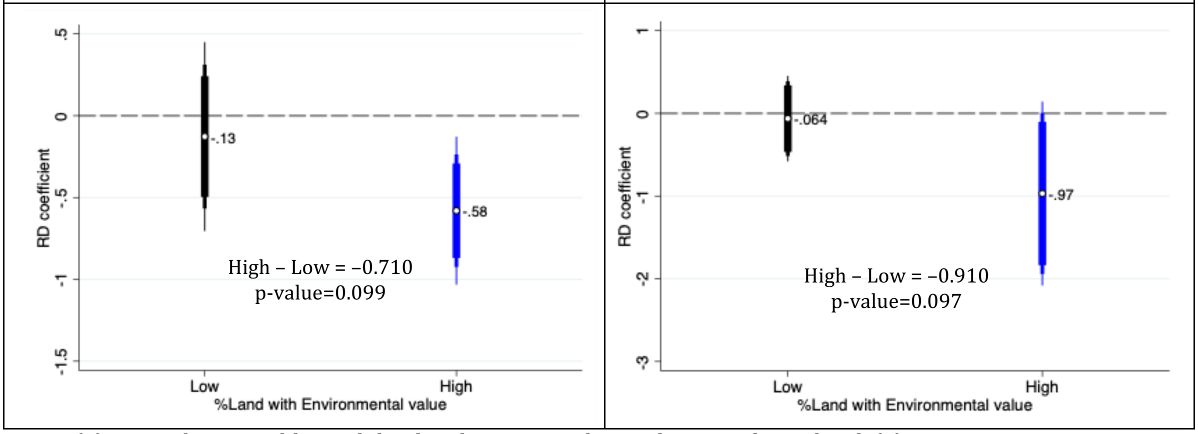
Figure 8: *Regression Discontinuity Design: Effect by distance to shore*

A. Municipality: Alignment	B. Coastal Area: Fragmentation
	

Notes: (1) Dependent variable: Developed land at the municipal or at the coastal area level. (2) 2SLS-RD using as treatment the Alignment dummy in the municipal level analysis and the Herfindahl index in the county level analysis; parametric estimation using a polynomial of order one and the bandwidth selected as per Calonico *et al.* (2014). (3) We control for log ($Vacant$), region and year fixed effects, and pre-determined controls (see Table 1). (4) We show the results non-overlapping distance bands (first 100M, 100 to 200M, etc). (5) The point estimate and the 90, 95 and 99% c.i. are shown. Standard errors are clustered at the county level.

Figure 9: *Regression Discontinuity Design*: *Environmentally valuable land*

A. Municipality: Alignment	B. Coastal Area: Fragmentation



Notes: (1) Dependent variable: Built land at the municipal or at the coastal area level. (2) 2SLS-RD using as treatment the Alignment dummy in the municipal level analysis and the Herfindahl index in the county level analysis; parametric estimation using a polynomial of order one and the bandwidth selected as per Calonico *et al.* (2014). (3) We control for log ($Vacant$), region and year fixed effects, pre-determined controls (see Table 1), and interactions with the controls; in the municipality case we use *inverse propensity score weights* as proposed by Carril *et al.* (2019) while in the county case we use parametric interactions). (4) We show the results for the samples with the %Land with Environmental Value that are smaller (Low) or larger (Hight) than the median (5) The point estimate and the 90, 95 and 99% c.i. are shown. Standard errors are clustered at the county level. (6) The table also displays a test of equality of the coefficients in the two subgroups and the p-value.

Table 1: *Regression Discontinuity Design. Placebo tests.*

Variable:	Coef.	p-value	Bw	#Obs.
(A) Lagged dependent variable				
$\widetilde{Built}_{t-1}$ (<1Km), Municipality	-0.067	0.670	0.193	1,345
$\widetilde{Built}_{t-1}$ (<1Km), County	0.049	0.782	0.259	1,710
(B) Lagged treatment				
$Alignment_{t-1}$	-0.005	0.931	0.160	1,085
Herfindahl index $_{t-1}$	-0.026	0.375	0.160	1,085

Notes: (1) Variables measured as z-scores, except those that are binary or expressed in logs. (2) Coef. = RDD coefficient, bw=bandwidth used, selected as per Calonico *et al.* (2014). #obs.=number of observations within bandwidth, at the left and right of the cutoff. (3) Estimation method=Local Linear Regression.

Table 2: *Municipal alignment RDD. Main results*

	(1)	(2)	(3)	(4)	(5)	(6)
	A. *Reduced form*, *Dep. Variable: Built land*					
$\mathbb{1}(v^0 > 0)$	-0.207 (0.122)	-0.229 (0.103)	-0.233 (0.093)	-0.263 (0.107)	-0.211 (0.089)	-0.254 (0.075)
	B. 2SLS, *Dep. Variable: Built land*					
Alignment (a)	-0.324 (0.185)	-0.357 (0.157)	-0.353 (0.135)	-0.411 (0.161)	-0.324 (0.108)	-0.361 (0.143)
	C. *First stage: Dep. variable: Alignment* (a)					
$\mathbb{1}(v^0 > 0)$	0.641 (0.044)	0.643 (0.044)	0.661 (0.054)	0.638 (0.055)	0.650 (0.049)	0.649 (0.044)
Kleibergen-Paap rk LM F-stat.	223.56 [16.38]	220.88 [16.38]	153.01 [16.38]	131.75 [16.38]	149.03 [16.38]	232.78 [16.38]
Bandwidth selector	MSE	MSE	MSE	CER	MSE	MSE
Bandwidth	0.160	0.163	0.127	0.098	0.127	0.138
Controls:						
$\log(\mathcal{V}acant)$	NO	YES	YES	YES	YES	YES
Region f.e.	NO	NO	YES	YES	YES	NO
Year f.e.	NO	NO	YES	YES	YES	YES
Pre-determined controls	NO	NO	NO	NO	YES	YES
Municipality f.e.	NO	NO	NO	NO	NO	YES
Effective obs.	1,085	1,097	889	692	874	961

Notes: (1) Panel A. reports the Reduced form results, Panel B. the 2SLS results, and Panel C. the First stage. (2) Built land measured as $\widehat{\mathcal{B}uilt} = \log\left(\mathcal{B}uilt + \sqrt{\mathcal{B}uilt^2 + 1}\right)$. The *Vote margin* is denoted by v^0, $\mathbb{1}(v^0 > 0)$ indicates whether the majority party (the one ruling in most municipalities in the coastal area) also has a majority of seats in the local council, and *Alignment* (a) is a dummy equal to one if the mayor belongs to the party bloc ruling in a majority of municipalities in the county; (3) Column 1 presents the results without controls; in column 2 we control for $\log(\mathcal{V}acant)$; in columns 3 and 4 we control for region and year fixed effects; in column 5 we control for pre-determined socioeconomic and geographic variables: log(Coast length), %Beach/Coast, %Environmentally valuable land, %Unemployed, %Low education level, %High education level, %Employed in construction and %Employed in services; in column 6 we control for municipality fixed effects. (4) Standard errors clustered at the county level in parentheses. (4) Kleibergen-Paap rk LM F-stat. is the weak instrument test; in brackets we report the value of the Stock-Yogo weak ID test critical value at 10% maximal IV size.

Table 3: *Coastal area fragmentation RDD. Main results.*

	(1)	(2)	(3)	(4)	(5)	(6)
	A. *Reduced form: Dep. Variable: Built land*					
$\mathbb{1}(v^0 > 0)$	-0.124 (0.070)	-0.135 (0.068)	-0.171 (0.101)	-0.121 (0.072)	-0.170 (0.101)	-0.151 (0.095)
	B. 2SLS*: Dep. Variable: Built land* (*County*)					
Herfindahl index	-0.622 (0.351)	-0.693 (0.352)	-0.634 (0.374)	-0.685 (0.392)	-0.643 (0.376)	-0.680 (0.410)
	C. *First stage: Dep. Variable:* Herfindahl index					
$\mathbb{1}(v^0 > 0)$	0.199 (0.035)	0.194 (0.034)	0.269 (0.051)	0.184 (0.031)	0.264 (0.049)	0.233 (0.047)
Kleibergen-Paap rk LM F-stat.	46.018 [16.38]	32.872 [16.38]	40.747 [16.38]	44.119 [16.38]	28.115 [16.38]	35.847 [16.38]
Bandwidth	0.159	0.159	0.172	0.159	0.159	0.172
Year f.e.	YES	YES	YES	YES	YES	YES
Region f.e.	YES	YES	NO	YES	YES	NO
Pre-determined controls	NO	YES	NO	NO	YES	NO
County f.e.	NO	NO	YES	NO	NO	YES
Weights	NO	NO	NO	YES	YES	YES
Effective obs.	1,079	1,079	1,079	1,079	1,079	1,079

Notes: (1) Panel A. reports the Reduced form results, Panel B. the 2SLS results, and Panel C. the First stage. (2) Results obtained from the estimation of the RDD with Build land measured at the county level. Herfindahl index measured with main ideology categories. (3) Same RDD specification than before: uniform kernel with polynomial of order one and MSE bandwidth selector; year and region or county f.e. and pre-determined covariates included as controls. (4) Weights equal to 1/number of municipalities in the county used in columns four to six. (5) Standard errors clustered at the county level.

The political economy of coastal development

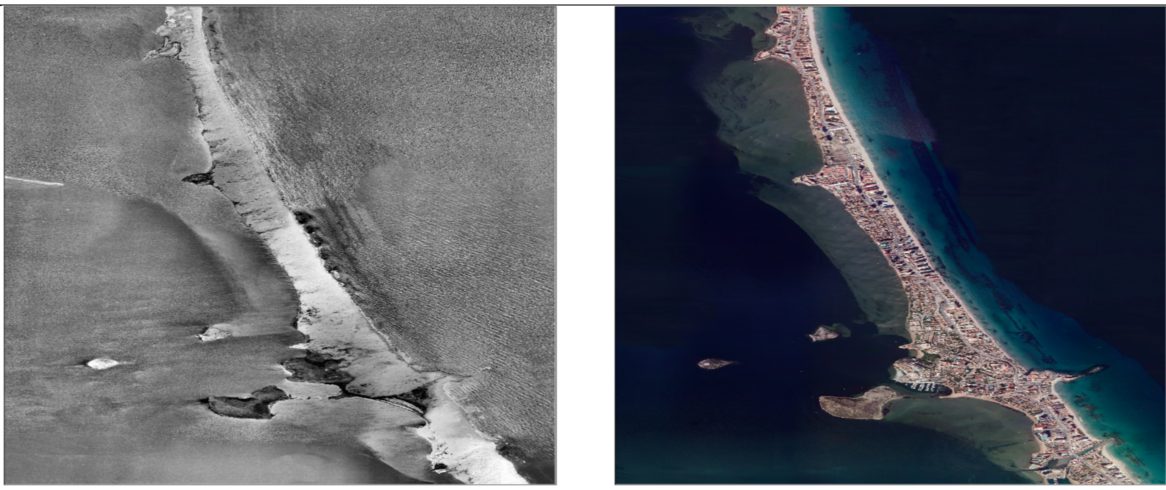
Pierre Magontier, Albert Solé-Ollé and Elisabet Viladecans-Marsal

Online Appendix

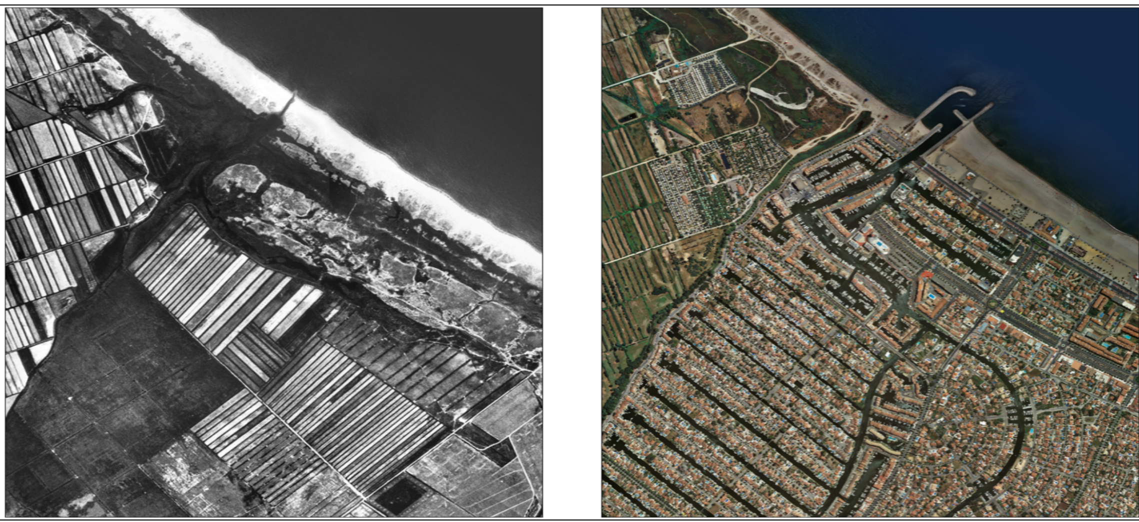
Section A.I: Additional figures

Figure A.1:
Intensity of Coastal development, 1956 v. 2012 (Examples)

A. La Manga del Mar Menor (Murcia)

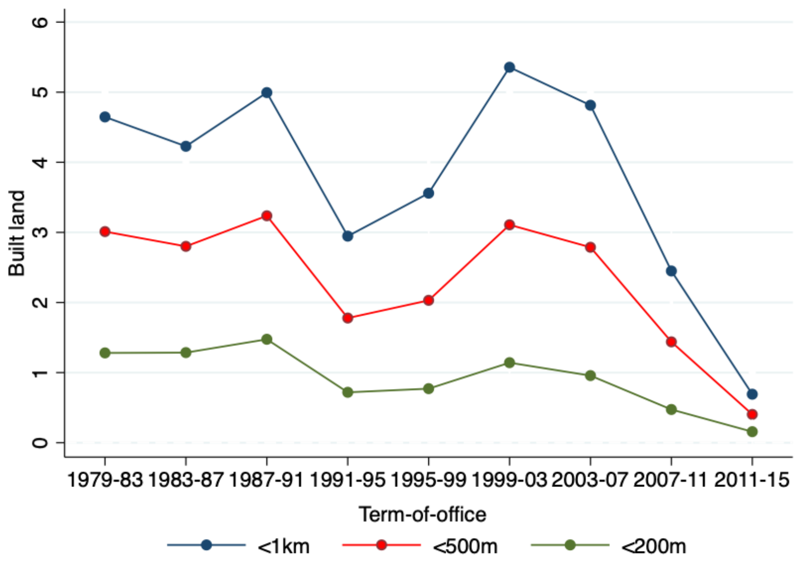


B. Empuriabrava (Girona)



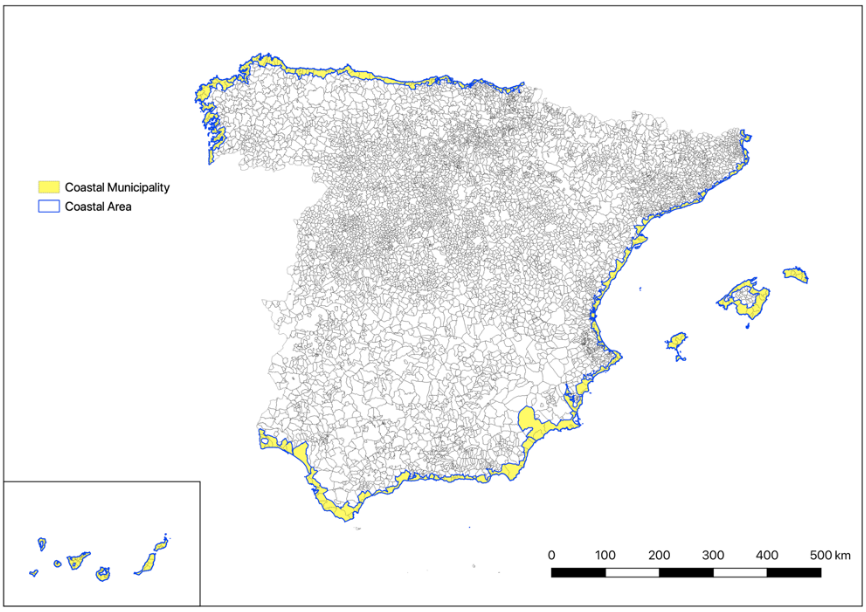
Sources: PNOA Americano Serie B for 1956. Google Earth for 2012.

Figure A.2:
*Evolution of the amount of Built land,*1979-2015



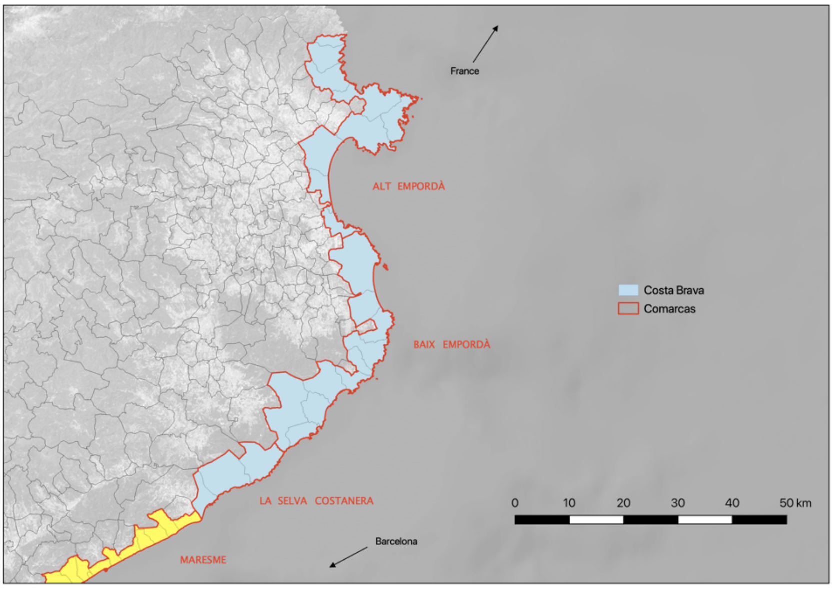
Notes: (1) Average amount of Built land (Ha) during per municipality and term in all Spanish coastal municipalities. (2) We report data for three overlapping fringes: less than 1km from shore, less than 500m and less than 200m. (3) Data from the Spanish cadaster (Dir. Gral. del Catastro).

Figure A.3: *Map of Spain's Coastal municipalities*



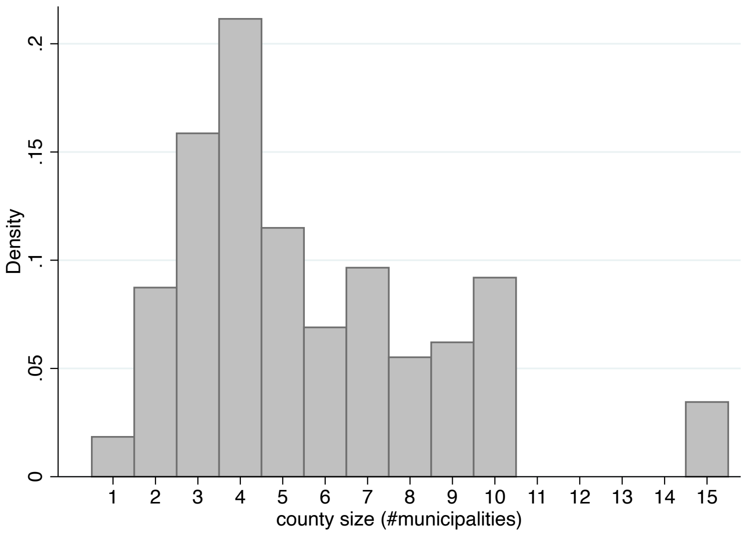
Note: (1) The map depicts in Yellow the municipalities located along the Spanish coastline. (2) Source: own elaboration.

Figure A.4:
Example of Coastal denomination ('Costa Brava') and its Counties



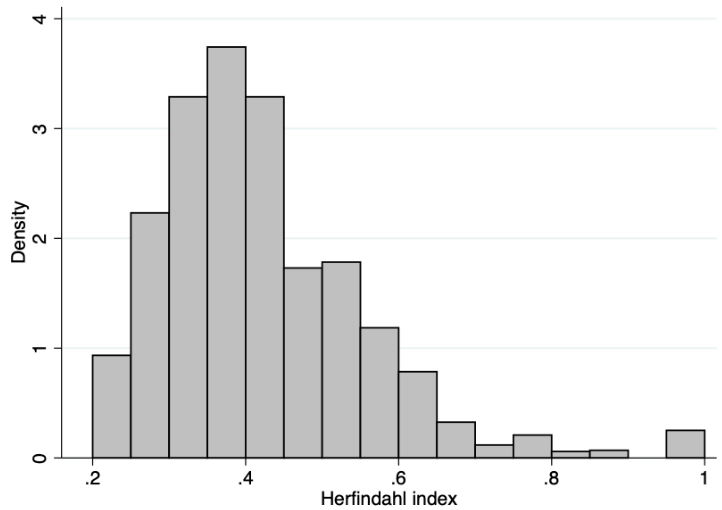
Note: (1) The map the Coastal denomination called 'Costa Brava' (in light blue) and is three Counties ('Comarcas'), named 'Alt Empordà', 'Baix Empordà' & 'La Selva Costanera'; in Yellow there is a county ('Maresme') located in a different 'Coastal denomination' ('Costa del Maresme'). (2) Source: own elaboration.

Figure A.5:
Histogram of County size



Notes: (1) The figure shows the density of municipalities by county size, that runs from one municipality to fifteen. The county definition used corresponds to geographical counties or 'Comarcas'. (2) Source: www.Geosoc.udl.cat.

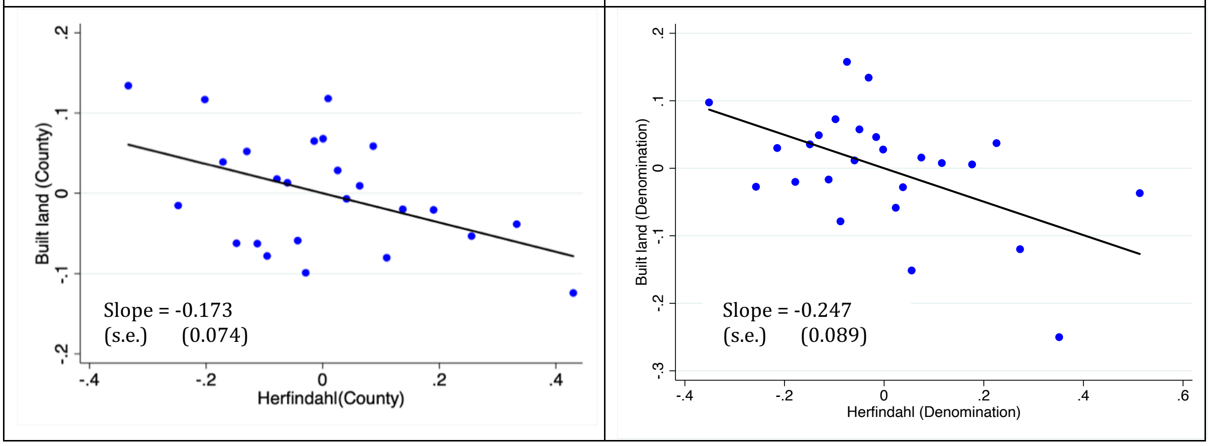
Figure A.6:
Histogram of the Herfindahl index. Counties.



Notes: (1) The figure shows the density of municipalities by county size, that runs from a minimum of 0.2 to 1. The county definition used corresponds to geographical Counties or 'Comarcas'. (2) Source: www.Geosoc.udl.cat.

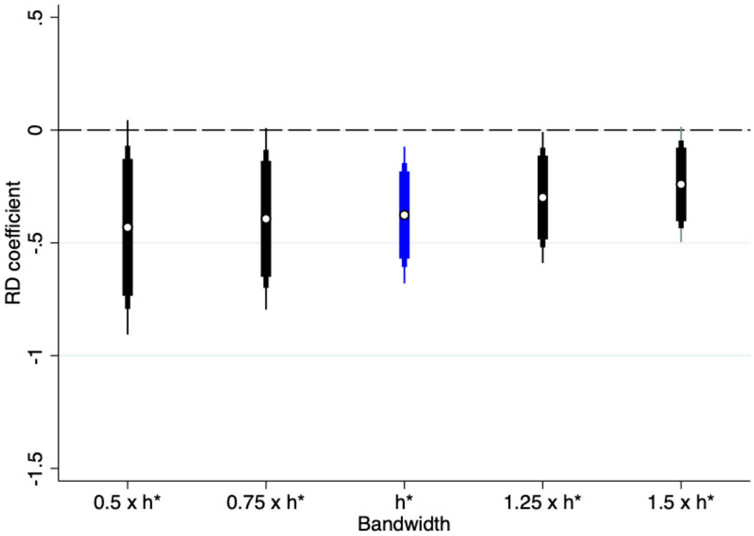
Figure A.7: *Fragmentation and Coastal area development. Alternative measures*

A. Counties and political parties	B. Coastal denominations and Ideological blocs.



Note: (1) Two-way relationship between logged *Built land* and the Herfindahl index, for the period 1979-2015, computed at the county level in Panel (a) and at the Coastal denomination level in Panel B; larger values of the index mean less fragmentation. (2) The Herfindahl index is computed with data on the *Political party* of the mayor in Panel A and the *Ideological bloc* of the mayor (left-wing, right-wing, and local party) in Panel (b) . (3) We have residualized this variable on county and term fixed effects. (4) The dots are the means of equally spaced 5% bins. (6) The estimated slope (and standard error) are reported in the figure

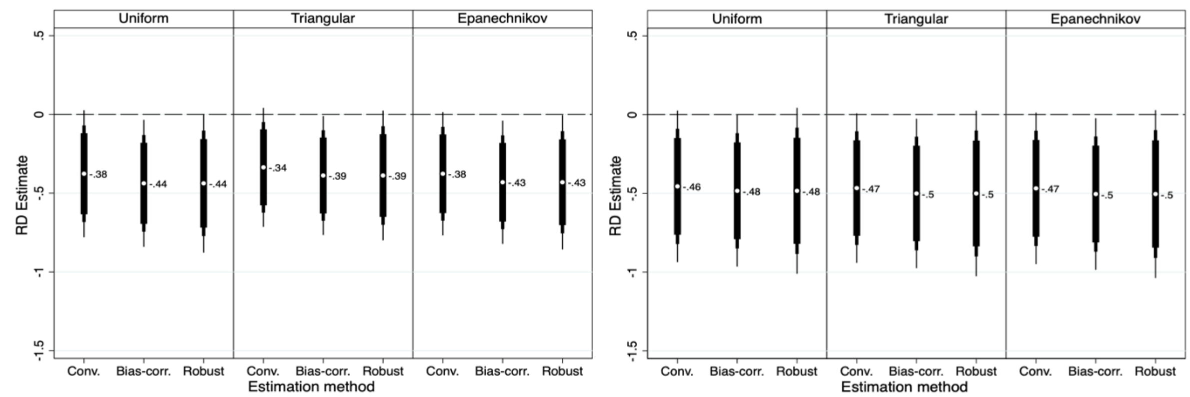
Figure A.8:
Robustness: Results by bandwidth.



Notes: (1) 2SLS estimates. (2) Dependent variable measured as $\widetilde{Built} = \log(Built + \sqrt{Built^2 + 1})$. Estimation by Local linear regression with the bandwidth selected as per Calonico *et al.* (2014), controlling for $\log(Vacant)$ and region and year f.e.. (3) In red we show the results for the bandwidth that is closest to the optimal one. (4) We show the point estimate and the 90, 95 and 99% c.i. Standard errors are clustered at the county level.

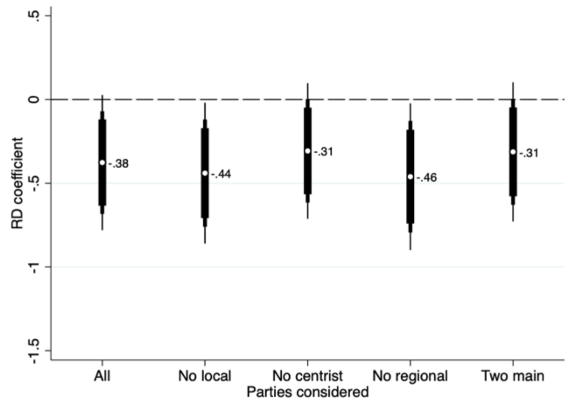
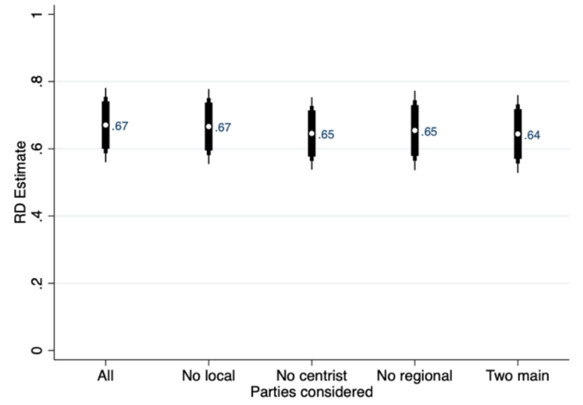
Figure A.9:
Robustness: Polynomial, Kernel & RD estimation method.

A. p(1) B. p(2)



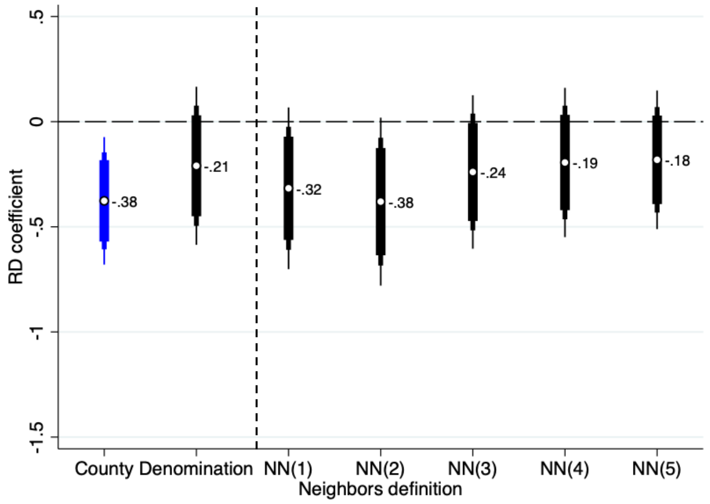
Notes: (1) We show the RD estimates using different kernels: Uniform, Triangular and Epanechnikov. For each kernel we report the Conventional, Bias-corrected and Robust estimates. For each of these cases we show the results using polynomials of order 1 (Panel (a)) and 2 (Panel(b)). (2) We show the point estimate and the 90, 95 and 99% c.i. Standard errors are clustered at the county level. (3) We show the 2SLS estimates. Dependent variable measured as $\widetilde{Built} = \log(Built + \sqrt{Built^2 + 1})$. Estimation by Local linear regression with the bandwidth selected as per Calonico *et al.* (2014), controlling for $\log(Vacant)$ and region and year f.e..

Figure A.10: *Robustness: Close elections sample.*

A. 2SLS results	B. First stage results
	

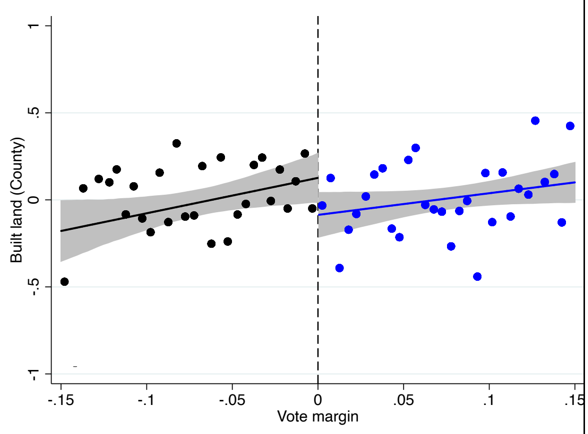
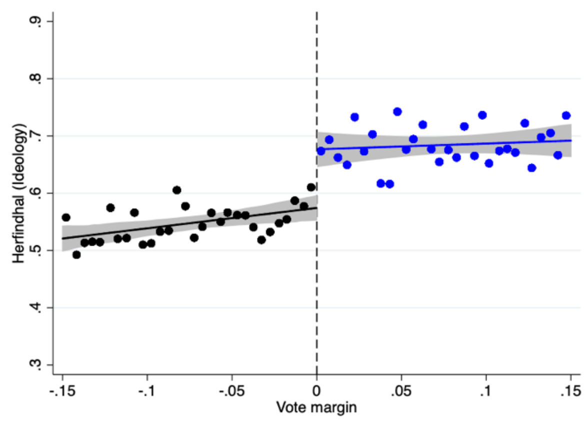
Notes: (1) We show the RD estimates using different dropping different sets of municipalities from the computation of the forcing variable and from the estimation of the RD equations. (2) First, we show the results for the whole sample, and then we exclude: the municipalities with Local party mayors, with Centrist parties (either from the Left or the Right bloc), with mayors belong to regionally-based parties (as e.g., CiU in Catalunya) or with mayors that do not belong to the main two parties (PSOE and PP). (3) In Panel (a) we report the 2SLS coefficient and in Panel (b) the First stage one. (4) We show the point estimate and the 90, 95 and 99% c.i. Standard errors are clustered at the county level. Estimation by Local linear regression with the bandwidth selected as per Calonico *et al.* (2014), controlling for log($\mathcal{V}acant$)and region and year f.e..

Figure A.11: *Robustness: Neighbors definition.*



Notes: (1) We show the RD estimates using different neighbors' definitions. We show first the two definitions using fixed areas: Counties and Coastal denominations, and second the Nearest Neighbor definitions, denoted by NN(J) and where J is the order of the farther away neighbor considered (e.g. J=1 includes the first order contiguous municipalities, J=2 includes those plus the municipalities that are contiguous to them, and so on. (2) We show the point estimate and the 90, 95 and 99% c.i. Standard errors are clustered at the county level. (3) We show the 2SLS estimates. Dependent variable measured as $\widetilde{\mathcal{B}uilt} = \log\left(\mathcal{B}uilt + \sqrt{\mathcal{B}uilt^2 + 1}\right)$. Estimation by Local linear regression with the bandwidth selected as per Calonico *et al.* (2014), control-ling for log($\mathcal{V}acant$) and region and year f.e.. (4) Standard errors are clustered at the county and coastal denomination levels in the first two cases, respectively; in the NN specification we account for spatial correlation of the error term (up to 5, 10, 20, 25 and 30km) and for time correlation up to 8 periods

Figure A.12: *Regression Discontinuity Design. Coastal area fragmentation.*

A. Reduced form. Dependent variable: Built land	B. First stage Dependent variable: Alignment (a)
	

Notes: (1) In Panel (a), the dots are 0.5% bin averages of the residual of a regression between $\widetilde{Built}$ and log ($\mathcal{V}acant$). The dependent variable was measured as $\widetilde{Built} = \log(\mathcal{B}uilt + \sqrt{\mathcal{B}uilt^2 + 1})$. In Panel (b), the dots are 0.5% bin averages of the Alignment dummy. (2) The blue line is a local linear regression fit on the optimal bandwidth used in the main analysis (computed as per Calonico *et al.*, 2014). (3) The grey area depicts the 95% c.i.

Section A.II: Data sources, calculation of variables, additional tables

Table A.1: *Variable definitions, data sources, and descriptive statistics*

Variable	*Mean (s.d.)*	*Definition*	*Source*
Built (<1Km)	3.71 (5.11)	Amount of land build up during a term, at less than 1km from shore, Ha.	Dir. Gal. del Catastro, Ministry of Economics and Finance
Vacant (<1Km)	1,339 (1,293)	Amount of land available for development at the start of the term at less than 1km (total land in the fringe – land already build up), Ha.	Global Human Settlement Layer Project (GHSL) & Dir. Gal. del Catastro
Land area	7,625 (11,019)	Total land area of the municipality	GHSL Project
%Environmentally valuable land	0.21 (0.24)	Land area protected by the Natura 2000 Network/ Total land area of the municipality, Ha.	Natura 2000 Network & GHSL Project
Coast Length	20.05 (20.87)	Coast length of the municipality, Km.	GHSL Project
%Beach	0.36 (0.73)	Beach length/Coast length	
#Rainy days	8.73 (3.91)	Number of rainy days per year	Instituto Metereológico Nacional (IMN)
Av. Temperature	16.82 (2.22)	Av. daily temperature	
% Unemployed	0.059 (0.031)	Number of unemployed/Population	Anuario Económico de España, 'La Caixa', several years
Population	28,423 (101,137)	Resident population	Municipal Population Register. National Institute of Statistics (INE).
%Low education	0.529 (0.175)	Residents with less than high school education/Population	Census of Population, National Institute of Statistics (INE), several years
%High education	0.091 (0.039)	Residents with graduate education/Population	
%Emp. agriculture	0.119 (0.100)	Residents employed in agriculture/Pop.	
%Emp. industry	0.169 (0.085)	Residents employed in industry/ Pop.	
%Emp. services	0.589 (0.121)	Residents employed in services/ Pop.	
%Emp. construction	0.109 (0.029)	Residents employed in construction/Pop.	
Herfindahl index	0.536 (0.258)	Herfindahl index computed with party shares of mayors in the County (or a alternatively with ideological shares or in the Coastal denomination)	Own classification of parties by ideology, based on party statutes and media reports. County definitions from www.Geosoc.udl.cat. Coastal denominations from TurEspaña. Vote margin computed with the algorithm developed by Curto *et al.* (2018), using local election statistics (votes and seats for all the parties) and partisan identity of the mayor. Source: Ministry of Interior.
Alignment (a)	0.676 (0.467)	Dummy equal to one if the ideological bloc of the mayor is the bloc that has more mayors in the coastal area	
Vote margin (v^0)	0.157 (0.363)	% of votes at the local elections that have to be added to (subtracted from) the ideological bloc that has more mayors in the coastal area in order to win (lose) a majority of seats in the local council	
Left-wing mayor	0.447 (0.497)	Mayor belongs to the left-wing ideological bloc	
Left-wing regional gov.	0.608 (0.488)	Regional president belongs to the left-wing ideological bloc	
Majority council	0.649 (0.477)	Dummy equal to one if single party has the majority of seats in the local council and zero otherwise	

Table A.2
Distribution of mayors by ideological party bloc

	Sample	
	Full	*Close elections*
Left wing:	46.33 %	51.17%
Far left	4.64 %	3.51 %
PSOE	36.45 %	45.23 %
Center left	5.24 %	2.43 %
Right-wing:	53.62 %	48.73 %
Local party	5.98 %	2.16%
Center right	14.18 %	8.10 %
PP	33.46 %	38.47 %
Far- right	0.05 %	0.09 %
Total	100.00 %	100.00 %
PP+PSOE	69.91 %	83.70 %

Notes: (1) Percentage of mayors belonging to the different ideological categories, for the coastal municipalities during all the terms that follow the local elections from 1979 to 2011. The Basque Country is excluded. (2) Full sample = all municipalities; Close elections = elections within the optimal bandwidth used in the main specification. (3) Party codes: own classification based on party names, party statutes, and press reports regarding the ideological stance of the party. (3) PSOE=Partido Socialista Obrero Español; this is the main left-wing party, with a left-wing moderate ideology (we include also the mayors of all the regional parties that are federated with the PSOE and all the left-wing pre-electoral coalitions where these parties participate). Far left and Center left = left-wing parties at the left (right) of PSOE. PP=Partido Popular; this is the main right-wing party in Spain (we include also the mayors to the parties that preceded the PP in the 1980s, as Alianza Popular and Union de Centro Democrático). Far right and Center right = right-wing parties at the right (left) of PP. Local parties = parties running only in just one or a few municipalities that we have not been able to classify as left-wing parties.

Table A.3 *List of political parties*

Party name	Acronym	Ideology	Scope	#Mayors		%Mayors	
				Full sample	Close elections	Full sample	Close elections
Partido Socialista Obrero Español	PSOE	Left	Spain	1,329	502	36.45	45.23
Partido Popular	PP	Right	Spain	821	326	22.52	29.37
Convergència i Unió	CiU	Center-right, Regionalist	Catalunya	274	59	7.52	5.32
Coalición Canaria	CC	Center-right, Regionalist	Canarias	180	20	4.94	1.80
Unión de Centro Democrático	UCD	Right	Spain	175	45	4.80	4.05
Alianza Popular	AP	Right	Spain	159	39	4.36	3.51
Izquierda Unida	IU	Far-left	Spain	72	15	1.97	1.35
Bloque Nacionalista Galego	BNG	Far-left, Regionalist	Galicia	60	19	1.65	1.71
Centro Democrático y Social	CDS	Right	Spain	37	12	1.01	1.08
Partido Regionalista de Cantabria	PRC	Center-left, Regionalist	Cantabria	35	12	0.96	1.08
Partido Andalucista	PA	Center-left, Regionalist	Andalucía	28	0	0.77	0.00
Unió Mallorquina	UM	Center-right, Regionalist	Balears	25	1	0.69	0.09
Bloc Nacionalista Valencià		Far-left, Regionalist	València	21	5	0.58	0.45
Esquerra Republicana de Catalunya	ERC	Center-left, Regionalist	Catalunya	19	5	0.52	0.45
Partido Demócrata Popular	PDP	Right	Spain	13	2	0.36	0.18
Total				3,248	1,062	89.08	95.68

Notes: (1) List of the most prominent political parties in Spain during the period 1979-2011; we include only the political parties with at least 10 mayors during this period (notice that they account for 89,08% of all mayors and for 95,68% of all mayor in the close-elections sample (i.e., within the bandwidth used in most of the paper); the parties are ranked according to the number of mayors. (2) Ideology categories=Far-left and Center-left (left-wing parties to the left and to the right of the PSOE, which is the main party on the left, which is labelled just as Left), Far-right and Center-right (right-wing parties to the right and to the left of the PP, which is the main party on the right, which is labelled just as Right), Regionalist = parties for which the Regional-National dimension is important (in addition to the Left-Right one) and that are willing to enter alliances both with left and right-wing parties (depending on the context). (3) Scope = whether the party runs in all country or only in some regions.

Table A.4: *Covariate continuity test. Municipality*

Variable:	Coef.	p-value	Bw	#Obs.
A. Lagged dependent variable				
$\widetilde{\mathcal{Built}}_{t-1}$ (<1Km)	-0.067	0.670	0.193	1,345
B. Lagged treatment				
$Alignment_{t-1}$	-0.005	0.931	0.160	1,085
C. Geographic variables				
$\log(\mathcal{V}acant)_{t-1}$ (<1Km)	0.037	0.836	0.201	1,544
$\log(\mathcal{L}and)$	0.024	0.893	0.182	1,415
%Env. valuable land	-0.022	0.868	0.184	1,430
Coast length	0.049	0.790	0.315	2,186
%Beach	0.045	0.801	0.262	1,180
#Rainy days	0.116	0.530	0.177	1,377
Av. Temperature	-0.083	0.645	0.163	1,293
Mediterranean	-0.046	0.609	0.215	1,640
Island	-0.004	0.958	0.222	1,687
D. Socio-economic variables				
%Unemployed $_{t-1}$	0.031	0.788	0.178	1,381
%Low education $_{t-1}$	0.017	0.869	0.206	1,589
%High education $_{t-1}$	-0.024	0.849	0.216	1,650
%Employed agriculture $_{t-1}$	-0.086	0.502	0.163	1,288
%Employed industry $_{t-1}$	0.055	0.743	0.183	1,419
%Employed services$_{t-1}$	-0.015	0.911	0.190	1,454
%Employed construction$_{t-1}$	-0.139	0.299	0.215	1,645
%Population growth $_{t-1}$	0.055	0.674	0.188	1,283
Population $_{t-1}$	0.077	0.707	0.327	2,241

Notes: (1) Variables measured as z-scores, except those that are binary or expressed in logs. (2) Coef. = RDD coefficient, bw=bandwidth used, selected as per Calonico *et al*. (2014). #obs.=number of observations within bandwidth, at the left and right of the cutoff. (3) Estimation method=Local Linear Regression.

Table A.5: *Covariate continuity test. County.*

Variable:	Coef.	p-value	Bw	#Obs.
A. Lagged dependent variable				
$\widetilde{Built}_{t-1}$ (<1Km)	0.049	0.782	0.259	1,710
B. Lagged treatment				
Herfindahl index	-0.026	0.375	0.160	1,085
C. Geographic variables				
log($Vacant$)$_{t-1}$ (<1Km)	0.102	0.434	0.219	1,667
log($\mathcal{L}and$)	0.059	0.687	0.222	1,692
%Env. valuable land	0.038	0.833	0.174	1,360
Coast length	0.039	0.815	0.226	1,711
%Beach	-0.022	0.898	0.220	1,654
#Rainy days	0.117	0.528	0.178	1,385
Av. Temperature	-0.073	0.698	0.163	1,286
Mediterranean	-0.103	0.609	0.215	1,640
Island	-0.009	0.958	0.222	1,687
D. Socio-economic variables				
%Unemployed $_{t-1}$	0.098	0.394	0.195	1,493
%Low education $_{t-1}$	0.017	0.869	0.206	1,589
%High education $_{t-1}$	-0.024	0.849	0.216	1,650
%Employed agriculture $_{t-1}$	-0.087	0.502	0.163	1,288
%Employed industry $_{t-1}$	0.055	0.743	0.183	1,419
%Employed services$_{t-1}$	-0.015	0.911	0.190	1,464
%Employed construction$_{t-1}$	-0.139	0.299	0.215	1,645
%Population growth $_{t-1}$	-0.103	0.806	0.152	1,090
Population $_{t-1}$	-0.009	0.844	0.209	1,606

Notes: See Table A.4.

Table A.6

Fragmentation and Coastal development. Panel estimates. Dep. variable: Built land

	(1)	(2)	(3)	(4)	(5)	(6)
	A. Counties and Ideological blocs					
Herfindahl index	-0.128	-0.141	-0.187	-0.164	-0.183	-0.210
	(0.046)	(0.066)	(0.080)	(0.081)	(0.086)	(0.099)
R^2-adj	0.010	0.068	0.076	0.009	0.067	0.073
#Obs.	693	693	693	693	693	616
	B. Counties and Political parties					
Herfindahl index	-0.173	-0.195	-0.224	-0.213	-0.240	-0.275
	(0.074)	(0.078)	(0.087)	(0.087)	(0.093)	(0.109)
R^2-adj	0.010	0.069	0.079	0.010	0.068	0.076
#Obs.	693	693	693	693	693	616
County f.e.	YES	YES	YES	YES	YES	YES
Term f.e.	YES	YES	YES	YES	YES	YES
County trends	NO	YES	NO	NO	YES	YES
Political controls	NO	NO	YES	YES	YES	YES
Socio-economic controls	NO	NO	NO	YES	YES	YES
Entropy balancing weights	NO	NO	NO	NO	NO	YES

Notes: (1) Panel fixed effects estimates of the relationship between logged *Built land* and the Herfindahl index, both computed at the *county* level for the period 1979-2015. The Herfindahl index is computed with data on the *Ideological bloc* of the mayor (left-wing or right-wing in Panel A and with data on *Political parties* in Panel B. (2) We include in the equation county and term fixed effects, *county* trends, Political control variables (% of municipalities aligned with the regional government, % controlled by left-wing parties, %with mayors belonging to local parties, % margin of victory of the ideological bloc of the mayor, and %turnout) and Socio-economic controls (Population, %Unemployed, %Without studies, %College and %Workers by sector). (3) In the last column we report results using Entrophy balancing weights for continuous treatments (Tübbicke, 2020). (4) Standard errors clustered at the *county* level.

Table A.7: 2SLS-RD analysis. *Municipal alignment. Alternative estimation methods.*

	(1)	(2)	(3)	(4)
	2SLS		IV-Poisson	IV-Negative Binomial
	Dep. Variable: Built land			
Sample	Full	Built land>0	Full	Full
Alignment (A)	-0.379 (0.119)	-0.511 (0.190)	-0.365 (0.169)	-0.420 (0.152)
Bandwidth (MSE)	0.140	0.140	0.140	0.140
Controls:				
log($\mathcal{Vacant\ Land}$)	YES	YES	YES	YES
Region & year f.e.	YES	YES	YES	YES
Effective Obs.	1,165	1,165	1,165	1,165

Notes: (1) In column 1 we reproduce the main results using the Inverse hyperbolic sine transformation to be able to keep the zeros. In column 2 we use log ($\mathcal{Built}$) dropping the zeros. In column 3 we estimate an IV-Poisson model by glm; in this case the dependent variable is not transformed, and we keep the zeros. In column 4 we estimate an IV-Negative Binomial model also by glm. (2) In all the cases the RD relies on a polynomial of order 1 and we use the optimal bandwidth selected as per Calonico *et al.* (2014) in the main analysis. (3) Standard errors clustered at the *county* level in parenthesis.

Table A.8:
2SLS-RD analysis. *Municipal alignment. Fixed effects and cluster options.*

	(1)	(2)	(3)	(4)	(5)	(6)
	Dep. Variable: Built land					
Alignment (a)	-0.365	-0.353	-0.349	-0.359	-0.344	-0.339
s.e.	(0.152)	(0.136)	(0.130)	(0.156)	(0.106)	(0.145)
Wild bootstrap p-value	--.--	--.--	[0.028]	--.--	--.--	[0.023]
Bandwidth	0.131	0.127	0.142	0.109	0.142	0.138
Region f.e.	YES	YES	YES	NO	NO	NO
Municipality f.e.	NO	NO	NO	YES	YES	YES
Cluster s.e. by Municipality	YES	NO	NO	YES	NO	NO
Cluster s.e. by County	NO	YES	NO	NO	YES	NO
Cluster s.e. by Region	NO	NO	YES	NO	NO	YES
Effective obs.	912	889	961	899	1,143	961

Notes: (1) See Table 2. (2) In the first three columns we control for region f.e. and in the other three for Municipality f.e. (3) In each case, we present results clustering s.e. at the Municipality, County and Region levels; in the last case we present Wild-bootstrap p-values to account for the small number of clusters in brackets. (4) Optimal MSE bandwidth used with a uniform kernel and a polynomial of order one. (5) We control in all equations for log($\mathcal{Vacant}$) and Year f.e.