The political economy of coastal destruction

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ABSTRACT:
We study the role of inter-governmental cooperation in the preservation of coastal land from development in Spain. Keeping coastal land undeveloped may provide benefits (e.g., preservation of open space) or costs (e.g., foregone jobs) to both residents and non-residents in the political jurisdiction. Therefore, local governments deciding in isolation –and not accounting for the welfare of non-residents– may not choose the right amount of development. We rely on a close-elections Regression Discontinuity Design to investiate how political alignment among neighboring municipalities –which may enhance the incentives to cooperate, and so to account for the welfare of non-residents– affects development close to shore. We find that municipalities where the party ruling a majority of municipalities in a neighboring area barely won the local election develop less land than municipalities where the same party barely lost, a result suggesting that lack of cooperation leads to over-development.

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1. Introduction

The coast is a place that provides both economic opportunities and environmental amenities. Coastal development brings economic benefits (e.g., local jobs in the tourism and construction industries, rents for the owners of undeveloped land) but reduces the environmental value of the coastline (e.g., beach erosion, damage to ecosystems, landscape destruction, congestion). Moreover, an excessive amount of development might affect the long-run capacity of the coast to keep delivering economic benefits (Alexandrakis et al., 2015). This situation is actually worsening due to climate change and rising sea levels (Pilkey and Cooper, 2014).

Both governments and international organizations are issuing recommendations on how to manage coastal development in the face of climate change (e.g., European Commission, 2009). At some point, these reports mention the need to design a better governance system. Yet, there is not much research about the effect of different institutions on outcomes of such policies. In this paper, we focus on an important institutional feature, the degree of inter-governmental cooperation. Some papers have studied the political economy of climate change (Campa, 2018; Gagliarducci et al., 2018) and just a few have studied the effect of decentralization, which –as will become clear later on- is a similar concept than cooperation (Burges et al., 2012; Lipscomb and Mobarak, 2016). None has yet focused on coastal preservation.

In this paper, we study the role of cooperation among local governments in the preservation of coastal land from development in Spain. Keeping coastal land undeveloped may provide both benefits and costs to residents in the locale but also to residents outside the political jurisdiction. Local governments deciding in isolation about this issue will not take into consideration the welfare of non-residents and may end up either overdeveloping the coast (if the spillovers from open space preservation dominate those related to job-creation) or under-developing it (when job-creation spillovers are more important). This suggests cooperation between coastal local governments in the design of land use and other local policies might be welfare enhancing. In this paper, we investigate whether this is the case by estimating the effect of political alignment among mayors of neighboring municipalities on the amount of land developed close to shore. We expect mayors belonging to the same party to have more incentives to cooperate than mayors of different parties. Mayors belonging to the same party may share electoral objectives, can be disciplined by party leaders, may trust each other more because they know they will need each other in the future, or simply communicate to each other more often.

To study this question, we rely on high resolution Satellite photos of the Spanish coast for several cross-sections during four decades and nine local terms-of-office. The data sources used to measure coastal development are the 'Global Human Settlement Layer' Project, and the 'CORINE Land Cover Project'. To identify the effects of political alignment, we rely on a 'close-elections Regression Discontinuity Design'. This approach has been previously used by Gutierrez and Durante (2015) to study the effect of cooperation in crime prevention between Mexican local governments. In order to account for the specificities of the Spanish Proportional Electoral system, we follow the method recently proposed by Curto et al. (2018).

We find that municipalities where the party ruling an important share of municipalities in the same coastal area barely won the previous local election developed less land close to shore than municipalities where the same party barely lost. This result remains after many robustness checks and it cannot be explained by political alignment with the regional government. The average result suggests that local governments deciding in isolation may not be accounting for the benefits that preservation provides to non-residents and so that they are over-developing the coast. Additionally, we find that the extent of over-development is higher where undeveloped land close to shore is scarce, and lower in places with high unemployment. These heterogeneous results are consistent with anecdotal evidence regarding the main drivers of coastal development in Spain (preserving the environment v. providing jobs).

The paper is related to several literatures. First, there are several papers looking at the effect of inter-jurisdictional cooperation on policy outcomes. In addition to the already-mentioned paper by Durante and Gutierrez (2015) which studies horizontal cooperation, Dell (2015) looks at the effects of vertical cooperation in the fight against organized crime in Mexico. Second, there are papers looking at the effects of either local government fragmentation or of decentralization reforms. For example, Hoxby (2000) looks at the effect of the number of schools in a given area on educational outcomes, using the number of water streams as an instrument of fragmentation. Hilber et al. (2018) use the same strategy to identify the effect of local government fragmentation on urban sprawl in Switzerland. Galiani et al. (2008) and Salinas and Solé-Ollé (2018) study the effect of education decentralization reforms in Argentina and Spain, respectively. The works by

Burges et al. (2012) and Lipscomb and Mobarak (2016) look at the impact of decentralization on deforestation in Indonesia and on river pollution in Brazil. Both papers find evidence of positive spillovers and suggest decentralization have been detrimental.

The paper also contributes to the literature on local land use regulations. For example, Helsey and Strange (1995) and Brueckner (1995, 1998) show that cities deciding in isolation whether to limit growth through the use of 'urban growth controls' do not take into account the externalities they impose on each other. Suburban local governments might be constraining too much residential development in their jurisdiction, creating a housing affordability problem in the whole metro area and, ultimately, harming its growth prospects. The same logic can be applied to a system of cities in a country (Hsieh and Moretti, 2018). The idea is going to be very similar in our paper, but the type of externality relevant in the case of non-residential shoreline development will be different. Finally, our work is also related to some recent papers that evaluate the impact of tourism on economic development and on environmental amenities. For example, Faber and Gaubert (2018) find that tourism along the Mexican coast had a positive impact in inland areas through its impact on manufacturing, thus suggesting there are positive geographical spillovers related to job creation. This paper does not consider the effect on coastal amenities. The paper by Hilber and Schöni (2016) evaluates the effect of a Swiss ban on second residences. The paper finds a detrimental effect of the ban on housing prices, which they interpret as evidence that the negative effects on local development dominate over the positive effects of amenity preservation.

The paper is organized as follows. In the next section, we describe the process of coastal development in Spain during recent decades and provide institutional context to our study. In section three we set up a simple theoretical model which we use to guide the interpretation of the empirical results. In section four, we describe the empirical methodology. Section five presents the results. The last section concludes.

2. Coastal development in Spain

The Spanish coast experienced a development boom starting at the beginning of the 1960's, after the Franco regime decided to open the country to tourism and foreign investment. These years are known as the 'desarrollismo' period, a concept that means development was the only priority, and that its collateral effects in terms of destruction of open space and loss of cultural character were sidelined.

The destruction of the Spanish coast kept more or less the same pace after the arrival of democracy. Decades of tourist development have left its mark on the Spanish coast. In Figure A.1 in the Appendix we show aerial photos from 1956 and 2012 of two examples of extreme development. The photos show a completely undeveloped stripe of white sand and of farmland in 1956, both completely developed as of 2012. The Spanish coastline is nowadays heavily developed: 36.5% of the shore is build up, and this number rises to 74.3% in the Valencia region or to 100% in the city of Marbella. When one looks at the 1 Km fringe, 15% of all land is already developed, and this number is as high as a 23% and 26% in the Valencia and Catalunya regions (data from the 'CORINE Land Use Cover). The buildup area close to shore is still growing at a fast pace nowadays, as can be seen in Figure A.2 in the Appendix for the period 1979-2011. During the period 1987-2005, for example, an area equivalent to 'two soccer fields' has been developed per day.

The consequences of development on coastal amenities are varied (Greenpeace, 2018). Development alters coastal landscapes, by shrinking of forests, dunes, wetlands and of the beaches themselves. This affects the beauty of the landscape but also reduces bio-diversity and increases flood and forest fire risks. Some of these risks are increasingly difficult to manage in the face of climate change, hotter and drier summers, and rising sea levels. It also increases pollution and exhaustion of water resources, and generates congestion reducing the quality of amenity consumption. Moreover, most of the effects are not reversible: once a coastal site has been destroyed it is nearly impossible to bring it back. All these concerns have been gaining room in the Spanish debate on the convenience of preserving the remaining undeveloped coastal land[1]. However, economic benefits also appear prominently in the discussion. For example, in one recent conflict regarding the construction of a huge hotel in a protected area, the mayor of the town insisted on the jobs generated and on the high unemployment rate in the town[2].

[1] 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 is born to protect Costa Brava from new construction," in La Vanguardia 4/8/2018.

[2] See "The mayor of…in favor of opening 'El Algarrobico' because 'it will bring jobs'", in El Mundo, 11/10/2011; in the text, the mayor mentions the very high unemployment rate in the town. 'El Algarrobico' is a huge hotel already built in Cabo de Gata, a protected national park in the Coast of Almería, whose opening has been paralyzed by judicial intervention but that it is still pending a definitive decision. See also "The Partido Popular in Baleares justifies a hotel in a virgin beach because of job creation," in El País 4/3/2012.

In this paper, we are interested in advancing our knowledge about the institutional determinants of coastal development. The main players in this field in Spain are the local governments. The local landscape in Spain is highly fragmented: there are more than 8,000 municipalities, 423 of them located on the coast. Municipalities are responsible for land use regulations (subject to a regional regulatory framework) and provide tradition-nal local public services funded by a mix of taxes and intergovernmental transfers (Solé-Ollé and Viladecans-Marsal, 2012 and 2013). In 1979, the first democratic Spanish local governments faced both a scarcity of tax revenues and an economic crisis with soaring levels of unemployment. Improving public services and providing jobs was in many cases key to win local elections. In dealing with these hard situations, local governments use to take decisions in insolation, without taking into account the effects on neighboring municipalities. These spillovers happen, for example, because residents enjoy visiting beaches in adjacent towns, and may also value the mere preservation of undeveloped coastland therein. They happen allso because coastal development in one town may increase congestion in nearby towns (e.g., more tourists staying in that town might visit them) or may harm the quality of the environment (e.g., infrastructure construction may cause erosion of the beach of close by towns[3], and development may harm adjacent wetlands and aquifers or cause spreading forest fires). Finally, hotel over-supply may reduce prices and tax revenues nearby.

There are several ways of dealing with these problems. First, the central and regional governments can intervene protecting parts of the coast from development, setting a regulatory framework that helps minimize the impact of spillovers, or providing public goods. In Spain, the central government is responsible for protecting the coast, although it has been quite slow and ineffective. The first real attempt at protecting the coast did not arrive until 1988 with the 'Ley de Costas', enacted under a left-wing government. Even in this case, the law was imperfectly enforced[4] and years later a right-wing government turned down some of its precepts. The regional governments (*Comunidades Autonomas*) provide the legal framework for land use regulations, can ban some develop-

[3] For example, the building of a port might create a barrier to the transport of sand along the coast, shrinking the beach of a nearby town. The canalization of a river bed might reduce the amount of sediments that reach the sea and help erode surrounding beaches.

[4] See for example an article in El País in 2005 stating that 'the lack of demarcation of land close to shore prevents the punishment for the occupation of public land in 30% of the coastline' (see *La Ley de Costas de* 1988 *sigue sin aplicarse en* 3.000 *kilómetros de playa*, El País 14/11/2005). Another article in the same newspaper says that 'The 'Ley de Costas' has been unable to stop coastal deterioration' (see *The destruction of Spanish beaches*, El País, 10/08/2010.

ments deemed unsustainable, and are responsible of enforcing the central legislation protecting the coast. As in the case of the central government, it is not clear that regional governments have been able to effectively protect the coast.

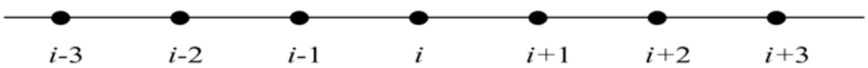
Second, absent an effective intervention by a higher layer of government, the localities might decide to fix these spillovers by cooperating voluntarily. They might decide to establish a voluntary association of municipalities (the so-called *Mancomunidad*), to reach specific contractual deals (*Convenios*), or to coordinate in a more informal manner their zoning and infrastructure policies.

3. Theoretical framework

3.1 Basic setup

In this section we present a simple theoretical model, with the only purpose of illustrating our main hypothesis: depending on the sign of the externality, lack of cooperation between neighboring local governments might result either in over-development or in under-development of the coast.

Let's consider a beach town *i* located in a linear coastal area and surrounded by neighboring beach towns *i* and –*i* (i.e., *i*-1, *i*-2, *i*-3…*i*+1, *i*+2, *i*+3…).



The indirect utility of a representative voter of this beach town can be expressed as $V(A_i, Y_i)$, where A represents coastal amenities and Y economic development benefits. The utility function has the usual properties: $V_A \geq 0$, $V_Y \geq 0$, $V_{AA} \leq 0$, and $V_{YY} \leq 0$. These two arguments of the utility function represent the two main issues that appear in the debate regarding the convenience of keeping the coast undeveloped in Spain (see the previous section). The utility provided by coastal amenities might account for the benefits derived from direct access to an undeveloped coast (both in the municipality and in whole the coastal area) or by the option or existence value associated to the preservation of land close to shore. We can think of economic benefits as jobs, but also as higher wages and business opportunities, or as higher local tax revenues. We will assume that keeping the coast undeveloped reduces the amount of these economic benefits.

L_i is the amount of land available for development in town *i* to start with:

$$L_i = U_i + D_i \tag{1}$$

where U_i and D_i stand for the land the local government will decide to keep undeveloped and for the that that will decide to develop, respectively. The amount of land available for development in a neighboring town –*i* can be expressed in a similar way:

$$L_{-i} = U_{-i} + D_{-i} \tag{2}$$

We introduce environmental spillovers by assuming that coastal amenities in *i* depend on the amount of land kept undeveloped in both *i* and –*i*:

$$A_i = U_i + \theta U_{-i} \tag{3}$$

where $\theta \in (0,1)$ is a parameter measuring the strength of this type of spillovers. Using (1) and (2) to find the expression for U_i and U_{-i} and substituting in (3), we get:

$$A_i = L_i + \theta\, L_{-i} - D_i - \theta D_{-i} \tag{4}$$

This expression is saying that the development decisions of governments *i* and –*i* reduce amenities enjoyed by representative voter in *i*. In the previous section, we provided examples justifying the fact that $\theta > 0$: residents in *i* may use amenities in –*i* and development activity in –*i* may have adverse consequences on the coastal environment in *i*. Note, however, that we are assuming that $\theta < 1$, which means that own effects are stronger. The reasons for that are that the residents' use of coastal amenities rise with accessibility and that the harm on the coastal environment decays with distance.

The following expression introduces economic development spillovers:

$$Y_i = D_i + \delta D_{-i} \tag{5}$$

where $\delta \in (0,1)$ is a parameter measuring the strength of this type of spillovers. This expression tells us that development in –*i* does have an effect over e.g., job opportunities in *i*. It might be that residents in *i* might end up working in the construction or in the tourism industry in –*i* or that jobs in the manufacturing sector in *i* increases due to development in –*i*. We assume, however, that job opportunities in *i* are more affected by development in *i* than by development in –*i*, which means that individuals are more willing to take a job in their town than in more distant places, or that they have more information on job opportunities in their town.

3.2 Non-cooperative equilibrium

In order to focus on inefficiencies derived exclusively from failure to cooperate, we assume that local governments are benevolent and aim at maximizing the utility of the representative voter. We also assume that the indirect utility function is $V(A_i, Y_i) \equiv A_i^\alpha\, Y_i^{1-\alpha}$. Substituting (4) and (5) into this expression, we get:

$$V(A_i, Y_i) \equiv [L_i + \theta\, L_{-i} - D_i - \theta D_{-i}]^\alpha [D_i + \delta D_{-i}]^{1-\alpha} \tag{6}$$

where $\alpha \in (0,1)$. The local government *i* maximizes (6) by choosing D_i assuming that the decision of local governments *–i* are all set (i.e., behaving Nash). After obtaining the F.O.C. and rearranging, we can get the reaction functions for *i* and *–i*:

$$d_i^* = \beta\ -\ \gamma d_{-i}^* \tag{7a}$$

$$d_{-i}^* = \beta - \gamma d_i^* \tag{7b}$$

where $d_i^* = D_i^*/L_i$, $d_{-i}^* = D_{-i}^*/L_{-i}$, $\beta = (1-\alpha)(1+\theta)$ and $\gamma = (1-\alpha)\theta + \alpha\delta$. Expression (7a) suggests that development in *i* and *–i* are strategic substitutes. When a local government in *–i* increases the portion of developed land d_{-i}^* by one unit, the local government in *i* reacts by reducing the portion of developed land d_i^* by γ units.

From now on, we focus in the symmetric equilibrium, where *i* and *–i* are identical The portion of land developed in a non-cooperative (symmetric) Nash equilibrium is:

$$d_N^* = \beta/(1+\gamma) \tag{8}$$

Note that the non-cooperative level of development is higher the stronger are the environmental spillovers (θ), and the smaller are the economic benefit spillovers (δ).

3.3 <u>The effect of cooperation</u>

In the cooperative equilibrium, a benevolent government chooses the amount of development in the whole area at the same time. The solution can be found by maximizing:

$$V(A_i, Y_i) \equiv [(1+\theta)(L-D)]^\alpha [(1+\delta)D]^{1-\alpha} \tag{9}$$

with respect to *D*. After obtaining the F.O.C. and rearranging, the portion of land developed in the cooperative equilibrium is simply:

$$d_C^* = 1 - \alpha \tag{10}$$

Note that the cooperative level of development depends on the weight of economic benefits v. amenities in the utility function but does not depend on the strength of spillovers. We can now compare the non-cooperative with the cooperative solution:

$$\Lambda = d_N^* - d_C^* = \lambda(\theta - \delta) \tag{11}$$

where $\lambda = \alpha(1-\alpha)/(1+\gamma)$. The following proposition summarizes the results.

PROPOSITION 1. *When* $\delta = 0$, $\Lambda = d_N^* - d_C^* > 0$ *and non-cooperative decision-making generates over-development. When* $\theta = 0$, $\Lambda = d_N^* - d_C^* < 0$ *and non-cooperative decision-making generates under-development. When both* $\theta > 0$ and $\delta > 0$, *the sign of* Λ *is equal to that of* $(\theta - \delta)$. *The relative degree of over-development (under-development) increases with* θ *and decreases with* δ.

This Proposition helps us to derive the main hypothesis to test in the paper, which says that local governments that able to cooperate with each other will choose a different amount of development that those deciding in isolation. Whether lack of cooperation results in over- or in under-development depends on whether isolated decision-making fails to account for the positive amenity spillovers linked to preservation of undeveloped coastal land or for negative spillovers linked to the adverse effects that preservation might have on the economy of neighboring towns. In fact, by estimating heterogeneous effects, one might be able to test some additional hypotheses related to the nature of spillovers. Note that the treatment of inter-jurisdictional spillovers is extremely simple in our model: undeveloped land in –*i* and *i* are substitutes and the degree of substitutability is constant. However, the substitutability of the effects of development in –*i* and *i* might be actually stronger in some situations. For instance, one might speculate that θ could be higher when: the amount of undeveloped land to start with is larger, when that land is more environmentally valuable, or when it is closer to shore. The idea is that the representative voter in *i* starts caring about development in the neighborhood when he perceives this undeveloped land close to shore irreversibly disappearing, and especially when this land has a high environmental value. Similarly, we can also speculate that δ will be larger when the level of unemployment is very high. The idea here is that it is economic hardship that forces people to consider taking jobs outside of the hometown.

3.4 <u>Discussion</u>

The model presented above is simple and focuses on purpose on the two main arguments found in the Spanish debate regarding the convenience of further coastal development. Here we discuss the consequences of two possible extensions.

First, in the model we do not address the role of owners of undeveloped land, of developers, or of the hotel industry (Hilber and Robert-Nicoud, 2013; Solé-Ollé and Viladecans-Marsal, 2012). These agents care about the profits they obtain from the development of additional plots of land close to shore. However, the more land they develop, the more they erode the coastal environment, and the lower the profit (and tax revenues) obtained from subsequent operations. Since environmental erosion also affects neighboring towns, reducing profits (and tax revenues) therein, this generates additional positive spillovers from preservation. So, this mechanism also suggests that lack of cooperation might generate over-development.

Second, voters in our model do not care about the value of their home, as is the case in models of residential land supply (Brueckner, 1995). We make this assumption because we are thinking of a small town, populated by immobile homeowner-voters who must decide on the amount of non-residential development. This development may happen far from the town center and it does not necessarily affect the supply of residential housing. These voters will favor development if they think it will improve employment prospects or if they want to make profits selling land. Owners of vacation homes may care about house values but, like other non-resident visitors, they do not vote. Of course, if these assumptions do not hold, home-value maximizing voters might constrain residential supply and push up prices in the whole coastal area, potentially harming the neighbors' economy. Note that this would be a story of negative development spillovers, suggesting that lack of cooperation might generate under-development.

4. Empirical design

Our empirical design is based on the idea that belonging to the same political party facilitates cooperation. We measure political alignment among neighbors (hereby called 'horizontal political alignment') as a situation where the mayor belongs to the same party that rules a majority of municipalities in the neighborhood. This approach allows us to use a Regression Discontinuity Design (RDD). In the rest of the section, we provide arguments in favor of using 'horizontal political alignment' as a proxy for cooperation and describe the implementation of the RDD.

4.1. Horizontal political alignment

There is a literature in public administration showing that 'political homophily' (i.e., the similarity of the political traits of two jurisdictions) helps explain the decision to cooperate among governments (Gerber et al., 2014; Song and Park, 2010). According to this literature, voluntary cooperation happens whenever the benefits of this behavior outweigh transaction costs (Clingermayer and Feiock, 2001; Feiock, 2007). Those transaction costs will be lower the more politically similar are the two jurisdictions (e.g., the party orientation of the electorate). Note, however, that this literature does not focus specifically on the party identify of politicians, which is what we do in the paper.

There are already several works suggesting that parties do help internalize spillovers in federations. The works by Riker (1964), Filippov et al., (2004) and Wibbels (2005) suggest that centralized political parties that compete in all jurisdictions can be a solution to the underlying collective action problem affecting federations. The contention is that centralized political parties help coordinate behavior across governments. The work by Rodden (2003) and Enikolopov and Zhuravaskaya (2007) provide evidence that party centralization enhances fiscal discipline and the provision of other national public goods. According to Wibbels (2005), there are several reasons why centralized parties may help to internalize spillovers. First, local officials can have incentives to cooperate if they have co-partisans at the regional or central level whose electoral success influences their own electoral chances. There is evidence of such coattails in several countries (Campbell, 1986, and Samuels, 2003, for the US and Brazil). Second, regional or national party leaders have the capacity to discipline co-partisans at other levels of government. For example, in closed-list systems, regional and national party leaders decide who runs for higher office. Third, local co-partisans interact more often and have expectations of having to rely on mutual support in the future for building alliances (Persico et al., 2011).

There is some evidence supporting the claim that political alignment facilitates cooperation among local governments. Some papers show that local governments merge more often with other governments controlled by co-partisans (see Sorensen, 2006, and Bruns et al., 2015, for Denmark and Germany, respectively) and others show that differences in political affiliation make voluntary agreements among local governments more improbable and more unstable (Feiock, 2007). There is also abundant anecdotal evidence that this is actually the case in Spain (see section two).

4.2. The RD Design

Motivation. We want to study how coastal development in a municipality responds to 'horizontal political alignment'. A first approach would be to estimate this relationship by OLS, controlling for a set of observed covariates. If we have access to panel data, we might also control for different types of fixed effects. However, this approach might still be problematic if there are omitted development shocks that also affect the probability of a municipality becoming 'horizontally aligned'. Imagine, for instance, that in a booming coastal area the voters in several municipalities turn towards a party that they think will facilitate (or deter) that development. This will surely increase the number of 'horizontally aligned' municipalities in the area and suggests the treatment is not random.

This is why we rely for identification on a close-elections Regression Discontinuity Design (RDD). Intuitively, the RDD compares municipalities where the party ruling a majority of municipalities in the neighboring area won the local election by a thin vote margin and municipalities where the same party lost by an equally small vote margin. Because in these two cases winning and losing is a matter of a small number of votes, the treatment is essentially random. For this reason, this identification method is considered the closest one to an experiment and has been recently used by economists and political scientists to study the effect of party identity (Lee et al., 2004; Lee, 2008; Pettersson-Lidbom, 2008; Ferreira and Gyourko, 2009; Gerber and Hopkins, 2011, and Folke, 2014).

RDD *in* PR *systems*. However, the fact that local councils are elected in Spain 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). After that, representatives on the city council 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 supporting the mayor to the opposition). Here, we follow the solution proposed recently for Spain by Curto et al. (2018), which follows other studies that already adapted the close-elections RDD to a PR system for other countries (see Folke, 2014; Ade and Freier, 2013; Fiva *et al*., 2015; and Fiva and Halse, 2016).

First, although in around a third of Spanish local governments the mayor's party does not hold a majority of seats in the council, ideology is a very powerful driver of the formation of the coalition of parties that support the mayor. This allows us to define our treatment as a situation in which the ideological bloc of the 'dominant party' in the neighborhood (i.e., the party controlling more than a majority of municipalities in the neighborhood) has a majority of seats in the local council. The idea is that when parties on the left of the ideological spectrum have a majority of seats in a local council, it is highly likely that the mayor will belong also to the left-wing party bloc; in this case, if the 'dominant party' belongs to a left-wing (right-wing) party then we can say that the mayor and the 'dominant party' are aligned (unaligned). The same applies when right-wing parties hold a majority of seats. This is exactly the procedure used in Fiva *et al*. (2015), and Fiva and Halse (2016). The fact that a small proportion of local parties are able to support both right- and left-wing parties means that the ideological factor will not always work, which justifies the use of a 'fuzzy' RDD as in Fiva and Halse (2016).

Second, even if the treatment in terms of the discontinuity of seats is relatively straightforward to define, elections won or lost by a difference of one seat are probably not that close in terms of the number of votes. In small municipalities, in particular, a high percentage of votes is needed to win one more seat. Thus, using the number or the percentage of seats as our forcing variable might not be appropriate (Fiva *et al*., 2015). Instead, we use a forcing variable computed as the percentage of votes that the ideological bloc of the 'dominant party' in the neighborhood must lose (win) in order to lose (win) the majority of seats in the council. We first have to identify the last seat that was won by the majority bloc in the town. Then, we have to compute how many votes the parties in that bloc would have to lose for that seat to be transferred to a party in the opposition bloc. This computation is far from straightforward because whether a seat is allocated to one party or to another depends on the vote shares of all the votes cast at the same time (see Fiva, 2014, and Fiva *et al*., 2015). We follow the procedure proposed by Curto et al. (2018) to calculate of the number of votes that have to be subtracted from the 'dominant party's' ideological bloc for that bloc to lose its majority in the council[5].

Equation specification. The Regression Discontinuity Design (RDD) involves the estimation of a discontinuity in coastal development at the close-elections threshold. We use the following two-equation model:

$$d_{it} = \alpha H_{it} + g(v_{it}^0) + \varepsilon_{it} \tag{12a}$$

$$H_{it} = \gamma M_{it} + l(v_{it}^0) + \epsilon_{it} \qquad \forall v_{it}^0 \in (-h, h) \tag{12b}$$

[5] Our calculations are based on assumptions that we consider reasonable in the Spanish case. The results are robust to changes in these assumptions. We explain in detail how this procedure works in the next section and refer to the Online Appendix in Curto et al. (2018) for details.

where d_{it} is the amount of land close to the coast developed by local government *i* during the term-of-office *t,* and H_{it} =1 if there is *Horizontal alignment* and zero otherwise. The variable v_{it}^{0} is the percentage of votes that the parties belonging to the ideological bloc of the 'dominant party' in the neighborhood would have to lose (if this party holds the mayoralty) or win (if the party is in the opposition) to lose (win) a majority of seats in the council and so lose (win) the control of the government. We refer to this variable as the *Vote margin*. With $M_{it} = 1$ we denote a situation where the vote margin is positive (i.e., $M_{it} = 1$ if $v_{it}^{0} > 0$, and 0 otherwise). The terms $g(v_{it}^{0})$ and $l(v_{it}^{0})$ are polynomials in v_{it}^{0}, fitted separately at each side of the threshold using the observations in a neighborhood around it, which we label h, hereby referred to as the bandwidth. Equation (12a) is used to estimate the effect of *Horizontal alignment* on coastal development. Equation (12b) is the first stage and estimates the discontinuity in *Horizontal alignment* that we use for identification. We estimate (12a) by 2SLS, using M_{it} as an instrument for H_{it}. The estimates obtained can be interpreted as a Local Average Treatment Effect or LATE (Lee and Lemieux, 2010).

RDD *validity*. The validity of the RD design rests on certain assumptions that have to be tested. First, we document that there is a genuine discontinuity in the probability of treatment. We show graphically that this is the case. The jump in the probability of treatment is lower than one, and this justifies the use of a 'fuzzy' design. Second, we show that the forcing variable used is continuous around the threshold by inspecting the histogram and using the formal test proposed by McCrary (2008). The continuity test provides a means for discarding the manipulation of the forcing variable. Third, we also test for the continuity of predetermined covariates to show that all factors, besides Horizontal alignment, that could potentially influence the coastal development are continuous at the threshold.

***Estimation and inference*.** Our preferred RD estimation uses a local polynomial with h equal to the optimal bandwidth, h*, computed as per Calonico et al. (2014), and which minimizes the mean squared error. We also report in the main table the results for h*/2 and in a graph the results for additional divisors and multiples of h*. The finding that the treatment is also precisely estimated for lower bandwidths would reassure our findings. As a complementary analysis, we also report the results of a RD analysis using a global polynomial and the OLS results. In this last case, we present the results with and without controlling for covariates. In all the cases, we control for *Coastal area* x *Term fixed effects*[6]. Their inclusion is not strictly needed in a RDD, given that covariates should be balanced at the threshold, but improves the precision of the estimates. The standard errors are clustered at the coastal area level.

4.3 Sample and data

Sample. We use data for all Spanish coastal municipalities (N=423) during nine terms-of-office, delimited by ten local elections: 1979, 1983, 1987, 1991, 1995, 1999, 2003, 2007, 2011 and 2015. This gives us a total of 3,807 elections to work with, although we lose a few of them due to data availability issues.

Land use data. Our dependent variable is the amount of land developed during a term-of-office relative to the amount of land undeveloped at the start of the term. We retrieve the amount of artificial land (developed) and the total amount of land under the local jurisdiction from two sources. The main source we rely on is the GHSL ('Global Human Settlement Layer', a joint project of the European Commission Joint Research Center and the European Space Agency (https://ghsl.jrc.ec.europa.eu). They use Satellite photos from the Landsat IV – VII Database from NASA. The information is available for four cross -sections (1975, 1990, 2000 and 2014) and has a high resolution (38-meter cells). In order to obtain a series for all the election years we mix this data with the information coming from the 'CORINE Land Cover Project' od the European Environmental Agency (https:// www.eea.europa.eu/publications/COR0-landcover), which is available for four additional cross-sections (1987, 2005, 2009 and 2015). This data has a lower resolution (100-meter cells) but provides more detail on land use types. We combine the two data sources to construct a series of developed and undeveloped land for each election year. In order to fill a few remaining holes in the data, we complement these two databases with information on housing construction from the Census of 1991, 2001 and 2011.

We measure developed and undeveloped land at various distances from the coast: less than 100 meters, less than 200 m., less than 500 m., less than 1 Km, less than 5 Km and less than 10Km. For the main analysis we rely on the 1 Km fringe. There is a reason for that. The pressure over the coast does not come only from development just on the shore. In some zones, the shore was fully developed early, and development was dis-

[6] Coastal areas are 29 well defined coastal denominations (see Table A.1 in the Appendix).

placed inland. Rugged terrain also means that development also happens inland. Because of this, Greenpeace focused in this fringe in its initial reports (Greenpeace, 2010), although more recently has also focused on both closer (100 m.) and more distant (5 and 10 Km) fringes (Greepeace, 2018). Having said that we will also present results for all distance fringes mentioned, since one of the hypotheses we want to test is whether the incentives to cooperate really increase for development projects that are close to shore.

Horizontal alignment. The information on the votes and seats of all the parties running at the local elections, and about the party of the mayor, comes from The Spanish Home Office ('Ministerio del Interior'). Using this data, we define whether a municipality is *Horizontally aligned* or not. First, we define this variable for several orders of neighbors (first order -so, bordering- and up to fifth order). We present our main results for the first to second order of neighbors together (up to second order). This means that a neighborhood surrounding a local government will have five municipalities (the own municipality plus two neighbors at each side). In this case, our 'dominant party' will be the one controlling three or more municipalities in the neighborhood. In robustness checks, we will present results for other orders of neighbors and majority thresholds. Our procedure works well because in most cases there are only two different parties running local governments. In a few cases this is not the case, especially because there are some mayors belonging to local parties in our sample. This is however a small percentage (around a 4%) and they are never the 'dominant party'. What we do is to redo our *Horizontal alignment* measure without including these cases in the calculus of the threshold. The municipalities controlled by local parties are always considered unaligned.

In addition to *Horizontal alignment*, we will also use a measure of *Vertical alignment* with the regional government, computed as a dummy equal to one if the mayor and the regional president belong to the same party. We account for *Vertical alignment* because one might argue that the effect of *Horizontal alignment* is actually due to this treatment being confounded with *Vertical alignment*. This is plausible, since the more municipalities becomes 'horizontally aligned' in a region the more probable this party is also controlling the regional government. Additionally, one may think that *Vertical alignment* moderates the effect of *Horizontal alignment* because regional incumbents may have more means to discipline co-partisan mayors than the opposition. We focus on alignment with the regional government because (as we explained in section two) this level of government also has relevant responsibilities on coastal development.

Forcing variable. The forcing variable is the *Vote margin*, computed as the votes needed for the ideological bloc of the 'dominant party' (the one ruling in a majority of municipal-lities) to win or lose the a majority of seats in the municipality, expressed as the percentage of total votes cast at the local election. To define the ideological blocs, we classify all parties standing at local elections in three groups: *left*, *right* and *local parties* (see the Online Appendix in Curto et al., 2018). Some local parties are hard to classify, and we consider this issue in the robustness checks.

We use the exact algebraic formulation of the forcing variable developed in Curto et al. (2018), which is based on the working of the d'Hondt method used to translate votes into seats in Spanish local elections. We compute the forcing variable under different vote migration scenarios. In our preferred measure (used in the main results), we assume that the votes taken away from the party holding the marginal seat are transferred only to abstention and not to the parties in the other ideological bloc[7]. We also assume that negative vote shocks simultaneously affect all the parties within the 'dominant' party's ideological bloc, so we subtract votes not just from the party holding the marginal seat but from all the parties in the bloc in proportion to the initial votes received by each party. Intuitively, the method works as if we were subtracting a small number of votes from one of the blocs, distributing these votes between the parties of that bloc according to their initial vote share, while keeping the votes of the other bloc constant. We stop subtracting votes when we observe a shift in the seat majority from one bloc to the other (i.e., when the last seat giving the majority to one bloc moves to the other bloc). The number of votes needed to reach this stage, divided by the total number of votes, is our forcing variable. As a robustness check, we compute the forcing variable using an alternative vote migration scenario. We consider that a vote might go (come) not just from (to) abstention but also from (to) the other ideological bloc.

Covariates. We have assembled a number of covariates (see Table A.2 in the Appendix). These variables are used in the validity checks and also as interaction variables. Some of the variables are time invariant and others vary over time. Among the time-invariant covariates, we have the *Coast length*, the *Beach length*, the index of terrain *Ruggedness* and the *Area* of the municipality (all measured using the GHSL database), the number of

[7] We believe this assumption to be plausible in Spain given the importance of vote transfers from/to abstention during all these years.

Rainy days and the *Av. Temperature* (data from Agencia Estatal de Metereología, https://www.aemet.es), a dummy for the ocean or sea (Atlantic/Cantabric v. Mediterranean) and a dummy for the Islands (Balearic and Canary Islands). The time varying information comes from the Census of 1981, 1991, 2001 and 2011 and refers to *Population* and employment by education level and sector. This data is interpolated for the years between census. We obtain the unemployment data from the 'Anuario Económico, La Caixa' ('Anuario del Mercado Español, Banesto' for the 1980's). This data is available biannually, so no interpolation is needed. The political variables are computed with the local elections data provided by the Spanish Home Office ('Ministerio del Interior').

5. Results

5.1 Exploring the discontinuity

Figure 1 plots the *Horizontal alignment* status against the *Vote margin*. When the vote margin is positive (negative) it means that the 'dominant party' (i.e., the one ruling in a majority of municipalities in the neighborhood) has (has not) a majority of seats in the local council. We see that there is a large jump in the probability of being 'horizontally aligned' at the threshold. The *Vote margin* measures the distance from the threshold in terms of the percentage of votes necessary to lose (gain) the seats that guarantee a majority in the council. The value of the discontinuity in the first stage (i.e., the discontinuity in the probability of *Horizontal alignment*) is around 60 percent. The results do not depend at all on the bandwidth or on the method of estimation (local versus global polynomial) and hold separately for all the elections studied and for all the regions.

[Insert Figure 1]

To test for manipulation, we examine the histogram and, more formally, we test for the continuity of this variable at the cut-off. Figure 2 shows no evidence of manipulation.

[Insert Figure 2]

Another validity check involves testing for the presence of a discontinuity in predetermined covariates. In Table 1 we look at a large group of variables and none of them seems to be discontinuous. At the bottom of this table we look at the discontinuity in other potential confounding treatments as the ideology of the local and regional governments (dummies *Left-wing mayor* and *Left-wing region*) and *Vertical alignment* (dummy one if the mayor and regional president belong to the same party).

[Insert Table 1]

Ideology does not seem to be discontinuous (see also Figure A.4 in the Appendix) but *Vertical alignment* is (see Figure 3 below), although the jump is much smaller than the one for Horizontal alignment (around 0.2 v. 0.6). Note, moreover, that this variable is not pre-determined, since it is affected by the same election outcomes that influence *Horizontal alignment*. This means that this discontinuity cannot be interpreted as evidence of manipulation. The origin of this discontinuity is mechanical: increases in the proportion of horizontally alignment municipalities in one region usually happen when many municipalities switch to a party that it is gaining popularity in the whole region, and this is also correlated with the probability that this party ends up controlling the regional government. The inclusion of *Coastal area* x *Term* fixed effects attenuates but does not totally fix the problem. The main issue with that discontinuity is that the *Horizontal alignment* treatment might be confounded by the *Vertical alignment* one. That is, even if we identify properly the treatment effect, we would have doubts regarding whether the effect is genuinely due to spontaneous cooperation between neighboring governments[8].

[Insert Figure 3]

We deal with this issue in two different ways. First, we follow Frölich and Huber (2017) and use regression weights that correct the imbalance in the proportion of vertically aligned and unaligned mayors at each side of the threshold. Second, we also look at conditional effects, that is we will estimate the effect of *Horizontal alignment* separately for the municipalities that are and are not vertically aligned. The first method may be preferable because one may not be able to interpret the heterogeneous effect. This need not be true in our case, because the theoretical discussion in section three already suggested the possibility that the effect of *Horizontal alignment* was stronger when the regional level of government was already controlled by the same party. Of course, the results of the conditional analysis will have to be interpreted with caution because, even if both treatment effects are well identified, the difference between the two estimates might be due to the theory we have in mind or to any other reason.

[8] This is a similar problem that the one encountered by Albouy (2013) who warns that traditional close-election RDD of legislators in the U.S. can conflate two treatments: being Democrat v. Republican and also being aligned with the president. The reason of this is that in the samples used there is a different number of elections under a Democrat and under a Republican president.

5.2 Horizontal alignment and coastal development

The discontinuity in coastal development around the cut-off is illustrated in Figure 4, which show the plot between coastal development and the forcing variable. The graph provides evidence of a clear and sizeable discontinuity around the threshold: municipalities marginally to the right of the cut-off (those likely to be 'horizontally aligned') develop much less land than those marginally to the left (those likely to be unaligned).

[Insert Figure 4]

Panel A of Table 2 presents the RDD estimates, which correspond to the second stage of a 2SLS regression, where the dependent variable is the amount of coastal development. The optimal bandwidth h^* is 25 percent, which is similar to other close-election studies (Meyersson, 2014). The 2SLS coefficient associated with the estimation of the local linear polynomial with the optimal bandwidth is around -0.83. This quantity has to be compared with the level of development just at the left of the cut-off, which is 1.32. An 'horizontally aligned' municipality would develop, on average, approximately 63% less land than a similar unaligned one. The coefficient we get for $h^*/2$ is a little smaller but also quite sizeable (the relative effect would be around 50%) and statistically significant. Note that using the Frölich and Huber (2017) weighs to account for the imbalance of *Vertical alignment* at the threshold does not affect at all our results.

The results using a third order global polynomial are also similar to those of the local polynomial. Figure A.5 in the Appendix present some robustness results for both cases. In Panel A, we show that the local linear polynomial estimates are quite stable provided we do not use a too large bandwidth. The global polynomial gives reasonable estimates provided we use a high order polynomial (order three and above). The last two columns of Table 1 report the OLS results, with and without covariates. The coefficient is smaller than the RDD one and it is less precisely estimated.

[Insert Table 2]

Panel B in Figure A.5 shows that the RDD results are also robust to changes in: the order of neighbors (from up to first order to up to fifth order), the majority threshold used to define what a 'dominant party' is (for the third order neighbors, having a least 3 to 7 aligned neighbors), the way of computing the forcing variable (assuming that votes migrate from/to abstention or also across ideological blocs) and the way we deal with local parties. None of these methodological choices do affect our results.

5.3 Heterogeneous effects

Vertical alignment. In Figure 5 we present RDD estimates of the effect of *Horizontal alignment* conditional on the *Vertical alignment* status and also on other political traits of the different layers of government. The first two lines show the estimated effect for vertically aligned (V=1) and unaligned (V=0) municipalities. The effect seems larger for vertically aligned municipalities, but the difference between the two groups is rather small and not statistically significant. We must conclude that *Horizontal alignment* matters for coastal development irrespective of the *Vertical alignment* status. This suggests that parties are not better able to enforce local cooperation when they are in control of a higher layer of government. Of course, this result has to be interpreted with care, since municipalities that are vertically aligned might be differ in other respects from municipalities that are not.

[Insert Figure 5]

The figure also compares the effect of *Horizontal alignment* in left-wing (l=1) v. right-wing municipalities (r=1) and in left-wing (L=1) v. right-wing (R=1) regional governments. In the case of municipalities, there are again no differences among the two groups. It seems that the propensity to cooperate does not depend on the ideology of the party of the mayor. In the case of regions, it seems that the effect of *Horizontal alignment* on cooperation is higher when the regional government is controlled by the right than when it is controlled by the left (the coefficient is around -1 in the first case and around -0.5 in the second). A possible interpretation of this result is that left-wing regional governments are stricter in the control of coastal development making 'horizontal cooperation' less necessary. In any case, however, this conclusion cannot be pushed too much, since the two coefficients are not statistically different from each other. Finally, the figure also reports estimates of the effects of 'horizontal cooperation' for the period before and after the approval of a major central law regulating development close to the coast (the so-called 'Ley de Costas', approved in 1988). The idea here is again that this law (if enforced) could make 'horizontal cooperation' redundant: we would observe horizontally aligned and unaligned municipalities to do the same because central regulation would be already dictating what can and what cannot be done. This seems not to be the case on average, since the coefficient estimated before and after the law is virtually identical[9].

Distance to the coast. Figure 6 plots the effect of *Horizontal alignment* for different fringes of distance to shore. Panel (a) presents the results for the following overlapping fringes: less than 100, 200, 300m, 400, and 500 meters, and less than 1, 5 and 10 Km. Panel (b) presents the results for the following non-overlapping fringes: 0-100m, 100-200m, 200-300m, 300-400m, 400-500m, 500m-1Km, 1-5Km, and 5-10Km. Remember from the theory section that we are expecting the effect of spillovers to increase in the environmental value of land. This can be assumed to be higher the close we are to the coast. Note, however, that in the case of the first fringes, central and regional regulations tend to be more restrictive, which suggest that (if these regulations are effective) horizontal co-operation should be less necessary at these distances. Panel (a) of Figure 6 shows that the effect of *Horizontal alignment* decays with distance to coast. The reduction of the effect happens when we move from the first to the second fringe (<100m to 100-200m) and when we move to distances higher than 500m. Panel (b) shows that the effect is especially remarkable in the second fringe (100 to 200 m). The RD coefficient for that fringe is -2.15, meaning that an 'horizontally aligned' municipality would develop, on average, approximately 88% less land than a similar unaligned one. To put things in perspective, remember that the average effect for the 1Km fringe was 63%. The RD coefficient for the other fringes is of a similar size, slightly below one, and some of them are statistically significant at conventional levels. However, for very large distances (5 to 10Km) the estimated coefficient is a very precise zero.

[Insert Figure 6]

Undeveloped land and Unemployment. In the theory section, we suggested that the effect of horizontal cooperation on coastal development should be more (less) positive or more (less) negative the lower the amount of share of undeveloped land to start with, and the higher the unemployment rate. Table 3 presents the estimation of a heterogeneous RDD (Egger et al., 2014). We interact the *Horizontal alignment* treatment (H) with the variable of interest *(%Undeveloped land* or *%Unemployed*) or with both variables at the same time, and also interacted with the local polynomial. Moreover, in order to make

[9] The opinion of environmental groups with regards the effectiveness of this law is rather negative (see Greenpeace, 2010 and 2018).

sure that the results are due to the effect of these variables, and not to other factors that can also moderate the effect of H on coastal development, we include a full set of interact-tions with other variables. We include interactions with: *Beach length* (which affects tourist demand), *Ruggedness* (which affects the accessibility to shore), # *Rainy days* (which affect the possibility of enjoying the beach), an *Urban Area* dummy (since in urban areas the development might be driven by factors other than proximity to the beach), and *%Educated* and *%Electoral turnout*, which might be correlated with the demand for preserving the coast. Finally, in a final specification, we also include interactions between H and a set of *Region* and *Term* fixed effects. This means that the effect of the interaction term is identified from within-region and within-term variation.

[Insert Table 3]

The results in Table 3 suggest that both *%Undeveloped land* and *%Unemployment* moderate the effect of *Horizontal alignment* on development. The coefficient in the first row indicates the effect of H measured at the average value of the interaction variable/s (all the interacting variables have been demeaned). Rows two and three display the interaction coefficients for the two variables we focus on. Both interaction coefficients are positive and statistically significant. The coefficients are quite stable across specifications and do not change when we include additional interactions.

[Insert Figure 7]

In order to be able to interpret the magnitude of the interacted coefficients we look at the marginal effects, which are presented in Figure 7. In Panel A.1, we show the marginal effect for %*Undeveloped land*: the marginal effect of H ranges from -1.5 (-1 s.d. of the interacted variable) to zero (+1 s.d.). Remember that the average treatment effect was around -0.83. This result suggests that *Horizontal alignment* does not deter coastal development at all in places that already have plenty of undeveloped land to start with, and that the effect becomes really strong as land close to the coast becomes scarcer. In Panel B.1, we show the marginal effect for %*Unemployment*. The graph looks similar to the previous one: in places with a high level of unemployment, *Horizontal alignment* does not limit development that much; conversely, in places with very low unemployment, aligned local governments end up developing much less land than the unaligned ones. The coefficient ranges from -1.5 (-1 s.d.) to -0.5 (+1 s.d). Note, however, that *Horizontal alignment* never creates a tendency to develop more, even in places with a very high level of development. In Panels A.2 and B.2, we show the effects evaluated at the median of each tercile, with the purpose of discarding that the marginal effect is driven by some outliers and/or is non-linear (Hainmueller et al., 2018). The effect grows from the lower to the middle tercile and from the middle to the upper one, so does seem quite linear.

We admit that these results have to be interpreted with care. The average treatment effect identified through the RD design can be interpreted as causal. However, it is less clear that the heterogeneous effects obtained by splitting samples or through the interacted RDD can be interpreted in the same way. In any case, notice that the different pieces of evidence point in the same direction: *Horizontal alignment* tends to limit development more in some stances than in others; horizontal cooperation kicks in when unemployment is low, coastal land scarce, and when development threatens land closer to the coast. The evidence regarding the effects of central and regional regulations is weaker, which also enhances the value of spontaneous cooperation among governments.

6. Conclusions

In this paper, we studied the effect of inter-governmental cooperation on coastal development. We have found that municipalities with a mayor belonging to the same party that rules in most of close-by municipalities develop much less land close to shore than other municipalities. The reason for that is that co-partisans tend to cooperate more, maybe because they share the same electoral fate, because the party can force them to cooperate, or maybe because they know that they are going to meet each other many times in the future. The fact that cooperation among local governments lead to less development suggests that lack of cooperation might generate over-development.

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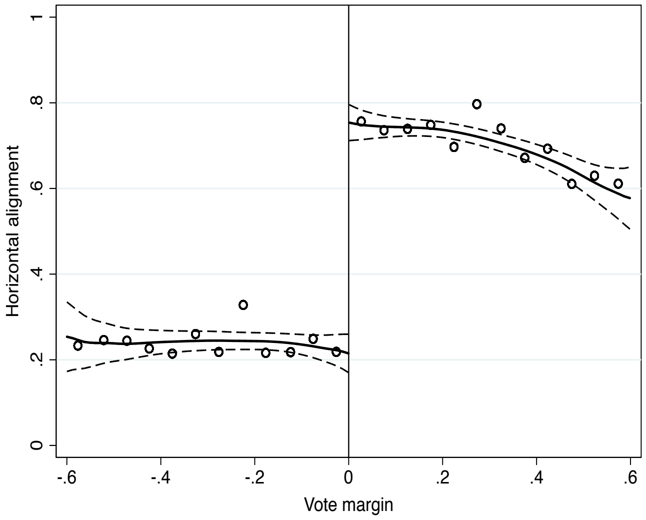
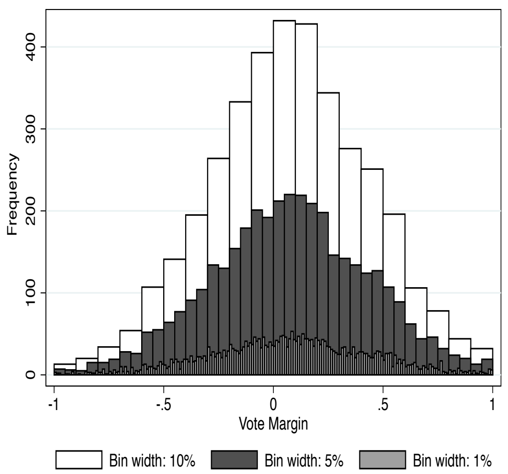
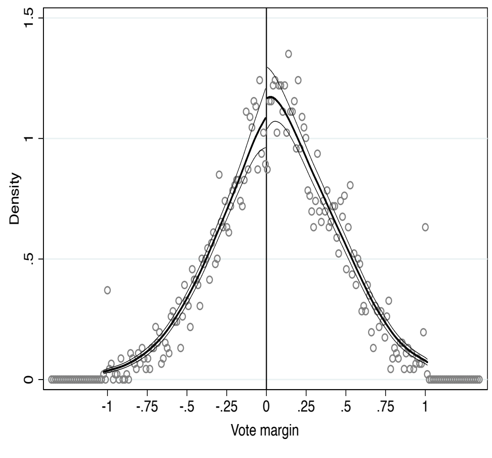
Tables and Figures

Figure 1: *First stage*



Notes: (i) Elections: 1979, 1983, 1987, 1991, 1995, 1999, 2003, 2007 and 2011. (ii) Horizontal alignment = dummy equal to one if the mayor belongs to the party that controls a majority of municipalities in the neighboring area (in this case, neighboring area = up to third order neighbors, majority = three or more municipalities). (iii) Vote margin = distance in percentage of local election votes to a change in the ideological bloc's seat majority. (iv) The dots are bin averages of 5 percent size. The solid line represents the predicted values of a local linear polynomial smoothing on each side of the threshold. The dashed lines are 95 percent confidence intervals.

Figure 2: *Continuity of the forcing variable*

A. Histogram	B. McCrary
	

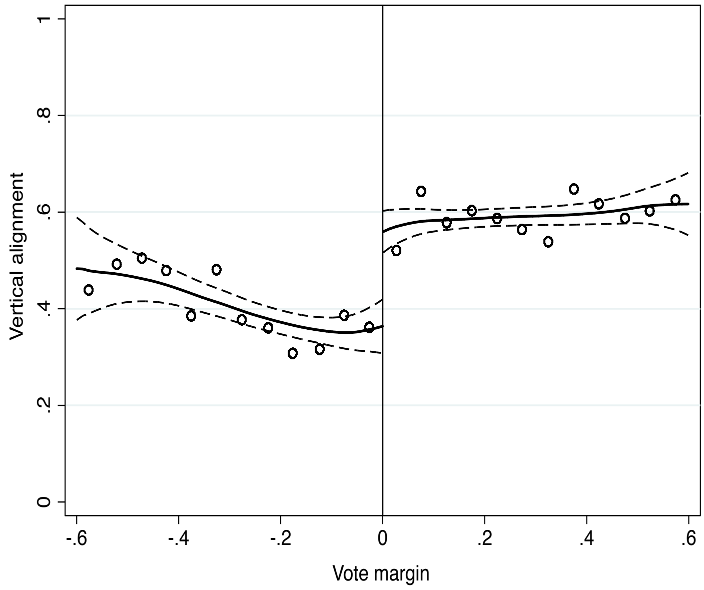
Notes: Dots for the McCrary graph: bin averages of the density of the forcing variables (Vote margin). Computed with McCrary's (2008) Stata program.

Table 1: *Covariate balance*

	Coef.	P-value	Bandwidth	# Obs.
Panel A. Pre-treatment covariates				
% Undeveloped land	-0.546	(0.712)	0.247	3.785
Coast length	0.028	(0.453)	0.281	3.785
Beach length	-0.086	(0.770)	0.199	3,785
Ruggedness	-1.774	(0.790)	0.162	3,785
# Rainy days	-0.009	(0.876)	0.315	3,633
Av. Temperature	-0.052	(0.421)	0.300	3,633
Mediterranean	-0.054	(0.210)	0.258	3.785
Islands	-0.042	(0.356)	0.262	3.785
log(Population)	0.024	(0.820)	0.263	3.785
log(Density)	-0.009	(0.943)	0.232	3.785
log(Area)	0.043	(0.679)	0.239	3.785
% Unemployed	-0.188	(0.652)	0.244	3.785
% No education	-0.006	(0.711)	0.243	2,358
% Primary education	0.002	(0.816)	0.249	2,358
% Secondary education	0.003	(0.921)	0.246	2,358
% Higher education	0.001	(0.415)	0.247	2,358
% Agriculture	0.003	(0.777)	0.234	3.785
% Industry	0.002	(0.840)	0.246	3.785
% Construction	-0.003	(0.266)	0.260	3.785
% Services	-0.001	(0.972)	0.315	3.785
Effective # of parties	0.017	(0.784)	0.263	3.785
% Electoral turnout	-0.002	(0.765)	0.245	3.785
Panel B. Potentially confounded treatments				
Left-wing mayor	0.011	(0.900)	0.183	3.785
Left-wing region	0.048	(0.367)	0.214	3.785
Vertical alignment	*0.172*	*(0.005)*	*0.309*	*3.785*

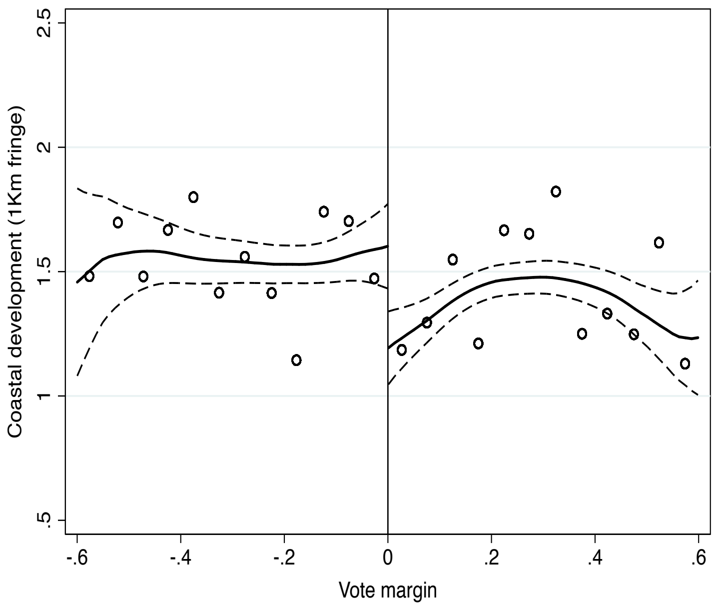
Notes: (i) Discontinuity of each covariate at the threshold, estimated with a local linear polynomial using the optimal bandwidth, calculated as per Calonico et al. (2014) (indicated for each variable in column three).

Figure 3:
Potential confounded treatments: Vertical alignment



Notes: (i) Vertical alignment = dummy equal to one if the mayor belongs to the party than the regional president. (ii) See Figure 1.

Figure 4: *Reduced form*



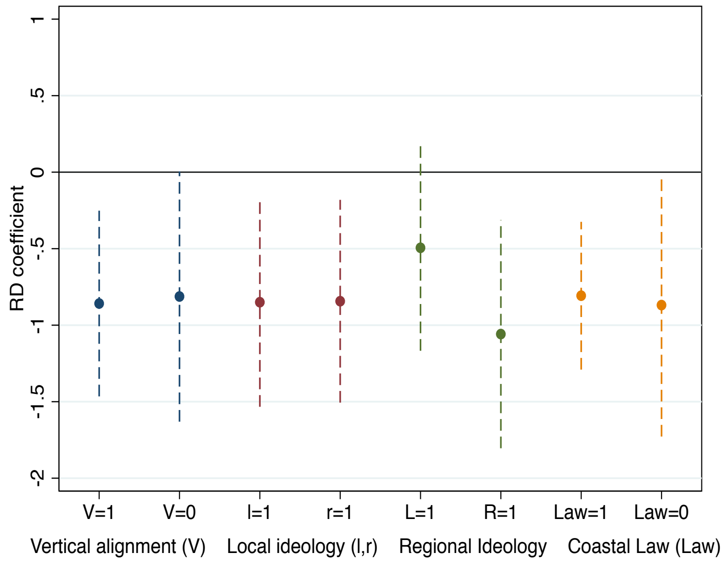
Notes: (i) Coastal development = land developed during a term-of-office relative to undeveloped land at the start of the term. (ii) The size of the discontinuity corresponds to the Reduced form coefficient which is equivalent to the ratio between the 2SLS and First-stage coefficients (expressions (12a) and (12b)). (iii) See Figure 1.

Table 2:
Effect of Horizontal Alignment (h) on Coastal development (*d*). *Period*: 1979-2015.

	RDD						OLS	
	Local				Global			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
A. *Second stage* (*Dep. variable: Coastal development, d*)								
Horizontal Alignment (*H*)	-0.825*** (0.322)	-0.834*** (0.335)	-0.668*** (0.327)	-0.679* (0.349)	-1.070*** (0.377)	-1.193*** (0.407)	-0.157* (0.089)	-0.147* (0.078)
B. *First stage* (*Dep. variable: Horizontal alignment, h*)								
Seat majority (*M*)	0.562*** (0.035)	0.521*** (0.039)	0.562*** (0.058)	0.521*** (0.064)	0.542*** (0.050)	0.508*** (0.052)	--.--	--.--
F-stat.	261.47 [0.000]	179.81 [0.000]	93.14 [0.000]	62.14 [0.000]	136.42 [0.000]	96.36 [0.000]	--.--	--.--
Polynomial order	1	1	1	1	4	4	0	0
Bandwidth (%)	*h**=25	*h**=25	*h**/2=12.5	*h**/2=12.5	100	100	100	100
Vertical alignment	NO	YES	NO	YES	NO	YES	NO	YES
Other controls	NO	NO	NO	NO	NO	NO	NO	YES
Observations	1.987	1.987	1.068	1.068	3.785	3.785	3.785	3.785

Notes: (i) Elections: 1979, 1983, 1987, 1991, 1995, 1999, 2003, 2007 and 2011. (ii) RDD='Regression Discontinuity Design'. Columns 1-6 in Panel A show the second-stage estimated of the 2SLS where Seat Majority (equal to 1 if the ideological bloc of the 'dominant party' in the neighborhood has a majority of seats in the local council) is used as an instrument for Horizontal alignment (equal to one if the mayor belongs to the 'dominant party'). (iii) Columns 1-4 show the results when using a local linear polynomial with the optimal bandwidth (based on Calonico et al. (2014)) and half the optimal bandwidth (columns 1-2 and 3-4, respectively). Columns 5-6 show the results when using a global polynomial of order 4 (the optimal order according to the AIC criterion). Columns 7-8 report the OLS results, with and without controls. (iv) Coastal area dummies x Term included in all columns. Vertical alignment: in the RDD we use the weighting scheme proposed by Frölich and Hunter (2018), and in OLS we control for the Vertical alignment dummy. (v) *, ** & ***: statistically significant at the 10, 5 & 1% levels; s.e. clustered at the Coastal area level (# clusters = 29).

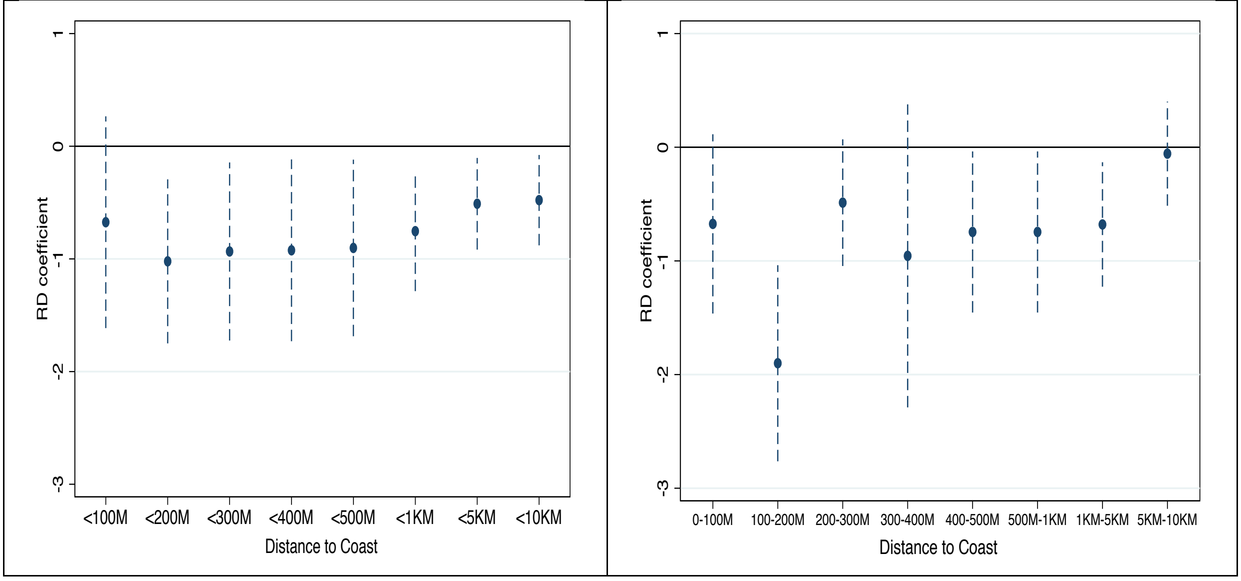
Figure 5: *Heterogeneous effects: Vertical alignment, Ideology, and Central regulation*



Notes: (i) Elections: 1979, 1983, 1987, 1991, 1995, 1999, 2003, 2007 and 2011. (ii) RDD estimates using a local linear polynomial with an optimal bandwidth specific for each case. (iii) S.e. clustered at the Coastal area level, dashed lines indicate 95% c.i. (iv) Vertical alignment = mayor and regional president belong to the same party (V=1) or to a differ-rent party (V=0). Local ideology = mayor is left-wing (l=1) or right-wing (r=1). Regional ideology = regional president is left-wing (L= 1) or right-wing (R=1). Coastal Law = years after the approval of the 'Ley de Costas' (Law=1) or before (Law=0).

Figure 6: *Heterogeneous effects: Distance to Coast*

a) Overlapping fringes	b) Non-overlapping fringes



Notes: (i) Elections: 1979, 1983, 1987, 1991, 1995, 1999, 2003, 2007 and 2011. (ii) Distance to coast: panel a) Development at distances lower that those indicated, Panel (b): Development between the distances indicated. (iii) RDD estimates using a local linear polynomial with an optimal bandwidth specific for each case. (iv) S.e. clustered at the Coastal area level, dashed lines indicate 95%.

Table 3:

Heterogeneous effects: % Undeveloped land and %Unemployed

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Horizontal align. (*H*)	-0.851*** (0.288)	-0.773*** (0.293)	-0.923*** (0.292)	-1.019*** (0.374)	-0.886*** (0.277)	-0.961**** (0.371)	--.--
x % *Undeveloped*	0.038** (0.016)	--.--	0.043** (0.016)	0.038** (0.017)	0.039** (0.015)	0.045** (0.018)	0.052* (0.028)
x % *Unemployed*	--.--	0.091** (0.045)	0.066* (0.035)	0.075* (0.041)	0.069* (0.041)	0.061* (0.042)	0.082* (0.044)
x *Beach length*	--.--	--.--	--.--	0.838 (0.501)	0.748 (0.551)	0.731 (0.531)	--.--
x *Ruggedness*	--.--	--.--	--.--	-0.023 (0.354)	-0.033 (0.312)	-0.037 (0.364)	--.--
x *Urban area*	--.--	--.--	--.--	--.--	0.112 (0.145)	0.068 (0.131)	--.--
x # *Rainy days*	--.--	--.--	--.--	--.--	-0.076 (0.102)	-0.045 (0.044)	--.--
x % *Educated*	--.--	--.--	--.--	--.--	--.--	-0.063* (0.031)	--.--
x % *Electoral turnout*	--.--	--.--	--.--	--.--	--.--	-0.058* (0.031)	--.--
Interacted Region & Term f.e.	NO	NO	NO	NO	NO	NO	YES

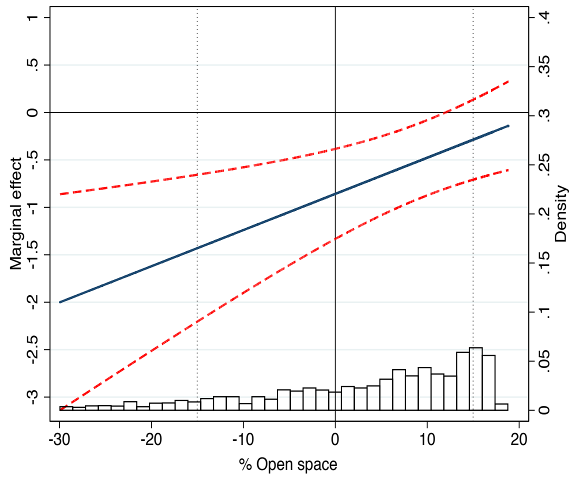
Notes: (i) Elections: 1979, 1983, 1987, 1991, 1995, 1999, 2003, 2007 and 2011. (iii) RDD estimates using a local linear polynomial with the same optimal bandwidth than in Table 2. (ii) All columns control for *Coastal area* x *Term* f.e. The last column controls for interactions between H and *Region* & *Term* fixed effects. (iii) All the interacted variables have been de-meaned. (v) *, ** & ***: statistically significant at the 10, 5 & 1% levels; s.e. clustered at the Coastal area level (#clusters = 29).

Figure 7:

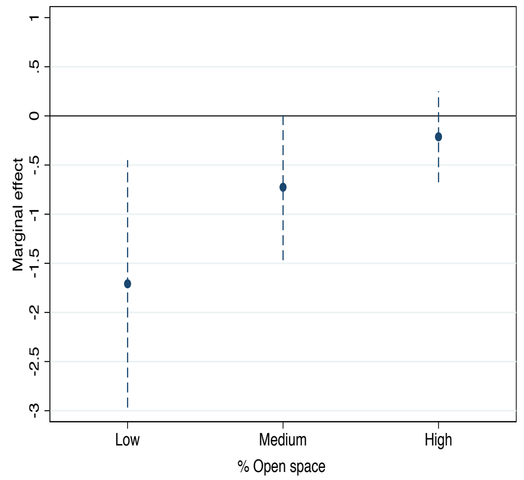
Heterogeneous effects: % Undeveloped land and %Unemployed

A. % Undeveloped land

A.1 Linear effect

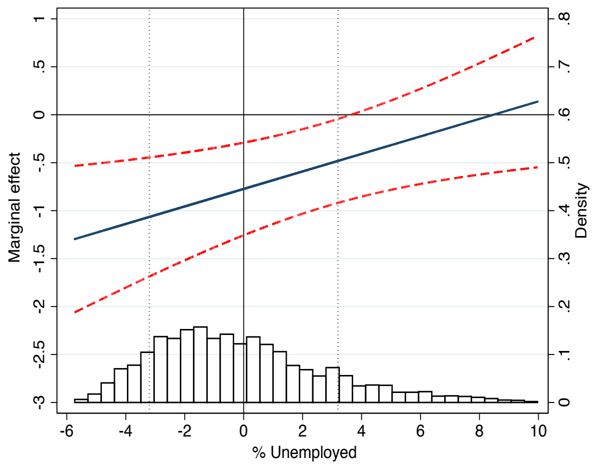


A.2 Non-linear effect (Terciles)

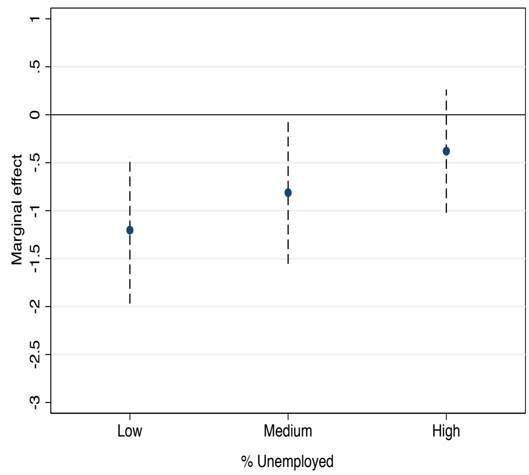


B. % Unemployment

B.1 Linear effect



B.2 Non-linear effect (Terciles)

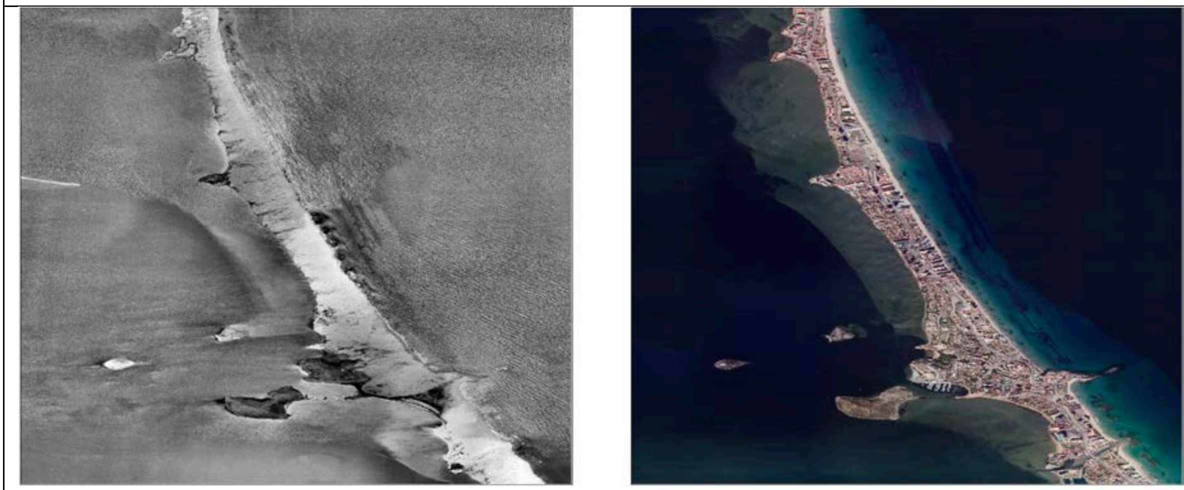


Notes: (i) Linear marginal effects (bold line) computed the results of column 3 in Table 3. Dashed lines are 95% c.i. (ii) Non-linear effects computed for the median of each Tercile following Hainmueller et al. (2018).

Appendix

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:

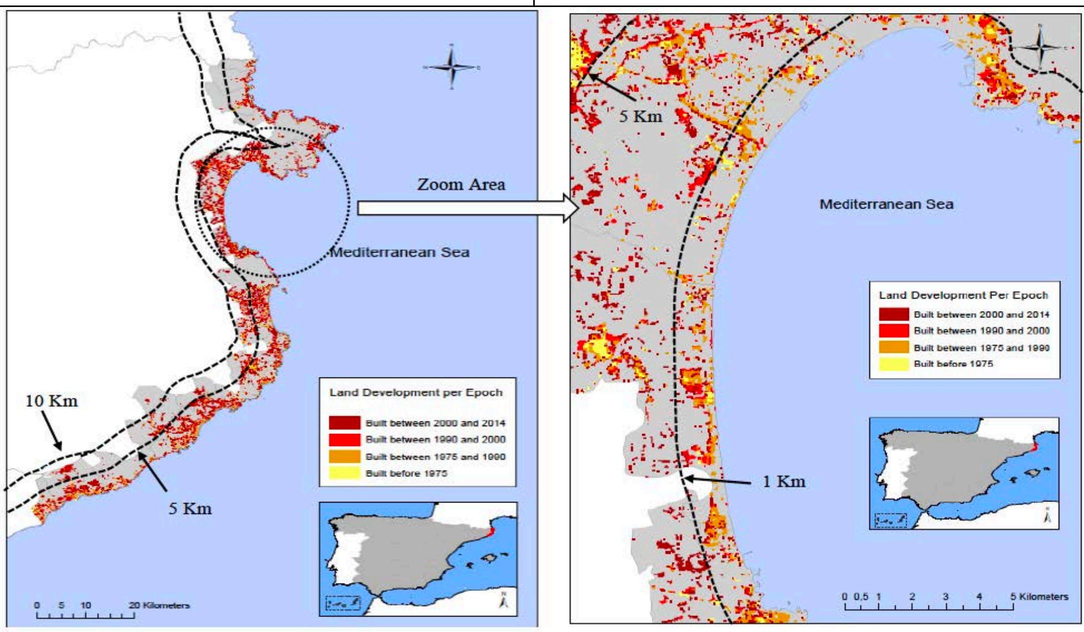
Intensity of Coastal development. Periods and distance to coast.

Notes: (1) $d_{i,t}$, measured as land developed in a given distance fringe during each term-of-office/land undeveloped in a given fringe at the start of each term; data shown for each of the nine terms starting the year indicated and for three fringes (between zero and 200 meters of the coast, between zero and 1 KM and between zero and 5 KM). (2) Sources: 'Global Human Settlement Layer', 'Corine Land Cover Project' and own elaboration.

Figure A.3:

The 'Global Human Settlement Layer' Database.

(a) 'Costa Brava'	(b) Zoom over 'Gulf of Roses'



Notes: (i) Map of 'Costa Brava' (Catalunya, Mediterranean sea) and zoom over 'Gulf of Roses (northern part of the coastal area). (ii) We show in different colors the amount of development in different periods (before 1975, from 1975 to 1990, from 1990 to 2000, and from 2000 to 2014). The dashed lines indicate the borders of different distance fringes from the coast (1 Km, 5Km and 10Km). (iii) Data from the *'Global Human Settlement Layer'* Database (https://ghsl.jrc.ec.europa.eu).

Table A.1: *List of Coastal Areas in Spain*

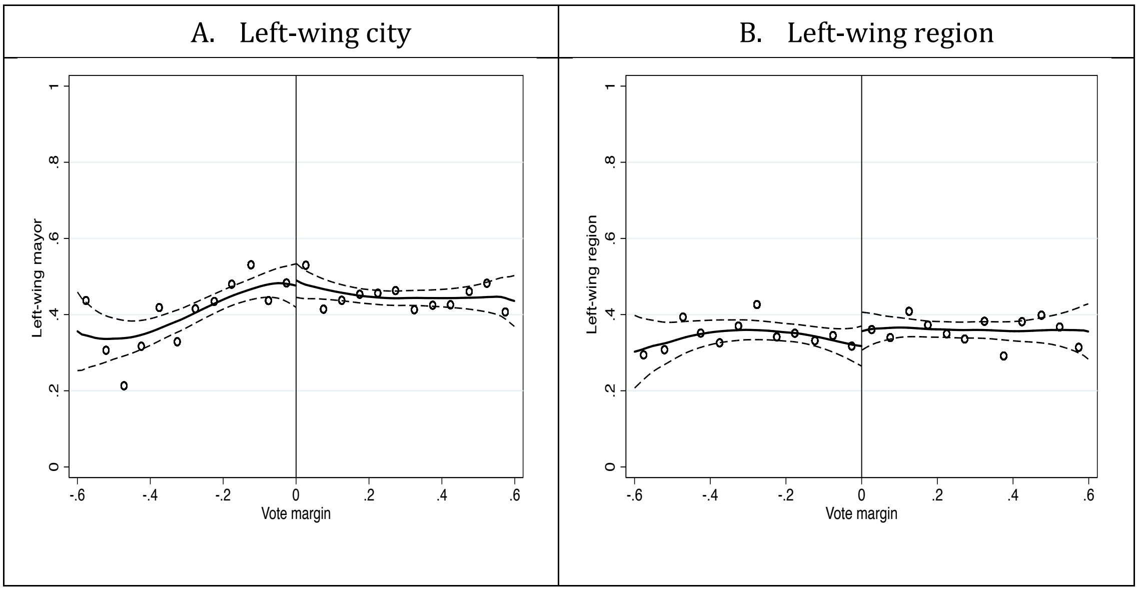
Region (*Comunidad Autónoma)*	Coastal area denomination	Ocean/Sea
Galicia	Rias Baixas	Atlantic
	Costa da Morte	Atlantic
	Golfo Ártabo	Atlantic
	Rias Altas	Atlantic / Cantabric
Asturias	Costa Verde	Cantabric
Cantabria	Costa Esmeralda	Cantabric
País Vasco	Costa Vasca	Cantabric
Catalunya	Costa Brava	Mediterranean
	Costa del Maresme	Mediterranean
	Costa del Garraf	Mediterranean
	Costa Daurada	Mediterranean
València	Costa del Azahar	Mediterranean
	Costa de València	Mediterranean
	Costa Blanca	Mediterranean
Balearic Islands	Mallorca	Mediterranean
	Menorca	Mediterranean
	Eivissa i Formentera	Mediterranean
Murcia	Costa Cálida	Mediterranean
Andalucía	Costa de Almería	Mediterranean
	Costa Tropical	Mediterranean
	Costa del Sol	Mediterranean
	Costa de la Luz	Atlantic
Canary Islands	Tenerife	Atlantic
	La Gomera	Atlantic
	Gran Canaria	Atlantic
	La Palma	Atlantic
	El Hierro	Atlantic
	Lanzarote	Atlantic
	Fuerteventura	Atlantic

Source: Wikipedia.

Table A.2: *Descriptive statistics*

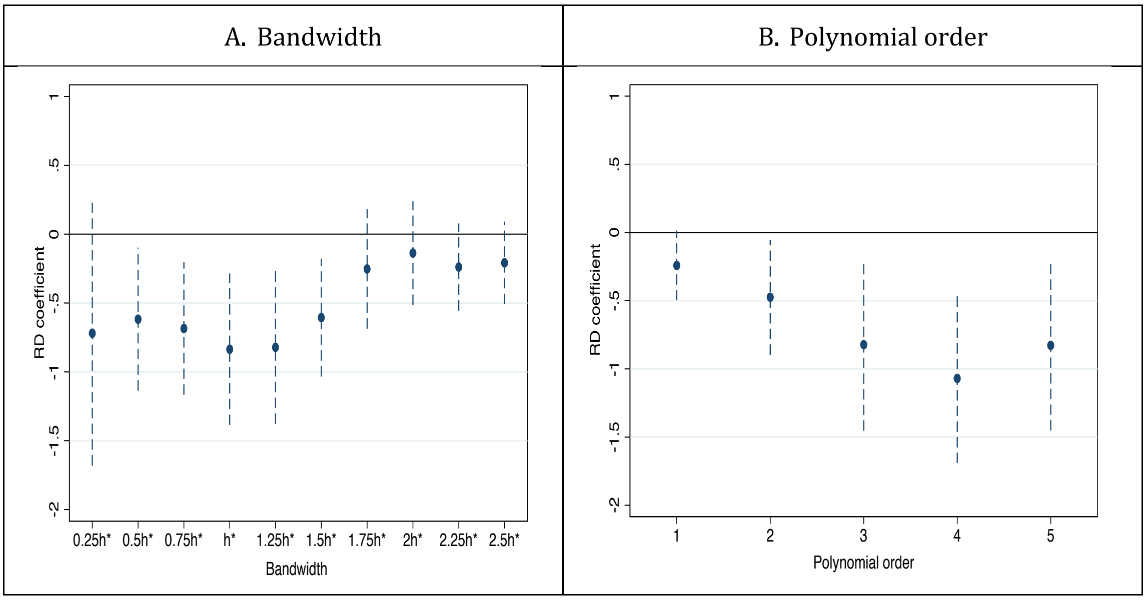
	Mean	s.d.	Min.	Max	# Obs.
Horizontal alignment (dummy)	0.497	0.500	0	1	3,785
Vertical alignment (dummy)	0.387	0.487	0	1	3,785
Left-wing mayor (dummy)	0.417	0.493	0	1	3,785
Left-wing region (dummy)	0.346	0.476	0	1	3,785
% Undeveloped land	83.08	17.62	4.21	99.77	3,785
Coast length (Km)	9.38	1.15	5.06	11.85	3,785
Beach length (km)	7.81	1.29	2.70	12.94	3,785
Ruggedness (% over 30% slope)	17.35	18.39	0	86.21	3,785
# Rainy days	8.69	3.91	2.63	16.94	3,633
Av. Temperature	16.84	2.22	11.43	21.77	3,633
Mediterranean (dummy)	0.72	0.45	0	1	3,785
Islands (dummy)(	0.25	0.43	0	1	3,785
log(Population)	9.17	1.35	4.25	14.45	3,785
log(Density)	5.41	1.44	1.24	9.86	3,785
log(Area)	3.76	1.16	-0.29	7.24	3,785
% Unemployed	15.84	7.39	2.61	42.19	3,785
% No education	51.60	17.30	18.7	87.3	2,358
% Primary education	20.70	6.91	4.72	48.10	2,358
% Secondary education	9.82	3.11	2.80	17.91	2,358
% Higher education	4.93	1.65	2.13	9.44	2,358
% Agriculture	12.11	10.13	15.40	60.32	3,785
% Industry	17.16	9.08	3.64	45.49	3,785
% Construction	10.90	2.97	4.37	21.45	3,785
% Services	59.72	11.71	19.82	86.33	3,785
Effective # of parties (1/sum vote shares squared)	2.665	0.811	1	6.422	3,785
% Electoral turnout	67.30	9.87	28.72	96.92	3,785

Figure A.4: *Potential confounded treatments: Ideology*



Notes: (i) Elections: 1979, 1983, 1987, 1991, 1995, 1999, 2003, 2007 and 2011. (ii) RDD estimates using a local linear polynomial with an optimal bandwidth specific for each case. (iv) S.e. clustered at the Coastal area level, dashed lines indicate 95%.

Figure A.5: *Robustness checks.*



Notes: (i) Elections: 1979, 1983, 1987, 1991, 1995, 1999, 2003, 2007 and 2011. (ii) In Panel A, RDD estimates using a local linear polynomial with bandwidth that are divisors or multiples of the optimal bandwidth. In Panel B, RDD estimates of a global polynomial of different orders. (iii) S.e. clustered at the Coastal area level, dashed lines indicate 95%.