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**The determinants of the regional allocation  
of infrastructure investment in Spain**

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## 1.- Introduction

The geographical pattern of central governments' infrastructure investment explains a considerable proportion of 'net fiscal flows' among Spanish regions. For example, consider the counterfactual of the central government reducing infrastructure investment to zero and using the savings to fund an across-the-board reduction in taxes<sup>1</sup>. Under these assumption, Bosch and Espasa (2008, this volume) obtain that infrastructure investment explains on average around 15% of 'net fiscal flows' of Spanish regions for the period 1991-2005. Moreover, when they relate infrastructure investment to 'normative fiscal flows' instead than to the real ones<sup>2</sup>, this percentages raises to around 30%.

This discussion suggests that the regional allocation of infrastructure investment is responsible for a sizeable proportion of what happens to 'fiscal flows'. Moreover, infrastructure-related 'fiscal deficits' are especially contested, at least for three reasons. First, these deficits, sustained though time, mean that the infrastructure capital stocks of rich regions are too small relative to the size of their private economy (Sala-i-Martin, 1996). The immediate results of this situation are increased levels of congestion, rising prices, and added difficulties in competing in globalized markets. It is not strange, therefore, that rich regions' business lobbies comply more about infrastructure deficits than about the 'fiscal deficit' in general.

Second, the central government has considerable discretion in the territorial allocation of infrastructure investment. For example, it is by far easier to reallocate road funds from one region to another than it is to carry out the same redistribution though public consumption or employment. Even in cases where infrastructure projects have been subject to a long planning process, yearly budget decisions determine the real amount of funds allocated to each project and thus the speed of its execution. This means that, although the regional allocation of infrastructure investment is partly based on 'objective' economic criteria (e.g., income, land area), pure short-term political

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<sup>1</sup> An other possible counterfactual could be to assume that infrastructure investment is allocated in proportion to regional GDP, which means in terms of the framework used in this paper and in Castells and Solé-Ollé (2005) that the government is fully oriented towards efficiency. The results obtained by Bosch and Espasa (2008) using this second method are very similar to the ones mentioned here.

<sup>2</sup> 'Normative fiscal flows' are the flows that one should observe for the different regions if revenues and spending were allocated according to some normative standard. For example, Bosch and Espasa (2008) assume that taxes are paid according to GDP and expenditures are allocated according to population.

interest also plays a prominent role. Tactical redistribution can either reduce or increase the compromise of rich regions with redistributive regional policies: it harms if rich regions perceive that other regions receive more funds even when they do not deserve them, but it could help if this is the only mean to make some side-payments and compensate for the effects of redistribution to specific regions (e.g., when there is a secession treat).

Third, it is not entirely clear what ‘objective’ criteria mean in this case, since infrastructure investment could be directed either to regions with high project impact, following an efficiency criterion, or to regions with low output levels (in order to foster convergence), thus following an equity criterion. The degree of redistribution observed in a given country depends in part on details of the constitutional contract –which, as in Spain or the EU might be the basis for the implementation of a regional cohesion policy– that is supposed to be endorsed by poor and rich regions alike. However, although constitutions constraint the options that government have regarding inter-regional redistribution, the evolution of the ideological preferences of parties and voters, and the territorial structure of power in a democracy could also determine the final equity-efficiency orientation of public policies, in general, and of infrastructure investment, in particular. In this context, rich regions might be in a disadvantaged situation when the territorial structure of electoral power and income do not overlap (e.g., the *votes/seats* ratio is higher for rich regions).

This discussion suggest that it is of great relevance to know more about the real motives of central government’s in allocation infrastructure investment across regions. The purpose of this chapter is thus to answer question like: to what extent is the regional allocation of infrastructure investment affected by tactical considerations?; which are the variables that best pick these short term political strategies?; to what extent is infrastructure investment biased against rich regions?; which are the political reasons of this bias?; does this bias have some constitutional basis or it is instead the result of electoral politics?.

With this purpose in mind, we have assembled a database for Spain covering the years 1964-2004, with electoral district (‘provincia’) data on central governments’ infrastructure provision and capital stock, and economic and political variables. The results of the analysis suggest that both ‘objective’ economic variables and political forces play a role in determining the amount of infrastructure investment allocated to a

district. Political considerations influence investment through two channels. First, there is evidence of particularistic or pork-barrel spending (what we call *tactical redistribution*), in the sense that districts which are economically equal (e.g., same per capita income) receive different amounts of money if the political profitability of the investment is not the same in both places. Political productivity is influenced by several factors: the incumbent's margin of victory/defeat in the last election, the percentage of votes needed to win an additional representative, the fact that some regional parties have been pivotal at the central level during some periods, and the partisan alignment between central and regional executives. Second, political factors also do influence the equity/ efficiency orientation of infrastructure investment, measured by the elasticity of investment to per capita income (this is what we call *programmatic redistribution*). This elasticity decreased with the arrival of the democracy, has been considerably lower for left governments and for right government before uncontested elections, and also during periods where regional parties were pivotal at the central level and shows a statistically significant relation with the correlation between per capita income and political productivity (i.e., the intensity of redistribution is mitigated as richer regions become more powerful).

There are only a few papers in the literature analysing the political motives behind the regional allocation of public investment. The papers by Knight (2002, 2004), Castells and Solé-Ollé (2005), Cadot *et al.* (2006), and Joanis (2007), perform this kind of analysis for US, Spain, France and Canada, respectively. Of course, there are many other papers analysing the political determinants of intergovernmental grants (see, e.g., Levitt and Snyder, 1995; Case, 2001; Dahlberg and Johansson, 2002; Johansson, 2003). No papers to my knowledge tried to explain why infrastructure investment (or even intergovernmental grants) is more or less redistributive (see Rodden, 2008, this volume, for an exception), although there are many papers that do measure the territorial redistributive effects of government programs (see, e.g., Bayoumi and Masson, 1994; Bosch *et al.*, 2003). In the Spanish case, some papers have previously analysed the rules implicit in the territorial distribution of public investment (Bosch and Espasa, 1999; De la Fuente, 2004). These papers do not account for political factors, which were previously discussed by Boix (1998), Vives and De la Fuente (1998), and Castells and Solé-Ollé (2005). This last paper focused of the period 1986-96, but since the left controlled the central government during all the years, they were not able to study the

effect of ideology on the *equity-efficiency trade-off*. By extending the period to 1964-2004 we are able to study the factors that have influenced the evolution of the taste for inter-territorial redistribution over that period.

The paper is organised as follows. In the next section we provide an interpretative framework for our analysis. In section three we describe our empirical strategy. In section four we present our data and explain how we have computed the different variables. In section five we present the results obtained. The last section concludes.

## **2.- Interpretative framework**

The regional allocation of infrastructure investment redistributes money from some regions (those that pay taxes) to the others (where the investment is made). So we can qualify this infrastructure investment as a *redistributive policy*. Following Dixit and Londregan (1996) we classify the politics of redistributive policies into two different forms. On the one hand, we have *tactical redistribution* (the so-called pork barrel politics in the US or particularistic spending elsewhere) in which the benefits (building the infrastructure) are paid to a few regions while the costs are shared by all the regions (Aldrich, 1995, p.30). The implicit allocation criterion here is simply: if I invest in your region, it is more probable that I will remain in power?. On the other hand, we have *programmatic redistribution*, in which the government withdraws resources from some regions and distributes them to others (i.e., the regions where the infrastructures are built), with electoral considerations in mind, but subject to some constraints in the selection of beneficiaries, usually to have a low income level. Programmatic benefits, therefore, have public good qualities: they redistribute from a given class of beneficiaries to another (from rich to poor regions), but within a class of beneficiaries, particular regions who qualify cannot be excluded. Below we discuss more in detail the empirical predictions obtained when analysing the allocation of infrastructure investment from each of these two points of view.

*Tactical redistribution.* The main theoretical models of tactical redistribution are those by Lindbeck and Weibull (1987) and Cox and McCubbins (1986). Both assume that the incumbent desires to stay in office, so he distributes the resources between a set of electoral districts with the aim of gaining elections. The main empirical prediction of the first paper is that monies will flow to *swing* districts, that is to districts with a high proportion of relatively unattached voters (i.e., voters that are prone to change its vote if

there is an economic gain in it), which are identified in practice as districts where the incumbent won or lose by a thin margin. The second paper suggests that politicians are risk averse and that they will prefer to send money to their strongholds or ‘core’ voter places, because this is a safer investment. There is some disagreement in the literature regarding which of the two hypotheses is more relevant (see, e.g., Rodden and Wilkinson, 2004) with a few papers finding evidence in favor of the *swing* voter one (Dalhberg and Johansson, 2003; Castells and Solé-Ollé, 2005; Cadot *et al.* 2006) and others finding strong evidence in favor of the ‘core’ voter one (see, e.g., Joanis, 2007). The problems in finding evidence of this behaviour might be related to the flawed methods used (see, e.g., Dalhberg and Johansson, 2003) but also to the fact that the two hypothesis could be valid at the same time: incumbents may channel more money to thin margin districts than to places in which they won less votes, but also could channel more funds to strongholds than to *swing* districts.

Other papers identify some additional factors that could also influence the allocation of funds to districts. First, depending on the electoral system, the incumbent will send more monies to district that are *swing* but also pivotal, that is, sufficiently big to change the outcome of the election. Stromberg (2004) shows that this incentive operate for example in the election of the US president under the electoral college. Second, legislative malapportionment is another relevant factor: the less votes are needed to win a seat the cheaper is that seat and the higher is the electoral productivity of funds send there (Atlas, 2000; Castells and Solé-Ollé, 2005). Third, partisan alignment between central and regional governments also make the funds delivered more productive, because it impedes that the opposition claims some of the credit. This argument has a lot more sense for intergovernmental grants (Solé-Ollé and Sorribas, 2007), since they are spent by the grantee, but in some instances can also be applied to direct spending by the central government. Finally, the formation of coalition governments in parliamentary systems opens the door for the influence of pivotal parties which are regionally based. There is some evidence that this happened in Spain during the 90’s (Castells and Solé-Ollé, 2005).

*Programmatic redistribution.* It is unfair to qualify all infrastructure investment as a result of tactical redistribution. When deciding the amount of infrastructure investment to carry out in a specific region, the government takes into account its political reality but also some ‘objective’ economic criteria. Moreover, the government

uses to be constrained to some extent by the ‘objective’ criteria set by the constitution and other laws. In any case, inside the margin set by these constraints, the government will be forced to justify in front of both party followers and the general electorate which are the concrete criteria used. So, both the preferences of the voters and the ideology of the party will influence the implementation of these ‘objective criteria’. The important idea to retain here is that we are in the realm of *programmatic redistribution*, so redistribution could not operate without some sort of criteria.

But, which are the possible criteria to use? On the one side, the government might consider to invest more where there are more users of the infrastructure (i.e., cars, trucks or miles driven), which basically means investing in rich regions, or where there is a lower stock of capital (i.e., if the region is ‘rich’ but already has the appropriate road stock, it might not deserve more road investment). This kind of policy is said to be ‘efficiency-oriented’. However, either a constitutional mandate or the ideology of the government might force the use of investment as an instrument of regional policy, the allocation going towards less developed regions. In this case, we will say that the investment policy is equity-oriented. According to Castells and Solé-Ollé (2005), an efficiency-based rule would allocate infrastructure investment in proportion to regional income (i.e., GDP), and a rule which gives some weight to equity will allocate investment less than proportionally to income (and could even give more monies to poor regions). So, the elasticity of investment to income will inform us about the efficiency-equity trade-off (or taste for inter-regional redistribution) of a given government.

This taste for redistribution will differ from country to country, depending on values and constitutional provisions (Wibbels, 2005). Democratic constitutions can be considered conceptually as a contract in which regions decide over future redistribution under uncertainty about future incomes (Person and Tabellini, 1997; Bodenstein & Ursprung, 2002). That contract will influence redistribution both through the inclusion of some principles and mandates, but also through the electoral rules that will provide poor people/regions with more influence than in an undemocratic setting. Constitutions can also be considered as a contract between different regions that bargain in order to distribute the costs and benefits of the union (Weber and Le Breton, 2002). In the case of Spain, the 1978 Constitution directly calls for policies to enforce territorial equity (see, e.g., De la Fuente, 2004). Moreover, EU funds can be considered also a result of the constitutional arrangements of the country, in the sense that they are imposed from

above and decided before the operation of yearly partisan politics. Some of these funds have a strong equity orientation (e.g., FEDER Objective 1 regions), with highly redistributive rules tightly constraining the internal allocation of funds between regions.

In any case, even after these constitutional constraint, there will be room for the upcoming governments to try to influence the degree of redistribution. This means that in *programmatic redistribution* models, the government does not directly choose the money send to each district, but is constrained to choose a taste-for-redistribution parameter (i.e., in the above discussion, the elasticity of investment to income). There are several ways to address this problem. First, the *median voter* theory of redistribution (Meltzer and Richards, 1983) says that the amount of redistribution will be the one preferred by the median voter (here the median region) and thus will increase in the distance between median regional income and average regional income. Second, *partisan* theories of redistribution (see, e.g., Alesina and Rosenthal, 1999) will suggest that if left and right parties have different views regarding inter-territorial redistribution –and they cannot credibly commit to provide regional policies that the voters know are different to its preferred ones– they will probably implement different policies once in office. Fourth, the partisan view can be combined with the median voter model, by assuming that parties compete for office proposing a platform that appeals to the median voter, but value not only winning office but also being able to implement its ideological platform (that differs from left to right). In this situation, redistribution will be influenced by the degree of electoral competitiveness of each election (see, e.g., Solé-Ollé, 2006). If the election is uncontested –in the sense that the incumbent knows for sure that he will be re-elected– the party in office will implement its preferred level of inter-territorial redistribution, but if the election is contested, the level of redistribution will approach that of the median voter. This means that in contested elections, left parties will redistribute less (than they would do in uncontested elections) and right parties will redistribute more.

Fifth, in the *probabilistic voting* model of redistribution (Person and Tabellini, 2003, ch. 6) no single voter-region has the full power to determine the outcome (as in the median voter case) but the resulting taste for redistribution is a weighted sum of the tastes of the different income groups, the weights being the electoral power of each group. As in the tactical models introduced above, the regions with more electoral power are the *swing* regions. So these models say that redistribution will be higher if



low income regions are *swing* regions. Empirically, the theory can be tested by focusing on the effect of the correlation between regional income (GDP per capita) and the incumbent's margin of victory. Other variables related with regional political power (e.g., seat price, alignment or pivotal regions) can also be included in the power index, that can be then used to compute that correlation.

### 3. Empirical design

*First step: tactical redistribution.* We begin by using Spanish electoral district data for the entire democratic period (1978-2004) to identify the political variables that do influence the effort in infrastructure investment (computed as the % of investment over the capital stock available at the end of the previous year), controlling for a set of economic covariates. The equation will look like:

$$i_{J,T} = \alpha_P z_{J,P} - \rho_P (k_{J,T} - \phi_P y_{J,T}) + \beta_P x_{J,T} + u_{J,T} \quad (1)$$

Where  $z$  = vector of political variables,  $k$ =capital stock per capita available at the end of the previous year,  $y$  = income per capita,  $x$  = vector of other economic controls, and  $u$ = error term. The subscript  $J$  indicates electoral district,  $T$  indicates year, and  $P$  each one of the periods analyzed, which for the democratic era will coincide with the various terms of office. Note that the coefficients  $\alpha_P$ ,  $\rho_P$ ,  $\phi_P$ , and  $\beta_P$  are assumed to be period-specific; the expectation that these coefficients (or at least some of them) are not stable over time is in fact the reason why choose to estimate the model by sub-periods. Note also that the political variables are not indexed by  $T$ , but only by  $P$ , meaning that most of them do not show variation during a term-of-office. This is in fact the reason we do not include fixed electoral district effects in the equation. Obviously, this might entail some loss of consistency of our estimators. We deal with this problem by including in the vector  $x$  some district traits that are fixed in time (e.g., land area, coast) and that, therefore, could not be included in a fixed effects regression. In any case, there is no solution to this problem since the estimation of a fixed effects regression by sub-period will make very difficult to identify the time-varying coefficients in which we are interested.

However, we do account for the possibility that infrastructure investment in the different districts is affected by common yearly shocks. With this purpose, the year mean has been subtracted from each of the variables. Since most of the explanatory

variables are expressed in logs (i.e., those that are neither a dummy nor a percentage), the expression for the main variables in (1) is:

$$i_{JT} = \left( \frac{I_{JT}}{K_{JT}} - \frac{I_{JT}}{K_T} \right) \quad k_{JT} = \log \left( \frac{K_{JT} / N_{JT}}{K_T / N_T} \right) \quad y_{JT} = \log \left( \frac{Y_{JT} / N_{JT}}{Y_T / N_T} \right)$$

Where  $I$  = investment,  $K$  = capital stock,  $N$  = population,  $Y$  = GDP. In any case, we will include random effects in the error term, and equation (3) will be estimated by GLS allowing for an AR(1) disturbance.

The results of the estimation of equation (1) will allow us to assess, for the different periods evaluated, the explanatory capacity of the political factors associated with *tactical redistribution* theories (included in the  $z$  vector). Note that the coefficient of these variables will tell us if two electoral districts that are equal on economic terms (same income per capita,  $y$ , and same economic traits,  $x$ ) does receive the same monies and, if this is not the case, the causes that make some districts receive more money than others even when objective criteria does not suggest that this should be the case.

*Second step: programmatic redistribution.* The results obtained in the estimation of equation (1) will also allow us to assess the *equity-efficiency trade-off* implicit in the interregional allocation of infrastructure investment, and embedded in the  $\phi$  parameter (see Castells and Solé-Ollé, 2005). The value of this parameter in the different periods will allow us to guess which political factors associated with *programmatic redistribution* theories could explain the intensity of inter-regional redistribution (see section 2).

But, in order to provide a more formal test to these theories, we follow by estimating equation (1) year by year, in order to obtain a time series for the  $\phi$  parameter. Then we use the estimated  $\phi$  parameter to run a time series regression with explanatory variables that proxy for several possible explanations of the degree of inter-regional redistribution. Obviously, the use of an estimated regression coefficient as a dependent variable in another regression poses some problems. Scholars fitting ‘estimated dependent variable’ (EDV) models generally recognize that variation in sampling variance of the observations on the dependent variable induce heteroskedasticity, with the result of reduced efficiency of the estimator and biased standard errors. Both OLS with White standard errors (Burden and Kimball, 1998) or WLS (weighted least squares) with weights  $1/\omega_t$ , where  $\omega_t$  is the standard error of the estimated coefficients (King, 1997), have been proposed as a solution. However, as pointed out

by Lewis and Linzen (2005), both methods have shortcomings, the estimated coefficients being more efficient and the standard errors lower with a two-step FGLS approach (see also Hanushek, 1974), the first step consisting in using the OLS residuals to estimate the variance of the sampling error ( $\sigma_u^2$ ), and the second one consisting in estimating the equation by WLS, weights being  $1/\sqrt{(\sigma_u^2 + \omega_t^2)}$ . This is the method we will apply here.

#### 4. Data and variables

*Sample.* In order to get a complete picture of the motives behind interregional redistribution in Spain, we estimate equation (1) with data on the entire democratic period (i.e., years 1978 to 2004). The year 2004 is the last one for which we have been able to collect the data on investment and capital stock at the electoral district level (i.e., ‘provincia’). We will use also the years 1964 to 1977, which belong to the pre-democratic period (i.e., Franco’s dictatorship). Our aim when including this period is to allow us to analyze the effect the democratic constitution over inter-territorial redistribution. We will divide the democratic period in 8 sub-periods, corresponding to the terms of office of each of the Spanish governments since 1978. The first two sub-periods correspond to the right UCD governments (Union de Centro Democrático, 1978-79 & 1980-82), the following four sub-periods are those of the left PSOE governments (Partido Socialista Obrero Español, 1983-86, 1987-89, 1990-93 & 1994-96) and the last two to the two right PP governments (Partido Popular, 1997-2000 & 2001-04).

*Dependent variable.* Our data on infrastructure investment includes only economic infrastructures, which are the ones deemed to have stronger effects on growth (Castells *et al.*, 2005 & Montolio and Solé-Ollé, 2008). The data comes from a database elaborated by the Fundacion BBVA (*El stock de capital en España y su distribución territorial* (1964-2002)). This database provides information at the provincial level on investment made by the Spanish central government in roads, railroads, ports, airports and water projects, which are the categories that we include in our definition of infrastructure. Unfortunately, this database only provides information till 1998. The new methodology used since then by the Fundacion BBVA (*El stock de capital en España y su distribución territorial* (1964-2005). *Nueva metodología*) provides information on investment till 2004 but not by layer of government. In the case of road investment, the statistics elaborated by the Ministerio de Fomento (*Anuario Estadístico*)

allow us to know the investment made by the central government in each province, so the database can be easily extended. For the remaining categories, we used two different procedures to extend the series of central infrastructure investment to the period 1999-2004. First, we distributed the investment made by the central government in each CA (known from the statistics of the Ministerio de Fomento) between its provinces using the provincial investment share in the period 1995-98. Second, we also calculated for each province the average share of the central government in non-road investment for the period 1995-98, and multiplied investment in these categories in the following years by this percentage. The correlation between the two measures of central government's investment obtained using these procedures is very high (0.987) and the results obtained are not affected by the concrete series we choose, so we decided to use an average of the two. Moreover, repeating our analysis using only road investment by the central government (here there are no imputations) does not alter the conclusions reached. Finally, performing the analysis with overall investment made by the central + regional governments (information is available for the full period) also provided the same qualitative results (as happened also in the study by Castells and Solé-Ollé, 2005).

(Insert Graph 1)

Graph 1 shows a time plot of the investment effort made by the Central + Regional governments (in black) and only by the Central government (in red). The infrastructure investment effort was quite low during the dictatorship, increased with the arrival of the democracy, and experienced an abrupt increase with the arrival of the left government in 1982 and again in the second half of the 80's, with the reception of EU funds. Then, infrastructure investment decreased during the 90's, coinciding with the economic crises at the beginning of the decade and with the pre-Maastricht budget stabilization policy. Finally, infrastructure investment decreased again since 2000, due to the stringent deficit policy of the new right government. We also plot (in green) the evolution of the share of infrastructure investment funded by redistributive EU funds, where we mean by redistributive those funds that are rule-earmarked to poor regions and have been used to fund infrastructure projects; as a practical solution, we measure these funds by the monies coming from FEDER Objective 1 and which have been used to fund these types of projects. The source of this data is the reports published yearly by the Ministerio de Economía y Hacienda. Note that the share of this infrastructure funded by the EU reached a peak of 19% in 1997 and decreased then to a 9% in 2004.

This means that although these funds can not be reallocated from poor to rich regions, its limited share will probably allow to compensate rich regions by other means (of course, only when the government considers desirable to do it). The final plot included in Graph 1 is the ratio of *Redistributive EU Funds* to overall EU funds, which decreased since the very beginning, first because Objective 1 Funds represented a higher share of FEDER's resources during the 80's than afterwards, and second as a result of the creation of the Cohesion Fund in 1993, which resources are not earmarked to infrastructure projects in poor regions. We will recover this evidence in section 5 to interpret the evolution of the redistributive intensity of infrastructure investment in Spain.

(Insert Graph 2)

To end this section, just comment that the investment effort that the central government makes in a region is not independent of its income level. In Graph 2 we show the estimated kernel density of investment effort for rich (in red) and poor (in blue) electoral districts in different sub-periods. The graph suggests that during the *Dictatorship* rich districts received more monies than poor ones. The pattern is just the opposite both for the right UCD governments (1978-82) and the left PSOE ones (1983-96), cases in which the kernel density for the poor is above the one for the rich at high levels of investment effort. The results are reversed again for the last two right PP governments, where the distribution of investments seems to be pro-rich. Of course, this is a merely descriptive analysis, and might not tell us anything about the *equity-efficiency trade-off* or redistributive taste of each government ( $\phi$ ). Recall that this parameter will be identified from the long-run effect of income on investment effort, once we have controlled for other influences. However, we can advance now that the time pattern shown by this parameter will not be really different to the one suggested by Graph 2.

*Economic variables.* The infrastructure *capital stock* used to compute the investment effort and also as a control variable, comes from the same data source and is measured at 2000 prices. In this case the variable refers to the overall capital stock, and the information has never been provided by layer of government. The coefficient of this variable can be interpreted as the share of the adjustment towards the desired capital stock which is implemented in a given year (see also Castells and Solé-Ollé, 2005). This parameter is crucial to estimate the long-run impact of income per capita over

investment (calculated as the ratio between the income and the capital stock coefficients).

The other economic control variables included are: *income* per capita, *land area* per capita, a *coast* dummy, an *island* dummy, variables measuring climate (% *days freezing*, % *days raining*) and terrain ruggedness (% *land over 500* and % *land over 1.000* meters of altitude), and an indicator of the level of *responsibilities* in the provision of infrastructure retained by the central government in a given year. Income per capita is the GDP per capita at market prices, measured at 2000 prices and one-year lagged to reflect the level of information at the disposal of the central government when planning the investment. The information comes from an old publication published yearly by BBV (*La renta nacional de España y su distribución provincial*, several years), and from the Spanish Regional Accounts published by the Instituto Nacional de Estadística ([www.ine.es](http://www.ine.es)). The geographical dummies have been taken from the *Anuario Estadístico de España*, also published yearly by INE. The indicator of the level of responsibilities have been computed after observing the concrete year when one regional government (Comunidad Autónoma, AC) has received a specific responsibility; before any responsibility has been transferred, the indicator for the provinces belonging to that AC is 1, and after the transfer is 1 minus Spanish investment in the transferred category over total Spanish infrastructure investment. We have to say now that the performance of most of these variables is rather poor; only income, the land area and the coastal dummy are statistically significant and show consistent results in a substantial number of cases. Even the responsibility index is not statistically significant at conventional levels; this might be due to the fact that these responsibilities were transferred at similar moments to the different AC's, with the result that the influence vanished once all the variables have been cross-sectionally demeaned. So, the results that we will present in the next section will include only these three economic controls.

*Political variables.* We include four political control variables: *margin*, *votes/seats*, *aligned* and *pivotal*. The information used to construct these variables comes from the website of the Ministerio del Interior ([www.elecciones.mir.es](http://www.elecciones.mir.es)). The variable *margin* of victory in the last election aims to capture the influence of voters that are not particularly attached to the incumbent or to the alternative party/parties and, therefore, are more prone to change its vote in response to an economic premium. However, as we explained in section 2, in practice the effects of the variable *margin*

can be confounded with that of *vote share*, which is the way scholars use to measure the alternative hypothesis that says that resources are allocated to the incumbent's strongholds. This suggests that the functional relationship between vote share and the investment should be empirically estimated, without imposing too much structure on the data. With this purpose we estimate a non-parametric *median spline* between the incumbent vote share in the last election and the residual of equation (1) estimated including only the economic covariates. The results are displayed in Graph 3 for various sub-periods.

(Insert Graph 3)

In all the cases the relationship has an inverted U-shape, with a maximum amount of investment received at a point between 40% and 50% of the vote. The relationship is quite symmetric in the case of the first right governments (UCD between 1978 and 1982) and for the full democratic sample, although the left side of the graph can not be fully displayed because there are no districts with more than 60% of the vote. The shapes for the leftist PSOE and for the rightist PP also follow this pattern but are more asymmetrical: that of the PSOE is flatter on the left side and that of the PP is flatter on the right side. In any case, these relationships suggest that the *swing* voter theory has some appeal in Spain and that a *margin* of victory computed as  $\text{abs}(\text{incumbents' victory} - \text{vote share at the peak})$  can be in general an appropriate variable to use. Of course, using the appropriate peak for each sub-period (e.g., 40% for UCD and PSOE, 45% for PP) could be important, as also allowing for different slopes at each side of the peak in some periods. In the next section we will present the results using the *margin* variable with a specific peak for each sub-period; results allowing for asymmetric slopes do sometimes provide a fatter fit, but do not change the overall picture obtained, and so are not presented here.

The second political variable included is the ratio *votes/seats*, logged. The marginal electoral productivity of investment in a district depends on the proportion of *swing* voters there (which we proxy with the *margin* variable), but also on the probability that these *swing* voters will make the incumbent win an additional seat, which depends on how many votes are needed to win that a seat (see Castells and Solé-Ollé, 2005). There are two different options to measure this variable. First, to use the results obtained in the last election to compute exactly how many votes more/less are needed go win/lose an additional seat. This option is used in Castells and Solé-Ollé

(2005), who use a simple algorithm of the d'Hondt rule (which is the one used in Spain to translate votes to seats) to perform this calculus. Second, to use the ratio *votes/seats* as here. The first option has the advantage that the variable has substantial time series variation<sup>3</sup>. However, this advantage is not really relevant in our case, because we work basically with cross-sectional variation. Being this the case, the *votes/seats* variable performs much better in most of the sub-periods, so we decided to opt for this last alternative.

The third political variable used is a dummy indicating if the regional government is or not aligned with the central one. We consider the two governments to be *aligned* if they are controlled by the same party (either as a majority party or as the leader of a coalition). This is the variable that had a better performance in previous analysis of the effect of alignment in Spain (Solé-Ollé and Sorribas, 2007). The last political variable is a dummy, *pivotal*, indicating if any of the regional parties give support to a minority central government. In practice, this dummy takes the value one for the provinces in Catalunya, País Vasco and Canary Islands, during the two minority governments of the 90's (PSOE during 1993-96 and PP during 1997-2000). Previous analyses have shown that this variable is quite relevant (Castells and Solé-Ollé, 2005).

## 5. Results

*Tactical redistribution.* The results of the estimation of equation 1 for each of the 8 terms of office of the Spanish democratic governments are presented in Table 1. We also provide these results for each of the parties that have been in power (UCD, right from 1978 to 1982; PSOE, left from 1983 to 1996; and PP, right from 2000 to 2004), and also for the full democratic period. The results in the top panel show that the four political variables have the expected sign and are statistically significant for the full period. Moreover, the size of the coefficients is of a considerable magnitude. For example, an increase of 10% in the *margin* of victory of the incumbent party (e.g., a move from a peak vote share of 45% to either 35% or 55%) reduces the investment

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<sup>3</sup>The votes needed to change the past election result in terms of seats depend on two things: the *vote/seats* ratio and a random factor that determines the distance from the threshold. In fact, if one looks at the correlation between this variable and *votes/seats* for a given election, it turns out to be quite low (0.2 to 0.3); however, the correlation between these variables for the full democratic sample is much higher (0.746), suggesting that over the long run both variables measure the same thing.



effort by 0.42% (e.g., if the mean investment effort is 6.1%, this would be reduced to 5.68%). Increasing one standard deviation in the ratio *votes/seats* (around 15,000 votes) will reduce the investment effort a 1.5% (from 6.1% to 4.6%). Not being *aligned* with the central government or *pivotal* in the formation of the central executive will reduce the investment effort a 0.8% and a 1.1%, respectively (i.e., from 6.1% to 5.3% and 5%, respectively).

(Insert Table 1)

Moreover, the results of the *margin* and *votes/seats* variables hold for the three different parties in charge and, with a couple of exceptions, for each one of the terms of office. PSOE left governments seem to have been a little less influenced by these tactical considerations. The coefficients for the UCD right governments seem to be the strongest ones. The *alignment* results only hold (at conventional statistical significance levels) in the PSOE case, the coefficients being of the expected sign but not statistically significant under the PP<sup>4</sup>.

Using the results of Table 1 one could evaluate the ‘relative’ *political power* of an electoral district *J* in period *P* as:

$$Power_{J,P} = \frac{\exp(\beta_P z_{J,P})}{\exp(\beta_P z_P)} \quad (2)$$

This indicator should be interpreted as the relative ability of a district to attract investment over a standard amount, determined by its ‘objective’ economic traits. Graph 4 shows the density of this indicator for the full democratic period<sup>5</sup>, as estimated by means of a kernel. The graph shows a polarized distribution, with a high proportion of districts either with low (50% of Spanish average) or high political power (150% of average). The political power of some districts have remained more or less the same during all the period (e.g., Navarra, Murcia and the average of Castilla-León), while for others has fluctuated between the two modes from one sub-period to the others. This is the case, for example, of the average district in Catalunya. The incumbents’ vote share has always been quite low, albeit much more for the right than for the left. Similarly, the *votes/seats* ratio has remained virtually unchanged during all the period.

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<sup>4</sup> Note that these variables are not included in all the terms of office, the reason being that these phenomena are specific of the considered periods (i.e., it has no sense to talk about alignment before 1983 and there are only two governments that have been conditioned by pivotal regional parties).

<sup>5</sup> The kernel for the sub-periods has the same bi-modal shape.

However, the regional right party (CiU, *Convergència i Unió*) was pivotal in the formation of the last PSOE and first PP governments. This alone provoked the movement of the region from the low-power to the high-power mode. Unfortunately for the region, the two low-power indicators (*margin* and *votes/seats*) are quite structural while the *pivotal* status (or the *alignment* one) is more circumstantial.

(Insert Graph 4)

*Programmatic redistribution.* The bottom panel of Table 1 analyses the effect of economic variables on investment effort. The results suggest that investment effort is lower the higher the previous level of capital stock. For the full democratic period, the capital stock coefficient suggests that investment closes each year a 7.2% of the gap between actual and desired capital stock. This number is higher during the PSOE governments and lower during the PP ones, surely reflecting the different amounts of funds assigned to infrastructure investment at different moments. The results shown also say that the central government invests more in regions with less density of population and on the coast (although the coefficient is not statistically significant in all the sub-periods), taking into account the differential spending needs and/or costs of these areas (see also Castells *et al*, 2001 and 2005). Any attempt to account for other factors, related either to needs/costs (e.g., climate, terrain ruggedness) or responsibilities has been unsuccessful.

Investment effort is affected positively by income, to the exception of the PSOE1 and PSOE2 terms-of-office. The row below the income results shows the *equity-efficiency trade-off* parameter ( $\phi$ ), with values that are positive and lower than one for most of the sub-periods, to the exception of the two aforementioned left governments, that display negative but modest values. In relative terms, the UCD governments have an efficiency orientation ( $\phi = 0.662$ ), but they were the first governments to implement the new demands for redistribution that arose with democracy; note, for instance, the quasi-absolute efficiency-orientation of infrastructure investment during the dictatorship ( $\phi = 0.902$ ). Also the recent right governments (PP, between 1997 and 2004) have been more efficiency-oriented ( $\phi = 0.678$ ) than the previous left ones (PSOE, between 1983 and 1997), which put more emphasis on equity ( $\phi = 0.039$ ). However, in no case the regional allocation of investment was fully efficient (this requires  $\phi = 1$ ).

(Insert Graph 5)

The value of this parameter for each sub-period is also shown in Graph 5, which also plots the estimated  $\phi$  value for each of the years of the sample<sup>6</sup>. The inspection of the graph suggests several explanations to the time evolution of the value of this *equity-efficiency trade-off*. First, the arrival of democracy brought the first impulse to equity in the allocation of infrastructure investment. Second, left governments are more redistributive (equity-oriented) than right governments. Third, the maximum level of interregional redistribution occurred with the first PSOE left government. To understand this, recall that PSOE won the 1983 by a huge margin; this fact, coupled with the desire to implement a long-delayed ideological program (this was the first left government in nearly half a century) could explain this intense equity orientation<sup>7</sup>. Fourth, the next redistributive impulse occurred in the PSOE 3<sup>rd</sup> term of office (1989-93), conditioned by the huge amount of EU funds that were earmarked to poor regions since the accession of Spain to the European Community. Fifth, the last PSOE government (1994-96) and the PP ones (1997-2004) sought an increase in the orientation of infrastructure investment towards efficiency. To understand the causes that might explain this result recall that, as shown in Graph 1, the amount of EU funds which were earmarked to poor regions and used to fund infrastructure investments decreased through time since the very beginning. This was due both to a decrease in the relative amount of money allocated to FEDER Objective 1 regions, and to the creation of the Cohesion Funds in 1993.

But of course, there could be other explanations that can not be detected from a bird-eye inspection of the data. For instance, some of the *programmatic redistribution* theories (see section 2) suggest that the level of redistribution in a democratic system will be the one preferred by the most powerful group of citizens. This group could be either the median income region or a weighted sum of all the regions, where the weights reflect the political power of each one. In terms of the political power variable presented above, powerful could mean a lower *margin* of victory, a lower *votes/seats* margin, that the regional and central governments are *aligned*, or that regional parties are *pivotal* in the formation of the central executive. Thus, different theories lead to

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<sup>6</sup> The results of the yearly estimation come from a simpler OLS regression with White robust standard errors and are much noisier than the by-period ones but are qualitatively very similar and, in any case, the  $\phi$  parameter is in all the cases around the average effect estimated for the full period and with standard errors that are in general acceptable

<sup>7</sup> See Boix (1998) for an analysis of the role of infrastructure investment in the ideological program of PSOE during those years.

different predictions. If the median voter theory is true in our context, we should observe that the efficiency orientation of the government (i.e.,  $\phi$ ) should increase as the *ratio between median and average income* increases. The other possibility is that the efficiency orientation of the government increases as the *political power* of the electoral districts is less negatively correlated with income/is more positively correlated with income. That is, when poor/ rich regions become less/more powerful the degree of redistribution is reduced.

Table 2 presents the results of a regression that attempts to test the different hypotheses introduced up to the moment. The dependent variable is the value estimated for  $\phi$  with yearly data.

(Insert Table 2)

In the first column we test the so-called *constitutional* explanations for redistribution; that is, the hypotheses that say that the inter-territorial redistribution is basically affected by the arrival of democracy and of the EU funds. The results in column 1 do in fact show that the *equity-efficiency trade-off* was on average higher during the dictatorship ( $\phi = 0.663$ , picked up by the constant term) than in the democratic period ( $\phi = 0.412$ , computed as the sum of the coefficient of *Democracy* and the constant term). Moreover, these differences are statistically significant. Also, the proportion of *Redistributive EU Funds* over infrastructure investment reduces the efficiency orientation of that investment. For each percentage point of *Redistributive EU Funding* the  $\phi$  coefficient is reduced by 0.015. This means that at the peak of EU infrastructure funding in 1997 (where this share was the 19%) the predicted value of  $\phi$  was 0.127 (=  $0.663 - 0.251 - 0.015 \times 19$ ) and at the end of the period (where this share was just the 9%) the value of  $\phi$  was 0.135. Note, however, that even accepting that EU funds had a statistically significant effect over redistribution, they do not explain the bulk of the differences between periods.

In the second and third columns we present the result of what we call the *partisan* explanation for redistribution. The results in column 2 show a negative and strongly statistically significant coefficient for the *Left* variable. While a right democratic government has a predicted  $\phi$  coefficient of 0.553 (=  $0.663 - 0.100$ ), the same parameter takes a value of 0.119 (=  $0.663 - 0.100 - 0.434$ ) for a left one. Column 3 tests a variant of the partisan theory, which states that ideology is mediated by the degree of

electoral competition. We expect that in contested elections left parties will redistribute less (than they would do in uncontested elections) and right parties will redistribute more. We test this hypothesis by interacting the *Left* and *Right* dummies with a *Contested election* dummy, which takes the value one for the elections where the incumbent did not expect a substantial vote downturn. The elections of 1979, 1986, 1989 and 2004 are those that have been considered uncontested from the perspective of the incumbent, while the other are the contested ones. As can be seen in the table, *Left* governments still redistribute much less than the *Right* ones if the election is uncontested (the coefficient of the *Left* dummy without interactions is negative and statistically significant). However, we observe now that *Right* governments redistribute more in contested than in uncontested elections. In fact, the  $\phi$  coefficient drops by  $-0.216$  between these two situations.

The fourth column of Table 2 tests the *Median Voter* theory of redistribution. The results are however rather disappointing. The coefficient of the ratio between median and average regional income is not only statistically insignificant but its sign is opposed to the expected one. Other trials, adding the square of this ratio (searching for a kind of Kuznets curve, Kuznets, 1955) did not provide satisfactory results. Finally, the fifth column of Table 2 tests the hypothesis that the degree of redistribution is affected by the correlation between political power and income per capita,  $\text{corr}(\text{power}, \text{income})$ . We use as our measure of power the one derived from the estimation of equation (1) (see Table 1 and expression 2), which is a geometrically weighted average of the variables *margin*, *votes/seats*, *alignment* and *pivotal*. The results suggest that this variable has a positive and statistically significant effect over redistribution. Additional results, disentangling this variable in its different components and not displayed here, show that all of them have a positive and significant effect. An additional intriguing effect of the inclusion of this variable is that the coefficients of both *Democracy* and *EU Funds* are no longer statistically significant at conventional levels. The results for the ideological variables remain the same. This would mean that the degree of inter-territorial redistribution is at a practical level less determined by constitutional rules and laws that try to channel funds towards less developed regions, but depends basically on the ideology of the party in office and on the electoral incentives that this party faces in each election.

(Insert Graph 6)

Finally, to complement these results with some visual intuition, Graph 6 plots the time evolution of both the  $\phi$  coefficient and of  $\text{corr}(\text{power}, \text{income})$ , in the top panel, and of both the  $\phi$  and each of the correlation and each of the components of the *power* indicator, in the bottom panel. It can be seen that after the pronounced effects of the arrival of democracy and the left party vanish, the plots for the power variables move in the same direction than that for the  $\phi$  coefficient.

## 5. Conclusion

Infrastructure investment is not only a sizeable component of regional fiscal flows, but one over which there is more discretion by the part of the central government. Being this the case, it is natural to expect that pork barrel (what we call *tactical redistribution*) influences do shape (at least partly) the regional allocation of investment. In this paper we have shown that, after controlling for important economic traits of Spanish electoral districts (income, capital stock, land area), the districts that are more ‘electorally productive’ still receive disproportionately high amounts of investment. These districts are those where there is a high proportion of *swing* voters (voters that are not specially attached to any of the parties), where the ‘price of a seat’ is low (less votes are needed to win a seat), where the regional government is controlled by the same party than the central one, or where there are regional parties that are pivotal in the formation of the central executive.

However, we also argued that it is not true that infrastructure investments are fully discretionary and, therefore, that *programmatic redistribution* theories explain also a part of the story. The equity orientation of the regional allocation of infrastructure investment is conditioned by constitutional rules, understood in a broad sense, including both the mandate of the Spanish Constitution but also the effects of EU policies. These rules constraint the investment allocation possibilities, forcing politicians to design formula-based allocations based basically on regional income. This is the realm programmatic regional redistribution, where the government basically determines the weight given to income in the allocation of investment, what we call his *equity-efficiency trade-off* or taste for redistribution. We have shown in the paper that the long-run effect of income on the investment effort is lower than one, meaning that the

allocation of investment is not only efficiency-oriented<sup>8</sup>. The weight given to equity was very low during the dictatorship, increased with the arrival of the democracy and, especially, after the first left government, and again after *EU Funds* began to flow to Spain. In the paper we try to test these highly intuitive explanations against some others derived from several theories of *programmatically redistribution*. We show that both the *Democracy* and *EU Funds* did have some effects over inter-territorial redistribution, but that these effects vanished after accounting for politics. Ideology seems to be a more powerful determinant of the equity orientation of infrastructure investment, left government redistributing much more than right ones. Also, redistribution seems to decrease as less developed regions lose some of its early political power.

Overall, the results suggest that the allocation of infrastructure investment in Spain is less constrained by rules than is generally believed, and much more influenced by politics, both by particularistic politics (*tactical redistribution*) but also by programmatic considerations (*programmatically redistribution*) that end up influencing how formulas are determined. To conclude, just to say that the reason that a region receives less investment than it deserved are basically two: (i) the region has low political power, so it will receive less monies than other regions with the same 'objective' traits, and (ii) the regions' peers (if the region is poor, the other poor regions, if it is rich the other rich regions) have low political power, so the overall pattern of redistribution runs against the interest of the region (if it is poor, the allocation is too efficiency-oriented, if it is rich, too equity oriented). A really intriguing question is why the central government tries to buy votes through the programmatic design of investment policies or intergovernmental grants instead of demanding more particularistic spending. After all, it is much cheaper to please a given poor region which is especially powerful, than to channel more funds to all the poor regions (some of them might not be that powerful, even when the average poor regions are). The reason for the use of *programmatically* rather than *tactical* redistribution is that the government can make only limited use of discretionary allocations of funds (not respecting any a priori established 'objective' criteria), because otherwise the electorate and/or the media will notice it.

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<sup>8</sup> The excessive orientation towards equity of the Spanish regional allocation of investment has also been pointed out by other authors (see, especially, De la Fuente, 2004 and 2007).

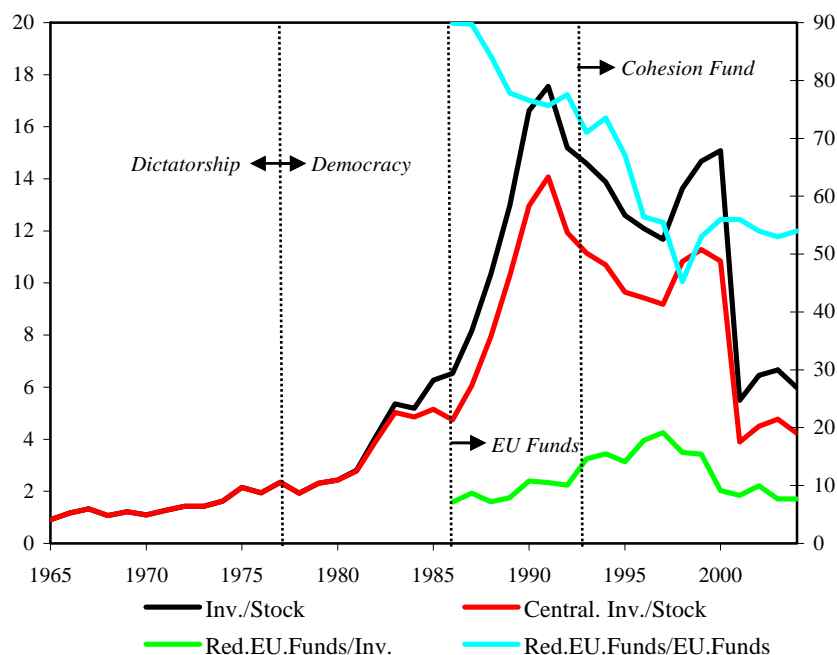
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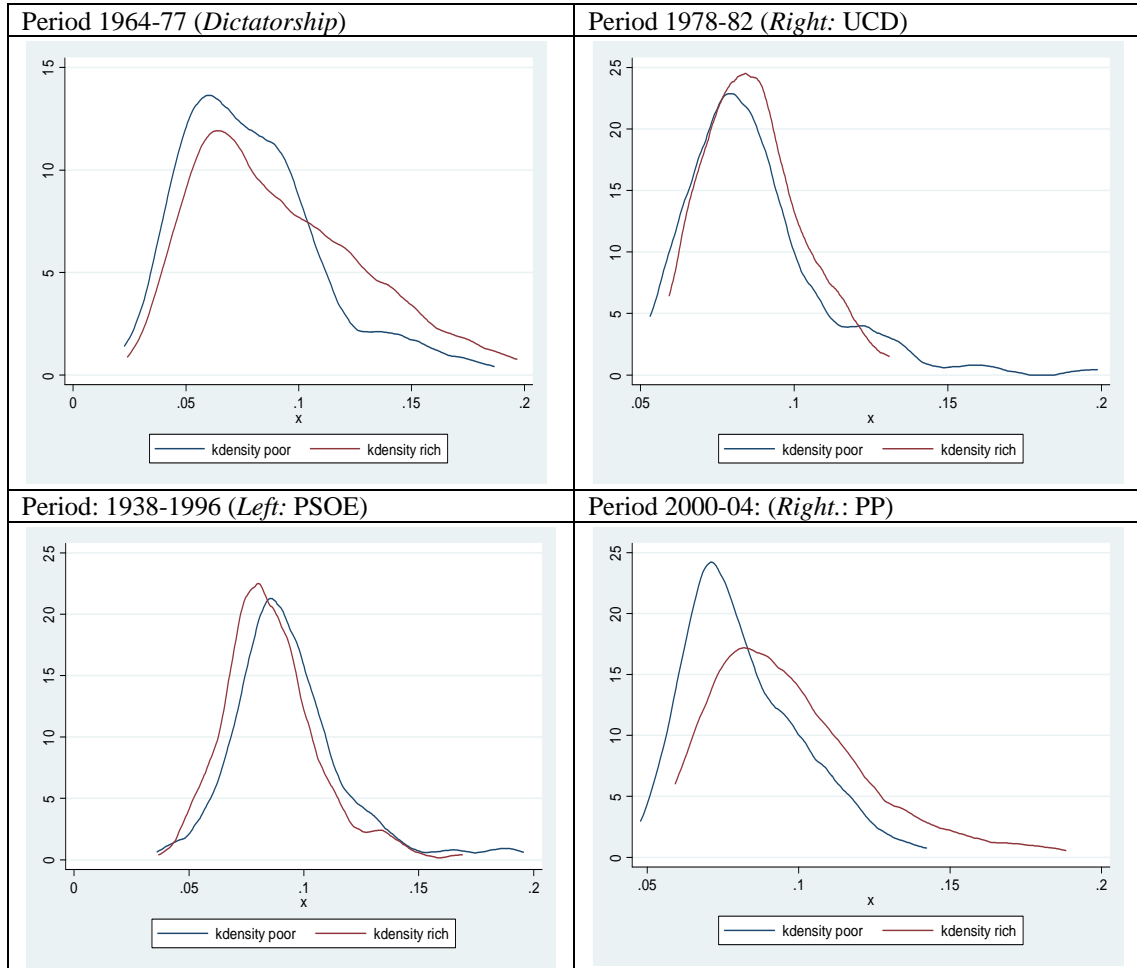
Graph 1:  
*Infrastructure investment (as a % of capital stock) in Spain 1964-2004. Total and Central infrastructure investment, & share funded by the EU*



Notes: (1) Inv./Stock: Central + Regional government infrastructure investment (as a % of infrastructure capital stock); Central. Inv./Stock: Central government infrastructure investment (as a % of infrastructure capital stock); Red.EU.Funds/Inv.: EU Funds earmarked to poor regions (measured as FEDER Objective 1 Funds) & used to fund infrastructure investment as a share of Central + Regional government infrastructure investment; Red.EU.Funds/EU.Funds: EU Funds earmarked to poor regions & used to fund infrastructure investment as a share of total EU funds used to fund infrastructure investment. (2) Investment on the left y-axis and EU funds on the right y-axis.

Data Sources: (1) Fundación BBVA (2002, 2007) for investment and capital stock; (2) Ministerio de Economía y Hacienda (several years) for EU funds.

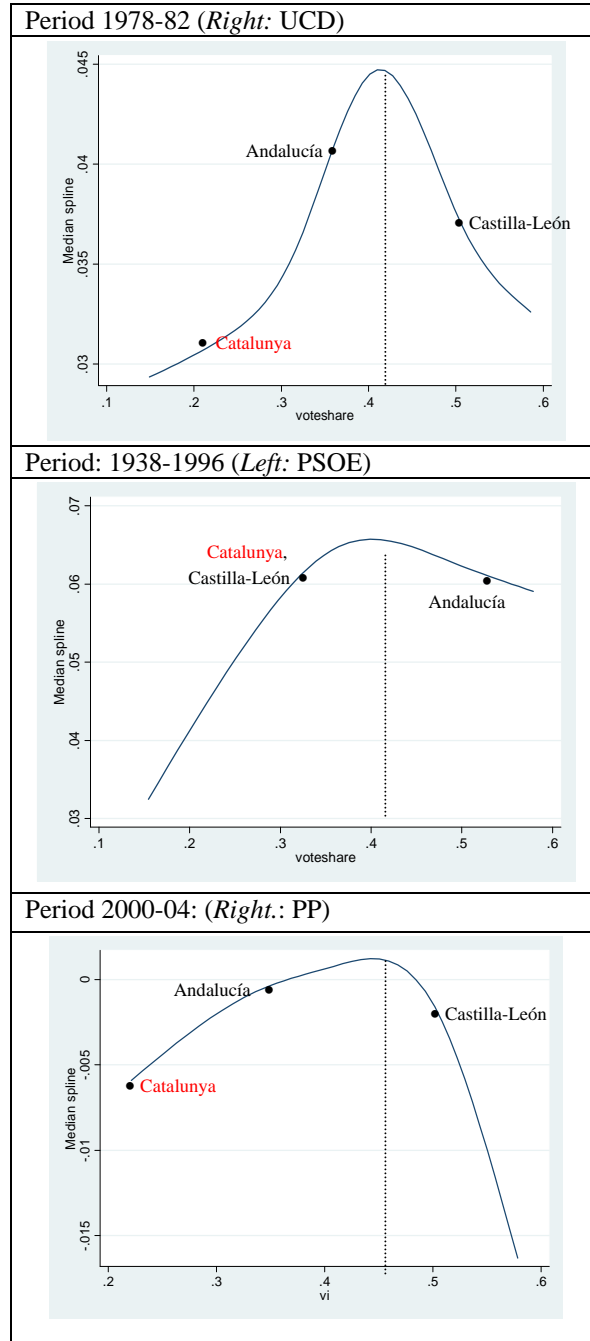
Graph 2:  
*Density of Infrastructure investment (as a % of capital stock)  
in Spain, comparing rich and poor regions, several periods*



Notes: (1) x-axis: central government infrastructure investment (as a % of infrastructure capital stock) minus Spanish year average; y-axis: kernel density estimation (Epanechnikov kernel); (2) Poor/Rich: GDP per capita below/above year median; (3) Party acronyms: UCD=Union de Centro Democrático, PSOE=Partido Socialista Obrero Español, PP=Partido Popular.

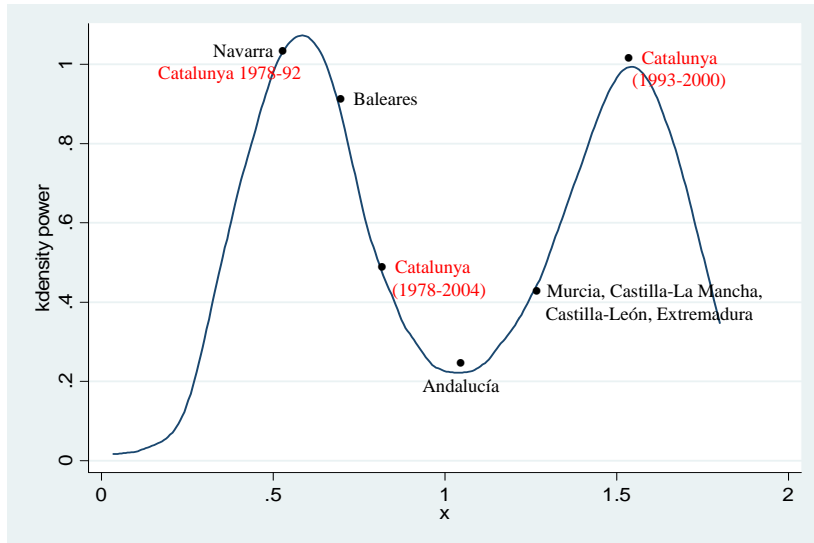
Data Sources: (1) Fundación BBVA (2002, 2007) for investment and capital stock; (2) BBV (several years) and INE (several years) for GDP and population.

Graph 3:  
*Relationship between Infrastructure investment (as a % of capital stock) and incumbent vote-share in Spain, Median spline for different periods*



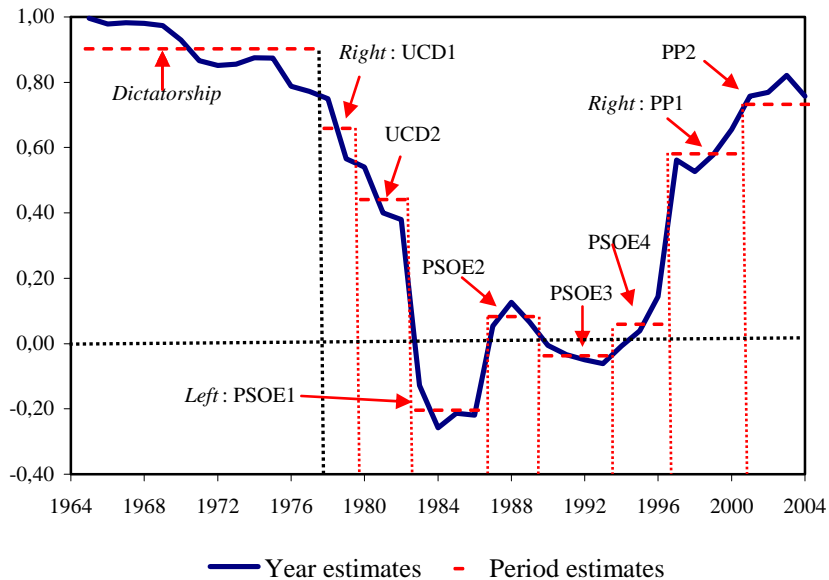
Notes: (1) x-axis: incumbent's vote share; y-axis: median spline of infrastructure investment (as a % of capital stock); (2) estimation method: median spline estimation using as dependent variable the residual of a regression between infrastructure investment, economic controls (GDP per capita, capital stock, land area, coast) and year dummies; (3) See Graph 2 for Party acronyms and Data sources.

Graph 4:  
Density of Regional Political Power in Spain, Period 1978-2004



Notes: (1) x-axis: Political power = weighted sum of margin, votes/seats, alignment & pivotal, with weight obtained from regression analysis (see Table 1); y-axis: kernel density estimation (Epanechnikov kernel).

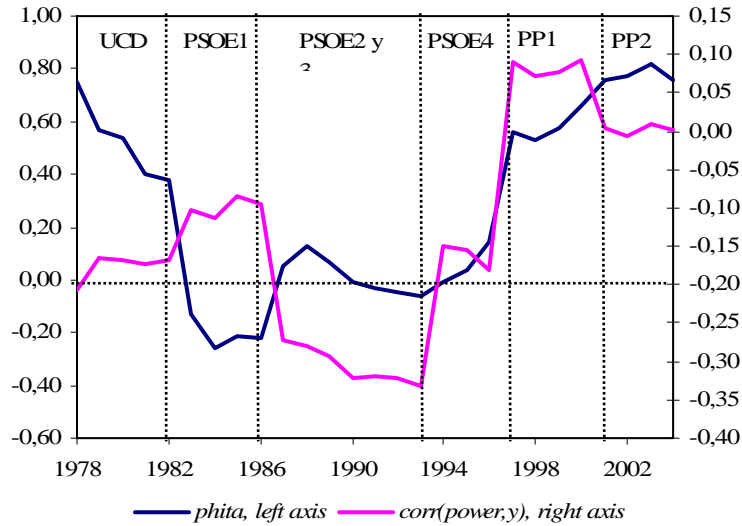
Graph 5:  
Equity-efficiency trade-off ( $\phi$ ) for infrastructure investment.  
Spain, Period 1964-2004 and sub-periods



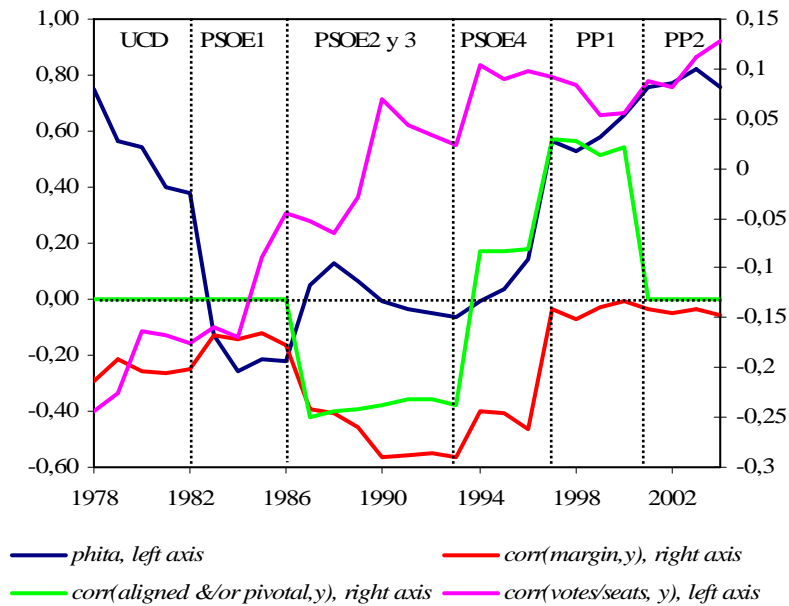
Notes: Equity-efficiency trade-off ( $\phi$ ) is the 'long-run' elasticity of investment to income, obtained after estimating a regression between infrastructure investment (as a % of infrastructure capital stock) and GDP per capita, controlling for the capital stock and other economic and political covariates (see Notes of Table 1 for additional methodological details).

Graph 6:  
*Equity-efficiency trade-off ( $\phi$ ,  $phita$ ) against correlation between income and political power ( $corr(power,y)$ ). Spain, Period 1964-2004*

*Panel a: All components*



*Panel b: By component*



Notes: (1)  $corr(margin, y)$  = correlation between incumbent's margin (computed as  $abs(\text{incumbent's vote share} - \text{vote share at the peak})$  and GDP per capita;  $corr(votes/seats, y)$  = correlation between the ratio of votes to seats by district and GDP per capita;  $corr(aligned \&/or \text{pivotal}, y)$  = correlation between the weighted sum of dummies aligned & pivotal and GDP per capita, aligned = Central and Regional government controlled by the same party (either as a majority party or as the leader of a coalition), pivotal = regional parties giving support to a minority central government; power = weighted sum of margin, votes/seats, alignment & pivotal, with weight obtained from regression analysis (see Table 1). (2) See Graph 4.

Table 1:  
Economic and political determinants of the regional allocation of infrastructure investment in Spain: (1964-2004 and subperiods)

Period:	1978-79	1980-82	1978-82	1983-86	1987-89	1990-93	1994-96	1983-96	1997-2000	2001-04	1997-2004	1978-2004	1964-77
Regime/Party	UCD1	UCD2	UCD	PSOE1	PSOE2	PSOE3	PSOE4	PSOE	PP1	PP2	PP	Dem.	Dic.
(i) Political factors													
Margin	-0.162 (-3.66) <sup>***</sup>	-0.102 (-3.76) <sup>***</sup>	-0.147 (-3.14) <sup>***</sup>	-0.144 (-1.57)	-0.172 (-3.34) <sup>***</sup>	-0.106 (-2.23) <sup>**</sup>	-0.122 (-1.77) <sup>*</sup>	-0.057 (-2.33) <sup>***</sup>	-0.075 (-2.13) <sup>***</sup>	-0.127 (-2.71) <sup>***</sup>	-0.079 (-2.17) <sup>***</sup>	-0.042 (-4.30) <sup>***</sup>	--.
Votes/Seats	-0.005 (-2.38) <sup>***</sup>	-0.004 (-5.36) <sup>***</sup>	-0.005 (-2.51) <sup>***</sup>	-0.002 (-2.46) <sup>***</sup>	-0.002 (-1.24)	-0.002 (-2.22) <sup>**</sup>	-0.001 (-2.10) <sup>***</sup>	-0.001 (-3.87) <sup>***</sup>	-0.003 (-5.30) <sup>***</sup>	-0.002 (-1.39)	-0.005 (-5.61) <sup>***</sup>	-0.005 (-2.71) <sup>***</sup>	--.
Alignment	--.	--.	--.	0.003 (1.65) <sup>*</sup>	0.010 (2.31) <sup>***</sup>	0.014 (1.89) <sup>*</sup>	0.007 (1.55)	0.005 (2.19) <sup>***</sup>	0.003 (1.34)	0.004 (1.54)	0.004 (1.20)	0.008 (3.86) <sup>***</sup>	--.
Pivotal	--.	--.	--.	--.	--.	--.	0.014 (2.14) <sup>**</sup>	0.012 (2.51) <sup>***</sup>	0.006 (2.23) <sup>**</sup>	--.	0.006 (2.20) <sup>**</sup>	0.011 (2.78) <sup>***</sup>	--.
(ii) Economic factors													
Capital stock	-0.077 (-2.76) <sup>***</sup>	-0.063 (-2.72) <sup>***</sup>	-0.068 (-3.13) <sup>***</sup>	-0.049 (-10.25) <sup>***</sup>	-0.101 (-11.31) <sup>***</sup>	-0.103 (-5.91) <sup>***</sup>	-0.089 (-7.77) <sup>***</sup>	-0.084 (-13.28) <sup>***</sup>	-0.048 (-2.14) <sup>**</sup>	-0.077 (-3.90) <sup>***</sup>	-0.042 (-4.94) <sup>***</sup>	-0.072 (-15.71)	-0.079 (-12.89)
Income	0.050 (3.04) <sup>***</sup>	0.028 (2.70) <sup>**</sup>	0.045 (5.72) <sup>***</sup>	-0.010 (-3.11) <sup>***</sup>	0.008 (3.47) <sup>**</sup>	-0.004 (-2.15) <sup>**</sup>	0.005 (1.81) <sup>*</sup>	0.003 (4.00) <sup>***</sup>	0.028 (4.82) <sup>***</sup>	0.027 (4.56) <sup>***</sup>	0.025 (4.04) <sup>***</sup>	0.034 (4.88) <sup>***</sup>	0.071 (6.92) <sup>***</sup>
$\phi$ [s.e.]	0.685 [0.236]	0.440 [0.163]	0.662 [0.166]	-0.205 [0.041]	0.082 [0.018]	-0.038 [0.019]	0.058 [0.034]	0.039 [0.011]	0.580 [0.181]	0.732 [0.203]	0.678 [0.170]	0.472 [0.074]	0.902 [0.113]
Land area	0.006 (0.231)	0.005 (0.110)	0.007 (0.328)	0.021 (4.38) <sup>***</sup>	0.015 (4.51) <sup>***</sup>	0.031 (6.16) <sup>***</sup>	0.022 (4.14) <sup>***</sup>	0.023 (2.75) <sup>***</sup>	0.008 (0.654)	0.010 (0.654)	0.009 (0.543)	0.017 (4.02) <sup>***</sup>	0.004 (0.871)
Coast	0.003 (0.120)	0.003 (0.098)	0.002 (0.134)	0.009 (2.89) <sup>***</sup>	0.008 (1.60)	0.004 (1.13)	0.019 (4.56) <sup>***</sup>	0.005 (2.34) <sup>**</sup>	0.002 (0.221)	0.001 (0.189)	0.003 (0.320)	0.005 (2.45) <sup>***</sup>	0.002 (1.210)
Adjusted R2	0.398	0.391	0.393	0.546	0.620	0.515	0.512	0.550	0.235	0.239	0.228	0.400	0.276
F-statistic	13.40 [0.00]	18.50 [0.00]	15.02 [0.00]	28.18 [0.00]	31.68 [0.00]	27.71 [0.00]	26.23 [0.00]	29.23 [0.00]	9.21 [0.00]	9.78 [0.00]	8.70 [0.00]	21.85 [0.00]	9.871 [0.00]

Notes: (1) t-statistics in parentheses, <sup>\*\*\*</sup>, <sup>\*\*</sup> & <sup>\*</sup> = statistically significant at the 99%, 95% and 90% levels; standard errors in brackets; (2) Capital stock, Income & Land area measured in per capita and logged; margin is computed as abs(incumbent's vote share – vote share at the peak), aligned = Central and Regional government controlled by the same party (either as a majority party or as the leader of a coalition), pivotal=regional parties giving support to a minority central government; (3)  $\phi$ = equity-efficiency trade-off, computed as the ratio between the coefficient of income and that of the capital stock (in absolute value); (4) Method of estimation: random effects with time effects and AR(1) correction.

Table 2:  
*Determinants of the Equity-efficiency trade-off ( $\phi$ ) in the regional  
allocation of infrastructure investment, Spain 1964-2004*

	(1) <i>Constitution</i>	(2) <i>Partisan</i>	(3) <i>Partisan</i>	(4) <i>Median voter</i>	(5) <i>Power</i>
<i>Constant</i>	0.663 (7.05) <sup>***</sup>	0.663 (7.63) <sup>***</sup>	0.663 (7.63) <sup>***</sup>	0.738 (9.19) <sup>***</sup>	0.826 (36.77) <sup>***</sup>
<i>Democracy</i>	-0.251 (-2.22) <sup>**</sup>	-0.100 (-1.76) <sup>*</sup>	-0.098 (-1.69) <sup>*</sup>	-0.109 (-1.25)	-0.103 (-1.34)
<i>Red. EU Funds / Investment</i>	-0.015 (-5.30) <sup>***</sup>	-0.004 (-2.65) <sup>***</sup>	-0.005 (-3.37) <sup>***</sup>	-0.005 (-2.41) <sup>**</sup>	-0.001 (-0.100)
<i>Left</i>	--	-0.434 (-9.67) <sup>***</sup>	-0.607 (-13.44) <sup>***</sup>	-0.562 (-9.32) <sup>***</sup>	-0.550 (-12.30) <sup>***</sup>
<i>Left × Contested election</i>	--	--	0.087 (0.651)	0.076 (0.540)	0.112 (0.611)
<i>Right × Contested election</i>	--	--	-0.216 (-4.21) <sup>***</sup>	-0.231 (-4.34) <sup>***</sup>	-0.209 (-4.78) <sup>***</sup>
<i>Median income/Income</i>	--	--	--	-0.013 (-0.67)	--
<i>Corr(Power, Income)</i>	--	--	--	--	0.355 (4.10) <sup>***</sup>
<i>Adjusted R2</i>	0.320	0.616	0.653	0.660	0.670
<i>F-statistic</i>	27.13 [0.00]	65.98 [0.00]	83.96 [0.00]	78.15 [0.00]	98.42 [0.00]

Notes: (1) t-statistics in parentheses, <sup>\*\*\*</sup>, <sup>\*\*</sup> & <sup>\*</sup> = statistically significant at the 99%, 95% and 90% levels; standard errors in brackets; (2) Red.EU.Funds/Investment = share of infrastructure investment funded by European Union redistributive funds (see Graph 1 for a definition); Left = PSOE executives (1983-1996); Contested election = election with an a priori uncertain outcome; Median Income/Income = ratio between median GDP per capita and average GDP per capita; Corr(Power, Income) = correlation between political power and GDP per capita = weighted sum of margin, votes/seats, alignment & pivotal, with weight obtained from regression analysis (see Table 1); (3) Estimation by WLS (weighted least squares), with weights  $1/\sqrt{(\sigma_u^2 + \omega_t)}$ . with  $\omega_t$  = (estimated) standard error of  $\phi$ .