Testing for Pork Barrel Politics in Public Infrastructure Accumulation: the case of Spain[*]

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February, 2010

Abstract

We test the effects of different combinations of parties simultaneously holding office in the central and regional governments on the growth rate of regional public infrastructure. Using panel data for the regions of Spain over the 1988-2004 period, we find evidence to support that certain combinations of parties have significant effects on

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the growth rate of public infrastructure. Our results show evidence of Pork Barrel Politics under both right-wing and left-wing central governments. However, a stronger result is found under majority left-wing central governments.

Key words: Panel Data, Pork Barrel Politics, Public Infrastructure.

JEL Classification: H77, C33

1   Introduction

In this article, we are interested in the effects that combinations of parties holding office at the different levels of government could have on the accumulation of public infrastructure at the regional level. We consider a federalist country at two levels of governance, each of which is characterized by a parliamentary system (central and regional parliaments) and whose representatives are elected democratically through electoral processes. Which party governs depends on the composition of the parliament. Thus, when there are at least two parties, mixed governance (i.e. different parties governing at each level of government) is practically ensured in at least one region.

Literature dealing with the effect of political parties on the economy falls within the sphere of the Partisan Theory and Pork Barrel Politics. The Partisan Theory holds that the preferences on economic outcomes are different depending on political parties, while Pork Barrel Politics analyzes the influence of political preferences on the regional distribution of total expenditure. Specifically, our work can be framed in the literature on Pork Barrel Politics since we are especially interested in testing whether ideological combinations in the different levels of government could have an effect on regional public infrastructure accumulation. Differences in time might arise in the relationships between the two levels of government involved due to party objectives, commitments, arrangements, disagreements and individual regional

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aspirations. Specifically with mixed governance, disagreements about certain projects are more likely to arise. In fact, major infrastructure projects could depend on the combinations of parties in the central and regional governments. However, mixed governance has the advantage that it may function as a useful mechanism for preventing arbitrariness.

We therefore hypothesize that public infrastructure could be affected by the different combinations of parties in the two levels of government. Core infrastructure might take years of discussion before being implemented due to the different interests and points of view of the governance levels involved. The central government could even favor regional governments led by the same party, punish regions governed by other parties, or the two levels of government may simply agree or disagree about undertaking public infrastructure projects.

Our goal is interesting not only at the Spanish level, but also at the European level due to the resurgence of regional policies to reduce disparities between European regions. [1]

In line with Castells and Solé-Ollé (2005), we specify an equation for the growth rate of regional public infrastructure per worker allowing for efficiency criteria, special infrastructure needs and political factors.

In this paper, we consider the Spanish case at two levels of government:

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[1] The regional policy of the European Union seeks to promote the reduction of structural differences between regions of the EU, the balanced development of the community and to ensure equal opportunities for all people.

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the central level and the regional level. We focus on part of the democratic period (1988-2004) and all the autonomous communities of Spain[2]. We basically find three kinds of parties which we have classified as right, left and regional.

Using panel data regression for the regions of Spain during the 1988-2004 period, we find evidence to support that certain combinations of parties have significant effects on public infrastructure accumulation. Our results show evidence of Pork Barrel Politics under both right-wing and left-wing central governments. However, a stronger result is found under majority left-wing central governments.

The article is organized as follows. A review of the literature on Partisan Theory and Pork Barrel Politics is provided in section 2. The econometric model and estimation issues are then described in sections 3 and 4, respectively, while conclusions are drawn in section 5.

2 Partisan Theory and Pork Barrel Politics

Partisan Theory states that political parties have different preferences over macroeconomic goals. The seminal work of Hibbs (1977) showed that in Western European and North-American nations, left-wing governments are more concerned with low unemployment, while right-wing governments are

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[2]The term "autonomous communities" refers to a set of territories that do not all share the same characteristics. Some have a more developed level of political decision-making than others.

more concerned with low inflation.[3] The "Rational Partisan Theory" (RPT) of Alesina (1987) presents a theoretical model supporting Hibbs' findings. Moreover, Alesina and Sachs (1988) empirically confirm Hibbs' results for the US case. Using data on OECD countries, Alesina and Roubini (1992) found that in the short term (about two years) left-wing governments expand the economy when elected. However, no support for permanent effects on the real economy was found. Using the same database, Schmidt (1996) showed that party influence on economic outcomes is contingent upon the type of democracy, finding stronger partisan effects in majoritarian democracies. However, Schmidt pointed out that it is more difficult to identify partisan influence on public policy in consensus democracies in which the political-institutional circumstances allow for co-governance of the opposition parties. Midtbø (1999) found that left-wing governments in the United States, Britain and Canada have reinforced the growth of both public spending and GNP. Recently, Pettersson-Lidbom (2008) found for Sweden that left-wing governments lower the unemployment rate by increasing public employment and spending and taxing more than right-wing governments.

Pork Barrel Politics can be broadly defined as the practice of targeting expenditure towards particular districts, states or regions based on political considerations. From the theoretical point of view, we have two findings. On the one hand, in the process to allocate funds, central governments may favor

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[3]A very good survey on the first fifteen years of research on the Partisan Theory can be found in Hibbs (1992).

regions governed by their allies and discriminate against regions governed by opposition parties in order to win re-election (Cox and McCubbins, 1986). On the other hand, central governments may channel more resources to swing regions to diminish the uncertainty of the electoral outcome (Dixit and Lodregan, 1995,1996). At the empirical level, there is vast evidence for the US case. Wilson (1986), Levitt and Snyder (1995) and Levitt and Poterba (1999) sketched a number of theoretical conjectures that might explain why legislators have a political preference for the Pork Barrel. They found empirical evidence supporting the fact that parties play a significant role in determining the geographic distribution of federal expenditure. Levitt and Snyder (1997) developed and subsequently estimated a theoretical model, finding similar results. Lee (2003) showed that political factors influence the distribution of earmarks in the US with majority government enjoying advantages and giving the minority some pork to inoculate itself against charges of wasteful spending. However, he found no evidence that political factors influence the distribution of funds to states. Directly related to our objective, Crain and Oakley (1995), Cadot *et al.* (2006), Kemmerling and Stephan (2002) and Golden and Picci (2008) found that political factors influence the allocation of infrastructure investment across states or regions in the US, France, Germany and Italy, respectively. For the specific case of Spain, Castells and Solé-Ollé (2005) estimated an equation of infrastructure investment allocation across Spanish provinces accounting for political factors. Their results

suggest that political factors explain the regional allocation of infrastructure. Kemmerling and Bodenstein (2006) showed that even at the European level there is a link between partisanship and the distribution of structural funds. Costa-I-Font *et al.* (2003) found evidence for Mexico and Leigh (2008) for Australia.

3 Econometric Model

3.1 Specification of the Evolution of the Stock of Regional Public Infrastructure

Most of the empirical evidence on Partisan Theory and Pork Barrel Politics is based on aggregated macroeconomic variables, considering their growth rates or ratios on GDP. This may be due to the fact that these studies have taken a short-term approach to explain business electoral cycles. Since public infrastructure is an input of the production function of the economy, and we want to analyze economic performance by public physical capital accumulation, our study is novel in that we consider variables measured per worker to shed light on the long-term economic implications of combinations of political parties leading the different layers of governments. Therefore, we propose a simple specification for the evolution of public infrastructure per worker as follows[4]

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[4]Our specification is in line with *Nerlove's* (1958).

$$\frac{k_{it}^{pu}}{k_{it-1}^{pu}} = e^{\left(D_{it}'\beta + \varepsilon_{it}\right)} \left(\frac{\hat{k}_{it}^{pu}}{k_{it-1}^{pu}}\right)^{\gamma} \qquad 0 \leq \gamma \leq 1, \tag{1}$$

where $k_{it}^{pu} = K_{it}^{pu}/L_{it}$ is a variable accounting for annual stock of regional public infrastructure per worker in region i during period t. We consider "core infrastructure" in constant euros with base year 2000, K_{it}^{pu}, in region i during period t, which includes streets and highways, water systems, railways, airports, ports and other urban infrastructures provided by local governments from the BBVA and the Economic Research Institute of Valencia (IVIE).[5] The number of employees per year or annual labor input in region i, L_{it}, is based on statistics of the Bancaja Foundation and the IVIE. $\hat{k}_{it}^{pu}$ is the optimal (desired) annual level of regional public infrastructure per worker and γ is the adjustment coefficient towards its optimal level. D_{it} is a vector that collects our political variables including dummy variables for the different combinations of parties ruling both levels of governments and for years t in which regional electoral processes are held.

In our context, right and left parties can hold office in both central and regional governments. However, regional parties can only be in charge of regional governments. Let us define the People's Party (PP) as a right party, and the Spanish Socialist Workers' Party (PSOE) as a left party. Let R (L) be a dummy variable that takes the value of one when the right (left) party holds office in the central government, and zero otherwise. And let

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[5]These correspond to the classification by asset 2.1, 2.2, 2.3, 2.4, 2.5 and 2.6 according to the new methodology of the BBVA Foundation-IVIE .

r, l, n be dummy variables that take the value of one when the right, left and regional parties[6] respectively govern the i autonomous community, and zero otherwise. We also consider dummy variables that take the value of one if the central government holds a majority (M) or a minority (m), thus allowing us to control for the possibility of negotiation between central and regional governments headed by different parties. In line with common political practice, when central governments lack a majority, they are willing to make concessions to regional parties governing autonomous communities in order to gain support for a law, the national budget, a foreign mission, etc. In fact, the Spanish experience shows that regional parties can play a key role in forming the central government when a majority is not reached. On the contrary, when the central government holds a majority, partners are not needed and there is no reason to negotiate to bring a proposal forward.

By constructing the interaction of dummies described above, we can specify the vector that collects the combinations of parties as

$$D_{it} = \left(\begin{array}{c} MRr_{it}, MRl_{it}, MRn_{it}, mRr_{it}, mRl_{it}, mRn_{it}, \\ MLl_{it}, MLr_{it}, MLn_{it}, mLl_{it}, mLr_{it}, mLn_{it}, V_{it} \end{array} \right)' \qquad (2)$$

When the central government holds a majority we have that MRr_{it} (MLl_{it}) is a dummy variable that takes the value of one when the right

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[6] In our sample period, regional or nationalist parties which held office can be considered center-right parties. These include the Partido Nacionalista Vasco (PNV) in the Basque Country, Convergència i Unió (CiU) in Catalonia, Coalicion Canaria (CC) in the Canary Islands, Partido Aragonés (PAR) in Aragon, and Unión para el Progreso de Cantabria (UPCA) and Partido Regionalista de Cantabria (PRC) in Cantabria.

(left) party simultaneously holds office at both levels of government, and zero otherwise; MRl_{it} (MLr_{it}) is a dummy variable that takes the value of one when the right (left) party holds office in the central government and the left (right) party rules the regional government, and zero otherwise; and MRn_{it} (MLn_{it}) is a dummy variable that takes the value of one when the right (left) party holds office in the central government and a regional party rules the regional government, and zero otherwise. When the central government holds a minority, mRr_{it}, mRl_{it}, mRn_{it}, mLl_{it}, mLr_{it}, and mLn_{it} stand for the same combinations as above.[7] V_{it} is a dummy variable that takes the value of one in the years that regional elections are held.

ε_{it} is an *iid* random disturbance.

Notice that whenever $\beta = 0$, no effect of the combination of parties on public infrastructure accumulation is implied. Therefore, in the extreme case of $\gamma = 1$, the public infrastructure of a regional economy can only deviate from its optimal level due to a random disturbance and the expected value of public infrastructure would equal its optimal expected level, $E\left(k_{it}^{pu}\right) = E\left(\hat{k}_{it}^{pu}\right)$. Analogously, if $\gamma = 0$, $E\left(k_{it}^{pu}\right) = k_{it-1}^{pu}$, we expect no growth in public infrastructure. On the contrary, if $\beta \neq 0$ and $\gamma = 1$, the economy can deviate from the optimal level of public infrastructure due to the random disturbance and political factors and we would have that

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[7]Notice that the first year of governance does not cover the whole year. Therefore, if in the first year of governance the party took office before June, this variable takes the value of one, and zero after June.

$E\left(k_{it}^{pu}\right) = e^{D'_{it}\beta}E\left(\hat{k}_{it}^{pu}\right)$. If $\gamma = 0$, the expected public infrastructure level could grow or decrease due to the political factors, $E\left(k_{it}^{pu}\right) = e^{D'_{it}\beta}k_{it-1}^{pu}$.

In order to estimate a model based on equation (1), we follow the same assumptions made by Castells and Solé-Ollé (2005). On the one hand, the central government has to decide whether or not to allocate infrastructure investment in region i in time t based on an expectation of the optimal level of public infrastructure per worker, $E\left(\hat{k}_{it}^{pu}\right)$. On the other hand, since it is difficult for the government to instantaneously adapt the allocation of investment to a region after a change in its economic characteristics and because investment decisions are most likely based on the most recent data available for each region, we specify $E\left(\hat{k}_{it}^{pu}\right)$ as follows

$$E\left(\hat{k}_{it}^{pu}\right) = e^{(\phi_i + \zeta_t)}\left(y_{it-1}\right)^{\varphi_1}\left(\frac{L_{it-1}}{S_i}\right)^{\varphi_2}\left(\frac{c_{it-1}}{km_{it-1}}\right)^{\varphi_3}, \qquad (3)$$

where ϕ_i is a constant specific regional effect, ζ_t is a time effect, y_{it-1} is the output per worker in region i in the $t-1$ period (gross added value per worker in constant euros with base year 2000), L_{it-1}/S_i is the number of workers relative to the surface in region i in the $t-1$ period (agglomeration effect) and c_{it-1}/km_{it-1} is the total number of cars per kilometers of roads in region i in the $t-1$ period (congestion effect).[8]

By substituting (3) in (1), considering (2) and taking natural logarithm

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[8]Regional data on gross added value, surface, cars and roads are taken from the National Statistics Institute of Spain (INE).

and expectations, we obtain the expected regional public infrastructure growth rate

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\begin{aligned}
E\left[\triangle Log\left(k_{it}^{pu}\right)\right] & = \delta_i + \tau_t + \beta_{1R}MRr_{it} + \beta_{2R}MRl_{it} + \beta_{3R}MRn_{it} \quad\quad (4) \\
& +\beta_{4R}mRr_{it} + \beta_{5R}mRl_{it} + \beta_{6R}mRn_{it} \\
& +\beta_{1L}MLl_{it} + \beta_{2L}MLr_{it} + \beta_{3L}MLn_{it} \\
& +\beta_{4L}mLl_{it} + \beta_{5L}mLr_{it} + \beta_{6L}mLn_{it} + \beta_7 V_{it} \\
& +\theta_1 Log\left(\frac{y_{it-1}}{k_{it-1}^{pu}}\right) + \theta_2 Log\left(\frac{L_{it-1}}{S_i}\right) + \theta_3 Log\left(\frac{c_{it-1}}{km_{it-1}}\right)
\end{aligned}
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where $\delta_i = \gamma\phi_i$ is a specific regional effect, $\tau_t = \gamma\zeta_t$ is a time effect and $\theta_1 = \gamma\varphi_1$, $\theta_2 = \gamma\varphi_2$, $\theta_3 = \gamma\varphi_3$.

Notice that our specification given by (4) allows us to capture efficiency criteria, special infrastructure needs and political factors as in Castells and Solé-Ollé (2005).[9] Efficiency criteria are captured by $Log\left(y_{it-1}/k_{it-1}^{pu}\right)$, while special infrastructure needs are collected by the agglomeration and congestion effects.

3.2 Hypotheses

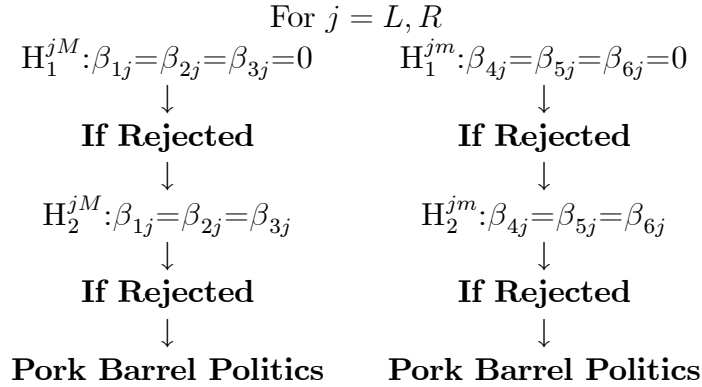The theoretical literature on Pork Barrel Politics offers us the possibility of establishing, *a priori*, a relationship between the parameters associated to the variables that capture the effects of combinations of parties on public

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[9]However, our specification differs from Castells and Solé-Ollé mainly because our endogenous variables are measured per worker as is the set of exogenous variables.

infrastructure growth rate. According to Cox and McCubbins (1986), risk-averse candidates will tend to over-invest in their closest supporters in order to maximize their expected vote. Thus, a party holding office in the central government would favor regions governed by its own party. Therefore, we should expect that $\beta_{1j} > \beta_{2j}, \beta_{3j}$ and $\beta_{4j} > \beta_{5j}, \beta_{6j}$ for $j = L, R$, even though all the coefficients turn out to be negative, since in that case we would have that $|\beta_{1j}| < |\beta_{2j}|, |\beta_{3j}|$ and $|\beta_{4j}| < |\beta_{5j}|, |\beta_{6j}|$.

We also perform a more powerful sequential test as described below.

$$\text{For } j = L, R$$

$$\text{H}_1^{jM}: \beta_{1j} = \beta_{2j} = \beta_{3j} = 0 \qquad \text{H}_1^{jm}: \beta_{4j} = \beta_{5j} = \beta_{6j} = 0$$
$$\downarrow \qquad\qquad\qquad\qquad\qquad \downarrow$$
$$\textbf{If Rejected} \qquad\qquad\qquad \textbf{If Rejected}$$
$$\downarrow \qquad\qquad\qquad\qquad\qquad \downarrow$$
$$\text{H}_2^{jM}: \beta_{1j} = \beta_{2j} = \beta_{3j} \qquad\qquad \text{H}_2^{jm}: \beta_{4j} = \beta_{5j} = \beta_{6j}$$
$$\downarrow \qquad\qquad\qquad\qquad\qquad \downarrow$$
$$\textbf{If Rejected} \qquad\qquad\qquad \textbf{If Rejected}$$
$$\downarrow \qquad\qquad\qquad\qquad\qquad \downarrow$$
$$\textbf{Pork Barrel Politics} \qquad \textbf{Pork Barrel Politics}$$

We first test the hypotheses H_1^{jM} and H_1^{jm}. If we do not reject the hypotheses, we conclude that there is no evidence for the effect of combinations of parties on our endogenous variables, i.e. no evidence of Pork Barrel Politics. Whenever we reject any of them, we find evidence supporting the influence of political factors on our endogenous variables but we cannot conclude that Pork Barrel Politics are taking place. In order to show evidence on that, we test the second set of hypotheses, H_2^{jM} and H_2^{jm}. The rejection of any of the hypotheses implies that a party holding office in the central gov-

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ernment discriminates across regions, since there would be different effects regarding the regional government, i.e. evidence of Pork Barrel Politics.

4   Estimation Issues

Table 1 shows the panel data regression for $\triangle Log\left(k_{it}^{pu}\right)$ using the least squares dummy variable approach (LSDV) to estimate the individual and time fixed effects which are not shown for reasons of space. All the regions of Spain (autonomous communities, NUTS2) are included: [10] Andalusia, Aragon, the Principality of Asturias, the Balearic Islands, the Basque Country, the Canary Islands, Cantabria, Castile-La Mancha, Castile and Leon, Catalonia, Extremadura, Galicia, La Rioja, Madrid, Murcia, Navarre and Valencia.

The estimations are robust to heteroskedasticity using a covariance matrix à la White (1980). Although our controllers exhibit the expected signs, only the congestion effect has a significant positive effect at the 10% level of significance. According to these results, efficiency criteria and special needs do not play a relevant role in the allocation of public infrastructure in Spain. Although Castells and Solé-Ollé (2005) found that some efficiency criteria and special needs variables have a statistically significant effect, they conclude that these variables play a limited role.

Regarding the political variables, note that all our Pork Barrel expecta-

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[10]From 1979 to 1983, all the regions of Spain were established as autonomous communities. The process concluded in 1996 when Ceuta and Melilla gained autonomous status, but these last two cities are not considered in our study due to the lack of data for the entire period.

tions have been fulfilled. We have obtained that $\beta_{1j} > \beta_{2j}, \beta_{3j}$ and $\beta_{4j} > \beta_{5j}, \beta_{6j}$ for $j = L, R$. Moreover, $\beta_{2j} > \beta_{3j}$ and $\beta_{5j} > \beta_{6j}$. It is striking that regions governed by regional parties are benefitted to a lesser degree. In fact, they exhibit negative effects in all cases. This result could somehow suggest that in regions governed by a regional or nationalist party, voters could be classified as an opposition group according to Cox and McCubbins (1986), that is, a group which is consistently opposed to the central government or that finds more reasons for opposing than agreeing with the central government. Notice that during minority left-wing central governments, $|\beta_{4L}| < |\beta_{5L}| < |\beta_{6L}|$ coincided with the implementation of policies to correct the severe public deficit in the mid-nineties. However, regions governed by opposition parties seem to have suffered higher cuts in public infrastructure spending per worker.

A glance at the individual statistical significance of combinations of parties reveals that under right-wing central governments, the only significant coefficient with a positive value is the coefficient for those regions also governed by right parties, which hold both a majority and a minority (β_{1R} and β_{4R}). As we already pointed out, under minority left-wing central governments, we obtain that, all regions exhibit a negative effect of the combination of parties on $\triangle Log\left(k_{it}^{pu}\right)$. However, strong evidence is found for regions governed by opposition parties since we reject the null hypothesis of significance at 5%, while we cannot reject the null hypothesis for regions governed by left

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parties. Moreover, under majority left-wing central governments, we obtain that the only significant coefficient at the 5% level is the coefficient for regions governed by regional parties and with a negative sign. No evidence of regional electoral processes was found.

Notice that the model is able to explain about 81% of the variability of the $\triangle Log\left(k_{it}^{pu}\right)$ and the DW statistic is close to 2, suggesting that there are no autocorrelated residuals and that relevant economic variables have not been omitted in our specification.

We also test the null hypotheses of equal individual and time fixed effects (W_i and W_t). Both are rejected. Therefore, different regional and time fixed effects affect $\triangle Log\left(k_{it}^{pu}\right)$.

Let us now show the results of our sequential test in Table 2. Considering up to a 10% significance level, we have found that all the hypotheses are rejected. Therefore, evidence of Pork Barrel Politics is found under both right-wing and left-wing central governments holding a minority and a majority. At the 5% level of significance we have found evidence of Pork Barrel Politics under right-wing governments holding both a majority and minority and under majority left-wing central governments. At the 1% level of significance, evidence of Pork Barrel Politics is only found under majority left-wing central governments.

5   Conclusions

In this article we test the effects of different combinations of parties ruling the central and regional governments on public infrastructure accumulation. We therefore cast evidence on the existence of Pork Barrel Politics.

We specify an equation for the growth rate of regional public infrastructure per worker that allows us to account for efficiency criteria, special infrastructure needs and political factors.

Using panel data regression for the regions of Spain during the 1988-2004 period, we find evidence to support that certain combinations of parties (among right, left and regional parties at the central and regional level) have significant effects on public infrastructure accumulation. Our results show evidence of Pork Barrel Politics under both right-wing and left-wing central governments regardless of whether or not they hold a majority or a minority in the central parliament. However, a stronger result is found under majority left-wing central governments.

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Table 1: Panel Data Regression for the growth rate of Public Infrastructure

	Coefficient	Std. Error
MRr	0.0210***	0.0076
MRl	0.0125	0.0077
MRn	-0.0084	0.0122
mRr	0.0266***	0.0085
mRl	0.0079	0.0094
mRn	-0.0092	0.0153
MLl	0.0059	0.0182
MLr	0.0010	0.0207
MLn	-0.0387**	0.0187
mLl	-0.0305*	0.0182
mLr	-0.0372**	0.0187
mLn	-0.0548***	0.0191
V_{it}	0.0015	0.0040
$Log\left(\frac{L_{it-1}}{S_i}\right)$	0.0160	0.0331
$Log\left(\frac{c_{it-1}}{km_{it-1}}\right)$	0.1214*	0.0728
$\triangle Log\left(y_{it-1}/k_{it-1}^{pu}\right)$	0.0337	0.0269
R^2	0.8076	
DW	2.2138	
W_i	80.6234	0.0000
W_t	291.0058	0.0000

$*\,{*}*, *\,*, *$ = Significant at 1%, 5% and 10% levels, respectively.

Table 2: Sequential Hypothesis Testing

	For $j = R, L$	
	$\downarrow$	$\downarrow$
	$\text{H}_1^{jM}{:}\beta_{1j}{=}\beta_{2j}{=}\beta_{3j}{=}0$	$\text{H}_1^{jm}{:}\beta_{4j}{=}\beta_{5j}{=}\beta_{6j}{=}0$
Right	11.6557 (0.0087)	11.6035 (0.0089)
Left	17.8087 (0.0005)	10.8787 (0.0124)
	Rejection	**Rejection**
	$\downarrow$	$\downarrow$
	$\text{H}_2^{jM}{:}\beta_{1j}{=}\beta_{2j}{=}\beta_{3j}$	$\text{H}_2^{jm}{:}\beta_{4j}{=}\beta_{5j}{=}\beta_{6j}$
Right	6.8106 (0.0332)	7.1283 (0.0283)
Left	17.2744 (0.0002)	5.4309 (0.0662)