DOCUMENT DE TREBALL

XREAP2010-15

Is it Redistribution or Centralization? On the Determinants of Government Investment in Infrastructure

Daniel Albalate (GiM-IREA)
Germà Bel (GiM-IREA)
Xavier Fageda (GiM-IREA)

XARXA DE REFERÈNCIA EN ECONOMIA APLICADA

IS IT REDISTRIBUTION OR CENTRALIZATION?
ON THE DETERMINANTS OF GOVERNMENT INVESTMENT IN INFRASTRUCTURE

Daniel Albalate*, Germà Bel* ^ & Xavier Fageda*
* Universitat de Barcelona
^Barcelona Graduate School of Economics

Abstract:
The efficiency-equity dilemma, in conjunction with political partisan interests, has received increasing attention in attempts to explain the territorial allocation of investment. However, centralization policies that seek to introduce or reinforce the hierarchization of the political system have, as yet, to be subject to empirical analysis. The main contribution of this paper, therefore, is that it provides evidence that meta-political objectives concerning the organization of political and administrative power do influence regional investment. Using data from Spain, we demonstrate that investment programs in network modes (i.e., roads and railways) are influenced by the centralization strategy of investing in regions near the state's political capital, while investment efforts in non-network modes (i.e., airports and ports) appear to be positively related to distance to the capital. Since investment in surface network transportation infrastructure is much higher than that in airports and ports, and taking into account that the regions surrounding the political capital are poorer than the state's average, we suggest that centralization rather than redistribution has been the driver behind the concentration of public investment in these regions.

Keywords: Investment, infrastructure, centralization, redistribution

Authors' e-mails: albalate@ub.edu, gbel@ub.edu, xfageda@ub.edu

Acknowledgements: This research has received financial support from the Spanish Ministry of Science and Innovation (ECO2009-06946/ECON), and from the Autonomous Government of Catalonia (SGR2009-1066). We have benefited from useful comments by Albert Solé-Ollé.

Is it redistribution or centralization? On the determinants of government investment in infrastructure

Daniel Albalate*, Germà Bel* ^ & Xavier Fageda*
* Universitat de Barcelona
^Barcelona Graduate School of Economics

Introduction

The economic literature has paid increasing attention to the analysis of the factors that explain the regional allocation of public investment in infrastructure (Yamano and Ohkawara, 2000; de la Fuente, 2005; Kemmerling and Stephan, 2002 and 2010; Knight, 2004; Castells and Solé-Ollé, 2005; Bel and Fageda, 2009; Solé-Ollé, 2010). Research in this field has focused extensively on the efficiency-equity dilemma, in conjunction with political partisan interests, to explain the territorial allocation of investment.

However, focusing solely on this dilemma might lead to one potential objective of transport infrastructure and services policy being overlooked: namely, the determination of the patterns of political power and the hierarchical structure of territorial administration. In a stimulating paper, Faguet (2004) sets out to answer the question as to why there is so much centralization in the first place. His model locates central government in a particular geographical space, the "capital", and invokes self-interest on the part of its residents. According to Faguet's analysis, centralization is a consequence of the interests of those that live in the capital city, as they are the ones that benefit directly from a highly centralized government within a context where the constitutional guarantees of territorial government are only weak.

This use of infrastructure policy to foster centralization has been analysed in the economic history literature for the Australian case - see, for instance, Wotherspoon, 1979; Docwra and Kolsen, 1989 and Gray, 2009 - and for the Spanish case – see Bel, 2010. However, to the best of our knowledge, the literature lacks robust empirical evidence to support this hypothesis. We believe that adopting this approach should shed light on the question as to how infrastructure investment is allocated by the central government. This, in turn, should complement analyses that centre on the efficiency-equity dilemma and their extension to a consideration of political factors.

The main contribution of this paper, therefore, is that it provides evidence that meta-political objectives concerning the organization of political and administrative power do influence regional investment. Spain proves to be an interesting testing ground to determine whether policies aimed at administrative and political centralization have influenced the regional allocation of investment. The main results from our empirical analysis show that investment programs in network modes (i.e., roads and railways) are negatively related to the distance from the capital city; thus, they are influenced by the centralization strategy of investing near the state's political capital. By contrast, investment efforts in non-network modes (i.e., airports and – obviously – ports) appear to be positively related to distance to the capital. Note that investment in terrestrial network transportation infrastructure is much higher than that in airports and ports. Given that regions surrounding the political capital are relatively poorer would suggest that centralization rather than redistribution has been the main driver behind the concentration of public investment in these regions.

The remainder of the paper is organized as follows. First we review the related literature. Next we explain our empirical strategy. Then we present our results, and discuss their main implications. Finally, we draw our main conclusions.

Literature review

The economic literature has paid increasing attention to analysing the factors that might account for the regional allocation of public investment in infrastructure. Early studies in this vein, such as Yamano and Ohkawara (2000) and de la Fuente (2005), focused on the traditional efficiency-equity trade-off. Other studies, while still concerned with this trade-off, extended their analyses to include the role of political factors as determinants of government investment in infrastructure.

Kemmerling and Stephan (2002) show that – in addition to the will to promote equity – the distribution of investment grants among German cities is positively related to the political support the incumbent party enjoys in each city. Similarly, Knight (2004) analyses US Congressional votes over the funding of transportation projects, and finds that the probability of supporting such projects increases in cases of own-district spending.

Castells and Solé (2005) also find that political considerations matter, since governments tend to invest more heavily in the regions where electoral productivity is highest. More recently, Bel and Fageda (2009) found regional investment in Spain's airports to be positively related to the electoral support for the incumbent party of national government. They also reported a positive relation with party alignment in national and regional governments (i.e., when the same political party holds power in both tiers).

Adopting a similar line, Kemmerling and Stephan (2009) emphasize the importance of country-specific political institutions in order to explain the regional distribution of investments.

In analysing this, the authors undertake a cross-country empirical analysis, considering France, Germany, Italy and Spain. This set of countries includes both federal (Germany and Spain) and unitarian (France and Italy) states, as well as distinct electoral systems.

Kemmerling and Stephan (2009) distinguish between (1) normative factors - those of efficiency, redistribution and equity, noting that the first two factors constitute conflicting objectives; and (2) political factors, among which they emphasize the ideology held by political parties (assuming left-wing and regionalist/separatist parties to be positively related with investment in the region), partisanship (where party alignment in national and regional governments results in the regions receiving greater central investment); and (3) the electoral interests of the national government (higher investment in pivotal regions and in the party's strongholds).

The results these authors report from their empirical estimation suggest that efficiency concerns are important in all four countries, and that redistribution is likewise a common key objective (albeit not statistically significant in the case of France). However, their results concerning the equity objective are more ambiguous, and no unequivocal conclusion can be drawn. As for the political variables, here their results are much more mixed, and major cross-country differences emerge. For example, partisan strongholds receive more investment in Spain and Italy, but this is not the case in either Germany or France; regional parties are positively related with regional investment in Spain, but this is not so in Italy, left-wing parties are related with higher regional investment in Italy and France, but this is not the case in Germany or Spain. Overall, there is considerable diversity concerning the effects of political variables, though two general trends can be identified: (a) ideological variables only play a significant role in centralized systems, and (b) electoral incentives play a role in most countries.

Solé-Ollé (2009) analyses why "fiscal deficits" attributable to investment in infrastructure are the subject of heated debate and concludes, firstly, because such deficits sustained over time can mean that the infrastructure capital stocks in rich regions are too small; second, because the central government can exercise considerable discretion in the territorial allocation of infrastructure investments; and third, because it is not exactly clear what the 'objective criteria' of infrastructure investment might actually be. Clearly, an important distinction has to be borne in mind in order to interpret the concepts here. On the one hand, there is tactical redistribution, the so-called pork barrel politics; on the other, there is programmatic redistribution, based on the citizen-candidate approach. What matters is that preferences regarding how society is best organized are also influenced by political decisions.

Solé-Ollé (2009) draws on data for investment and capital stock at Spain's provincial level between 1978 and 2004. The period 1964-1977, before democracy was reestablished in Spain, is also considered in the study, but is not included in the analysis of political variables, of which he includes the following four in his empirical model; (1) *Margin* - derived from swing voter theory; (2) *Votes/seats* - associated with efforts to maximize the effectiveness of investments so as to 'buy' votes; (3) *Aligned governments* – i.e., Do your party comrades rule the region?; and (4) *Pivotal* - indicating whether the central government needs support from regional specific parties. All these variables were reported as working reasonably well, although the results for alignment were mixed: alignment usually proving significant for Social-Democrat (the PSOE in the case of Spain) governments, but not for Conservative (PP in the case of Spain) governments.

Overall, Solé-Ollé's (*op. cit.*) results suggest that the regional allocation of infrastructure investment in Spain is heavily affected by political questions, with the impact of tactical redistribution and programmatic redistribution being equally strong. More specifically, he ventures that the two main reasons why a region would obtain less investment than deserved are the fact of it: a) being a region of limited political power, and b) belonging to a group (according to the region's characteristics) that also has limited political power.

Solé-Ollé's (2009) results show a high degree of consistency, reflecting perhaps the fact that single-country studies allow a much wider set of variables to be considered. Undoubtedly, his estimation benefits from this.

An interesting question to emerge from these earlier studies is that of how best to approach the criterion of efficiency. While relating regional output to the region's infrastructure stock seems a sensible way to approach the issue in an aggregated manner, the methodology would benefit from undertaking a more detailed and disaggregated analysis. Rich regions do not always have high project impact, and by the same token poor regions do not always have low project impact. This matter crucially depends on the previous stocks of a given type of infrastructure. For instance, Spain's motorway plan (1984-1991) in stressing investment in areas where high capacity roads were absent was more than likely adhering to a criterion of efficiency. Technically, what is really important is not whether a region is rich or poor, but its traffic intensity (i.e., average daily traffic) adjusted for the existing motorway capacity (current level of service).

A further distinction that might prove useful is that which exists between budget-funded infrastructure and user-funded infrastructure. The former is exemplified by the case of railway infrastructure in all countries, and by that of most of the motorways in Spain and (almost all those) in Germany. However, most motorways in France and Italy are tolled, as is a non-negligible part (roughly 25%) of the motorway network in Spain. Generally, airports and ports are funded by user charges (albeit that some cross subsidies are provided in some countries). It is quite possible that a national government will apply different criteria to the regional allocation of specific infrastructure investment depending on just how that investment is to be funded. In principle, redistribution and political objectives are more likely to form part of budget-funded infrastructure than infrastructure paid for by users. Thus, a disaggregated analysis according to infrastructure type could provide more robust results.

As discussed above, Faguet (2004) seeks to offer explanations for centralization. In this paper, we attempt to verify his hypothesis for the case of Spain. It is our belief that the approach we adopt should facilitate an understanding of how infrastructure investment is allocated by the central government, supplementing analyses based on the efficiency-equity dilemma and the further consideration of political factors.

Empirical analysis

- Data and variables

First, we describe the variables used in the empirical analysis and identify the sources drawn upon. The data for each of these variable were obtained at the Spanish provincial level, which means we have information for 51 provinces (*provincias*), for a period that runs from 1981 to 2005.[1] In total, we have some 1,275 observations. The main variables were the following:

Dependent variable

Our main concern is to identify the determinants of central government investment efforts during the period studied. Therefore, our dependent variable is the ratio between gross investment in transportation infrastructure made by central government *(I)* and the gross stock of capital in transportation infrastructure in the previous period (k_{t-1}). Information for these variables was obtained from the *Fundación BBVA-Instituto Valenciano de Investigaciones Económicas* **(**FBBVA-IVIE) website. Data are expressed in thousands of current euros and are available for each transportation mode: roads, railways, airports and ports.

Regressors and instruments

1. Distance between the centre of each region's capital and Madrid's city centre (*Distance_capital*). The data for this variable were computed using the algorithm of Google

[1] The only province not considered in our sample is Ceuta (the autonomous city on the North African side of the Strait of Gibraltar), owing to a problem of missing data for several variables.

Maps in which we calculate the shortest route in kilometres by road. This variable measures the central government's centralization objective.

2. Gross domestic product per capita (*GDP_per_capita*). Information for this variable was obtained from the Spanish Statistics Institute (INE). Data are expressed in thousands of current euros. This variable captures economic wealth and, as such, it measures the central government's redistributional objective through its infrastructure investment effort. In an effort to overcome problems of endogeneity, we also used the mean number of schooling years of the active population (*edu*) as an instrument for predicting current GDP. Information for this variable was also obtained from the FBBA-IVIE website.

3. Percentage number of votes obtained by the incumbent party in central government at the elections to the central parliament across regions (*Votes*). Information for this variable was obtained from the Ministry of Domestic Affairs' website. This variable captures the opportunistic political behaviour of the incumbent party in central government.

4. Population (*Pop*). Information for this variable was obtained from the INE. Data are expressed in terms of the total number of inhabitants and are a measure of mobility needs.

5. Land area of the province (*Land*). Information for this variable was obtained from the INE. Data are expressed in terms of square kilometres and provide a further measure of mobility needs.

- **Estimation strategy**

In line with the cross-section time series nature of the data, we performed several estimations to test our main hypotheses. First, we regressed total investments on several groups of determinants (**Model 1**) so as to analyse the political objectives of redistribution, centralization and electoral opportunism (i.e., our policy regressors), as well as a number of other control variables. The centralization objective was determined using the distance from the capital to the province receiving investments as our covariate. Thus, we expected a negative relationship between this variable and the total investment effort so as to confirm our hypothesis. Likewise, a negative correlation between *GDP_per_capita* and total investment effort would mean that redistribution had been considered when designing these investment programs. Since the literature also points to the fact that the government (or incumbent party) tends to favour those political communities from which it receives most electoral support, we introduced this opportunistic behaviour by including the *Votes* variable in the model. Here, we expected a positive relationship between the percentage of votes polled by the incumbent party of central government and the amount of investment in the corresponding province.

Among the control variables, three groups of regressor can be distinguished. The first group is formed by covariates that capture mobility needs, namely population (*Pop*) and land area (*Land*). The second group controls for investment inertia and previous capital stock as determinants of current investments. Here, the variables introduced are the first lag of total investment efforts (i_{it-1}^{total}) and the first lag of capital stock per capita (k_{it-1}^{total}). The third and final group of regressors contain a dummy variable (D^{foral}) denoting with a value of 1 the provinces that have jurisdiction - due to political decentralization – over the network modes of road and rail transport and 0 otherwise. In addition, we included the time trend to take into account the time dimension of our data.

We expected investment efforts to be positively associated with mobility needs but to present mixed – or at least unclear - effects with the second group of regressors. In fact, government investment programs tend to extend over more than one year, which implies an inertia that should positively correlate with current total investments. However, there will tend to be fewer investment needs in regions where the investment effort has been high in recent years thereby satisfying the needs for better or new infrastructure. A similar uncertainty can be attributed to past capital stock. Indeed, regions with more capital stock present lower public investment needs but it not unreasonable to consider that once a region has certain infrastructure it will have to maintain and renew this stock. If this is the case then we would expect a positive relationship between the lag of capital stock and current investments. Yet, recent studies support a negative correlation between investment efforts and previous capital stock in Spain (Sole-Ollé, 2009)

Finally, the remaining control regressor, the binary variable (D^{foral}) should have a negative impact on central government investments in those transport modes under the jurisdiction of regional governments. Given that these modes are surface network modes, accounting for most of central government investments, this negative relationship is clearly expected.

Below we present the specification of **Model 1**:

Model 1: $i_{it}^{total} = \alpha + \beta_1 Distance\_capital_i + \beta_2 GDP\_per\_capita_{it} + \beta_3 Votes_{it} + \beta_4 Pop_{it} + \beta_5 Land_i + \beta_6 i_{it-1}^{total} + \beta_7 k_{it-1}^{total} + \beta_8 D^{foral} + \beta_9 Time\_trend + \varepsilon$

Although we tested our hypothesis on the political objectives set by successive Spanish central governments in their investment program design, recall that we are also interested in distinguishing the statistical impacts of the transportation modes so as to show that considering total investments alone can lead to a misinterpretation of results. For this reason, in **Model 2** and **Model 3** we replicated the estimation strategy differentiating between network (roads and rail) and non-network modes (airports and ports), respectively. This should account for the different characteristics of network and non-network infrastructure. Indeed, network infrastructure limits the ability to extend the transportation stock, a limitation that is not suffered by non-network infrastructure. Thus, the regional investment distribution should only be restricted by the existing network in the case of surface network modes. This means that we should expect a stronger relationship between investment efforts and existing capital stock in the case of network infrastructure. The two models aggregated by mode are presented below:

Model 2: $i_{it}^{network} = \alpha + \beta_1 Distance\_capital_i + \beta_2 GDP\_per\_capita_{it} + \beta_3 Votes_{it} + \beta_4 Pop_{it} + \beta_5 Land_i + \beta_6 i_{it-1}^{network} + \beta_7 k_{it-1}^{network} + \beta_8 D^{foral} + \beta_9 Time\_trend + \varepsilon$

Model 3: $i_{it}^{no\text{-}network} = \alpha + \beta_1 Distance\_capital_i + \beta_2 GDP\_per\_capita_{it} + \beta_3 Votes_{it} + \beta_4 Pop_{it} + \beta_5 Land_i + \beta_6 i_{it-1}^{no\text{-}network} + \beta_7 k_{it-1}^{no\text{-}network} + \beta_8 D^{island} + \beta_9 Time\_trend + \varepsilon$

As is evident, Model 3 (non-network investment) includes a variable not found in Model 2 (network investment). This covariate is a dummy variable that identifies with a value of 1 those provinces that are an island (D^{island}) and 0 otherwise. This binary variable is considered necessary to account for investment in point-to-point transportation infrastructure, such as ports and airports, given that these provinces (islands) are not linked to the rest of the network infrastructure for obvious reasons. Here, the estimation that uses aggregate investment and investment in network modes as dependent variables excludes from its sample the island provinces. After all, our main goal is to distinguish between the different policy objectives pursued by central government and including islands in the estimations that consider surface network modes could distort the results of the *Distance* variable.

If the differences between network and non-network infrastructure can lead to information loss or misinterpretation when combined in this way, it is useful to replicate the empirical strategy for each transportation mode separately to further investigate investment policy heterogeneity.

Models 4-7 therefore consider the investment effort for road, rail, airports and ports, respectively and are presented in the appendix together with their main results.

Note that the only difference between **Model 4** and the basic **Model 2** for network investments is the introduction of private investments in the road mode equation. These investments are made by private toll motorway companies and, as such, we expect lower investment efforts when private investment serves to substitute public stocks.

- Estimation and results

Below we present the results of the estimation of the total investment effort equation (**Model 1**). **Tables 1** and **2** show the descriptive statistics and the correlation matrix of the main variables used in the empirical analysis, respectively. From these tables, we can see that all the variables present sufficient variability, while the multicollinearity between regressors did not seem to pose a problem.[2]

Insert table 1 about here

Insert table 2 about here

We estimated the investment equations using the Two-Stage Least Squares estimator (2SLS-IV) because the GDP per capita variable may be endogenous. Indeed, we suspect that the level of investment and income in a province are determined simultaneously. Greater investment in transport infrastructure should have a substantial economic impact on the province benefiting from those investments. As instruments of GDP per capita, we used the first lag of this variable and the mean number of schooling years in each province as a proxy of the level of education. Note that neither the Hansen test nor the test of significance of the instruments rejected the null hypotheses that the instruments are exogenous and strongly correlated with the instrumented variables (See **table 3**). As such, these tests provide evidence of the validity of the instruments.

Note also that we computed standard errors that were robust to any bias from heteroscedasticity. Additionally, we adjusted our estimates by clustering observations from the same region to account for the possible correlation between observations (provinces) in the same region (*Comunidad Autónoma*).

Our estimation procedure does not take into account the panel data nature of the sample. The use of a fixed-effects model is not appropriate in our context since this technique excludes anything that is time-invariant from the model, such as the distance from Madrid or the fact of

[2] The only exception was the high correlation between GDP per capita and the stock of capital. As we will see below, this high correlation did not distort the individual interpretation of results for these variables.

being an island. A random-effects model is also not appropriate because the individual effects related to provinces are likely to be correlated with the error term, as indicated by the Hausman test. Finally, the Hausman-Taylor estimator is inappropriate as it assumes all explanatory variables to be exogenous.

Table 3 displays the results of the estimates of the investment effort equations. We first estimated the total investment equation considering all transportation modes and then we differentiated between network modes and non-network modes, as described in the previous section. The results of the estimates of these specifications are indicated in **table 3**. In table A1, in the appendix, we also show the results of the estimates of the investment effort equations for each transportation mode. Recall that a key point in our analysis was to identify differences between investment patterns in network and non-network modes.

Insert table 3 about here

Results for total investments (**Model 1**) presented the expected relationships – with the sole exception of GDP per capita, which was positively related to total investments per capita – and showed a good model fit (R^2 = 0.56; F-test = 772.51***). Our results confirm the centralization hypothesis by finding a negative and highly statistically significant impact of the variable capturing the distance from the political capital. Thus, regions close to Madrid seem to receive more investment efforts than is the case of the more distant regions. By contrast, the redistribution objective, captured by the GDP per capita variable, does not seem to have played a significant role in central government investment programs. Indeed, we found a statistically significant relationship for this coefficient that implies more investment efforts were made in rich provinces than in poor regions. Finally, as the first two policy variables were statistically significant, the number of electoral votes received in a given province by the incumbent party in central government did not seem to drive total investment plans, at least when we considered all modes from an aggregate perspective.

As for mobility needs as a determinant of investment, our results were disappointing with neither of the variables used (i.e., population and land area) being statistically significant at the 10% level, although they presented a positive impact on the dependent variable, with the land area coefficient being significant at the 15% level. More significant were the variables accounting for investment inertia and existing capital stock. On the one hand, the lag of total investments (**i_{it-1}**) positively correlated with total investments and was highly significant, clearly indicative of the fact that investment programs usually extend over several years. On the other hand, the impact produced by the lag of capital stock (**k_{it-1}**) on current investment efforts was negative, in line with the recent literature. This implies that total investment efforts tended to promote new infrastructure in provinces with lower stock endowment.

Finally, note the importance of using a variable denoting those regional governments with jurisdiction over their network modes. The highly significant coefficient recorded confirms that central government reduces its investment efforts when such powers have been transferred.

Model 2 (network modes) and **Model 3** (non-network modes) show that most of **Model 1's** (aggregate investment) results are driven by network modes. Indeed, the model fit is not as good and several coefficient signs and statistical significances change in **Model 3**. For instance, network mode investment programs are influenced by the centralization strategy of investing near the political capital, while non-network mode investment appears to be positively related to distance. This means, as expected, that large ports and large airports are found only at some distance from the political capital. Given that Madrid is situated in the geographic centre of Spain (unlike most political capitals in Europe, which enjoy close access to water transportation modes) is an obvious explanation for the result for the ports, but in the case of airports too the transportation policy has avoided regional investments close to Madrid. This is equivalent to saying that no airports of any size have been built to compete with the capital's airport. This is confirmed by **Model 6** (airports) and **Model 7** (ports) for each of the non-network modes.

The rest of the policy variables also provided mixed results. First, the *GDP per capita* variable would seem to be relevant in non-network modes, although it was positively correlated with network investments. Second, the *Votes* variable was one of the only statistically significant coefficients in **Model 3** (non-network modes) although it was not significant in the previous models.

Significant differences were also to be found for the variables measuring mobility needs. Land area was associated with greater network investments, while in the case of non-network investments the population variable was significant at the 10% level. As for the other variables, the investment inertia coefficient was the only variable to share the same sign and statistical significance in both network and non-network models, although its coefficient fell appreciably when non-network modes were considered on their own. Previous stock was not a driving determinant of investment in non-network modes and the fact of being an island was only significant at the 15% level.

Insert table 4 about here

Finally, the results by transportation mode for network and non-network investments are presented in the **Appendix** (**Table A1**). The results show that the road and port investment equations provided a better fit than the rail and airport models. In fact, the lack of data to describe specific traffic by mode could be a reason for their weakness. Overall, we found that the distance to the political capital was still statistically significant in all cases except for airports, albeit that the sign was positive for ports and negative for network modes in line with results presented before. Here again, the redistribution objective did not play any obvious role in determining specific mode investment efforts. However, the electoral opportunistic strategy presented itself as an important determinant of investment efforts in the case of roads, airports and ports. Interestingly, private investment in road transportation, led by toll motorway companies, reduced public investment efforts in regions with such private concessions. And, as expected, island provinces also seemed to obtain greater investment efforts for non-network – airports and ports - infrastructure than was the case with the mainland provinces.

Concluding remarks

The literature examining the determinants of the regional allocation of infrastructure investment shows that efficiency and redistribution are important drivers behind the decisions taken by central governments. Additionally, political factors such as electoral strength and party alignment have been shown to play a role. However, it is our claim that greater attention needs to be paid to factors associated with the broader meta-political objectives that the central government sets itself and seeks to implement through specific policies such as infrastructure investment.

Our results for those variables traditionally dealt with in the literature (both economic and political) are generally consistent with previous empirical evidence. Yet, regarding our main empirical contribution, we have found that investment in surface network modes is influenced by the centralization strategy of investing near to the political capital. By contrast, the investment effort in non-network modes appears to be positively related to distance to the capital. Since investment in surface network transportation infrastructure is much higher than that in airports and ports, and taking into account that the regions surrounding the political capital are poorer than average, we suggest that centralization rather than redistribution has been the driver behind the concentration of public investment in these regions.

The Spanish case would seem to illustrate the fact that centralization can be a major driver of the allocation of surface transportation infrastructure. Moreover, it could well be the case that what has traditionally been classed as redistribution is in fact a policy that seeks to connect the capital (the geographical centre) with the peripheral regions by means of the transport infrastructure that happens to cross through less developed regions. This raises the question: Is the main driver redistribution or centralization?

References

Bel, Germà (2010). *Infrastructure and nation building: The regulation and financing of network transportation infrastructures in Spain (1720-2010)*, Working Paper IREA

Bel, Germà and Xavier Fageda (2009). 'Preventing competition because of solidarity: Rhetoric and reality of airport investments in Spain', *Applied Economics* , 41(22), 2853-2865.

Castells, Antoni and Albert Solé-Ollé (2005). 'The regional allocation of infrastructure investment: the role of equity, efficiency and political factors', *European Economic Review,* 49 (5), 1165-1205.

De la Fuente, Angel (2004). 'Second-best redistribution through public investment: a characterization, an empirical test and an application to the case of Spain', *Regional Science and Urban Economics,* 34 (5), 489-503.

Docwra, G.E. & Kolsen, H.M. (1989). Transport and Australian federalism, 1901-1972. *Journal of Transport History, 10,* 59-73.

Gray, I. (2009). Maintaining the power of central governments: Regional land transport in the Australian Federation, 1850-2007. *Journal of Transport History, 30*, 22-39.

Faguet, Jean-Paul (2004). *Why so much centralization? A model of primitive centripetal accumulation*. London School of Economics, STICERD: Research Paper No. DEDPS 43.

Kemmerling, Achim and Andreas Stephan (2002). 'The contribution of local public infrastructure to private productivity and its political economy: evidence from a panel of large German cities', *Public Choice,* 113 (3/4), 403-424.

Kemmerling, Achim and Andreas Stephan (2009). *The determinants of regional transport investment across Europe*, Working Paper.

Knight, Brian (2004). 'Parochial interests and the centralized provision of local public goods: evidence from congressional voting on transportation projects', *Journal of Public Economics*, 88 (3/4), 845-866.

Solé-Ollé, Albert (2009), *The determinants of the regional allocation of infrastructure investment in Spain*, Working Paper.

Yamano, Norihiko and Toru Ohkawara (2000). 'The regional allocation of public investment: efficiency or equity?', *Journal of Regional Science,* 40 (2), 205-229.

Wotherspoon, G. (1979). The determinants of the pattern and pace of railway development in New South Wales, 1850-1914. *Australian Journal of Politics & History, 25*, 51-65.

TABLES

Table 1. Descriptive statistics of the variables used in the empirical analysis (N = 1275)

Variable	Mean Value	Standard Deviation	Minimum value	Maximum value
i^{total}	0.041	0.03	0.00007	0.32
$i^{network}$	0.041	0.052	0	1.10
$i^{no\text{-}network}$	0.09	0.34	0	9.82
k_{t-1}^{total}	3.14	2.46	0.24	16.22
$k_{t-1}^{network}$	2.90	2.45	0.01	16.22
$k_{t-1}^{no\text{-}network}$	0.24	0.38	0	2.88
Distance_capital	426.53	320.81	0	1770
GDP_per_capita	9,702.98	5,566.76	825.71	28,971.92
Land	10,162.75	4,847.82	12.3	21,766
Population	779,964.1	938,331.4	52,388	5,964,143
Votes_Incumbent_Party	41.89	9.87	15	66

Table 2. Correlation Matrix of the variables used in the empirical analysis (N=1150)

	i^{total}	$i^{net.}$	$i^{no\text{-}net.}$	$k_{t-1}^{tot.}$	$k_{t-1}^{net.}$	$k_{t-1}^{no\text{-}net}$	**Dist.**	**GDPc**	**Land**	**Pop.**	**Vot.**
i^{total}	1										
$i^{network}$	0.98	1									
$i^{no\text{-}network}$	0.01	-0.009	1								
k_{t-1}^{total}	-0.07	-0.06	0.012	1							
$k_{t-1}^{network}$	-0.07	-0.06	0.008	0.99	1						
$k_{t-1}^{no\text{-}network}$	-0.04	-0.06	0.04	0.17	0.05	1					
Dist.	-0.12	-0.14	0.07	-0.15	-0.21	0.47	1				
GDPc	-0.06	-0.07	0.08	0.81	0.78	0.37	-0.003	1			
Land	0.19	0.22	-0.06	-0.04	0.007	-0.42	0.32	-0.19	1		
Pop.	0.11	0.06	0.06	-0.20	-0.24	0.24	0.10	0.11	-0.14	1	
Votes	0.17	0.18	0.02	-0.06	-0.05	-0.09	-0.06	-0.16	0.40	-0.03	1

Note: In the computation of correlations, we excluded provinces located on islands.

Table 3. Investment equation estimates (2SLS)

	Model 1: All modes	Model 2: Network modes	Model 3: Non-network modes
Distance_capital	-9.06e-06 (2.37e-06)***	-0.000010 (2.41e-06)***	0.00015 (0.00008)*
GDP_per_capita	6.37e-07 (2.09e-07)***	5.73e-07 (1.91e-07)***	0.000010 (7.31e-06)
Land	2.14e-07 (1.33e-07)$^{+}$	2.97e-07 (1.35e-07)***	-4.06e-06 (4.38e-06)
Population	1.30e-10 (4.56e-10)	-3.23e-10 (3.97e-10)	1.42e-08 (6.94e-09)*
Votes_Incumbent_Party	0.00006 (0.00008)	0.00004 (0.00009)	0.0022 (0.00069)***
i_{it-1}	0.71 (0.032)***	0.70 (0.03)***	0.15 (0.08)*
k_{it-1}	-0.0016 (0.00039)***	-0.0015 (0.00036)***	-0.069 (0.06)
D^{foral}	-0.0085 (0.0019)***	-0.009 (0.001)***	-
D^{island}	-	-	0.07 (0.04)$^{+}$
Time_trend	-0.0001 (0.0001)	-0.00013 (0.00019)	-0.004 (0.004)
Intercept	0.012 (0.003)***	0.013 (0.004)***	-0.08 (0.04)*
N **R^2** **F (joint sig.)** **Hansen Test** **F-test of excluded instruments**	1104 0.56 772.51*** 0.12 27885.30***	1104 0.55 1077.73*** 0.003 25995.74***	1112 0.05 20.04*** 0.39 23517.90***

Note 1: Standard errors in parenthesis (robust to heteroscedasticity and clustered by region)
Note 2: Statistical significance at 1% (***), 5% (**), 10% (*), and 15% ($^{+}$) levels.
Note 3: Instruments for GDP per capita are the following: mean number of schooling years and first lag of GDP per capita.
Note 4: Hansen Test: H_o is no over-identification of all instruments. Excluded instruments test: H_o is weak identification of all instruments.

Appendix

Here we present the models used to estimate investment efforts by each transportation mode separately. Their results are also presented below.

Model 4: $i_{it}^{roads} = \alpha + \beta_1 Distance\_capital_i + \beta_2 GDP\_per\_capita_{it} + \beta_3 Votes_{it} + \beta_4 Pop_{it} + \beta_5 Land_i + \beta_6 i_{it-1}^{roads} + \beta_7 k_{it-1}^{roads} + \beta_8 D^{foral} + \beta_9 Time\_trend + \beta_{10} D^{toll\_roads} + \beta_{11} Time\_trend + \varepsilon$

Model 5: $i_{it}^{rail} = \alpha + \beta_1 Distance\_capital_i + \beta_2 GDP\_per\_capita_{it} + \beta_3 Votes_{it} + \beta_4 Pop_{it} + \beta_5 Land_i + \beta_6 i_{it-1}^{rail} + \beta_7 k_{it-1}^{rail} + \beta_8 D^{foral} + \beta_9 Time\_trend + \varepsilon$

Model 6: $i_{it}^{airports} = \alpha + \beta_1 Distance\_capital_i + \beta_2 GDP\_per\_capita_{it} + \beta_3 Votes_{it} + \beta_4 Pop_{it} + \beta_5 Land_i + \beta_6 i_{it-1}^{airports} + \beta_7 k_{it-1}^{airports} + \beta_8 D^{island} + \beta_9 Time\_trend + \varepsilon$

Model 7: $i_{it}^{ports} = \alpha + \beta_1 Distance\_capital_i + \beta_2 GDP\_per\_capita_{it} + \beta_3 Votes_{it} + \beta_4 Pop_{it} + \beta_5 Land_i + \beta_6 i_{it-1}^{ports} + \beta_7 k_{it-1}^{ports} + \beta_8 D^{island} + \beta_9 Time\_trend + \varepsilon$

Table A1. Investment equation estimates (2SLS)

	Model 4: Roads	Model 5: Rail	Model 3: Airports	Model 4: Ports
Distance_capital	-9.12e-06 (2.60e-06)***	-0.00004 (0.00002)*	0.000003 (0.00004)	0.00002 (7.79e-06)***
GDP_per_capita	7.75e-08 (2.44e-07)	3.81e-06 (2.63e-06)	0.00001 (7.83e-06)$^{+}$	-1.75e-07 (3.09e-07)
Land	1.32e-07 (1.37e-07)	6.98e-07 (8.67e-07)	-1.80e-06 (3.85e-06)	-5.79e-07 (2.49e-07)
Population	-1.69e-09 (5.86e-09)***	2.60e-10 (2.76e-09)	1.61e-08 (5.57e-09)***	2.26e-09 (1.01e-09)**
Votes-Incumbent_Party	0.00008 (0.00004)*	0.00003 (0.0006)	0.0017 (0.0006)**	0.00021 (0.00008)***
$\mathbf{i_{it-1}}$	0.68 (0.018)***	0.51 (0.09)***	0.15 (0.07)**	0.66 (0.09)***
$\mathbf{k_{it-1}}$	-0.0019 (0.0007)**	-0.028 (0.009)***	-0.25 (0.18)	0.008 (0.002)**
$\mathbf{D^{foral}}$	-0.009 (0.001)***	-0.015 (0.013)	-	-
$\mathbf{D^{island}}$	-	-	0.17 (0.06)**	-0.024 (0.005)***
$\mathbf{i^{private}}$	-0.0009*** (0.001)	-	-	-
Time_trend	7.97e-08 (0.0002)	-0.0007 (0.026)	-0.06 (0.045)	0.000029 (0.00001)
Intercept	0.015 (0.0036)***	-0.0007 (0.026)	-0.06 (0.04)	-0.005 (0.003)*
N $\mathbf{R^2}$ **F (joint sig.)** **Sargan Test** **F-test of excluded instruments**	1104 0.56 1686.62*** 0.001 23378.66***	1104 0.26 66.30*** 0.46 30129.99***	1112 0.04 12.55*** 0.31 23012.17***	1112 0.65 104.94 2.42 23078.00***

Note 1: Standard errors in parenthesis (robust to heteroscedasticity and clustered by region)
Note 2: Statistical significance at 1% (***), 5% (**), 10% (*) and 15% ($^{+}$) levels.
Note 3: Instruments for GDP per capita are the following: mean number of schooling years and first lag of GDP per capita.
Note 4: Sargan Test: H_o is no over-identification of all instruments. Excluded instruments test: H_o is weak identification of all instruments.

2006

CREAP2006-01
Matas, A. (GEAP)**; Raymond, J.Ll.** (GEAP)
"Economic development and changes in car ownership patterns"
(Juny 2006)

CREAP2006-02
Trillas, F. (IEB)**; Montolio, D.** (IEB)**; Duch, N.** (IEB)
"Productive efficiency and regulatory reform: The case of Vehicle Inspection Services"
(Setembre 2006)

CREAP2006-03
Bel, G. (PPRE-IREA)**; Fageda, X.** (PPRE-IREA)
"Factors explaining local privatization: A meta-regression analysis"
(Octubre 2006)

CREAP2006-04
Fernàndez-Villadangos, L. (PPRE-IREA)
"Are two-part tariffs efficient when consumers plan ahead?: An empirical study"
(Octubre 2006)

CREAP2006-05
Artís, M. (AQR-IREA)**; Ramos, R.** (AQR-IREA)**; Suriñach, J.** (AQR-IREA)
"Job losses, outsourcing and relocation: Empirical evidence using microdata"
(Octubre 2006)

CREAP2006-06
Alcañiz, M. (RISC-IREA)**; Costa, A.; Guillén, M.** (RISC-IREA)**; Luna, C.; Rovira, C.**
"Calculation of the variance in surveys of the economic climate”
(Novembre 2006)

CREAP2006-07
Albalate, D. (PPRE-IREA)
"Lowering blood alcohol content levels to save lives: The European Experience”
(Desembre 2006)

CREAP2006-08
Garrido, A. (IEB)**; Arqué, P.** (IEB)
“The choice of banking firm: Are the interest rate a significant criteria?”
(Desembre 2006)

CREAP2006-09
Segarra, A. (GRIT)**; Teruel-Carrizosa, M.** (GRIT)
"Productivity growth and competition in spanish manufacturing firms:
What has happened in recent years?"
(Desembre 2006)

CREAP2006-10
Andonova, V.; Díaz-Serrano, Luis. (CREB)
"Political institutions and the development of telecommunications"
(Desembre 2006)

CREAP2006-11
Raymond, J.L.(GEAP)**; Roig, J.L..** (GEAP)
"Capital humano: un análisis comparativo Catalunya-España"
(Desembre 2006)

CREAP2006-12
Rodríguez, M.(CREB)**; Stoyanova, A.** (CREB)
"Changes in the demand for private medical insurance following a shift in tax incentives"
(Desembre 2006)

CREAP2006-13
Royuela, V. (AQR-IREA)**; Lambiri, D.**; **Biagi**, **B.**
"Economía urbana y calidad de vida. Una revisión del estado del conocimiento en España"
(Desembre 2006)

CREAP2006-14
Camarero, M.; Carrion-i-Silvestre, J.LL. (AQR-IREA).;**Tamarit**, **C.**
"New evidence of the real interest rate parity for OECD countries using panel unit root tests with breaks"
(Desembre 2006)

CREAP2006-15
Karanassou, M.; Sala, H. (GEAP).;**Snower** , **D. J.**
"The macroeconomics of the labor market: Three fundamental views"
(Desembre 2006)

2007

XREAP2007-01
Castany, L (AQR-IREA)**; López-Bazo, E.** (AQR-IREA)**.**;**Moreno** , **R.** (AQR-IREA)
"Decomposing differences in total factor productivity across firm size"
(Març 2007)

XREAP2007-02
Raymond, J. Ll. (GEAP)**; Roig, J. Ll.** (GEAP)
"Una propuesta de evaluación de las externalidades de capital humano en la empresa"
(Abril 2007)

XREAP2007-03
Durán, J. M. (IEB)**; Esteller, A.** (IEB)
"An empirical analysis of wealth taxation: Equity vs. Tax compliance"
(Juny 2007)

XREAP2007-04
Matas, A. (GEAP)**; Raymond, J.Ll.** (GEAP)
"Cross-section data, disequilibrium situations and estimated coefficients: evidence from car ownership demand"
(Juny 2007)

XREAP2007-05
Jofre-Montseny, J. (IEB)**; Solé-Ollé, A.** (IEB)
"Tax differentials and agglomeration economies in intraregional firm location"
(Juny 2007)

XREAP2007-06
Álvarez-Albelo, C. (CREB)**; Hernández-Martín, R.**
"Explaining high economic growth in small tourism countries with a dynamic general equilibrium model"
(Juliol 2007)

XREAP2007-07
Duch, N. (IEB)**; Montolio, D.** (IEB); **Mediavilla, M.**
"Evaluating the impact of public subsidies on a firm's performance: a quasi-experimental approach"
(Juliol 2007)

XREAP2007-08
Segarra-Blasco, A. (GRIT)
"Innovation sources and productivity: a quantile regression analysis"
(Octubre 2007)

XREAP2007-09
Albalate, D. (PPRE-IREA)
"Shifting death to their Alternatives: The case of Toll Motorways"
(Octubre 2007)

XREAP2007-10
Segarra-Blasco, A. (GRIT); **Garcia-Quevedo, J.** (IEB); **Teruel-Carrizosa, M.** (GRIT)
"Barriers to innovation and public policy in catalonia"
(Novembre 2007)

XREAP2007-11
Bel, G. (PPRE-IREA); **Foote, J.**
"Comparison of recent toll road concession transactions in the United States and France"
(Novembre 2007)

XREAP2007-12
Segarra-Blasco, A. (GRIT);
"Innovation, R&D spillovers and productivity: the role of knowledge-intensive services"
(Novembre 2007)

XREAP2007-13
Bermúdez Morata, Ll. (RFA-IREA); **Guillén Estany, M.** (RFA-IREA), **Solé Auró, A**. (RFA-IREA)
"Impacto de la inmigración sobre la esperanza de vida en salud y en discapacidad de la población española"
(Novembre 2007)

XREAP2007-14
Calaeys, P. (AQR-IREA); **Ramos, R.** (AQR-IREA), **Suriñach, J**. (AQR-IREA)
"Fiscal sustainability across government tiers"
(Desembre 2007)

XREAP2007-15
Sánchez Hugalbe, A. (IEB)
"Influencia de la inmigración en la elección escolar"
(Desembre 2007)

2008

XREAP2008-01
Durán Weitkamp, C. (GRIT)**; Martín Bofarull, M.** (GRIT) ; **Pablo Martí, F.**
"Economic effects of road accessibility in the Pyrenees: User perspective"
(Gener 2008)

XREAP2008-02
Díaz-Serrano, L.; Stoyanova, A. P. (CREB)
"The Causal Relationship between Individual's Choice Behavior and Self-Reported Satisfaction: the Case of Residential Mobility in the EU"
(Març 2008)

XREAP2008-03
Matas, A. (GEAP)**; Raymond, J. L.** (GEAP)**; Roig, J. L.** (GEAP)
"Car ownership and access to jobs in Spain"
(Abril 2008)

XREAP2008-04
Bel, G. (PPRE-IREA) **; Fageda, X.** (PPRE-IREA)
"Privatization and competition in the delivery of local services: An empirical examination of the dual market hypothesis"
(Abril 2008)

XREAP2008-05
Matas, A. (GEAP); **Raymond, J. L.** (GEAP); **Roig, J. L.** (GEAP)
"**Job accessibility and employment probability**"
(Maig 2008)

XREAP2008-06
Basher, S. A.; Carrión, J. Ll. (AQR-IREA)
Deconstructing Shocks and Persistence in OECD Real Exchange Rates
(Juny 2008)

XREAP2008-07
Sanromá, E. (IEB)**; Ramos, R.** (AQR-IREA); Simón, H.
Portabilidad del capital humano y asimilación de los inmigrantes. Evidencia para España
(Juliol 2008)

XREAP2008-08
Basher, S. A.; Carrión, J. Ll. (AQR-IREA)
Price level convergence, purchasing power parity and multiple structural breaks: An application to US cities
(Juliol 2008)

XREAP2008-09
Bermúdez, Ll. (RFA-IREA)
A priori ratemaking using bivariate poisson regression models
(Juliol 2008)

XREAP2008-10
Solé-Ollé, A. (IEB), **Hortas Rico, M.** (IEB)
Does urban sprawl increase the costs of providing local public services? Evidence from Spanish municipalities
(Novembre 2008)

XREAP2008-11
Teruel-Carrizosa, M. (GRIT), **Segarra-Blasco, A.** (GRIT)
Immigration and Firm Growth: Evidence from Spanish cities
(Novembre 2008)

XREAP2008-12
Duch-Brown, N. (IEB), **García-Quevedo, J.** (IEB), **Montolio, D.** (IEB)
Assessing the assignation of public subsidies: Do the experts choose the most efficient R&D projects?
(Novembre 2008)

XREAP2008-13
Bilotkach, V., **Fageda, X.** (PPRE-IREA), **Flores-Fillol, R.**
Scheduled service versus personal transportation: the role of distance
(Desembre 2008)

XREAP2008-14
Albalate, D. (PPRE-IREA), **Gel, G.** (PPRE-IREA)
Tourism and urban transport: Holding demand pressure under supply constraints
(Desembre 2008)

2009

XREAP2009-01
Calonge, S. (CREB)**; Tejada, O.**
"A theoretical and practical study on linear reforms of dual taxes"
(Febrer 2009)

XREAP2009-02
Albalate, D. (PPRE-IREA)**; Fernández-Villadangos, L.** (PPRE-IREA)
"Exploring Determinants of Urban Motorcycle Accident Severity: The Case of Barcelona"
(Març 2009)

XREAP2009-03
Borrell, J. R. (PPRE-IREA)**; Fernández-Villadangos, L.** (PPRE-IREA)
"Assessing excess profits from different entry regulations"
(Abril 2009)

XREAP2009-04
Sanromá, E. (IEB)**; Ramos, R.** (AQR-IREA), **Simon, H.**
"Los salarios de los inmigrantes en el mercado de trabajo español. ¿Importa el origen del capital humano?"
(Abril 2009)

XREAP2009-05
Jiménez, J. L.; Perdiguero, J. (PPRE-IREA)
"(No)competition in the Spanish retailing gasoline market: a variance filter approach"
(Maig 2009)

XREAP2009-06
Álvarez-Albelo,C. D. (CREB)**, Manresa, A.** (CREB)**, Pigem-Vigo, M.** (CREB)
"International trade as the sole engine of growth for an economy"
(Juny 2009)

XREAP2009-07
Callejón, M. (PPRE-IREA)**, Ortún V, M.**
"The Black Box of Business Dynamics"
(Setembre 2009)

XREAP2009-08
Lucena, A. (CREB)
"The antecedents and innovation consequences of organizational search: empirical evidence for Spain"
(Octubre 2009)

XREAP2009-09
Domènech Campmajó, L. (PPRE-IREA)
"Competition between TV Platforms"
(Octubre 2009)

XREAP2009-10
Solé-Auró, A. (RFA-IREA)**,Guillén, M.** (RFA-IREA)**, Crimmins, E. M.**
"Health care utilization among immigrants and native-born populations in 11 European countries. Results from the Survey of Health, Ageing and Retirement in Europe"
(Octubre 2009)

XREAP2009-11
Segarra, A. (GRIT)**, Teruel, M.** (GRIT)
"Small firms, growth and financial constraints"
(Octubre 2009)

XREAP2009-12
Matas, A. (GEAP)**, Raymond, J.Ll.** (GEAP), **Ruiz, A.** (GEAP)
"Traffic forecasts under uncertainty and capacity constraints"
(Novembre 2009)

XREAP2009-13
Sole-Ollé, A. (IEB)
"Inter-regional redistribution through infrastructure investment: tactical or programmatic?"
(Novembre 2009)

XREAP2009-14
Del Barrio-Castro, T., **García-Quevedo, J.** (IEB)
"The determinants of university patenting: Do incentives matter?"
(Novembre 2009)

XREAP2009-15
Ramos, R. (AQR-IREA), **Suriñach, J.** (AQR-IREA)**, Artís, M.** (AQR-IREA)
"Human capital spillovers, productivity and regional convergence in Spain"
(Novembre 2009)

XREAP2009-16
Álvarez-Albelo, C. D. (CREB), **Hernández-Martín, R.**
"The commons and anti-commons problems in the tourism economy"
(Desembre 2009)

2010

XREAP2010-01
García-López, M. A. (GEAP)
"The Accessibility City. When Transport Infrastructure Matters in Urban Spatial Structure"
(Febrer 2010)

XREAP2010-02
García-Quevedo, J. (IEB), **Mas-Verdú, F.** (IEB), **Polo-Otero, J.** (IEB)
"Which firms want PhDs? The effect of the university-industry relationship on the PhD labour market"
(Març 2010)

XREAP2010-03
Pitt, D., **Guillén, M.** (RFA-IREA)
"An introduction to parametric and non-parametric models for bivariate positive insurance claim severity distributions"
(Març 2010)

XREAP2010-04
Bermúdez, Ll. (RFA-IREA), **Karlis, D.**
"Modelling dependence in a ratemaking procedure with multivariate Poisson regression models"
(Abril 2010)

XREAP2010-05
Di Paolo, A. (IEB)
"Parental education and family characteristics: educational opportunities across cohorts in Italy and Spain"
(Maig 2010)

XREAP2010-06
Simón, H. (IEB), **Ramos, R.** (AQR-IREA), **Sanromá, E.** (IEB)
"Movilidad ocupacional de los inmigrantes en una economía de bajas cualificaciones. El caso de España"
(Juny 2010)

XREAP2010-07
Di Paolo, A. (GEAP & IEB), **Raymond, J. Ll.** (GEAP & IEB)
"Language knowledge and earnings in Catalonia"
(Juliol 2010)

XREAP2010-08
Bolancé, C. (RFA-IREA), **Alemany, R.** (RFA-IREA), **Guillén, M.** (RFA-IREA)
"Prediction of the economic cost of individual long-term care in the Spanish population"
(Setembre 2010)

XREAP2010-09
Di Paolo, A. (GEAP & IEB)
"Knowledge of catalan, public/private sector choice and earnings: Evidence from a double sample selection model"
(Setembre 2010)

XREAP2010-10
Coad, A., **Segarra, A.** (GRIT), **Teruel, M.** (GRIT)
"Like milk or wine: Does firm performance improve with age?"
(Setembre 2010)

XREAP2010-11
Di Paolo, A. (GEAP & IEB), **Raymond, J. Ll.** (GEAP & IEB), **Calero, J.** (IEB)
"Exploring educational mobility in Europe"
(Octubre 2010)

XREAP2010-12
Borrell, A. (GiM-IREA), **Fernández-Villadangos, L.** (GiM-IREA)
"Clustering or scattering: the underlying reason for regulating distance among retail outlets"
(Desembre 2010)

XREAP2010-13
Di Paolo, A. (GEAP & IEB)
"School composition effects in Spain"
(Desembre 2010)

XREAP2010-14
Fageda, X. (GiM-IREA), **Flores-Fillol, R.**
"Technology, Business Models and Network Structure in the Airline Industry"
(Desembre 2010)

XREAP2010-15
Albalate, D. (GiM-IREA), **Bel, G.** (GiM-IREA), **Fageda, X.** (GiM-IREA)
"Is it Redistribution or Centralization? On the Determinants of Government Investment in Infrastructure"
(Desembre 2010)

XARXA DE REFERÈNCIA EN ECONOMIA APLICADA

xreap@pcb.ub.es