Regional Community Policy: Does Aid Received from the EU Displace Funding by Member States?*

CRISTINA GARCÍA NICOLÁS
JOSÉ MARÍA CANTOS CANTOS

Universidad de Castilla-La Mancha

Received: May, 2016
Accepted: February, 2017

Abstract

The implementation of the EU regional policy has been characterized by the establishment of multianual public investment programs in the Member States that are co-financed by the EU through matching grants. According to the additionality principle, governments receiving aid should increase their financial efforts in relation to the pre-existing situation. Using data on the implementation of regional policy, this paper has two aims: to verify whether Community aid displaces local funds for public investment, and to uncover whether there is endogenous behaviour regarding Community aid as a result of local political processes. We have obtained evidence that funding from the EU crowd-out local financing of public investment. On the other hand, although there is some evidence of an endogenous behaviour of Community aid, we find that this endogeneity is not statistically significant.

Keywords: Regional policy, intergovernmental transfers, public investment.

JEL Classification: H77, R58

1. Introduction: The European Union’s regional policy and the ‘additionality’ principle

Community regional policy was born in 1975 with the launch of the European Regional Development Fund (ERDF), although the Treaty of Rome (1957) had already set the goal of ensuring the harmonious development of the Member States’ economies. However, it was not until 1986 and the Single European Act (SEA) that a consolidated objective was discussed as a way of achieving economic and social cohesion by coordinating funds of a structural nature. The implementation of the SEA, the decision to create the Economic and
Monetary Union (EMU), and the recent enlargement of the EEC towards the south led to the first reform of the Structural Funds in 1988, in response to fears of a widening gap between the levels of development in the Community’s regions.

This involved the creation of two new regulations and – in a ‘communitarisation’ process – the formulation of a series of principles that have been decisive in subsequent developments and have made it possible to talk of a true Community regional policy aimed at effective convergence between European regions. These are the principles of concentration, autonomy, cooperation, programming and additionality, the last two of which fall under the responsibility of the European Commission. As indicated in Isla Pera, Mella Márquez and Soy i Casals (1998: 335), additionality “is met when each Member State maintains, across the whole of the territories concerned, public or equivalent structural expenditure that maintains at least the same level as the previous programming period, while taking into account the macroeconomic conditions of the funding exercises. The objective is therefore to prevent the Structural Funds from being used by national governments in place of their own investments, and to seek maximum impact from Community interventions”.

The programming periods 1989-1993 and 1994-1999 highlight the difficulty of assessing the implementation of the additionality principle, which was only evaluated ex-post. In the case of Objective 1, Member States are required to send the financial information corresponding to each programme. Information on expenses must be accompanied by an indication of the information sources, the deflators used and the estimation methodologies applied. The additionality principle was not fulfilled by either the cohesion countries or by Germany, France and the United Kingdom.

The European Commission subsequently simplified the geographical level of control to facilitate compliance with the additionality principle. Between 2000 and 2006 the reference was the entire investment by the regions eligible for Objective 1 in each Member State, and the total investment of the Member State in the case of Objectives 2 and 3. Member States also had to provide the European Commission with all the necessary information on three occasions: when the programmes were approved, mid-term and at the end of the financial year.

Between 2007 and 2013 the Community Support Framework (CSF) was replaced with the National Strategic Reference Framework (NSRF), which included the guidelines and economic policy documents of all Member States, and modified the application of the additionality principle. The Commission, together with the Member States, verified the levels of public spending and agreed an amount for the whole period; however, any future breach of this principle would potentially lead to a financial correction, a case that had never previously arisen (Kaiser Moreiras, 2008).

The Fifth Cohesion Report raised doubts as to the actual functioning of the additionality principle, stating that “there is a need to review the way in which the additionality principle is verified to ensure that Cohesion Policy funds are used to finance additional investments
that governments would not have undertaken if they had not counted on such funds. [...] The system must be reformed to make it more reliable, transparent and simple” (European Commission, 2010).

It should be noted that the additionality principle, as conceived in EU regional policy, formally alters the behaviour of citizens and governments receiving subsidies through any of these channels by modifying the pre-existing order of priority between the needs for current public spending and investment, the pre-existing order of priority among the specific needs for public investment expenditure, and the pre-existing distribution of resources for public and private goods, including the option for public debt. The implementation of the principle of additionality seems to have been relaxed during the first programming periods in regional policy, where the main concern was to reduce the most marked divergences between territories. There was a renewed interest in the effective application of this principle in the 2000-2006 period, when the emphasis was not only on the effectiveness of the management and application of funds, but also on the efficiency of the expenditure incurred, and its contribution to the endogenous development of the territories.

The principle of additionality refers to the effectiveness of Community regional policy to increase public investment in the beneficiary Member States. Although this effectiveness has long been questioned, even by the European Commission’s own reports (see footnote 2), there is very little empirical research available. One of the few existing studies is that of González Alegre (2012), who estimates that for each euro of Community aid, only 60 cents are invested in the Member States. This circumstance deserves a more detailed explanation, and we have therefore formulated a model to explain this discrepancy.

Since the EU allocates financial resources to the Member States at zero time (even at time -1) in the multiannual programming period, the political process in the receiving Administration always occurs after the allocation of the final funding, giving it several years to plan its entire public investment, and even replacing it with current public spending or lower taxes. In contrast, the EU aid received by each Member State is actually applied in each period, and differs from the nominal aid allocated at the beginning of the multiannual programming period. The aid received from the EU therefore depends on another unobservable explanatory variable we call political process, making it a non-independent but endogenous variable. Another reason a receiving Administration is able to influence the amount of Community aid received each year is that since most European funds for regional policies are allocated to infrastructure spending (former Objective 1), a very wide range of investment is eligible, covering almost all possible types of public investment in the Member States. The receiving Administration could therefore easily replace its own funds with EU funds so the outcome of the political process associated with transfers from the EU could be a crowd-out of public investment in Administrations benefitting from the EU regional policy.

This does not imply that the governments of the Member States receiving aid, under continued pressure from their citizens, necessarily alter their financial behaviour. This assumption would require several empirical tests at the very least. This research follows this line
of thought, and proposes two objectives: to study the expansionary impact of Community aid on public investment; and to analyse whether the political process in the receiving States can significantly alter the implementation of Community aid by creating endogeneity.4

This paper is organised as follows: section two reviews some theories on the determinants of the size of the public sector, with special emphasis on intergovernmental transfers. Section three formulates a hypothesis of the behaviour of the political process regarding intergovernmental transfers, while section four describes the development of an empirical model to study the behaviour of EU regional policy aid for public investments in the Member States. It focuses specifically on the European Regional Development Fund (ERDF) and the Cohesion Fund (CF), as they are the only financial instruments of EU regional policy that provide aid to governments by matching grants to public investment. Finally, section five contains the report’s conclusions.

2. Intergovernmental transfers as factors determining the size of the public sector

Cameron (1978) summarised the profuse doctrinal debate to date, and ventured five probable explanations for increases in the size of the public sector, including causes of an economic nature (focusing on the so-called “Wagner law” and all subsequent discussions), a fiscal explanation (the argument of “fiscal illusion”), causes of a political nature (electoral competition for spending programmes), institutional causes (basically the formal relationship between levels of government), and international causes (related to the economy’s degree of openness). Meanwhile, Boix (1999) found four basic explanations to summarise the doctrinal debate: the impact of modernisation, income redistribution, the role of democracy and economic internationalisation. Boix (2001) grouped the main causes of public sector growth into three sets of theories: explanations related to demand (the public sector grows in response to social progress, demographic changes and different productivity levels in the public and private sectors); political theories on the redistributive function of governments; and institutional models (theories on bureaucracy, the electoral cycle, fiscal federalism and others).

Among this latter group of causes, the theory of fiscal federalism assumes that a sub-central government has the autonomy to provide and finance public goods, and even to determine its own budget without intervention from the central government. However, in most cases the ability to generate income is uneven, resulting in a vertical fiscal imbalance in favour of the central government, whose outcome may affect fiscal discipline and the size of the public expenditure in sub-central governments (Inman and Rubinfeld, 1996). As the most common solution to this imbalance is to establish a programme of intergovernmental transfers, it is worth asking what the impact of the programme would be on public spending levels for the receiving government. In theory, two types of opposing results can be expected: first, a transfer would reduce the marginal costs (economic and political) perceived by voters
for obtaining additional funds compared to the cost of procuring these funds through taxes, leading to an increase in public spending (crowd-in). Alternatively, the receiving government could reduce its citizens’ tax efforts to offset income from the transfer programme without any increase in public spending (crowd-out).

Bradford and Oates (1971b) included the treatment of matching grants in a new framework of analysis, and incorporated the political process to establish the circumstances for corroborating the notion that conditional transfers could have a more expansive impact on public spending than unconditional transfers, an issue they had already explored in a previous paper (Bradford and Oates, 1971a). Using the simple majority rule in a scenario of fixed tax rates, convex preferences and only one public good, the authors concluded that matching grants always lead to higher governmental spending than when lump-sum transfers are made. This is because these transfers do not impose any spending constraints on the receiving government, although it should be noted that an unconditional lump-sum transfer would result in tax savings for citizens in an amount equivalent to the received transfer.

To estimate the flypaper effect of federal transfers on the States and analyse the interdependence of fiscal policy, Case, Rosen and Hines (1993) presented a paper that was widely questioned. Some, like Becker (1996) and Wyckoff (1991), blamed the disparity in the results—a substantial gap between the expansionary impact of spending by item and total public expenditure—on the poor model specification, according to some of the explanations in the scientific literature. They thought it was an error to consider matching grants as an exogenous variable, and claimed that if this variable were also correlated with the omitted variables it would cause a bias that would overestimate the impact on public spending.

Gramlich (1987) suggested that the crowd-in that was sometimes observed was due to political factors, since government programmes take root by generating some political patronage, and are difficult to avoid even in the case the intergovernmental transfers received are insignificant. This is corroborated by the work by Inman (2008), who introduces a political explanation according to which, rather than being an anomaly, the flypaper effect is the result of the behaviour of political institutions and incentives associated to elected politicians. The work of Lago-Peñas (2005) also incorporates the electoral cycle as a factor deserving of consideration.

Counter to the existence of the flypaper effect, a number of investigations not only found evidence that unconditional intergovernmental transfers to lower-level governments crowd out public spending by containing or reducing the size of the budget, but in some cases also reported that even matching grants displace local spending by displacing specific local co-financing to other parts of the budget or reducing the local government budget, thus producing a crowd-out. On this point the work of Besley and Case (2000) is interesting as it addresses a problem that has seriously affected the validity of certain empirical models, namely the failure to consider the possible endogeneity of the transfer in terms of political decision-making in a negotiation scheme of intergovernmental transfers. The aim is to detect whether the political process of granting transfers could in itself be considered an unobserv-
able explanatory variable determined through a model of legislative negotiations, in which case the estimates of models that include grant matching as a predetermined variable may be biased against the crowd-out of local government spending.

There are few empirical studies to draw on within the scope of the European Union to obtain evidence of a crowd-in or crowd-out in public spending caused by grant matching. There is some evidence from Pallesen (2006), who found that the public spending impact of moving from matching grants to lump-sum transfers across Danish municipalities barely altered the pattern of public spending. In the case of EU regional policy aid, González Alegre (2012), using annual data from 1993 to 2005 for the EU-15, was unable to obtain evidence of a full crowd-out on public investments for each State, and concluded that this investment would have meant an increase of only 60 cents for every euro allocated by the EU.

As demonstrated, there has recently been more empirical evidence in favour of the crowd-in than the crowd-out of public spending as a result of an intergovernmental transfer programme. However, an increasing number of studies are now uncovering evidence to suggest that transfers reduce the size of public spending at the receiver government level. Bracco et al. (2015) recently reported that 60% of the transfer income received by Italian municipalities affiliated to the nationwide governing party is used by the political process to reduce the residents’ tax burden.

3. Political processes and intergovernmental transfers

Bradford and Oates (1971a) point out the impossibility of establishing an equivalence between public and private funding in general, given the wide diversity of political processes, although they set out to study this equivalence wherever the political decision-making process follows the simple majority rule. The goal of any political process is to transform a set of initial possibilities into results that can be of value to citizens, for which there are two basic tools: resources, and the ability to use them, subject to the fewest possible administrative restrictions. The result of the process of producing public goods cannot be segmented between the different public goods a government offers, as although each group of voters has a different object of interest, the government must consider many groups of voters if it wants to be re-elected. However, not all the objects of interest separately linked to voter groups can be given enough specific resources to achieve the minimum objectives to guarantee the government’s re-election. This is why a government will implement political processes to reallocate the initial distribution of resources and transform it into another distribution resource to service other issues of interest and satisfy the majority of its voters. This feature enables public productive processes to be included within the concept of political process6.

The initial conditionality set by EU regional policy on the purpose of public investments and co-financing levels can become a very weak restriction for the government level manag-
ing the programme, for two reasons: firstly, because the recipient government has a very long multi-year implementation period and it can reprogram the aid received; and secondly, because the government can apply part of the funds received to other spending needs that it would carry out in any case, reducing the total tax burden on its jurisdiction. The political process will transform the provision of resources initially assigned to certain objects of interest, and subject to formal restrictions, into other provisions of resources whose objects of interest have been readjusted, although subject to their respective restrictions after review. The result is a direct crowd-out of the specific or total investment spending, and even indirectly a potential tax burden relief for its citizens (increase in private income).

It is impossible a priori to generalise the equivalence between public subsidies and direct aids to individuals, given the diversity of political processes. All we know is that as public resources are limited in relation to expenditure needs, the government will use them to guarantee its re-election, and therefore seek to apply the aid received to other more politically profitable targets (Niskanen, 2007). This is what enables public productive processes to be included in the concept of political process. It is therefore unsurprising that these features of the political process are not readily observable.

In our empirical model, the effectiveness of a matching grants programme on regional public spending depends on the political process for the allocation of EU subsidies, and the political process in the receiving regions. If the political process in the Member States is able to substitute local funding by EU funding, then the formal advantage of matching grants for the donor disappears and the impact is similar to lump-sum grants.

Figure 1 should be carefully analysed for a better understanding of this argument. The top side represents the preferences of the median individual in an offer of public and private goods derived from an unconditional transfer (for example, a lump-sum grant) granted by a top-level government to another lower level or local government. An increase in local government spending will depend on the income elasticity in the local community. The indifference curve for the median individual \( E_0 \) is associated with the budget constraint \( AA' \), whose slope is equal to \(-1\), which allows private goods to be easily transformed into public goods, assuming a constant rate. \( E_0 \) represents the combination preferred by the median individual, whose budget is \( 0Q \), financed with local taxes \( T_0 \), for \( Y_0 \) expenditure level on private goods. When the local government receives an unconditional transfer, the new budget constraint becomes \( C'C \) and the new equilibrium is \( E_1 \). The local government budget now increases by \( QP \) until reaching \( OP \), and the entire budget is financed by local taxes and the transfer \( T_1 + AC \). The consequence is that the median individual chooses a larger public budget but funded by a lower tax burden \( T_0/0Q > T_1/0P \), which also allows an increase in the consumption of private goods. The final balance will depend on the income elasticity of public goods in relation to private goods.

The bottom side of Figure 1 shows the expected impact of a graduated conditional transfer (matching grant) on the demand for public and private goods, assuming that the public good behaves as a normal good. Upon receipt of the transfer the new budget goes from \( AA' \) to \( AB \),
and the equilibrium point of the median individual goes from $E_0$ to $E_1$ taking into account the income effect; and to $E_2$, when also considering the price effect. The increase in local government spending ($QR$) is divided into $QP$ and $PR$ respectively. In this case the tax burden on local jurisdiction decreases less ($T_0 \rightarrow T_1$) than in an unconditional transfer, and there is a smaller increase in private spending ($Y_0 \rightarrow Y_1$). In the classical theory of transfers, when a matching grant is used, the preference for public goods increases due to the income effect ($QP$) and the substitution effect ($PR$), as can be seen when comparing the two sides of Figure 1.

Figure 1: Intergovernmental transfers and public spending
As stated in Oates (1972), the expansionary impact of matching grants on public spending by the receiving government can be expected to be greater than in the case of an unconditional transfer. In this context, the flypaper effect is one hypothesis to explain why an unconditional transfer produces an expansionary impact on public spending in the long run, even when the transfer has ceased. But this is not the goal of this investigation.

However, the main conclusion of Bradford and Oates (1971a) is different. Under certain conditions linked to the political decision-making process, an unconditional transfer is equivalent to a lump-sum grant for citizens, or to tax reduction or containment. In the situation shown on the top of Figure 1, this implies that the impact of the transfer would result in an increase in private income equal to the amount of the transfer, while the demand for public goods after the transfer would remain at \( Q \). This would lead to a specific case of the classical theory of unconditional transfers, where the public good has an income elasticity close to zero and is an inferior good. In the case on the bottom of Figure 1, this statement would imply that \( P - Q = 0 \). Although Bradford & Oates (1971b) do not reach this conclusion in the case of matching grants, there is nothing that actually prevents this from occurring.

But Bradford and Oates did not explicitly address another possibility that was later observed in some empirical research: that the public good could behave like a good for which the law of demand is not fulfilled. In fact, our empirical model does not compare private income with public expenditure, but rather analyses how a particular type of public expenditure behaves in relation to the remaining public spending and private income, with the additional circumstance that there is a political process that replaces the median voter and whose decisions may be different from those of a median voter\(^\text{10}\). A political decision-making process can reflect a preference for private and other public goods for over 100% of the transfer. This could also well be fulfilled in the case of matching grants if two circumstances are met: the first is that preferences for the subsidised public goods are very different between the donor government and the recipient government; and the second, that the condition imposed by top-level government is weak enough. This is the approach underlying Knight’s (2002) paper, among others.

The top side of Figure 1 shows the expected impact of an unconditional transfer on total consumption for the median individual. An increase in disposable income would lead to a massive replacement of public by private goods, so the level of public goods consumption for the new budget constraint \( C''C' \) would be appear to the left of point \( Q \). Similarly, on the bottom of Figure 1, the expansionary impact of matching grants on the median individual would have a reduced price effect (\( PR \)) and a huge income effect (\( QP \)) of the opposite sign, so the consumption level of public goods would be to the left of point \( Q \). In this case, public goods could also behave as Giffen goods, with a strong negative income elasticity. Since this situation is uncommon in the classical theory of consumer behaviour, but is more frequent in political decision-making processes, it is necessary to explain the reasons why this might occur. In our case, the answer may be that the political process masks reality by diverting a portion of its funding from specific public investments to other government spending, decreasing total public spending, or dedicating these funds to reducing the level of public debt.
Depending on the level of displacement, public investment by the receiver government could behave as a normal good, as an inferior good, and even as a Giffen good, considering that a matching grant is a very distorting financial instrument for the receiver government.

As expected, political processes in the receiving State administrations are based on optimisation strategies for obtaining resources, so officials have information of key importance: they know the allocation of resources in the European Union’s matching grants programme in advance during the planning period. These administrations can plan future expenditure allocation by transforming the initial specific restrictions to accommodate objects of greater political interest, which necessarily includes to the replacement of certain previous spending needs with new ones. Public investment therefore depends not only on the transfers received, but also on the political decision-making process in the receiving administration. In turn, the political process behaves as an explanatory variable that determines the distribution of the variable Community aid, so that this variable no longer behaves as independent, but is determined within the model.

In this paper, we explore the possibility that these phenomena may occur in the case of aid received from the EU. Should this be so, the estimation method used must be consistent with the existence of endogeneity in the explanatory variable for aid received from the EU in order to obtain an unbiased coefficient. The expected effect would be a smaller coefficient associated with the transfer; that is, a greater expulsion of public investment (Knight, 2002), as previously argued by Besley and Case (2000).

| Table 1 |
|-----------------|-----------------|
| PERCENTAGE SHARE OF STRUCTURAL FUNDS (ERDF + CF) IN PUBLIC INVESTMENT |
| Member States | Average 1995-2011 |
| Germany | 5.7 |
| Austria | 3.4 |
| Belgium | 3.0 |
| Denmark | 0.8 |
| Spain | 15.3 |
| Greece | 39.6 |
| Finland | 2.6 |
| Ireland | 6.4 |
| France | 1.8 |
| Italy | 7.4 |
| Luxembourg | 1.1 |
| Netherlands | 0.7 |
| Portugal | 40.5 |
(Continued)

<table>
<thead>
<tr>
<th>Member States</th>
<th>Average 1995-2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sweden</td>
<td>1.1</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>3.6</td>
</tr>
<tr>
<td>Total EU-15</td>
<td>6.9</td>
</tr>
</tbody>
</table>

Source: European Commission.

Table 1 shows the percentage share of the two structural funds in total EU-15 public investment. As can be seen, this share is relatively low. The exception is Spain, where the average for the period was 15.3%; and Greece and Portugal, with shares of the subsidy received of around 40% of the total investment.

Each government level knows in advance the resources they will receive through the conditional transfer programme during the whole programming period. These governments can plan the allocation of future expenses by transforming the initial specific restrictions to accommodate objects of greater political interest, which may include investment projects already envisaged by the recipient governments of the Community aid, being able to substitute local financing for the EU. The released funds can be applied to other public spending destinations or to reduce taxes.

Although the EU aid allocation criterion imposes conditions on future recipient government investments, this investment is also related to the transfer itself through the political process associated with the programme management at each level of the receiving government. The political process would act as an unobservable variable that would be inversely related to the entire public investment, and directly related to the size of the transfer received.

Under this hypothesis, the greater the interference of the political process, the less the impact of community aid on total public investment, as the aid received is dedicated to funding projects that would in any case have been funded by the government. If this hypothesis is fulfilled, the inherent advantage of a matching grant (price effect) disappears and the impact is similar to the transfer of an unconditional lump sum (income effect). Bradford and Oates (1971a) studied the conditions under which a lump-sum transfer to a government would be equivalent to a direct subsidy to the citizens in a jurisdiction.

4. **Empirical model for the impact of EU aid on public investment**

This section develops an empirical model to study the impact of Community regional aid on public investment in the Member States, using the European Regional Development Fund (ERDF) and the Cohesion Fund (CF) for this purpose, since these are the main financial instruments integrated into the concept of investment in the public budget of the Member
We use simple estimations of the empirical model, and conclude with an estimate under the assumption that an explanatory variable has an endogenous behaviour provoked by the political decision-making process. The following variables are used in the model (see Table 2), which includes information for 1995-2011:

(PubInv): Public investment in each Member State measured in euros per capita. Source: Eurostat.

(FEC): Aid received by each Member State measured in euros per capita: European Regional Development Fund (ERDF) and Cohesion Fund (CF). This is the variable of interest. Source: European Commission.

(PI): Private investment. Private investment is a variable usually associated with public investment (measured in euros per capita). Source: Eurostat.

(Energy): Instrumental variable (IV). Energy consumption per inhabitant: in thousands of tons of oil equivalent (TOE/PC). Source: Eurostat. Energy consumption is associated with the economic activity indicator and in particular with investment. It can therefore be expected to be positively correlated with the FEC variable.

(Exclusion_%): Instrumental variable (IV). Percentage of population at risk of poverty (cut at 60% of equivalent median income after social benefits). Source: Eurostat. Since the Member States benefiting most from the regional community aid policy are the poorest, this variable must maintain a positive relationship with the FEC variable.

(Exclus_FEC): Instrumental variable (IV). Euros of FEC aid per person at risk of social exclusion (cut at 60% of equivalent median income after social benefits). Source: Eurostat. This variable must also be positively correlated with FEC.

The Member States in the sample are: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Netherlands, Luxembourg, Portugal, Spain, Sweden and United Kingdom. These are the most senior European Union States, and we do not include more States to avoid significantly reducing the sample period. The documentary sources used are also included in Table 2. The time series starts in 1995 and ends in 2011.

We began by studying the primary behaviour of all the observations, without regard to the fixed effects that may occur at the level of Member States. The first estimate is based on the Combined Ordinary Least Squares (COLS) method and is obtained from equation 1, where public investment depends on the FEC variable of interest, which includes the effective amounts of transfer received from Community Structural Funds for each State and year, while private investment is PI. Subscripts i and t represent the Member States and the time respectively.

\[ PubInv_{it} = \beta_1 + \beta_2 FEC_{it} + PI_{it} + \epsilon_{it} \] (1)
**Table 2**

**DEFINITION OF THE VARIABLES**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition</th>
<th>Mean/ Std. Deviation</th>
<th>Data source</th>
</tr>
</thead>
<tbody>
<tr>
<td>PubInv</td>
<td>Euros per capita of public investment in the Member State</td>
<td>755.1 (528.8)</td>
<td>Eurostat</td>
</tr>
<tr>
<td></td>
<td>EU aid received by each Member State from the ERDF and CF (euros per capita). Effective aid received each year</td>
<td>50.8 (68.7)</td>
<td>European Commission</td>
</tr>
<tr>
<td>FEC</td>
<td>Euros of gross fixed private capital formation per capita</td>
<td>5635.2 (2403.6)</td>
<td>Eurostat</td>
</tr>
<tr>
<td>Energy</td>
<td>Energy consumption per inhabitant: in thousands of tons of oil equivalent (TOE)/PC</td>
<td>4.40 (1.70)</td>
<td>Eurostat</td>
</tr>
<tr>
<td>Exclusion_%</td>
<td>Percentage of population at risk of poverty (cut at 60% of equivalent median income after social benefits)</td>
<td>15.0 (3.9)</td>
<td>Eurostat</td>
</tr>
<tr>
<td>Exclus_FEC</td>
<td>Euros of FEC aid per person at risk of social exclusion</td>
<td>285.4 (339.8)</td>
<td>Eurostat</td>
</tr>
</tbody>
</table>

*Note: Period 1995-2011.*

Since the distribution of the variables diverges from the normal distribution, creating long tails on the right, the logarithmic transformation was used with the natural logarithm. Table 3 shows several estimates of the equation 1 model. Columns 1 and 2 present the first results of adjustment by COLS and the Least Absolute Deviation (*LAD*) method respectively. Column 1 contains a correction for robust standard deviations, and the robust estimation method corrected by *LAD* was used in Column 2. These first two estimates provide preliminary knowledge of the behaviour of the variable of interest (*FEC*) in the model. This is a model of public investment that depends on two explanatory variables, namely EU aid received and private investment. The estimated *FEC* parameter in Column 1 is 0.0433, and although it is not statistically significant, it differs very little from the value in Column 2, with 0.0544 and significant at 5%. This is also the case with PI, whose estimated parameters are 1.0268 and 1.0347 respectively, significant at 1%.

The parameters for *FEC* indicate that for every 1% increase in Community aid, public investment in the receiving State increases by only around 0.05%, while private investment, at 1.03%, would have a real impact on public investment. In the case of the *FEC* variable, the sign reflects the general results of empirical studies on matching intergovernmental grants, although the value obtained in our estimations is relatively low (see González Alegre, 2012). The sign of the private investment parameter is as expected, since it must be positively associated with public investment.
## Table 3

### ESTIMATION RESULTS

<table>
<thead>
<tr>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
<th>(8)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Intercept</strong></td>
<td>-24.599</td>
<td>-2.5130***</td>
<td>-1.1220*</td>
<td>-1.0899**</td>
<td>-2.9653**</td>
<td>0.2875</td>
<td>-2.4621***</td>
</tr>
<tr>
<td><strong>FEC</strong></td>
<td>0.0433</td>
<td>0.0544**</td>
<td>-0.0984***</td>
<td>-0.0889***</td>
<td>—</td>
<td>-0.0999***</td>
<td>—</td>
</tr>
<tr>
<td><strong>PI</strong></td>
<td>1.0268***</td>
<td>1.0347***</td>
<td>0.9221***</td>
<td>0.9149***</td>
<td>-0.1452</td>
<td>0.7579***</td>
<td>-0.1400</td>
</tr>
</tbody>
</table>

### Instruments (IV):

**Exclus_FEC**  
Energy  
**Exclusion_%**

### Tests:

<table>
<thead>
<tr>
<th></th>
<th>R²</th>
<th>F Sn/p-valor</th>
<th>Breusch-Pag/pvalor</th>
<th>Hausman /p-valor</th>
<th>Sargan/p. valor</th>
<th>Wald T/p-valor</th>
<th>Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1)</td>
<td>0.4917</td>
<td>--</td>
<td>121.90</td>
<td>956.61/0.000</td>
<td>6.06 / 0.0482</td>
<td>17.38 / 0.0001</td>
<td>255</td>
</tr>
<tr>
<td>(2)</td>
<td></td>
<td></td>
<td>0.8820</td>
<td>111.43 / 0.000</td>
<td>6.06 / 0.0482</td>
<td>15.06 / 0.0005</td>
<td></td>
</tr>
<tr>
<td>(3)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(4)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(5)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(6)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(7)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(8)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:** Time series: 1995-2011. All variables in logarithms.
Columns 3 and 4 in Table 3 show the parameters and other statistical estimates obtained from panel techniques with fixed and random effects. In both cases the parameters are significantly reduced in relation to previous estimates. Specifically, the $FEC$ parameter becomes negative and is situated near $-0.09$, and is statistically significant at 1%. The parameter for the $PI$ variable is reduced to around 0.92, while the joint significance of the model is 88%, with a marked improvement in the goodness of fit over the previous two models. The Breusch-Pagan test indicates that the fixed effects panel method is preferable to the COLS method. In addition, the Hausman test does not support the hypothesis that unobserved heterogeneity is not associated with Member States, so the fixed effects method is preferable to the random effects method. In terms of the variable of interest, both estimates reveal a major crowding-out effect of EU aid on public investment in each Member State. For equations 3 and 4, the reduction in the size of the parameters may be a sign of an important hidden variable or simply that unobservable heterogeneity has been considered, which could influence the $FEC$ variable and explain the excessive sensitivity to the estimation method.

If an important variable is omitted in a panel data structure, its consequences are shifted to the residuals and –depending on its behaviour– can seriously affect the unbiasedness and consistency of the estimators. One way to solve this problem is to find one or more variables that are good proxies of the omitted variable in order to continue applying the usual methods for fixed or random panel effects, but this was not possible. When it also seems likely that an omitted variable can be correlated with $FEC$, there may be a problem of endogeneity, and the result of the estimation could be misleading. This is precisely the hypothesis set out in section 3.

In this case the model may be affected by endogeneity. It should be noted that in the process of planning and implementing EU regional policy over the last two decades, Community aid allocations are made over periods of between 5 and 7 years, to which must be added delays in execution of one to two years for each period. In any political decision-making process, the managers of each receiving State actually have between 6 and 9 years in practice to plan pre-allocated annual aid. This leads to great discretionary spending and significantly reduces the conditionality of this aid, facilitating the replacement of local funding by the Community; this behaviour may render the $FEC$ variable endogenous due to its dependence on local political decision-making processes. The problem can be solved statistically by obtaining one or more $Z$ instrumental variables outside the co-variables from the model, but must meet the two known conditions:

1. $\text{Cov } (Z, \varepsilon) = 0$; $Z$ must not be correlated with the error term of the model.
2. $\text{Cov } (Z, X_t) \neq 0$; $Z$ must be correlated with the endogenous explanatory variable.

A complete model to test the crowd-out hypothesis potentially caused by a matching grant could be:

$$\mathit{PubInv}_{jt} = \beta_1 + \beta_2 \mathit{FEC}_{jt} + \beta_3 \mathit{PI}_{jt} + \gamma_1 \mathit{PP}_{jt} + \varepsilon_{jt}$$ (2)
That is, the public investment made in the \( j \) receiving State (each \( t \) time period) depends on a set of three \( i \) explanatory variables (including the \( FEC \) variable of interest). However, the political process (\( PP \)) variable is not observable. The set of explanatory variables should be free of errors, with no sample bias within the ‘population’ they represent, and be determined outside the model, so they have no correlations between them. However, this does not always occur in the models. For example, in this case the \( PP \) variable may be correlated with \( FEC \), but as \( PP \) cannot be observed, it cannot be included in the model. If this correlation is confirmed, the \( FEC \) variable would also be correlated with the errors in the model, since \( PP \) is now within the error term. The error is not distributed randomly and the estimate would be biased and inconsistent.

One way to avoid bias and inconsistency in the estimators in the presence of an endogenous explanatory variable is by using the TSLS estimation method. The relevance of the instrumental variables (\( IV \)) can be verified by performing a linear projection of \( FEC \) on the \( PI \) variable and the \( Z \) instruments:

\[
FEC_j = \pi_0 + \pi_1 PI + \delta_1 Z_1 + ... + \delta_m Z_m + v_j
\]  

(3)

In the case of a single instrument, \( \delta_1 = \text{Cov}(Z_1, FEC)/\text{Var}(Z_1) \), provided that the relevance condition is met. Here it is easy to test the null hypothesis \( H_0: \delta_1 = 0 \) for a sufficiently small significance level such as 5\%\(^{16} \). The next step is to find one or more instrumental variables not correlated with \( PP \) or any other unobservable factor affecting \( PubInv \), but correlated with \( FEC \). Table 4 shows the results of some instrumental variables that have been projected on \( FEC \) to check the \( a \) priori condition of relevance of each instrument, although what is important here is their overall significance in the model. The three instruments have the expected sign and are statistically significant.

### Table 4

**RELEVANCE OF INSTRUMENTAL VARIABLES (1)**

<table>
<thead>
<tr>
<th>Instruments (( Z ))</th>
<th>( \delta_1 )</th>
<th>( \delta_2 )</th>
<th>( \delta_3 )</th>
<th>Data source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exclusion_%</td>
<td>34,073</td>
<td></td>
<td></td>
<td>R(^2): 0.495; Sign. Level: ***</td>
</tr>
<tr>
<td>Energy</td>
<td></td>
<td>-20,421</td>
<td></td>
<td>R(^2): 0.304; Sign. Level:***</td>
</tr>
<tr>
<td>Exclus_FEC</td>
<td></td>
<td>0.8297</td>
<td></td>
<td>R(^2): 0.816; Sign. Level:***</td>
</tr>
</tbody>
</table>

(1) All instrumental variables are expressed in logarithms.

**Note:** Asterisks represent the significance level of the estimated parameter: 1\% (***).

As our working hypothesis is the presence of endogeneity in the variable of interest (\( FEC \)), we follow the usual procedure for instrumental variables (\( IV \)) to estimate the model by the two-stage least squares (\( TSLS \)) method. We select at least as many instruments as there
are endogenous explanatory variables, given that these instrumental variables must meet the two known requirements of exogeneity and relevance. The instrument relevance (correlation with the endogenous explanatory variable) can be tested a priori: the only requirement is for this correlation to be statistically significant. The requirement of instrument exogeneity (no correlation with residuals and the omitted variable) can only be tested if there is more than one instrument per endogenous explanatory variable, and demands a good dose of introspection.

We chose three instruments based on our economic knowledge, but the most important criterion is that they should fulfil the statistical requirements. We therefore surmise there is a positive relationship between the amount of Community aid received by a Member State and the population at risk of social exclusion, energy consumption and the percentage of population at risk of poverty (which was tested individually in Table 4). From a statistical standpoint, it is important that these variables should not be correlated with the omitted variable but with Community aid.

The Exclus_FEC variable, defined as the amount of aid received by each person at risk of social exclusion, proved to be the best instrument of FEC when considered in isolation. It could be not correlated with the residuals (or with PubInv), since public investment decisions made in accordance with the political process described above would be unlikely to consider this instrumental variable. After listing the potentially useful instruments, a structural model was proposed for its estimation by the TSLS method:

\[
\text{PubInv} = \beta_0 + \beta_1 \text{FEC} + \beta_2 \text{PI} + \epsilon
\]  

(4)

where \(E(\epsilon) = 0\), \(\text{Cov}(\text{FEC}, \epsilon) \neq 0\) and \(\text{Cov}(\text{PI}, \epsilon) = 0\). That is, the hypothesis is that FEC is an endogenous explanatory variable. After selecting several instruments (Exclus_FEC, Energy and Exclusion%), the reduced form of the model is estimated, which is the first stage:

\[
\text{FEC} = \pi_0 + \pi_1 \text{PI} + \delta_1 \text{Exclus_FEC} + \delta_2 \text{Energy} + \delta_3 \text{Exclusion}\% + \nu
\]

(5)

and includes the exogenous explanatory variable of the structural model and all the instruments used. Column 5 in Table 3 shows the results of estimating the first stage of the TSLS method for the fixed effects panel. The estimation has a 95% goodness-of-fit, and all instruments are statistically significant. Once equation (5) is estimated, \(\widehat{\text{FEC}}\) can be used to estimate PubInv in equation (6), the second stage of TSLS:

\[
\text{PubInv} = \beta_0 + \beta_1 (\widehat{\text{FEC}}) + \beta_2 \text{PI} + u
\]

(6)

Column 6 of Table 3 shows the results of the estimation by TSLS carried out in an integrated manner. As shown, the parameter corresponding to the FEC variable is almost equal to the one in Column 3, although for the PI variable the parameter in Column 6 is considerably reduced. It appears that when unobserved heterogeneity is associated with the Member
States, only the $PI$ variable is sensitive to the estimation method, although the two variables are statistically significant in both estimates.

Although the Hausman test points to the advisability of using the fixed effects panel, we also estimated the random effects panel by the TSLS method (Columns 7 and 8 of Table 3), maintaining the endogeneity hypothesis for the $FEC$ variable. Again, the $FEC$ estimator in Column 8 is similar to the one obtained in the estimation in Column 4, while the $PI$ estimator is considerably smaller. From this result, we deduced that the endogeneity would not be as expected, and therefore followed the Hausman-Wooldridge recommendation regarding the sensitivity of the estimated parameters in the estimation method, applying the exogeneity test jointly and individually to potentially endogenous variables (see Table 5).

### Table 5
RESULT OF EXOGENEITY TESTS FOR FEC AND PI VARIABLES

<table>
<thead>
<tr>
<th>Tests for exogeneity</th>
<th>LAD Method</th>
<th>Fixed Effects Method</th>
<th>Random Effects Method</th>
</tr>
</thead>
</table>
| **Hausman joint test:**
  FEC and PI variables |            |                      | ?                     |
| $\beta$ Estimated for FEC method (Table 3) | 0.0544** | -0.0984*** | -0.0889*** |
| $\beta$ Estimated for FEC-TSLS (Table 3)**(1)** | 0.0531** | -0.0999*** | -0.0940*** |
| **Hausman individual test:**
  FEC variable |            |                      |                      |
| Estimated for PI (Table 3) | 1.0347*** | 0.9221*** | 0.9149*** |
| Estimated for PI-TSLS (Table 3)**(1)** | 1.2915*** | 0.7579*** | 0.7903*** |
| **Hausman individual test:**
  IP variable |            |                      |                      |
| Estimated for PI (Table 3) |            |                      |                      |

Note: p-value: 0.01***; 0.05**. It was impossible to obtain the joint Hausman test for random effects as the SRR - SRS result is negative in the Wald statistic.

(1) The TSLS estimate for Column 2 (LAD) is not listed in Table 3.

The upper part of Table 5 shows the Hausman exogeneity test where we suspect the presence of more than one potentially endogenous variable, although we were unable to make it estimate the random effects panel. We found at least one variable behaves endogenously, but it was impossible to determine which one. The second part of Table 5 shows the $FEC$ and $PI$ estimators in $LS$ regressions (see columns 2, 3 and 4 in Table 3) and the same estimators in TSLS regressions (see Columns 6 and 8 in Table 3). When a parameter is obtained using two different estimation methods and the results tend asymptotically to the same value, then both methods are understood to be equivalent. In our case the interpretation is that the variable associated with this parameter behaves exogenously, as occurs with our
Indeed, when the Hausman individual test was performed on the variables, we were able to confirm that the \textit{FEC} variable behaves as exogenous and the \textit{PI} as endogenous.

In sum, the evidence obtained failed to prove the presence of endogeneity in the \textit{FEC} variable. This does not necessarily mean that transfers received from the EU for regional policy do not behave endogenously in the model, since the instrumental variables chosen may not be the most appropriate. This is the most difficult issue to resolve when using this method, and is a challenge for future research.

It is not surprising to find endogeneity in the private investment (\textit{PI}) variable, although in this case the cause is likely to be the reverse causality between \textit{PI} and \textit{PubInv} variables: in many cases it is unclear whether private investment is due to public investment or vice versa.

5. Summary and Conclusions

Although the doctrinal positions have mostly supported a direct relationship between public spending and the transfers received, the two contributions of Bradford and Oates (1971) suggest the possibility that this is not occurring. An increasing number of empirical studies since then have called into question the direct relationship between transfer revenues and public spending at the receiving government level, even in the case of matching grants. The aim of this paper is to provide evidence of this relationship by studying the aid received from Community regional policy by the EU-15.

In the case of EU regional policy, the first methodological goal was to determine whether the principle of financial equivalence in EU regional policy formulated by Bradford and Oates (1971a) for unconditional lump-sum type transfers is also fulfilled in the case of matching-grant transfers, as also suggested by Bradford and Oates (1971b). When using a data structure that is not itemised by Member States, 1% of Community aid has been found to represent an increase of barely 0.05% in investment in the destination State. However, with a data panel structure that considers the individual effects on the States, the contribution of Community aid to public investment is around $-0.09\%$. Clearly, the local financing of public investment in Member States is reduced and replaced by Community aid, thereby decreasing total public investment. A similar result was obtained by Knight (2002) in the case of federal transfers to US states for roads.

The second methodological goal was to determine whether the political process in the government receiving Community aid is capable of significantly affecting the temporary distribution of this aid, implying that this explanatory variable would be endogenous to the model. Finally, signs of endogeneity were detected in the exogeneity test, but these are related to the private investment (\textit{PI}) variable, which behaves endogenously due to simultane-
ous causality with the public investment variable. On the other hand, we have not been able to obtain evidence that Community aid behaves endogenously.

We have argued that the restriction involving matching grants (Community aid) is weakened for two reasons and could cause endogeneity. First, the scope of the eligible investment is very broad, meaning that many of the investment projects previously planned by Member States will now be partly funded by Community aid. Second, the time period for planning investment programmes in the EU is between 7 and 9 years (including extensions), and the receiving administrations already know their aid entitlement before the start of this period. The result is that the discretionary nature of Community aid is much broader than might appear, and the receiver governments are likely to replace local funding with Community funding. Although no endogeneity was found in transfers received from the EU, this does not necessarily mean that the behavioural model formulated is incorrect, but rather that it has simply not been possible to obtain statistically significant evidence, probably due to the inadequacy of the instrumental variables used in the TSLS regression. This is a challenge for future research.

One implication of the findings is that the additionality principle of Community regional policy may not have been met. The European Commission (European Commission, 2010) has expressed its doubts about this, but the considerable complexity of this hypothesis is beyond the scope of this paper. Our findings reinforce the European Commission’s concern in regard to this issue. However, this task requires specific research that considers the legal and administrative restrictions on each scheduling period.

Annex I

CORRELATION MATRIX

<table>
<thead>
<tr>
<th></th>
<th>PubInv</th>
<th>FEC</th>
<th>PI</th>
<th>Exclus_FEC</th>
<th>Energy</th>
<th>Exclusion_%</th>
</tr>
</thead>
<tbody>
<tr>
<td>PubInv</td>
<td>1</td>
<td>-0.2007</td>
<td>0.6944</td>
<td>-0.2008</td>
<td>0.5417</td>
<td>-0.2212</td>
</tr>
<tr>
<td>FEC</td>
<td></td>
<td>1</td>
<td>-0.4164</td>
<td>0.9033</td>
<td>-0.5511</td>
<td>0.7037</td>
</tr>
<tr>
<td>PI</td>
<td></td>
<td></td>
<td>1</td>
<td>-0.3298</td>
<td>0.6704</td>
<td>-0.3676</td>
</tr>
<tr>
<td>Exclus_FEC</td>
<td>1</td>
<td></td>
<td></td>
<td>1</td>
<td>-0.3976</td>
<td>0.4897</td>
</tr>
<tr>
<td>Energy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>-0.6628</td>
</tr>
<tr>
<td>Exclusion_%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>
Notes

1. What is known as Objective 1 of the regional policy covers regions and territories –according to the NUTS statistical classification (Nomenclature of Territorial Units for Statistics)– whose per capital GDP is below 75% of the European Union average. The funds go towards promoting the development and structural adaptation of less developed regions.


3. Objective 2 includes regions with difficulties adapting economically to the transformation and decline of their industry. Objective 3 is of a transversal and non-territorial nature, and its funding is intended to help combat unemployment.

4. Although the endogeneity hypothesis will be discussed in Section 3, according to Besley and Case (2000), public sector decisions tend to be affected by the conditions imposed by the political process influencing the authorities concerned. A political process is a set of actions aimed at solving a society’s problems with the involvement of political parties and other social institutions, but where the recipients are the citizens. In a democratic system, a legitimate aim of people in positions of political responsibility is to guarantee their re-election, although this goal may drive them to make decisions that are inconsistent with the decisions of other authorities who also have jurisdiction over the same territory. In a model where the explanatory variables include the decisions of both authorities it cannot necessarily be expected that final public spending behaves as predicted by the classical theory of matching grants, that is, with an expansionary impact derived from a price effect and an income effect of the same sign (see more details in section 3). This could also create a statistical problem, as it would violate the condition of independence between the explanatory variables. When one of the variables is observed and the other not, then the first behaves endogenously and the model cannot be estimated by the OLS method.

5. A simple but intuitive definition of the so-called “flypaper effect” is provided by Inman (2008): “The flypaper effect results when a dollar of exogenous grants-in-aid leads to significantly greater public spending than an equivalent dollar of citizen income: Money sticks where it hits”. The origin of this denomination comes from two empirical works by Henderson (1968) and Gramlich (1969). They obtained unexpected results in their research, as an additional dollar of private income increased government spending by $0.02 to $0.05, while a dollar of public subsidy received by the local government increased public spending around $0.30. This surprised his colleague Arthur Okun, who stated that “money seems to stick where it hits”.

6. The classical theory of the impact of intergovernmental transfers has not been easy to test empirically. As Rego (2002: 8) points out, there is no unanimity as to where the new equilibrium point for public expenditure will be placed as a result of the stimulation of an intergovernmental transfer. A few years after the work of Bradford and Oates (1971a-b), McGuire (1975) conducted a study on the impact of transfers received for education expenditure, confirming that the conditionality of matching grants was easily avoided by the host governments in an amount close to 70%, and may be transformed into unconditional transfers or a reduction of the tax burden. Miller (1974) reached a similar conclusion when he found that 85% of the federal subsidies received to expand the main road network were intended to replace investments already planned by States. A similar conclusion was reached by Zampelli (1986) in the case of US local governments. As Grossman (1988) and Bungey (1991) have already pointed out, further research is needed on the reasons why political processes condition intergovernmental transfers. On this point, Huckins and Carnevale (1988) pointed out that the boost to public spending through the use of transfers depends on factors such as the different preferences of the donor and recipient governments for the subsidised good, and the rigidity of the obligations imposed by the donor, among others.

7. As established in the classical theory of intergovernmental transfers, well summarised in Oates (1972), both an unconditional transfer and a conditional transfer for a specific purpose –a lump-sum grant– can be expected to have an income effect on public expenditure, while a matching grant also has a price effect.

8. Although Bradford and Oates’ collective decision model is not explicitly a median voter model, the authors make an implicit use of Duncan Black’s theorem, allowing their conclusions to be considered equivalent
Duncan Black’s theorem indicates that the equilibrium level of the public good is the median point, that is, the level located in the median of the budgets preferred by individuals, which coincides with the median voter theorem.

9. In the case of a flat-rate conditioned transfer, the classical theory of intergovernmental transfers predicts that the new budgetary restriction would be given by $\text{ACC}'$, and the set of possibilities that could be achieved by the median voter would exclude segment $C^\prime C$.

10. The majority rule or the median voter’s theorem are not without problems when used as the basis for a collective decision rule. The median voter –Duncan Black’s theorem– allows the equilibrium budget level to be determined under the hypothesis that there are single-peaked preferences that coincide with those of the median voter. However, to move from a majority rule based on individual preferences to a social choice rule, five hypotheses must be fulfilled (Arrow, 1951): 1. Rationality: social ordering must be complete and transitive; 2. Independence: the choice between two alternatives depends only on the individual ordinations between these two alternatives; 3. Optimal weak: if all individuals prefer one alternative over another, this is the socially preferred option; 4. Democracy as a system of government; 5. Unrestricted domain: the system of choice must function in all possible situations. The problem is that hypotheses 1 (Condorcet’s Paradox) and 5 are often not met. There are also several additional problems: the optimal point of the majority rule (Black’s median voter) is not always an efficient solution (Bowen, 1943); exploitation of the minority by the majority is allowed; and it encourages less electoral participation. Other theoretical developments such as the Downs-Hotelling model (1956), the Niskanen bureaucracy model (1971), or the modern conception of the public sector as a “leviathan”, reveal the difficulty of moving a scheme of individual preferences to a rule of collective decision.

11. This is possible within the law, since the scope of “eligible” investment for the European Union is very wide. The authorities in the Member States substitute their own funds with EU funds to carry out pre-planned investments (Miller, 1974).

12. We only use the ERDF and CF funds for two reasons: because they are the only financial instruments based on territory and because other regional policy financial instruments bear little relation to the budgetary concept of public investment in the receiving states, and often appear as capital transfers or transfers to families, businesses and administrations.

13. Since there is no official statistical information on the annual amount of aid obtained by each Member State from each Structural Fund, the necessary information has been expressly provided to the authors by the European Commission.

14. Consistent information on the $FEC$ variable was found for this period only.

15. The Combined Ordinary Least Squares (COLS) method –also called “pooled data”— included in several econometric software packages, considers each observation independently and not associated with any particular unit (country), regardless of any assumptions that may be made about unobserved effects in the distribution of each Member State in the sample. If the following expression represents the composition of residues in a panel data model $U_i = u_i + v_t + w_{it}$, where $u_i$ represents the unobservable effects varying between the study units but not in time, $v_t$ are the unquantifiable effects varying over time but not among the study units, and $w_{it}$ refers to purely random error, the COLS method assumes $u_i = 0$. Since most of the software works with panel data using the “one-way” method, where $v_t = 0$, there is therefore no deterministic error component and the OLS method can be applied in the estimation.

The Least Absolute Deviation (LAD) estimation method makes the adjustment differently from the OLS method and is especially useful when the normality residuals assumption is not met, as is the case. Although there are no explicit formulas for parametric estimators, an iterative algorithm is used to minimise the sum of the absolute values of the errors. With the LAD method, the mean square error of the calculated estimators is more stable than with OLS, and even improves the result obtained with nonparametric regression based on ranges, especially when the error distribution is symmetrical with heavy tails [See Taylor, L.D. (1974); Portnoy, S., Koenker, R. (1997)].

16. It should be noted that if the $Z$ variable is unrelated to $v$ in Equation 3, then $\pi_0 + \pi_1 PI + \delta_1 Z_1 + \ldots + \delta_m Z_m$ will not be true either. And if $FEC = Z$, the estimate would be obtained by the OLS method, as $FEC$ would be
an exogenous variable and could be used as its own instrument, implying that the IV estimator is identical to OLS.

17. To check the instruments used for exogeneity, we performed the Sargan test; H0: all instruments are exogenous.

18. For more details, see Chap. 15 of Wooldridge, J. M. (2013), *Econometrics. A modern approach*, South-Western, Cengage Learning. Our choice of these instrumental variables is based on intuition and the availability of data for the 15 Member States. This is the trickiest part of the econometric analysis when the TSLS method is used, because these time series are not always available for each Member State.

19. There is no perfect collinearity between \( F_{EC} \) and \( \text{Exclus}_FEC \), as although the latter also depends on the population at risk of exclusion, it is determined by criteria other than \( F_{EC} \) (see Annex I).

20. Hausman (1978) suggests comparing OLS and TSLS estimations to determine whether the differences are statistically significant. There are two ways to proceed: either by looking directly at the estimated parameter of the supposedly endogenous explanatory variable calculated by OLS and TSLS, and if both parameters are clearly different, endogeneity can be assumed. Alternatively, a consistent test can be applied involving a regression analysis on the reduced form of the model and testing the null hypothesis (H0) = exogeneity in two steps [see Wooldridge (2013: 534)].

References


**Resumen**

La aplicación de la política regional de la UE se ha caracterizado por el establecimiento de programas plurianuales de inversión pública en los Estados miembros cofinanciados por la UE mediante subvenciones graduadas. De acuerdo con el principio de adicionalidad, los gobiernos que reciben ayuda deberían aumentar sus esfuerzos financieros en relación con la situación preexistente. Utilizando datos sobre la implementación de la política regional, este documento tiene dos objetivos: verificar si la ayuda comunitaria desplaza los fondos locales para la inversión pública y descubrir si existe un comportamiento endógeno en relación con la ayuda comunitaria como resultado de los procesos políticos locales. Hemos obtenido evidencia de que la financiación de la UE excluye la financiación local de la inversión pública. Por otro lado, aunque hay cierta evidencia de un comportamiento endógeno de la ayuda comunitaria, encontramos que esta endogeneidad no es estadísticamente significativa.

**Palabras clave:** política regional, transferencias intergubernamentales, inversión pública.

**Clasificación JEL:** H77, R58