FISCAL DECENTRALIZATION POLICIES AND SUB-NATIONAL GOVERNMENT DEBT IN EVOLVING FEDERATIONS *

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Abstract: As part of a process of democratization, many countries spanning Europe, Latin America, Africa, and Asia are reorganizing their governments by devolving fiscal responsibility and authority to newly empowered regional and local governments. Although decentralization in each country proceeds differently, a common element tends to be an initially heavy reliance on central government grants to fund regional spending. We develop a theoretical model of regional borrowing decisions in an evolving federation that shows that the incentives for regional borrowing depend crucially on how the regions expect the federal system of finance to evolve. If the region expects a "soft" budget constraint in the future, the price of borrowing has a "problem of the commons" element to it, and possibly an opportunity cost component, both of which differ over time and among regions. We empirically examine the implications of the model using data on Spain for the period 1984-1995. Spain in many ways is typical of the problems of a federation that evolves from a previously centralized form of government. Controlling for other factors, the results of our empirical investigation indicate that, among certain Spanish regions, higher income results in greater borrowing, indicating an initial mismatch in grants and desired expenditure. Certain regions also seem to perceive and respond to the problem of the commons component of the price variable, while other regions appear to be influenced by a perceived opportunity cost of borrowing.

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1. Introduction

As part of a process of democratization, many countries spanning Europe, Latin America, Africa, and Asia are reorganizing their governments by devolving fiscal responsibility and authority to newly empowered regional and local governments.[1] Although decentralization in each country proceeds differently according to particular historical circumstances, institutions, cultures, and political realities, in many instances a common feature is that the devolution is evolving and incomplete. This is likely to lead to incentive problems for spending and borrowing in subnational capital markets.

For instance, a recent OECD publication by Fukasako and de Mello (1999) highlights three important common elements of fiscal decentralization in emerging economies:

> First, the devolution of expenditure functions and revenue sources to lower levels of government has been unbalanced .... Second, revenue-sharing arrangements have relied excessively on intergovernmental transfers .... Third and most important, the design of institutional arrangements often allows the loss of central government control over subnational finances, leading to a deterioration of its fiscal position.

The first problem cited above results in a mismatch between regional government expenditures and revenues. Regional governments with access to subnational capital markets may issue debt to correct for this mismatch. The second problem can be related to the first in creating a mismatch, but is also suggestive of a more subtle problem involving a break in the link between

[1] For surveys of practices in various countries, see Freire, Huertas, and Darche (1998) on Latin America, do Carmo Oliveira (1998) and Tanzi (1995) on Brazil, Inman (1999) on South Africa, Fukasako and de Mello (1999) on many emerging economies, and Bordignon (1999) on Italy. See also The Economist (February 7, 1998, p. 53) for a discussion of Poland.

the benefits and costs of public spending.[2] If the regional government issues debt because of the first problem, and is financed primarily by central government grants as the second problem indicates, does the region expect the central government to increase its grants in the future in order to pay off the debt? This expectation is crucial to understanding behavior in the present and is particularly relevant in evolving federations because intergovernmental fiscal relationships are new and changing. The third problem is that institutions (such as constitutional arrangements) or political pressures may make it difficult for the central government to avoid a regional government expectation of higher future grants in response to increased borrowing. These are the issues that we explore in this paper.

In addition to the literature on fiscal federalism generally, surveyed, for instance, in Oates (1994), our analysis is related to several other specific strands of literature. First, our analysis is related to a literature that examines the consequences of a broken link between the benefits and costs of government programs. Winer (1983), for instance, studies the separation of benefits and costs in Canadian provinces due to the central government financing regions by grants rather than regional financing using own taxes. He finds that central government financing creates a lower perceived tax-price on the part of Canadian provinces. This finding is reminiscent of the fiscal illusion explanation of the voluminous flypaper effect literature, surveyed by Hines and Thaler

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[2] It has long been recognized that when spending responsibility and revenue-raising authority are divorced from one another, governments tend to face incentives that lead to inefficient decisions, emphasized particularly by Buchanan (1967). Oates (1972) states

> ... it is generally desirable, at least at the margin, to have decentralized levels of government finance programs with their own resources rather than with funds from external sources. If revenues are not raised locally, the explicit link between the benefits and real costs of the programs is broken. (p. 124)

(1995), which studies inefficient behavior on the part of lower-level governments that are funded by grants from higher-level governments. These studies do not generally consider the inter-temporal aspect of the problem.

A second related literature studies the effect of institutional rules on borrowing. For instance, Poterba (1995) and Von Hagen (1991) study the effect of U.S. state constitutional rules on borrowing. These studies do not consider the inter-relationship among levels of government in borrowing decisions, however. Others, such as Bird, Ebel, and Wallich (1995), Prud'homme (1995), and Tanzi (1996) argue that the central government needs to impose some sort of rule or constraint on regional borrowing to influence regional government expectations. However, Inman and Rubinfeld (1996) stress that in practice the central government is likely to be influenced by political pressures, so it may be politically difficult to pass a constitutional rule in the first place, or to enforce it at a later date. And Ter-Minassian (1999) notes that governments may attempt to circumvent rules.

A third related literature studies soft budget constraints. This literature, surveyed by Maskin (1999), derives from Kornai's (1986) analysis of centrally planned economies in which an unprofitable enterprise expects to be bailed out by the central government. Qian and Roland (1998) extend this analysis to federalism in transition economies by analyzing how the incentive to bail out the unprofitable enterprise changes when it is the lower level of government that decides whether or not to bail out the enterprise.[3]

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[3] They find that this sort of decentralization increases the opportunity cost of bailing out the enterprise, thus decreasing the incentive to bailout and making the enterprise's budget constraint harder. Qian and Roland also find that when the central government partially funds the lower level of government through grants, the regional government's opportunity cost of bailing out the enterprise is even higher still, further hardening the enterprise's budget constraint.

Our analysis is complementary to, but quite distinct from this literature. We do not study the softness of an enterprise's budget constraint, but rather the softness of the regional government's budget constraint. McKinnon and Nechyba (1997) argue that central government access to the central bank inherently makes the central government budget constraint soft. Qian and Weingast (1997) further argue that, to the extent that subnational governments do not have direct access to the central bank, their budget constraints will be harder than the central government's. However, they also note that central government grants provide a way in which subnational governments may gain indirect access to the central bank, and hence soften regional government budget constraints. We add to this by analyzing how a region's expectation of future grant policy by the central government influences the perceived softness of the region's budget constraint, and hence regional borrowing.

Finally, Wildasin (1997) also studies the softness of the regional government budget constraint. He argues that the central government's objective is to correct for the external impact on the economy as a whole that would result if a lower level government were to go bankrupt. Since the externality is big for large jurisdictions, the central government acts to bail out large lower level governments, but not small ones. Large lower level governments, in turn, have an incentive to induce a bailout by the central government. Our analysis differs from this in that we argue that if the regional government is financed primarily from central government grants, a region would not expect a hard budget policy by the central government to be credible because of political pressures. Our focus is on the way in which a region's borrowing incentives change depending on its expectations of the softness of its budget constraint in the future.

We begin by exploring a theoretical model of regional borrowing decisions in an evolving federation that we represent in a two-period model. The central government finances the regions through grants in period one, reflecting administrative or political costs of decentralized taxation in new federations.[4] Given the initial central government grant allocation, a regional government borrows in period 1 to optimize its inter-temporal consumption decision.

The incentives for borrowing depend crucially on how the regions expect the federal system of finance to evolve in period two when the bonds come due. If the region expects the central government to devolve regional taxing authority in period two, the region will take into account the true resource cost of its borrowing decision, and the solution is both inter-temporally and contemporaneously efficient. This case serves as a benchmark and illustrates that subnational capital markets can perform the important function of correcting for an initial mismatch of a region's grant allocation and its desired consumption of public goods.

If the region instead expects that it will rely on grants from the central government in period two to finance its borrowing, the incentives for regional borrowing depend crucially on how the region expects the central government to change its grant allocation in response to additional regional borrowing. If the region expects the central government to force a "hard" budget constraint by refusing to increase second period grants at all in response to additional regional borrowing, the region will recognize the full opportunity cost of foregone public good consumption in period two, and it will borrow in an inter-temporally efficient manner. Sub-

[4] Inman (1999) suggests that administrative costs may at least initially force regional governments in a new federation to be financed in this way. Alternatively, this may result because those previously in power in a centralized state may have an interest in maintaining some centralized power.

national capital markets may be unable to correct any initial contemporaneous distortion that would result if the central government were to incorrectly allocate period one grants, however.

Inman and Rubinfeld (1996) stress that in practice the central government allocation of grants is likely to be influenced by political pressures, and regions therefore may not consider a hard budget constraint to be a credible policy on the part of the central government. We consider two possible ways in which the region might expect the central government to create a "soft" regional budget constraint by increasing grants in period two in response to additional regional borrowing. In the first scenario, the central government increases second period grants dollar for dollar (in present value) with a region's first period borrowing. This eliminates any opportunity cost of foregone public consumption in period two, and results in a "problem of the commons." Each region will face a price for borrowing below the true resource cost and regions will have an incentive to borrow too much. In the second scenario, the central government again funds all borrowing, but the region expects that its grants will increase according to its share of initial grants for period two. The second scenario also results in a problem of the commons. In addition, in the second scenario the region perceives that an increase in its own borrowing will result in an increase in central government grants that does not fully offset first period borrowing. Borrowing thus reduces the opportunity cost of foregone public consumption in period two. The result is that the price of public consumption in periods one and two are reduced. The impact on borrowing depends on the relative price, which may be higher or lower than before. It is likely to differ from the true resource cost, and regions will likely borrow in an inefficient manner.

We empirically examine the implications of the model using data on Spain for the period 1984-1995. A process of devolution has been occurring in Spain since the death of Franco in

1975 and the creation of a new Constitution in 1978. During the early 1980s seventeen regional governments were given varying degrees of spending responsibility and taxing authority. The amount of autonomy in laws and expenditures for regional governments has slowly increased over time, but fiscal autonomy has lagged behind, with the central government retaining control of the vast majority of revenues available to the regional governments. Thus, Spain in many ways is typical of the problems of a federation that evolves from a previously centralized form of government.

In addition, previous studies of the Spanish federal system of government indicate a likely mismatch of expenditures and revenues. Garcia-Milà and McGuire (1991, 1993) find either a negative or zero relationship between personal income and public spending. This is contrary to typical findings for fiscally empowered sub-national governments, and suggests that the grants from the central government, the main source of funding during the period under examination, are not reflective of regional government demand. Goodspeed (1994) also explores the possibility that central government grant funds do not match the demands of the regional governments. Assuming that debt is not the marginal source of funds, he estimates the welfare loss that results from a mismatch of grant revenues and expenditures. He finds a significant positive relationship between the estimated welfare loss and the amount of new debt issued, indicating that those regional governments that are underfunded tend to issue more new debt.

The results of our empirical investigation indicate that, controlling for other factors, higher income results in greater borrowing among certain regions. Certain regions also seem to perceive and respond to the problem of the commons component of the price variable, while other regions appear to be influenced by a perceived opportunity cost of borrowing.

The paper is divided into three additional sections. Section 2 presents an intertemporal model of regional government borrowing decisions under an evolving system of fiscal decentralization. In section 3 we describe the recent evolution of federal finance in Spain, expectations about the future development of the system, and we examine the borrowing decisions of regional governments in Spain. We conclude in the final section.

2. A theory of evolving federations

We develop a two-period inter-temporal model of borrowing decisions in evolving federations. The federation is assumed to consist of a central government and a set of regional governments. The central government decides on an initial level of grants for each region in each of the two periods, denoted g_{i1} and g_{i2} in per-capita terms. This initial decision is exogenous to the model. To provide a rationale for borrowing (or lending), it is assumed that this initial exogenous choice by the central government does not exactly match the demand of the regional government for spending in at least one of the two periods.[5] The regional government therefore borrows or lends in period one to optimize its inter-temporal consumption decisions. The incentives for borrowing depend crucially on how the regions expect the federal system of finance to evolve in period two when the bonds come due.

[5] That the central government lacks enough information to constantly match spending demands of regions is of course a prime rationale for a federal system of government. See the decentralization theorem of Oates (1972).

In all cases, we assume that the regional government acts to maximize the utility of a representative consumer.[6] The utility of the representative consumer in region i is assumed to be a function of private consumption in periods 1 and 2, C_{i1} and C_{i2}, and per-capita public consumption in periods 1 and 2, G_{i1} and G_{i2}. The representative consumer has private income in each period, Y_{i1} and Y_{i2}. In addition to the exogenous central government grants received for public consumption mentioned above, the region is able to borrow an amount per capita for public consumption in period 1 of B^g_{i1}. Consumers can borrow an amount for private consumption in period 1 denoted by B^C_{i1}.

2.1 Regional government financing of regional borrowing

The first way that the federal system of finance may evolve in period two is for the central government to devolve taxing authority. In this case, first period borrowing is paid back through regional taxes and second period grants received from the central government. Regional government i is assumed to maximize the utility of a representative consumer of region i subject to the constraints described above[7]:

[6] The model could be extended to include more complex public choice mechanisms that do not assume regional homogeneity, but this is not central to our main results.

[7] We could add a central government budget in periods one and two to account for taxes paid to finance the initial grant levels, but all parts of such a constraint (the initial grants, the central government tax rate that finances such grants, and the total tax base) are exogenous to the model, so this will have no bearing on the results. We follow this methodology for all cases. The model could be extended to include a labor supply or migration response, in which case the central government funding of initial grant levels would become relevant.

$$\underset{B_{i1}^{C},\, B_{i1}^{G},\, t_{i2}}{Max} \quad U_i(G_{i1},\, C_{i1},\, G_{i2}\; C_{i2})$$

$$\begin{aligned} s.t.\;\; G_{i1} &= g_{i1} + B_{i1}^{G} \\ C_{i1} &= Y_{i1} + B_{i1}^{C} \\ G_{i2} &= g_{i2} + t_{i2}Y_{i2} - B_{i1}^{G}(1 + r) \\ C_{i2} &= Y_{i2}(1 - t_{i2}) - B_{i1}^{C}(1 + r) \end{aligned} \qquad \textbf{(1)}$$

where r is the interest rate.[8] The third and fourth constraints assume that the region imposes a proportional income tax at rate t_{i2} in the second period which generates revenue $n_i t_{i2} Y_{i2}$ where n_i denotes the population of region i. The funds generated by this tax are used either to provide an additional amount of the public good in period 2, of which each resident is assumed to consume a per-capita amount, or to pay off borrowing, as indicated in the third constraint. Substituting the constraints into the objective function yields the following unconstrained problem:

$$\underset{B_{i1}^{C},\, B_{i1}^{G},\, t_{i2}}{Max} \quad U_i(g_{i1} + B_{i1}^{G},\; Y_{i1} + B_{i1}^{C},\; g_{i2} + t_{i2}Y_{i2} - B_{i1}^{G}(1 + r),\; Y_{i2}(1 - t_{i2}) - B_{i1}^{C}(1 + r)) \qquad \textbf{(2)}$$

The first-order conditions are

$$\begin{aligned} \frac{\partial U_i}{\partial C_{i1}} - (1 + r)\,\frac{\partial U_i}{\partial C_{i2}} &= 0 \\ \frac{\partial U_i}{\partial G_{i1}} - (1 + r)\,\frac{\partial U_i}{\partial G_{i2}} &= 0 \\ \frac{\partial U_i}{\partial G_{i2}} Y_{i2} - \frac{\partial U_i}{\partial C_{i2}} Y_{i2} &= 0. \end{aligned} \qquad \textbf{(3)}$$

[8] We view each region as a small open economy that takes the interest rate as given.

The first two first-order conditions can be rearranged to yield the usual intertemporal relationship between present and future consumption (the marginal rate of substitution is equal to the ratio of first and second period prices) for private and public good consumption, respectively:

$$\frac{\frac{\partial U_i}{\partial C_{i1}}}{\frac{\partial U_i}{\partial C_{i2}}} = \frac{\frac{\partial U_i}{\partial G_{i1}}}{\frac{\partial U_i}{\partial G_{i2}}} = (1 + r) \qquad \textbf{(4)}$$

The first two first-order conditions also imply that the contemporaneous marginal rate of substitution between public and private goods for period one is equal to that for period two, and the last first-order condition can be rearranged to indicate that the marginal rate of substitution is equal to one in period two, so the first-order conditions also indicate:

$$\frac{\frac{\partial U_i}{\partial G_{i1}}}{\frac{\partial U_i}{\partial C_{i1}}} = \frac{\frac{\partial U_i}{\partial G_{i2}}}{\frac{\partial U_i}{\partial C_{i2}}} = 1. \qquad \textbf{(5)}$$

Since the contemporaneous marginal rate of transformation between public and private goods is also one, this solution is contemporaneously efficient as well.[9] This case serves as a benchmark and illustrates that subnational capital markets can perform the important function of correcting for an initial misallocation of grants by the central government. If the central government initially allocates an insufficient level of grants to a region, the region will borrow to cover the gap between its allocated grants and its desired level of spending. Since the region

[9] This result depends of course on the efficiency of the public choice mechanism.

takes into account the true resource cost of its borrowing decision, the solution is both inter-temporally and contemporaneously efficient. The region may borrow more than it would have if first period taxes had been available, but this is irrelevant for efficiency in our model.[10]

A graphical depiction of the solution in terms of demand for public spending in period 1 is illustrated in Figure 1. The region will equate the representative consumer's demand, represented by U_{iG1}/U_{iC1}, to the ratio of prices he faces, one. The region is given g_{i1} from the central government to spend on G_{i1}. If this leaves the representative consumer off of his demand curve, the region will borrow (or save) until the representative consumer just satisfies his demand. Figure 1 illustrates the case in which the region is given too little in the way of grants and borrows the difference between its desired demand and the grant level, B_{i1}^{G*}. The optimal level of spending, G_{i1}^{*}, is the sum of the given grant level and the optimal amount of borrowing.

2.2. Central government financing of regional borrowing

When the central government does not devolve regional taxing authority, the region must rely on grants from the central government to finance its borrowing. This changes problem (1) in two ways. First, the region must have some expectation of whether and how the central

[10] The result that both contemporaneous and intertemporal efficiency hold for this case has an interpretation in terms of the Ricardian equivalence result. If the central government restricts the regional government to consume less than the regional government would have freely chosen in period 1, the regional government will correct this inefficiency as long as it is unrestricted in period 2. This is the fiscal federalism version of the Ricardian equivalence result. Restricting the regional government in period 1 has no effect on efficiency because the regional government is able to undo the first period restriction imposed by the central government. The regional government raises higher taxes in the future to pay for increased borrowing in the present, while private agents save more now to pay for the higher future taxes.

government will increase grants in response to increased regional borrowing. Second, any increase in grants is assumed to be funded by a proportional income tax imposed by the central government, $t_2^c \sum n_i Y_{i2} = \sum n_i g_{i2}^B$, where $n_i g_{i2}^B$ represents additional grants received by regional government i, and the tax rate is under the control of the central government rather than the regional government.

The resulting incentives for borrowing on the part of the region depend crucially on how the region expects the central government to change its grant allocation in response to additional regional borrowing. We consider several possibilities.

No increase in regional grants. If the region expects that the central government will not increase grants at all in response to regional borrowing, the central government will collect no additional revenues in period two, the central government tax rate will therefore be zero, and the region receives no additional grants. The region's problem is thus

$$\begin{aligned} &\underset{B_{i1}^C,\, B_{i1}^G}{Max}\ U_i(G_{i1},\, C_{i1},\, G_{i2}\ C_{i2}) \\ &s.t.\ G_{i1} = g_{i1} + B_{i1}^G \\ &\quad C_{i1} = Y_{i1} + B_{i1}^C \\ &\quad G_{i2} = g_{i2} - B_{i1}^G(1 + r) \\ &\quad C_{i2} = Y_{i2} - B_{i1}^C(1 + r) \end{aligned} \qquad \textbf{(6)}$$

Substituting the constraints into the objective function yields:

$$\underset{B_{i1}^C,\, B_{i1}^G}{Max}\ U\left(g_{i1} + B_{i1}^G\ ,\ Y_{i1} + B_{i1}^C,\ g_{i2} - B_{i1}^G(1 + r),\ Y_{i2} - B_{i1}^C(1 + r)\right) \qquad \textbf{(7)}$$

The first order conditions are:

$$\frac{\partial U_i}{\partial C_{i1}} - (1 + r)\frac{\partial U_i}{\partial C_{i2}} = 0$$
$$\frac{\partial U_i}{\partial G_{i1}} - (1 + r)\frac{\partial U_i}{\partial G_{i2}} = 0 \qquad \textbf{(8)}$$

These are the same as the first two first-order conditions of the case in which regional taxing authority is devolved. Inter-temporal efficiency is achieved when the central government refuses to increase grants at all when borrowing increases. The central government forces the region to face a "hard" budget constraint and the region considers the true opportunity cost of its borrowing decision, the value of reduced public consumption in period two. However, since the region does not control the tax rate and therefore cannot trade-off public and private consumption, the last first-order condition of the case in which regional taxing authority is devolved (and contemporaneous efficiency) is not necessarily achieved. That is, subnational capital markets will not correct for any initial over- or under-funding of regional governments unless the initial over-funding in one period is exactly offset by an under-funding in the other period such that the total amount of funding is efficient.

Figure 2 illustrates the solution to this problem. The region is given g_{i1} from the central government to spend on G_{i1} and g_{i2} to spend on G_{i2}. Figure 2 illustrates the case in which the region is given relatively more grants in period 2 than period 1. The region will equate the representative consumer's marginal rates of substitution U_{iG1}/U_{iC1} and U_{iG2}/U_{iC2}. This is accomplished in Figure 2 by borrowing in period 1 and reducing g_{i2} in period 2.

It is likely that the central government will find itself under political pressure to change grants in period two. The regional government may therefore not consider a hard budget policy

by the central government credible. We consider two possible ways in which the region might expect the central government to create a "soft" regional budget constraint by increasing grants in period two in response to additional regional borrowing.

Increase grants according to a region's first period borrowing. A second possibility is that the region expects the central government to increase second period grants dollar for dollar (in present value) with a region's first period borrowing. The regional government's problem in this case is:

$$\begin{aligned} \underset{B_{i1}^{C},\, B_{i1}^{G}}{Max}\ & U(G_{i1},\, C_{i1},\, G_{i2},\, C_{i2}) \\ s.t.\ \ G_{i1} &= g_{i1} + B_{i1}^{G} \\ C_{i1} &= Y_{i1} + B_{i1}^{C} \\ G_{i2} &= g_{i2} + g_{i2}^{B} - B_{i1}^{G}(1 + r) \\ C_{i2} &= Y_{i2}(1 - t_2^{c}) - B_{i1}^{C}(1 + r) \\ t_2^{c}\sum_i n_i Y_{i2} &= \sum_i n_i g_{i2}^{B} \\ n_i g_{i2}^{B} &= n_i B_{i1}^{G}(1 + r) \end{aligned} \qquad \textbf{(9)}$$

where the next to last constraint represents the additional funds necessary to finance any increase in second period grants and the last constraint is the regional government's expectation of the additional grants that it will receive from the central government.

Substituting the last constraint for g_{i2}^{B} in the third constraint and for $n_i g_{i2}^{B}$ in the next to last constraint, substituting the tax rate (from the next to last constraint) into the fourth constraint, and substituting the constraints into the objective function yields:

$$\underset{B_{i1}^{C},\, B_{i1}^{G}}{Max}\; U\left(g_{i1} + B_{i1}^{G},\; Y_{i1} + B_{i1}^{C},\; g_{i2},\; Y_{i2}\left(1 - \frac{(\sum_i n_i B_{i1}^{G})(1 + r)}{(\sum_i n_i Y_{i2})} \right) - B_{i1}^{C}(1 + r) \right) \quad \textbf{(10)}$$

The first-order conditions are

$$\begin{aligned} \frac{\partial U_i}{\partial C_{i1}} - (1 + r)\,\frac{\partial U_i}{\partial C_{i2}} &= 0 \\ \frac{\partial U_i}{\partial G_{i1}} - (1 + r)\,\frac{n_i Y_{i2}}{\sum_i n_i Y_{i2}}\,\frac{\partial U_i}{\partial C_{i2}} &= 0 \end{aligned} \quad \textbf{(11)}$$

Re-write the second first-order condition as

$$\frac{\dfrac{\partial U_i}{\partial G_{i1}}}{\dfrac{\partial U_i}{\partial C_{i1}}} = \frac{\dfrac{\partial U_i}{\partial G_{i1}}}{\dfrac{\partial U_i}{\partial C_{i2}}\,(1 + r)} = \frac{n_i Y_{i2}}{\sum_i n_i Y_{i2}} \quad \textbf{(12)}$$

where the first equality follows from the first first-order condition. The region does not expect to experience any opportunity cost of reduced period two public good consumption because the region expects the central government to increase its grants dollar for dollar with borrowing. In contrast, the price of borrowing for first period public good consumption is reduced below one when the region expects the central government to increase grants dollar for dollar to finance the borrowing.[11] Since payment for borrowing is spread over all regions, the representative

[11] This could be represented by a lower price in Figure 1. However, the demand curve would not be the same demand curve pictured in Figure 1 unless $g_{i2}^{B} = t^{c}{}_{2}Y_{2}$; if $g_{i2}^{B} > t^{c}{}_{2}Y_{2}$ the demand curve would be slightly higher, and if $g_{i2}^{B} < t^{c}{}_{2}Y_{2}$ it would be slightly lower.

consumer in each region pays for only a portion of each dollar of additional borrowing, equal to the ratio of aggregate regional relative to national income under a proportional income tax.

This is an example of the "problem of the commons," which occurs frequently in public economics. Here, the common resource is funds for borrowing for public consumption in period one, and since the price faced by a region is below one, the common resource is over-utilized. Each region considers only its own incentives, not the effect of its actions on the other regions.[12]

Increase grants according to a region's share of initial grants for period two. A third possibility is that the region expects the central government to increase second period grants according to the region's initial share of grants for period two. The regional government's problem in this case is:

$$\begin{aligned} \underset{B_{i1}^{C},\, B_{i1}^{G}}{Max} \;\; & U(G_{i1},\, C_{i1},\, G_{i2},\, C_{i2}) \\ s.t.\;\; G_{i1} &= g_{i1} + B_{i1}^{G} \\ C_{i1} &= Y_{i1} + B_{i1}^{C} \\ G_{i2} &= g_{i2} + g_{i2}^{B} - B_{i1}^{G}(1 + r) \\ C_{i2} &= Y_{i2}(1 - t_2^{c}) - B_{i1}^{C}(1 + r) \\ t_2^{c}\sum_i n_i Y_{i2} &= \sum_i n_i g_{i2}^{B} \\ n_i g_{i2}^{B} &= \left(\frac{n_i g_{i2}}{\sum_i n_i g_{i2}} \right) \sum_i n_i B_{i1}^{G}(1 + r) \end{aligned} \qquad \textbf{(13)}$$

[12] Exactly the same incentive results when a group splits a restaurant bill. If the bill is evenly split, there is an incentive for each person in the group to buy something slightly more expensive than otherwise, thinking that the additional cost is shared among the group. Here the bill is split in proportion to income (and each "person" is actually composed of n_i identical people), but the effect is the same. In the first problem with regional taxing authority, each person goes into the restaurant alone, and pays for exactly what he or she has ordered.

where again the next to last constraint represents the additional funds necessary to finance any increase in second period grants and the last constraint is the regional government's expectation of the additional grants that it will receive from the central government.

Substituting the last constraint for g^B_{i2} in the third constraint and for $n_i g^B_{i2}$ in the next to last constraint, substituting the tax rate (from the next to last constraint) into the fourth constraint, and substituting the constraints into the objective function yields:

$$\underset{B^C_{i1},\, B^G_{i1}}{Max}\; U\left(g_{i1} + B^G_{i1}\,,\; Y_{i1} + B^C_{i1},\; g_{i2} - B^G_{i1} + \left(\frac{g_{i2}}{\sum n_i g_{i2}}\right)\sum n_i B^G_{i1}(1+r),\; Y_{i2}\left(1 - \frac{\sum n_i B^G_{i1}(1+r)}{(\sum_i n_i Y_{i2})}\right) - B^C_{i1}(1+r)\right) \qquad \textbf{(14)}$$

The first-order conditions are

$$\begin{aligned} &\frac{\partial U_i}{\partial C_{i1}} - (1+r)\,\frac{\partial U_i}{\partial C_{i2}} = 0 \\ &\frac{\partial U_i}{\partial G_{i1}} - \left(1 - \frac{n_i g_{i2}}{\sum n_i g_{i2}}\right)\frac{\partial U_i}{\partial G_{i2}}(1+r) - (1+r)\,\frac{n_i Y_{i2}}{\sum_i n_i Y_{i2}}\,\frac{\partial U_i}{\partial C_{i2}} = 0 \end{aligned} \qquad \textbf{(15)}$$

Re-write the second first-order condition as

$$\frac{\dfrac{\partial U_i}{\partial G_{i1}}}{\dfrac{\partial U_i}{\partial C_{i1}}} = \frac{\dfrac{\partial U_i}{\partial G_{i1}}}{\dfrac{\partial U_i}{\partial C_{i2}}(1+r)} = \frac{n_i Y_{i2}}{\sum n_i Y_{i2}} + \frac{\dfrac{\partial U_i}{\partial G_{i2}}}{\dfrac{\partial U_i}{\partial C_{i2}}}\left(1 - \frac{n_i g_{i2}}{\sum n_i g_{i2}}\right) \qquad \textbf{(16)}$$

where the first equality follows from the first first-order condition. The price of borrowing for public consumption in period one now has two parts. The first term represents the problem of

the commons as in the case in which the region expects the central government to increase grants dollar for dollar with borrowing. This is because regional borrowing is funded by the central government, and again, since payment for borrowing is spread over all regions, the representative consumer in each region pays for only a portion of each dollar of additional borrowing.

However, the region now expects the central government to increase grants according to the initial share of period two grants. This means that an additional dollar of borrowing by the region is only expected to result in something less than a dollar in additional grants. The region therefore expects to experience some opportunity cost from its borrowing decision. It must give up some second period public good consumption when it increases its first period public good consumption by borrowing, though not the full dollar of second period public consumption that it would have had to give up under the expectation of a hard budget constraint.

The result is that the price of public consumption in both periods one and two is reduced by borrowing. The impact on borrowing depends on the relative price, which may be higher or lower than before. It is likely to differ from the true resource cost, and regions will likely borrow in an inefficient manner.

Section 3. Empirical results: a case study for Spain

Our theoretical model implies a relationship between borrowing and the amount by which desired spending exceeds grants. For regions with similar income per capita, we should observe higher borrowing where grants per capita are smaller. As the demand for the public good is assumed to be normal, holding grants per capita constant, richer regions will be borrow more

than poorer ones. Therefore, for any future evolution of the federal system studied, we should expect to find that per capita borrowing has a negative relation with per capita grants and a positive one with per capita income.

The above two relationships will be the only ones present in our first theoretical case, where regions expect to have taxing power in the future. When regions expect future grants to increase dollar for dollar with present borrowing, there is an additional incentive for all regions to borrow more, all else equal, as the price of borrowing for first period public consumption, the share of income, is below one. The price in this case is larger the smaller is the income share. We should find a negative relationship between borrowing per capita and the income share of the region if a dollar for dollar increase in grants is expected by the regional governments.

Finally, if regions expect that future grants will increase with borrowing according to the share of initial grants, the price for borrowing has two components. The first component, as in the previous case, is the income share of the region, with a lower price the smaller is the region's income share. The second component is the region's share of grants, with a lower price the larger is the region's grant share. We cannot test whether the price for borrowing is one or not. But, we can test whether price differences due to different income shares or grant shares matter.

Spain presents a particularly pertinent case for testing the implications of our theoretical model because its system of fiscal decentralization is relatively new, incomplete and evolving. A process of devolution has been occurring in Spain since the death of Franco in 1975 and the creation of a democratic Constitution in 1978. Seventeen regional governments (called Autonomous Communities) have been given varying degrees of spending responsibilities and taxing authority. While the degree of regional fiscal autonomy has slowly increased over time,

the central government still retains control over the vast majority of revenues available to the regional governments[13]. Fifteen of the regions are regulated by the Common Regime and share the same financing scheme but have different levels of spending responsibility, higher for those regions with stronger cultural and historical identities. For historical reasons, Navarra and País Vasco have a special status called the Foral Regime, based on regional collection of taxes and payments to the central government according to the cost of services that the central government provides. Because the arrangements of these two regions are so different from the other fifteen, we omit them from our discussion and analysis.

In Table 1 we illustrate the different types of arrangements for the fifteen regions and display income per capita for each region. The fifteen regions are divided into two groups; ten have responsibility for a variety of minor services such as housing policy, culture and protection of the environment and five have responsibility for these services as well as the major services of health and education. Among the ten low-responsibility regions, five are multi-provincial meaning that there is an additional level of sub-regional government (roughly equivalent to a U.S. county) with some spending authority. Among the five high-responsibility regions is one of the poorest (Andalucía) and one of the richest (Cataluña); the ten low-responsibility regions include the poorest (Extremadura) and the richest (Baleares).

For the regions under the Common Regime there are three primary sources of revenue, two of which are in large part set by the central government. The first source, centrally provided grants to the regions, consists of two types. One type, the Interterritorial Compensation Fund, is

[13] This is particularly true for the period of our sample, up to 1995. Since 1997 the system is evolving towards a higher fiscal autonomy of the regions.

largely redistributive. The other type, which is much more significant for most regions, provides grants according to the spending responsibilities that have been devolved to the regions. Essentially, the central government attempts to determine the costs per capita of providing various services and then gives a grant to regions using a formula based on factors such as population, land area, degree of urbanization and which services have been devolved. Also included in grant revenues for the regions are grants from the European Union.

A second source of revenues is certain taxes that have been ceded to the regions by the central government. This source of revenue is also under the control of the central government because the bases and rates of ceded taxes are largely set by the central government.[14] Recently the system has been evolving to allow greater regional control of the income tax, but these changes are not relevant for the period we study, except for their influence on expectations about the future evolution of the system. The third source of revenue is borrowing, which, subject to a limit set by the central government on the amount of debt servicing, is largely under the control of the regional governments.

Table 2 displays the percentage of total revenues attributable to each source for each regional government on average over the period 1984-1995. Because of the dependence of central grants on the different levels of spending responsibility the proportion of funding from grants varies a great deal from region to region. Generally, those that have responsibility for health and education obtain a larger percentage of their funding from grants. On average, summing grants and ceded taxes, nearly 90 percent of total regional revenues are under the control of the central government. The only significant source of revenue under the control of

[14]In some instances, regions can impose surcharges on the rates.

the regions is borrowing, which has contributed about 10 percent of regional revenues on average over this period. This system of finance is in marked contrast to the system of fiscal federalism in the U.S. in which regional governments have significant taxing authority.

Regional governments began to rely on borrowing as a source of revenue in the mid 1980s and its importance as a revenue source has increased over time. Because of the rapid increase in borrowing over the decade analyzed, the ratio of debt service to non-capital revenues has grown from three percent in 1984 to nearly ten percent in 1995 on average (see Table 3). The central government limits this ratio to no greater than 25 percent. In the three years displayed in Table 3 no region except for Cantabria in 1995 had violated this limit, but several had come close.

Table 4 displays annual observations for income per capita, total revenue per capita and deficit per capita for the aggregate of the fifteen regions from 1984 to 1995. Clearly, by these measures, the size of the regional government sector relative to the private sector rose over the period with average annual increases of ten percent for total revenue per capita and only three percent for income per capita. Deficit spending per capita increased from a small surplus to a peak of 18,563 pesetas in 1992 to close out the period at 9,622 pesetas.

Taken together these facts indicate the increasing role of borrowing and debt in the finances of the regional governments in Spain, and suggest that Spain may be a good country to test our theory. It is also the case that the evolution of the decentralization process has elements that could be identified with the future of the models that we have developed in the previous section. Since 1997 regional governments have been able to choose to have part of their central grants substituted by a percentage of the income tax raised in their region. At present the political

discussion is centered on the devolution of some indirect taxes. In addition, for some regions and types of expenditures, additional grants were given to cover the historical debt that had been accumulated due to an inadequacy of grant revenues relative to expenditures; this is close to a dollar for dollar increase in grants in response to borrowing, at least for part of the debt. Finally, the amount transferred by the central government is increasing, annually negotiated, and has responded to the pressures of various regional governments to obtain more funds. These funds have usually been distributed using the same criterion as the original funds. This behavior of the central government is not far from an increase in grants according to the initial grant share.

Overall it seems that, although with some limitations, the Spanish case may be quite appropriate to test our theory. In an attempt to do that we estimate the relationship between borrowing per capita and the variables that the theory suggests under the various regimes: income per capita, grants per capita, share of income and share of grants. We use annual observations of fifteen regions (all but Navarra and País Vasco) over the period 1984-1995. To control for higher levels of grants from the central government associated with having responsibilities for health and education, we include dummy variables indicating whether and when a region has such responsibilities[15]. Analogously, we include a dummy variable for those low-responsibility regions that are uni-provincial. These five regions have responsibility for sub-regional spending that the multi-provincial regions do not. Finally, we include annual time dummies to capture general

[15] Dummies for health and education are needed because, while all high-responsibility regions were responsible for education over the time period analyzed, health was devolved at different times for different regions (Andalucia and Cataluña had responsibility for health throughout the period; C. Valenciana started in 1988, Galicia in 1991, and Canarias in 1994).

trends over the period in borrowing and general time-varying factors affecting borrowing, such as the interest rate.[16]

We have reason to expect that the relationship between borrowing and our income and price variables will be different for the five high-responsibility regions and the ten low-responsibility regions. The five high-responsibility regions have responsibility for two important and relatively income elastic categories of spending -- health and education – while the categories of spending common to all regions are likely to be less income elastic. The relationship between borrowing and the price variables may differ across the two types of regions as demand may be more elastic for the high-responsibility regions. Further, the two types of regions receive grants based on different formulas, and may differ as to their expectations of future grant revenues and hence price.

We therefore estimate a general model that allows for different slopes for the two types of regions for both income per capita and the variables that influence price, and we test whether the different slopes are supported by the data. We also consider the possibility that regional individual characteristics not captured by our explanatory variables may have an influence on borrowing decisions, and, if so, we test whether fixed or random effects specification is more appropriate.

The main problem we encounter is that the two share variables, income share and grant share, are highly correlated, with correlation coefficients of 0.96 for the high-responsibility

[16] While theory suggests including interest rates faced by the regions, it appears that interest rates are essentially identical across regions, possibly because the markets recognize that ultimate responsibility for regional debt lies with the central government. Any changes over time in the interest rate will be captured by yearly dummy variables.

regions, and 0.88 for the low-responsibility regions. Given that we cannot isolate one effect from the other, we estimate equations with one share variable at a time. We allow for individual characteristics of the regions by estimating a random effects estimator, that according to the Hausman test is consistent for the specifications presented. The results are displayed in the first two columns of Table 5.

Although the theory suggests that there should be a negative relationship between grants per capita and the amount of borrowing of a region, all else equal, in all specifications that we have explored, grants per capita are not significantly different from zero. That can be seen in the three columns of Table 5, where the t-statistic for that variable is always very small. This could be indicating that the random effects estimation and the dummies that control for types of communities and expenditure responsibilities take into account all differences in grants that may be relevant for borrowing decisions.

The results obtained indicate that income per capita is not a significant determinant of borrowing for the ten low-responsibility regions, but it is a positive and statistically significant determinant of borrowing for the five high-responsibility regions. This finding for the five is consistent with our theoretical model. Among the five high-responsibility regions, richer regions may be more tightly constrained by the level of central-government grants (their desired spending may be further away from their grant levels) and thus they may choose to borrow more. In contrast, low-responsibility regions, because their central government grants may be well designed to meet their needs, and also because the European Union grants form a large share of their relatively small total grant amounts, may not find their grant amounts to be significantly

below their desired levels of spending and thus differences in income do not result in significant differences in borrowing.

Income share is not statistically significant for the low-responsibility regions, and has a positive significant effect, on the high-responsibility regions. This latter result is contrary to what the theory suggests for either of the soft budget constraint cases, as the theory predicts a negative relationship between borrowing per capita and income share. The share of grants variable has a negative effect on the low-responsibility regions, and a positive effect on the high responsibility regions, although in neither case is the coefficient significant at the 5% level.

Given the high correlation of the two variables, one way to interpret these results is to consider that both variables have the possibility of capturing either of the two share effects embedded in the price. The sign of the coefficient, then, indicates which share effect dominates. For the low-responsibility regions the result points to a negative relationship (most strongly in column 2), which could be evidence that those regions expect some form of bailout, and that they respond to the problem of the commons effect. The high-responsibility regions, on the other hand, respond more to a perceived opportunity cost reflected theoretically in the second effect embedded in the price (see equation 16). This is seen in the positive effect of either share variable but more strongly with income share in column (1). A positive effect of either share component of price may be capturing differences in price due to differences in opportunity cost. Thus, there is some evidence that the low-responsibility regions are responding to the problem of the commons part of the price effect that comes from an expectation that the cost of borrowing will be shared among all regions, and there is somewhat stronger evidence that the high-

responsibility regions expect and respond to differences in the opportunity cost of increased borrowing.

Evidence that the income share and grant share variables are closely related is presented in column (3). Since income share can be decomposed as $\frac{n_i Y_{i2}}{\sum n_i Y_{i2}} = \frac{n_i}{\sum n_i} \frac{Y_{i2}}{Y_2^m}$ where Y_2^m is mean national income and grant share can be decomposed as $\frac{n_i g_{i2}}{\sum n_i g_{i2}} = \frac{n_i}{\sum n_i} \frac{g_{i2}}{g_2^m}$ g_2^m is mean national grant, the common component is population share. In column (3) we present the results of estimating the equation with population share instead of income or grant share. Similar to the previous results, we find that population share has a positive coefficient for the five high-responsibility regions and a negative coefficient for the ten low-responsibility regions.

4. Conclusion

Devolution is occurring in many countries around the globe as part of a transition from dictatorships to democracies. Oftentimes, spending responsibilities and borrowing authority are devolved but taxing authority, at least initially, remains with the national government, and regional governments are financed primarily by way of central government grants. We study the consequences of this evolutionary method of decentralization; these consequences depend crucially on how the regional government expects the federation to evolve.

One consequence of initially deficient grant revenues is the tendency for regional governments to rely on debt. If the regional government expects to be granted taxing authority in the future, sub-national capital markets can provide an efficient means to correct any initial revenue deficiency. However, this important function of subnational capital markets can become distorted. The distortion results if the region expects the central government to increase grants in response to regional borrowing, creating a "soft" budget constraint for the region. We show that if the region expects a "soft" budget constraint in the future, the price of borrowing has a "problem of the commons" element to it, and possibly an opportunity cost component that differs among regions.

We then empirically examine the implications of the model using data on Spain for the period 1984-1995. Spain in many ways is typical of the problems of a federation that evolves from a previously centralized form of government. Controlling for other factors, the results of our empirical investigation indicate that, among certain Spanish regions, higher income results in greater borrowing, indicating an initial mismatch in grants and desired expenditure. Certain regions also seem to perceive and respond to the problem of the commons component of the price variable, while other regions appear to be influenced by a perceived opportunity cost of borrowing.

Our analysis of the incentives created by the federal system in Spain has important policy implications for other countries undergoing a process of decentralization. As fiscal decentralization in emerging democracies unfolds it is important to understand the consequences for borrowing and debt and for the efficient allocation of resources.

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Figure 1
Equilibrium Borrowing under Regional Financing

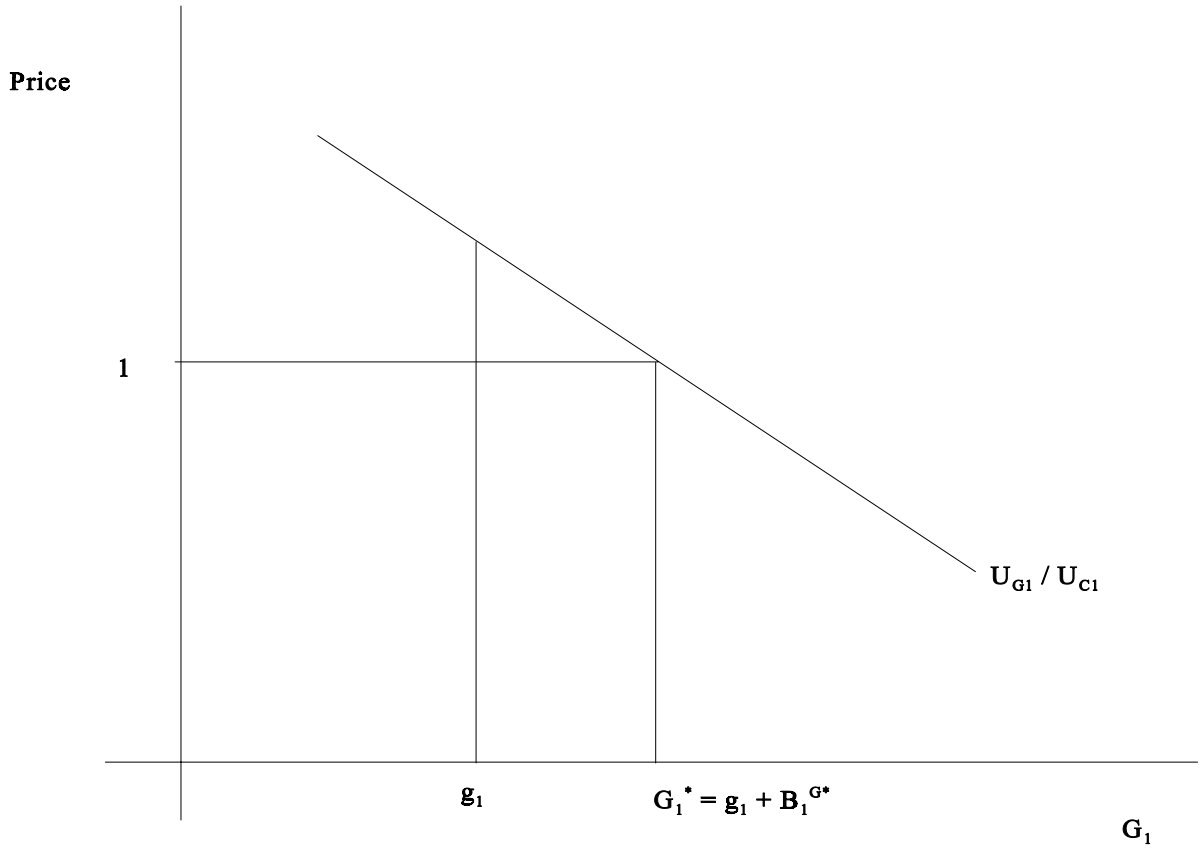

Figure 2
Equilibrium Borrowing Under Central Government Financing with No Increase in Grants

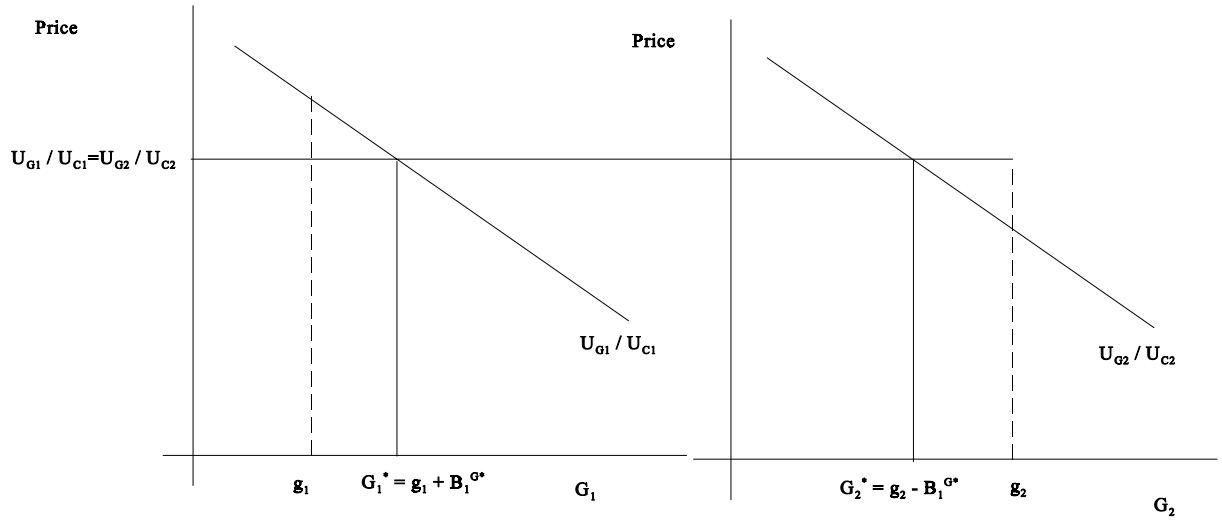

Table 1: Fiscal Responsibilities of Regions in Spain at Present, and 1995 Income Per Capita (pesetas)

	1995 Income per Capita	(Relative to Average for Spain = 100)	Responsible for Education and Health	Not Responsible for Education and Health	
				Uni-provincial	Multi-provincial
Andalucía	1,249,778	(75)	X		
Aragón	1,861,303	(111)			X
Asturias	1,488,956	(89)		X	
Baleares	2,088,042	(125)			X
Canarias	1,663,214	(99)	X		
Cantabria	1,615,407	(96)		X	
Castilla-León	1,471,767	(88)			X
Castilla-La Mancha	1,431,372	(85)			X
Cataluña	2,064,897	(123)	X		
Extremadura	1,165,115	(70)			X
Galicia	1,331,317	(79)	X		
Madrid	2,032,177	(121)		X	
Murcia	1,528,922	(91)		X	
La Rioja	2,274,291	(136)		X	
Valenciana	1,653,070	(99)	X		

Table 2: Percentage of Total Revenues Attributed to Various Sources, Average Over 1984-1995 Period

Region	Grants	Ceded Taxes	Borrowing	All other
Andalucía	84	9	6	1
Aragón	43	38	15	4
Asturias	49	30	14	7
Baleares	37	48	12	3
Canarias	57	34	6	3
Cantabria	54	29	15	2
Castilla-León	56	20	7	17
Castilla-La Mancha	78	14	5	2
Cataluña	67	16	15	2
Extremadura	70	15	8	7
Galicia	81	11	6	1
Madrid	50	30	15	4
Murcia	48	34	16	2
Rioja	52	34	11	3
Valenciana	74	20	6	1
Spain *	71	17	10	2

* Excluding Navarra and País Vasco

Table 3: Debt Service As a Share of Revenues From Non-Capital Sources

Region	1984	1991	1995
Andalucía	0.003	0.038	0.065
Aragón	0.000	0.051	0.143
Asturias	0.076	0.207	0.210
Baleares	0.052	0.114	0.098
Canarias	0.001	0.034	0.043
Cantabria	0.084	0.247	0.380
Castilla-León	0.000	0.043	0.067
Castilla-La Mancha	0.000	0.023	0.048
Cataluña	0.070	0.205	0.146
Extremadura	0.000	0.032	0.171
Galicia	0.004	0.026	0.084
Madrid	0.064	0.091	0.166
Murcia	0.109	0.222	0.214
Rioja	0.098	0.138	0.134
Valenciana	0.000	0.030	0.066
Spain *	0.030	0.086	0.098

* Excluding Navarra and País Vasco

Table 4: Income, Total Revenue, and Deficit Per Capita for Aggregate of Fifteen Regions*, Real (1986) Pesetas

	Income Per Capita	Total Revenue Per Capita	Deficit Per Capita
1984	729,782	43,423	-494
1985	744,955	50,008	4,087
1986	776,565	57,654	5,264
1987	809,250	67,872	2,723
1988	843,600	76,981	2,405
1989	879,136	87,798	6,688
1990	915,079	98,052	9,438
1991	932,235	106,403	17,595
1992	947,390	121,840	18,563
1993	936,349	115,099	12,073
1994	955,024	121,473	11,545
1995	980,308	121,818	9,622
% annual increase	3%	10%	N.A.

* Excluding Navarra and País Vasco

Table 5
Random Effects Results, Borrowing Per Capita
1984-1995

	(1)	(2)	(3)
Income Per Capita * Low	4.72	3.29	4.39
	(0.77)	(0.48)	(0.69)
Income Per Capita * High	23.58	32.54	33.06
	(2.50)	(3.32)	(3.64)
Grants Per Capita	-0.007	-0.004	-0.02
	(0.12)	(0.06)	(0.39)
Share Aggregate Income * Low	-22.40		
	(0.98)		
Share Aggregate Income * High	65.93		
	(2.15)		
Share of Grants * Low		-131.24	
		(1.81)	
Share of Grants * High		33.07	
		(1.46)	
Share of Population * Low			-34.40
			(1.21)
Share of Population * High			61.87
			(1.94)
Health	2.29	0.99	2.37
	(0.58)	(0.22)	(0.60)
Education	-16.17	-24.21	-23.78
	(2.01)	(2.47)	(2.60)
Uni-Provincial	4.31	3.66	4.12
	(2.12)	(1.58)	(1.95)
Constant	-6.97	-4.04	-5.59
	(1.26)	(0.65)	(0.96)
# of observations	180	180	180
R^2	0.54	0.55	0.54
Sum of squared residuals	9,168.2	8,937.12	9,103.22

Notes:
Health = 1.0 for regions with responsibility for health, 0.0 otherwise.
Education = 1.0 for regions with responsibility for education, 0.0 otherwise.
Uni-provincial = 1.0 for Asturias, Cantabria, Madrid, Murcia and La Rioja, 0.0 otherwise.
High = 1.0 for Andalucía, Canarias, Cataluña, Galicia and Valenciana, 0.0 otherwise.
Eleven yearly time dummies are included in each regression.
t-statistics in parentheses.