FISCAL DECENTRALIZATION AND THE BUDGET PROCESS: A SIMPLE MODEL OF COMMON POOL AND BAILOUT

GIUSEPPE PISAURO

Fiscal decentralization and the budget process: a simple model of common pool and bailout

Giuseppe Pisauro

1. Introduction

The last decades have witnessed a general trend toward fiscal decentralization—the devolution of spending and revenue responsibilities to subnational levels of government—both in developed and developing countries (OECD 1997, Ter-Minassian 1997b, Wildasin 1997b). The main rationale behind this trend is based on the wide acceptance of the subsidiarity principle and on the traditional argument of the public finance literature that views local governments as being at advantage in dealing with the allocative function of the public budget. Following the Musgravian taxonomy, the public finance literature maintains (with some exceptions, see e.g., Sewell 1996) that, conversely, the redistributive and the stabilization functions would better remain in the domain of central governments. When Musgrave (1959) wrote his classic analysis, macroeconomic policy (the stabilization function) was just about counter-cyclical action. A particular facet of the stabilization function that was not prominent then, but has become since, is the need to maintain fiscal restraint and avoid structural public budget deficits. Some authors (Prud'homme, 1995; Tanzi, 1996) have stressed that to decentralize fiscal responsibilities may be inconsistent with fiscal discipline.

As noted by Tanzi (1996), there are mainly three channels through which fiscal decentralization may aggravate structural fiscal problems: the assignment of major tax bases to subnational governments, the sharing of major tax bases, and the ability of borrowing by subnational governments. This paper will focus on the budgeting process that determines expenditure *levels* and financing means (own revenues, central government grants, and borrowing). In the set of incentives facing subnational governments, there are two potential sources of distortion: (i) a common pool problem, arising from the fact that the opportunity cost of public revenues as perceived by subnational governments is lower than the true social cost; and (ii) a moral hazard problem, associated with the implicit insurance

provided by the central government that it would bailout a subnational government which was unable to meet its financial commitments.

Two strands of the economic literature seem relevant to our purposes. The first one is that on budgetary institutions (e.g., Poterba and von Haghen, 1999), which views the set of rules and regulations according to which budgets are drafted, approved, and implemented as an important determinant of public sector deficits and debts. The second strand is that on the soft budget constraint (e.g., Muskin, 1999), a syndrome arising when an economic agent (for example, a public sector firm) is not held to a fixed budget but finds its budget constraint softened by the infusion of additional credit (or guarantees) when it is on the verge of failure.

The main point of the paper is that policies devised to correct the common pool problem may exacerbate the moral hazard problem associated with bailouts. The common pool problem is clearly aggravated by a larger vertical fiscal gap: subnational governments have every incentive to overspend when a large share of financing is raised by the central government.[1] An obvious answer would then be to reduce as much as possible the fiscal gap. If local sources of tax revenues were sufficiently large to enable subnational governments to finance their expenditure tasks without having to rely on central government's support, the divergence between private (local) and social (national) opportunity costs of public funds would disappear, and with that also any incentive to local overspending. This line of reasoning, however, overlooks the moral hazard problem: subnational governments may rationally decide not to raise the revenue required to finance their expenditure—even though they have enough fiscal autonomy to do that— since they may believe they have the option of being bailed out by the central government and then of financing local expenditure with national revenues (whose opportunity cost, again, is lower than that of local revenues from the point of view of subnational governments).

---

[1] To be more precise, what really matters is the financing of *marginal* expenditure. In a number of local government regimes, transfers from the center finance the local government only up to some target level expenditure. Thereafter, the local government is able to spend resources—but only if it can raise from its own local tax regime, including fees, charges and any borrowing. This may attenuate the common pool problem, but arguably leaves still open the soft budget constraint problem (see below). I thank B. H. Potter for drawing my attention on this point.

Another trade-off facing the design of intergovernmental relations originates from the fact that whereas more decentralization (fragmentation) may make a bailout less likely, since no local government will be "too big to fail," at the same time it may also widen the gap between social and private costs of public funds.

If it is accepted that the moral hazard problem implies that the divergence between opportunity costs of tax revenues as perceived by central and subnational governments cannot be eradicated, one is left with the option of designing proper institutional arrangements to address that problem. On this, some insights can come from the literature on budget procedures that indicate as effective those arrangements that involve either a delegation of authority to a "fiscal entrepreneur," or a credible commitment by actors to a set of fiscal targets collectively negotiated. As we will see, the experience of some federal countries seems to indicate that it is possible to transfer, with proper adjustments, this recipe to intergovernmental relations.

The paper is organized as follows. In Section 2 we first review the literature on the budget process in central government that emphasizes the common pool problem and discuss its relevance for intergovernmental fiscal relations, then we will illustrate some recent contributions on the soft budget constraint in intergovernmental fiscal relations. In Section 3 we present a model of budgeting in a federal context. Section 4 provides some concluding remarks.

2. Common pool and soft budget constraint in the budget process: a review

The idea that a common pool problem is intrinsically rooted in the typical public budget process can be traced back to the paper by Weingast, Shepsle, and Johnsen (1981). Focusing on the parliamentary stage of the budget process, they consider a legislature made up by representatives with a geographically based constituency and explain why a cooperative legislature would stand for policies that are Pareto dominated. The legislature will oversupply those programs that concentrate the benefits in geographically specific constituency, while spreading their costs across all constituencies through generalized taxation. In other words, each representative will fail to internalize the full cost, in terms of deployment of

the common pool of national tax revenues, of financing expenditure programs that benefit mainly his constituency. The divergence between real and perceived costs will be wider, and hence the commons problem more serious, the more fragmented is the legislation (that is, the higher is the number of districts for a given total population).

Taken at its face value, this model explains nothing more than the tendency for a parliamentary determined budget to exhibit a level of expenditure on "pork barrel" projects higher than is economically warranted. In fact, the more recent literature has built on the same basic idea to provide a representation of the government stage of the budget process and to generate a bias toward excess deficits as well as excess public spending. One can reasonably replace the geographically based constituency of a representative in the legislature with the special-interest based constituency of a spending ministry in the government. A good example is von Hagen and Harden (1995), who consider a government consisting of n spending ministers. The budget allocates public funds, raised through distorting taxation, to spending ministers, each of them pursuing its policy target. Collectively, the cabinet would wish to minimize the divergence between policy targets and actually allocated funds and, at the same time, to minimize the excess burden of taxation. The common pool problem arises, as in Weingast et al. (1981), from the fact that each spending minister takes into account only a share of that excess burden: the portion that falls on his constituency. From this premise, the budget released by the cabinet is going to depend critically on the decision-making procedure. If the procedure entails collecting each minister's bid and taking a vote on the resulting budget, we are in the reign of what Weingast et al. (1981) labeled as "universalism" and "reciprocity" (any spending unit will get some funds and a process of mutual support and logrolling will be established), where the final budget will exhibit a spending bias.

As noted in several evaluations of the literature on budget institutions (e.g., Alesina and Perotti, 1995; Milesi-Ferretti, 1997), early models with government resources as "common property" explain how budget procedures can have an implicit bias toward overspending and then excess budget size, but they do not say anything about the budget deficit. More recent models (Hallerberg and von Hagen, 1999; Velasco, 1999, 2000) show that the "common property"

approach is able to generate excess deficits as well. For example, Hallerberg and von Hagen (1999) propose an extension to two periods of the model of budgeting within government by von Hagen and Harden (1995). The budgeting decision now involves not only allocating funds among the spending ministers but also setting taxes endogenously in order to meet the intertemporal budget constraint. Again, individual spending ministers would disregard the externality arising from their expenditure decision, and hence in a completely decentralized budget process both spending and borrowing (in the first period) would be inefficiently high.

There are two ways of reducing the spending and deficit bias arising from the coordination problem in the budget process: either delegation of authority to a "fiscal entrepreneur" (the finance minister, without portfolio) or commitment by the whole government to a set of binding limits on expenditure allocations collectively negotiated at the beginning of the budgeting process. The larger the finance minister's agenda-setting power, the closer the deficit comes to the collectively optimal outcome. Under the commitment approach, the multilateral nature of the negotiations on fiscal targets implicitly forces all participants to consider the full cost in terms of tax burden associated with additional spending. Hallerberg and von Hagen (1999) note that both approaches require that the finance minister is vested with enforcement powers in the implementation phase of the budget (in short, there is an efficient system of public expenditure control and management), in order to neutralize the incentive that single spending ministers will have to defect from the approved budget.

What is the relevance of the common property model of budgeting for intergovernmental fiscal relations in a federal state? Alesina and Perotti (1995, p. 21) see a clear analogy: if spending decisions are taken at the local level and are financed with transfers by the national government, which raises taxes, the same mechanism operates under fiscal federalism as in the case of geographically elected representatives and dispersed interests. If the problem were just a common resource one, however, the answer would be almost trivial (at least conceptually): make local authorities responsible for both taxing and spending decisions; in other words, reduce as much as possible any vertical fiscal gap between the central state and subnational governments. There are conceivably practical difficulties in finding proper taxes to be assigned to subnational governments: as noted by Tanzi

(1996), local governments are seriously limited to the tax revenue they can raise on their own, if they restrict themselves to taxes that possess those characteristics commonly regarded as desirable (efficiency, ease to administer, and being of a benefit-received nature). Yet, the general prescription would be clear: try as much as possible to match the sizes of tax and expenditure assignments to local governments.[2]

Unfortunately, this "easy" solution misses something. To see why, consider the limiting situation where all local expenses are financed through local taxation. Then the common pool problem is clearly resolved: we would be left with a set of fiscally quasi-independent states (with possibly a residual role left for a federal government, consisting in the provision of national public goods). As stressed by Keen (1998, p. 471) in the context of tax competition "there is a fundamental distinction between issues of fiscal federalism and of international taxation: the presence or absence of an overarching federal government." In our case, the presence of the federal government makes a basic difference: it makes it conceivable that subnational governments will eventually be bailed out. In other words, the mere presence of a federal government introduces an insurance element that will affect the budgeting decisions of subnational governments, exposing intergovernmental fiscal relations to a moral hazard problem.

A basic question is whether it is possible to set a system of incentives such as to induce local governments not to follow the kind of behavior that would elicit a bailout. In this spirit, two recent papers, Wildasin (1997c) and Carlsen (1998), propose formal models of bailouts in fiscal federalism. Both papers model intergovernmental fiscal relations as a game where firstly the central government chooses a bailout policy, i.e., a set of conditions under which it will provide financial assistance to local governments; the possibility of a bailout brings about a nonlinear budget constraint for the local government that will decide whether or not to trigger a bailout, according to its objective function, after taking into

---

[2]Another practical difficulty in closing any vertical fiscal gap derives from the unequal distribution of tax bases among local jurisdictions, which calls for equalization schemes and for more financial support to poorer local governments. Here we neglect these considerations. In the real world, the argument for closing the fiscal gap needs to be qualified, as limited to the richer localities. Thus, the Canadian province of Alberta is fully autonomous fiscally (Courchene, 1999); the same will happen in Italy for Lombardy under the 1999 reform of regional finances.

account the costs associated with being bailed out, consisting in loss of autonomy and disruption of local activities.

In Wildasin (1997c), there is a fixed total population of identical households, partitioned into several local jurisdictions, each of the same size. The central government provides a pure public good, localities a quasi-private local good. The crucial assumption is that consumption of the local good generates a positive externality: each household cares about the total consumption of that good by all other households. Both tiers of government finance their expenditure through lump-sum taxation; in addition, localities receive matching grants from the central government. The first-best allocation of resources in this economy is characterized by the usual Samuelson conditions; following standard Pigouvian principles, it is then possible to use matching grants to achieve an efficient Nash equilibrium where all localities maximize the utility of a representative household and the budget constraints of both tiers of government are satisfied. In practice, however, the central government may not be able to enforce a commitment to its announced grant policy, so actually softening the budget constraint of the localities: if a locality chooses to provide a very low level of its local good (exerting a very low local tax effort), it will damage other localities, given the postulated positive externality. It may then be in the interest of the central government to intervene and bailout that locality by providing a conditional lump-sum grant, financed by reducing the level of expenditure on the national public good. The single locality now faces the alternative of either providing the level of the local good entailed by the Nash equilibrium with a hard budget constraint or exploiting the soft constraint option and triggering a bailout. The actual choice will depend on the intensity of the externality (that determines the generosity of the bailout) and on the preferences of the locality, given the cost of a bailout for the locality, represented by the lower consumption of the national public good.

The main implication of the model is that, under fairly general conditions, larger localities can extract larger bailouts from the central government than smaller ones, and small localities may not be able to extract any bailout from the center at all. The reason for this is that the local good provided by larger localities generates a larger positive externality. In other words, incentives for a bailout can be especially strong when subnational governments are considered "too big to fail." Wildasin (1997c) interprets this result as an indication that problems of

fiscal discipline may result not because there is too much decentralization, but because there is too little: it may make sense to carry out more thorough decentralization, devolving fiscal authorities to smaller jurisdictions.

Carlsen (1998) describes intergovernmental fiscal relations as a two-period game between a representative local government and the central government. Local finances come from local taxation, assumed to be fixed, and grants from the center, whose level is decided endogenously. The two levels of government agree on the preferred composition and intertemporal distribution of spending, but they disagree on spending levels, since the local government does not perceive that central government grants have an opportunity cost. At the beginning of the first period, the central government grants an unconditional transfer, then the local government sets preliminary budgets to two local goods. If the central government could credibly commit itself not to bailout, the local government would be able to do nothing but to set a budget that coincides with the one preferred by the central government. However, the local government can elicit a bailout by distorting its preliminary budget: the central government will provide supplementary finance if the cost of the distortion is higher than the opportunity cost of tax revenues. In practice, a bailout may arise either because the central government wants to correct the composition of local spending or because the local government runs a deficit in the first period. In the former case, the bailout involves a supplementary conditional grant (to the expenditure item that the local government decided to underfund); in the latter, the central government will concede a general grant also in the second period.

As in Wildasin (1997c), to follow a policy aimed at eliciting a bailout is not without costs for the local government: in Carlsen (1998), such cost is represented by the distortion in the composition, and in the intertemporal distribution, of spending. The local government will be willing to incur this cost when local spending is low, which implies that the marginal benefit of additional transfers is high. One way for the central government to avoid this outcome is to "bribe" the local government to abstain from budget distortions by raising the first-period unconditional grant. Indeed, Carlsen (1998) shows that in equilibrium the central government wants to follow exactly this line of conduct, local expenditure will then be higher than what it would be socially efficient but the local government will not distort its budget in order to elicit a bailout.

The models by Wildasin (1997c) and Carlsen (1998) do not address simultaneously all the dimensions of the problem of intergovernmental fiscal relations. A more complete model should incorporate elements as endogeneity of local taxes, divergence between the perceived marginal costs of public funds (the common pool problem), possibility of a bailout with some costs for both central and local governments, and should deal with problems as the optimal size of local governments and the design of financial relations between levels of government, including the relative roles of central government grants and local tax revenue.

3. A model of common pool and bail out

Even if the common pool problem in intergovernmental fiscal relations could be solved by closing any vertical tax imbalance, fiscal discipline could not be taken for granted. When subnational governments finance their expenditure through national revenues, they will not take into account the true social marginal cost of taxation and will choose an excessive level of expenditure. On the other hand, even if local expenditure was, in principle, to be entirely financed by local taxation, a subnational government will still be able to gain access to the common pool of national tax resources when its budget constraint is "soft." In other words, if there is an implicit guarantee that the central government will come to rescue a subnational government that faces financial difficulties, there is always a chance that the latter will behave in such a way to elicit that intervention.

In order to illustrate this idea, we present a simple model, in the tradition of Weingast, Shepsle, and Johnsen (1981). We consider an economy with a fixed total population of N identical individuals, partitioned into I local jurisdictions, each with population n_i ($\sum_i n_i = N$). Per capita expenditure for locally provided goods and services is y_i. Local expenditure is financed by central government grants (g_i) and local taxation (t_i), so that $y_i = g_i + t_i$. The individual benefit of local expenditure is $u(y_i)$ (with $u(0) = 0, u' > 0, u'' \leq 0$), the opportunity cost of the (national and local) taxes raised to finance it is $c(x_i)$ (with

$c(0) = 0, c' > 0, c'' \geq 0$). We assume that the central government's objective function is to maximize the total net benefit of local expenditure:

$$(1) \quad \sum_{i=1}^{I} n_i B(y_i) = \sum_{i=1}^{I} n_i \left[u(y_i) - c(y_i) \right],$$

where $B(y_i)$ is the net benefit in per capita terms (and $B(0) = 0$). The obvious solution to this problem is to fix per capita local expenditure at the same efficient level for all jurisdiction, that is y_C such that

$$(2) \quad u'(y_C) = c'(y_C).$$

Local governments differ from central government in the perception of the cost of financing expenditure: they take into account only a share, equal to their share of population, of the burden of national taxation, while considering the entire burden of local taxes. The objective function of a representative local government i, in per capita terms, is[3]

$$(3) \quad V(g_i, t_i, m_i) = u(y_i) - m_i \left[c(g_i) + \sum_{j \neq i} c(g_j) \right] - c(t_i),$$

where $m_i = n_i / N$. Assuming $g_j = \bar{g}$ for $j \neq i$, and $m_i = m$ $\forall i$ (therefore $I - 1 = (1 - m)/m$), we can rewrite equation (3) as:

$$(3\text{bis}) \quad V(g_i, t_i, m) = u(y_i) - mc(g_i) - c(t_i) - (1 - m)c(\bar{g})$$

If the local government enjoys no tax autonomy at all ($t_i = 0$), we are in the pure common pool case: the level of expenditure that maximizes $V(.)$, say y_{LL}, is defined by the following equation:

$$(4) \quad u'(y_{LL}) = mc'(y_{LL}).$$

Clearly $y_{LL} \geq y_C$ if $m \leq 1$. Fragmentation of the public budget process leads to inefficiently high levels of expenditure, and the inefficiency is the more serious the more fragmented is the process, that is the lower is *m*.

We model the fiscal relations between levels of government as a von Stackelberg game: the central government fixes the level of the grant taking into account its implications on the level of local taxes chosen by the local government.

---

[3] An alternative specification of the perceived cost such as $c(mg + t)$ would not change the qualitative conclusions of the paper, but would unnecessarily burden the algebra.

The reaction function of the local government is obtained by solving the following problem (for the sake of simplicity we drop the suffix i):

(5) $\underset{\{t\}}{\text{Max}}\ V(g,t,m) = u(g+t) - mc(g) - c(t) - (1-m)c(\bar{g})$.

The first-order condition

(6) $u'(g+t) = c'(t)$

defines implicitly the reaction function of the local government, $t_L = t_L(g)$. Implicitly differentiating condition (6) we get

(7) $-1 < \dfrac{dt_L}{dg} = \dfrac{u''(t_L + g)}{c''(t_L) - u''(t_L + g)} < 0$.

Since the level of expenditure chosen by the local government is $y_L(g) = t_L(g) + g$, from (7) we have $0 < dy_L/dg < 1$. Comparing equations (6) and (2), we see that $y_L(g) > y_C$, as long as $g > 0$. Note that for a given g, both t_L and y_L are independent of the dimension of local government (m).

The problem of central government now becomes that of choosing the level of g that maximizes the following expression

$B(y) = u(g + t_L(g)) - c(g + t_L(g))$.

Kuhn-Tucker conditions are $dB(y)/dg \leq 0,\ g \geq 0,\ (dB(y)/dg)g = 0$. Since from (6) we have that $u'(g+t_L) - c'(g+t_L) < 0$ for $g > 0$, it follows that the central government will provide no grant at all ($g = 0$). This will induce the local government to raise local taxes at a level equal to the efficient level of expenditure ($t_L(0) = y_C$).

Figure 1 provides a graphical illustration of the problem. We depict in the plane [g, t] the isoutility curves for the local government, with slope:

(8) $\left.\dfrac{dt}{dg}\right|_{V\text{const.}} = -\dfrac{dV/dg}{dV/dt} = -\dfrac{u'(g+t) - mc'(g)}{u'(g+t) - c'(t)}$.

We limit our analysis to the area where $dV/dg \geq 0$ (as we will see below, this is the only relevant area); in that area the isoutility locus is negatively (positively) sloped for $t < t_L(g)$ ($t > t_L(g)$). In the pure common pool case (no tax autonomy, $t = 0$), the local government is on the highest isoutility curve at $g = y_{LL}$, where $dt/dg|_{V\text{const}} = 0$. With tax autonomy, for a given level of g, say g_0, the local

698

government will choose the level of t corresponding to the tangency between the isoutility curve and the line $g = g_0$ (where $dt/dg|_{V\text{const}} = -\infty$). The locus of tangency points as g varies represents the reaction function $t_L(g)$. The optimal policy for the central government will then be to fix the grant at the level that guarantees $y = y_C$, that is $g = 0$. Thus preventing the access of local governments to the pool of national tax resources apparently solves the common pool problem.

However, the local government facing $g = 0$ has also another option: instead of setting $t = y_C$, it can choose to raise no local taxes (i.e. it can set $t = 0$) in the hope that the central government will intervene with a bailout, granting ex post financing. Having recognized this possibility, the next thing to do is to describe the bail-out policy of the central government: a set of conditions under which it will provide financial assistance to local governments. We assume that there is a cost for the central government, in terms of disruption of the public budget and loss of credibility, and that this cost, say F, is independent of the dimension of the local government.[4] Under this condition, once the central government has decided to intervene and bear the fixed cost F, it has no reason to provide an ex post grant different from y_C, the efficient level of expenditure. Thus the central government will intervene if $nB(y_C) = n[u(y_C) - c(y_C)] - F > nB(0) = 0$, that is if

(9) $B(y_C) > \dfrac{F}{n}$.

This formulation is consistent with the popular aphorism "too big to fail": only local governments with a dimension larger than a certain threshold (i.e. $n > F/B(y_C)$) are able to elicit a bailout.

---

[4] Arguably the cost of a bailout includes also a component directly related to the dimension of the local government involved. This would not change the qualitative conclusions of the paper.

If the dimension of the local government is sufficient to guarantee intervention, there are no doubt that it will elicit a bailout, since the strategy of behaving correctly ($t = y_C$) is strictly dominated by that of raising no local taxes at all. Indeed the latter is superior to any strategy involving positive levels of local taxation: ex post financial assistance from central government would always top any local tax revenue up to the efficient level, y_C. Since the local government would in any case end up with the same expenditure level, its optimal choice is to raise no local taxes and elicit a grant equal to y_C. Indicating with V^b the local government's utility from a bailout (no local taxation and a grant equal to y_C), we have:

(10) $V(0, y_C, m) < V(y_C, 0, m) = V^b$,

since $V(0, y_C, m) = u(y_C) - c(y_C) - (1-m)c(g_0)$

and $V^b = u(y_C) - mc(y_C) - (1-m)c(g_0)$.

As long as $m < 1$, utility from behaving correctly ($g = 0, t = y_C$) is strictly lower than utility from being bailed out.

If condition (9) holds the central government may bailout the local government that did not raise own tax revenues by transferring ex post a grant equal to y_C. However, this is not the only available option for the central government: it can also avoid the bailout if it transfers ex ante a positive grant sufficient to eliminate any incentive for the local government to follow the behavior that would trigger a bailout. We will now analyze this second policy. The level of the grant, say g^*, capable of avoiding a bailout behavior is the solution to the following problem:

(11) $\underset{\{g\}}{\text{Min}} \, g$ s.t. $\Psi(g, m) \geq V^b(m)$,

where $\Psi(g, m) \equiv V(g, t_L(g), m)$ is the maximum value function for problem (5).

The Kuhn-Tucker conditions are (assuming that the constraint is binding):

(12) $\dfrac{\partial \Psi(g, m)}{\partial g} = -\dfrac{1}{\lambda} > 0$

(13) $\Psi(g, m) = V^b(m)$,

where λ is the Lagrange multiplier associated with the constraint. From condition (13) we obtain $g^*(m)$, the minimum level of the grant that avoids a bailout inducing behavior. Condition (12) gives $\lambda^*(m) < 0$, that measures the effect on g of relaxing the constraint.

In Figure 2 g^* is individuated by the vertical line tangent to the isoutility curve that passes through the point $(g, t) = (y_C, 0)$ and corresponds to the utility level V^b. The bailout option determines a discontinuity in the local government's reaction function, that coincides with the horizontal axis ($t=0$) for $g < g^*$ and jumps up to $t_L(g)$ for $g \geq g^*$. Condition (12) is confirmed by the observation that an increase in g^* determines a decrease in t along the reaction function $t(g)$, so moving the local government onto a higher isoutility curve. Figure 2 shows also the isoutility lines (straight lines with slope -1) for the central government: the highest utility line is that corresponding to $y = y_C$; with the kinked reaction function the highest attainable utility line passes through the kink and corresponds to $y_L(g^*) = g^* + t_L(g^*)$.

Conditions (12) and (13) enable us to establish the following result on g^*.

PROPOSITION 1: For a given $m < 1$, the ex ante grant necessary to avoid a bailout, g^*, is unique and is $0 < g^* < y_C$.

PROOF: g^* is defined by $\Psi(g^*, m) - V^b(m) = 0$. If it were $g^* = 0$, it would be $y_L(g^*) = t_L(g^*) = y_C$, and $\Psi(g^*, m) - V^b(m) = mc(y_C) - c(y_C) < 0$. On the contrary, for $g^* = y_C$, $\Psi(g^*, m) - V^b(m) > 0$ by definition of Ψ.[5] Therefore it exists at least a value $g^* \in (0, y_C)$ that satisfies equation (12). Uniqueness of g^*

---

[5] Strictly speaking this is true provided that $t_L(y_C) > 0$, which can be proved by considering a first-order approximation: $t_L(y_C) = t_L(0) + (dt_L/dg)y_C = (1 + dt_L/dg)y_C > 0$.

in the interval $(0, y_C)$ follows from $\partial(\Psi - V^b)/\partial g = \partial\Psi/\partial g > 0$ by condition (11). Q.E.D.

The next two results concern the relationship between g^* and m.

PROPOSITION 2: The ex ante grant necessary to avoid a bailout, g^*, is a decreasing function of the relative dimension of the local jurisdiction, m.

PROOF: By implicit differentiation of equation (13) we find, using equations (6):

$$\frac{dg^*}{dm} = \frac{\dfrac{\partial V^b}{\partial m} - \dfrac{\partial \Psi}{\partial m}}{\dfrac{\partial \Psi}{\partial g^*}} = \frac{c(g^*) - c(y_C)}{u'(y_L(g^*)) - mc'(g^*)} < 0.$$

The sign follows from the fact that the numerator is negative (since $g^* < y_C$ by Proposition 1), while the denominator is positive by condition (12). Q.E.D.

PROPOSITION 3: As m goes to 1, $g^* \to 0$. As m goes to zero, $g^* \to g_+^* < y_C$.

PROOF: The first part of the statement is proved using the first two propositions and the fact that for $m = 1$ and $g^* = 0$, $\Psi(g^*, m) - V^b(m) = c(y_C) - c(y_C) = 0$, i.e. condition (13) is satisfied. To prove the second part, note that as $m \to 0$ the slope of the isoutility locus remains negative for $t < t_L(g)$ (see equation (8)). Since the two points $(y_C, 0)$ and $(g^*, t_L(g^*))$ must be on the same isoutility locus, it follows that $g_+^* < y_C$. Q.E.D.

The implications of the results so far obtained for the level of local expenditure can be summarized as follows.

PROPOSITION 4: The level of local expenditure consistent with no inducement of a bailout, (i) is higher than the efficient level of expenditure, (ii) is a decreasing function of the dimension of the jurisdiction, (iii) tends to the efficient level as the jurisdiction becomes bigger.

PROOF: Local expenditure is $y_L(g^*) = g^* + t_L(g^*)$. Recall that $dy_L/dg > 0$ and $y_L(0) = y_C$. From Proposition 1, $g^* > 0$, it follows that $y_L(g^*) > y_L(0) = y_C$. Proposition 2, $dg^*/dm < 0$, implies that $dy_L(g^*)/dm < 0$. From Proposition 3, $g^* \to 0$ as $m \to 1$, it follows that $y_L(g^*) \to t_L(0) = y_C$ as $m \to 1$. Q.E.D.

We are now able to complete the description of the bailout policy. In order to avoid the cost of a bailout the central government has to accept an inefficiently high level of expenditure. It will be willing to bear that cost if it is lower that the cost of intervening ex post with a bailout. That is, if

(14) $n[B(y_C) - B(y_L(g^*))] < F$.

Combining (9) and (14) we have:

(15) $F_0(m) < F/n < F_1$, where $F_0(m) = B(y_C) - B(y_L(g^*))$, $F_1 = B(y_C)$.

Notice that while F_1 is a constant, F_0 decreases with n, since $y_L(g^*)$ is a decreasing function of $m = n/N$. When F/n is within the range individuated by condition (15), the central government will prefer to avoid a bailout and provide ex ante a grant $g = g^*(m)$. If $F/n < F_0$, the cost of a bailout is low if compared with the efficiency cost of excessive local expenditure, hence the central government will find it preferable to bear F and provide ex post a grant $g = y_C$, (there will be no local taxation in this case). If $F/n > F_1$, the local government is not able to elicit a bailout, therefore the central government will provide no grant at all, local expenditure will be at its efficient level, entirely financed by local taxation. Table 1 summarizes these results.

Table 1 - Local expenditure and taxation in relation to the cost of a bailout

Bailout cost	grant	local tax	local expenditure	total efficiency cost
$F < nF_0(m)$	y_C	0	y_C	F
$nF_0(m) \leq F \leq nF_1$	g^*	$t_L(g^*)$	$y_L^* > y_C$	$nF_0(m)$
$F > nF_1$	0	y_C	y_C	0

An illustrative example may help to better understand the implications of our model. We consider $u(y) = a\sqrt{y}$ and $c(x) = x^2$, where a is a positive constant. This specification implies $y_C = (a/4)^{\frac{2}{3}}$ and $y_{LL} = y_C m^{-\frac{2}{3}}$. Setting $a=4000$, we get $y_C = 100$ and $F_1 = 30,000$ (Figures 1 and 2 were drawn using this example with, respectively, $m=0.40$ and $m=0.10$).

Table 2 shows for selected values of the share of total population the levels of local expenditure and taxes, and the limits of the relevant range of the bailout cost. The level of expenditure consistent with no bailout inducement, $y_L(g^*)$, is always lower than y_{LL}, expenditure in the pure common pool case (although y_L converges toward the efficient level much more slowly than y_{LL}). Thus when local governments have no tax autonomy at all, and expenditure is financed entirely by grants from the central government, inefficiency is at its worst. However, in the opposite polar case, when expenditure is financed entirely by local taxation, there is a strong incentive for local governments to elicit a bailout. To avoid this, it is necessary to maintain a vertical fiscal gap, measured by the ratio g^*/y_L, that although tends to zero as m goes to 1, in the example remains relatively high even for values of m around 0.5.

The dimension of the local jurisdiction has contrasting effects on the two problems that plague fiscal discipline in intergovernmental fiscal relations. A relatively large n means that it is more likely that the local government is able to elicit a bail-out (nF_1 is higher), but on the other hand the common pool problem will be less serious and the both the grant necessary to avoid a bailout and the associated per-capita efficiency cost (F_0) will be relatively low. On the contrary, for a small local jurisdiction it is more difficult to elicit a bailout. But, since the common pool misperception is more serious, if a small locality is still able to induce intervention by the centre this will have to be more costly.

Finally, it is worth noting that even though the per capita cost for small localities is higher, the total cost, nF_0, may be lower, due exactly to the lower n. In the example this is true for a range of values of m: nF_0 increases with m only up to a point (m around 0.35 in the example), then it decreases and tends to zero as m approaches unity. Figure 3 summarizes this results, showing that as m increases the area where the central government will provide an ex ante grant to avoid bailout inducement becomes larger (and conversely the no intervention area becomes smaller); on the other hand, as m increases the bailout area tends to become larger up to a point and then to become smaller. In conclusion, extreme values of m seem to be preferable. Very small local governments are less likely to be able to induce a bailout, and even if they can, the cost of avoiding a bailout is relatively low, due exactly to the small number of residents involved. For very

large values of *m* (approaching unity), the local government will be in the best position to elicit a bailout, but the cost of avoiding it will again be low, this time due to the low per capita efficiency cost associated with a less intense common pool problem. The worst case is that of intermediate values of *m*: local governments are likely to be able to elicit a bailout and the aggregate efficiency cost deriving from the common pool problem is relatively high, so that central government may prefer to bear the cost of a bailout rather than avoiding it.

Table 2 - Local expenditure, taxation, grants and efficiency costs for selected values of *m*.

	Share of the population ($m=n/N$)								
	1%	5%	10%	25%	50%	75%	90%	95%	99%
y_{LL}	2154.4	736.8	464.2	252.0	158.7	121.1	107.3	103.5	100.7
g^*	54.0	52.3	50.0	42.5	28.3	13.5	5.2	2.5	0.5
$t_L(g^*)$	84.9	85.3	85.8	87.7	91.42	95.7	98.31	99.2	99.8
$y_L(g^*)$	138.8	137.5	135.8	130.2	119.7	109.2	103.5	101.7	100.3
$g^*/y_L(g^*)$	38.9%	38.0%	36.8%	32.7%	23.6%	12.3%	5.0%	2.5%	0.5%
F_0	2144.2	2004.5	1828.5	1306.7	562.9	124.6	18.0	4.3	0.2
nF_0	21.4N	100.2N	183.9N	326.7N	281.4N	93.4N	16.2N	4.1N	0.2N
nF_1	300N	1500N	3000N	7500N	15000N	22500N	27000N	28500N	29700N

We know from the literature on the budget process that possible ways to achieve an efficient outcome are either delegation of authority to a "fiscal entrepreneur" or a cooperative approach. In our case it is obvious that delegating to the central government the decision over local expenditure levels would bring about the efficient outcome. The same result can be obtained strengthening the collective interest of local governments. This would be done under a cooperative approach, involving negotiations among all local governments over the level of their local taxation. The Nash bargaining outcome would solve the following problem:

(16) $\displaystyle\operatorname*{Max}_{\{t_i\}} \prod_{i=1}^{I} (V_i)^{m_i}$,

by symmetry, $m_i = m$, hence $I = 1/m$; since $V_i = V_j$, we have $\bar{g} = g_i$, and therefore problem (16) reduces to:

$$(17) \operatorname*{Max}_{\{t_i\}} \left(V_i^{\frac{1}{m}} \right)^m = V_i = u(y_i) - mc(g_i) - (1-m)c(g_i) - c(t_i) = u(y_i) - c(g_i) - c(t_i) \ .$$

The solution for this problem, defining a reaction function $t_i = t_i(g_i)$, coincides with that found before for problem (5), but now there will be no incentive to elicit a bailout, since the solution with no local taxation (V^b) does no longer dominates that with no central government grant (compare with equation 10):

$$(17) \ V(0, y_C, m) = u(y_C) - c(y_C) = V^b = u(y_C) - mc(y_C) - (1-m)c(y_C).$$

4. Concluding remarks

In intergovernmental fiscal relations simple recipes do not work. Policies designed to correct the common pool problem may exacerbate the moral hazard problem associated with bailouts. More decentralization (fragmentation) may make less likely a bailout since no local government will be "too big to fail," but at the same time it may also widen the gap between social and private costs of public funds.

A similar trade-off concerns the size of the vertical fiscal imbalance between central and local governments. While assigning to local governments enough tax-raising autonomy to finance their expenditure seems an obvious recipe for increasing political accountability and attenuating the common pool problem, it may render more likely the occurrence of a bailout. We have seen how it may be in the interest of the central government to grant a transfer higher than warranted by economic efficiency, in order to incentive the local government not to engage in policies that would force the center to intervene with a bailout.

This result has a straightforward interpretation that can throw some light on the problem of intergovernmental fiscal relations. The existence of a vertical fiscal gap in a federation implies that subnational governments have access to the common pool of national tax resources. But closing the gap does not necessarily mean closing the access to the pool, as in a house locking the front door does not prevent strangers from entering in, if there is an open backdoor. A bailout is

precisely a backdoor to the common pool of tax resources. If it is not possible to keep that backdoor locked, the central government by allowing some access through the front door (financing part of local expenditure through grants) can better control the deployment of the pool and avoid the more disruptive access through the back door.[6]

A quite different point of view on the relationship between vertical fiscal gap and bailouts is that in von Hagen and Eichengreen (1996). They consider two stylized situations: one in which all taxes are raised by a central government that provides grants to subcentral governments to permit the latter to carry out their functions, and another in which subcentral governments control taxes sufficient to finance their own expenditures. In the first case, a subcentral government does not possess any fiscal power to cope with the effects of region-specific shocks, small though they may be. The central government will then face the alternative of either allowing the subcentral government to go bankrupt or bailing it out. If the first choice is precluded, bailout is the only remaining option. As a consequence the moral hazard problem is exacerbated. In contrast, when there is enough local tax autonomy, the central government has the further option of demanding subcentral governments that they increase their own tax revenues to service the debt.

Indeed von Hagen and Eichengreen (1996) compare only two corner solutions: either full or no tax autonomy at all. We have supported the idea that *some* degree of fiscal dependence may be desirable; investigating the optimal degree of tax autonomy from the point of view of fiscal discipline is an interesting direction for future research. It is certainly true that a local authority with no own tax revenues will not have any instrument to offset the effects of a shock on its budget balance and will have to rely on assistance from the center (indeed, it will also have scarce incentives to follow efficient expenditure policies). However, even in a corner solution context, to assert the superiority of the full tax autonomy solution one still has to prove that subcentral governments will agree to increase local taxes instead of asking for supplementary transfers from the central government.

---

[6] Needless to say that a good public expenditure management system can play an important role in guarding the back door.

There is some empirical evidence that a vertical fiscal gap is not necessarily associated with less fiscal restraint.[7] De Mello (1999) estimates the effect of some decentralization indicators (subnational government spending, subnational tax autonomy, and subnational dependency on intergovernmental transfers, or vertical imbalances) on the central government's budget balance for two separate samples, seventeen OECD countries, and thirteen non-OECD (Latin American and Asian) countries. The results are quite contrasting for the two samples: in the OECD sample less subnational tax autonomy and larger vertical imbalances tend to improve fiscal outcomes; for non-OECD countries, tax autonomy does not seem to affect the government deficit, whereas dependency on intergovernmental transfers tends to worsen it. De Mello (1999) interprets these results as evidence that common pool problems are more serious in non-OECD countries, whereas in the OECD sample "vertical imbalances, rather than measuring the extent of common pool problems, may provide evidence of the ability of central governments to put a cap on subnational spending by increasing their dependency on intergovernmental transfers." It is also plausible that what really makes the difference is the quality of budget institutions, which, on average, is higher in OECD countries.

REFERENCES

Alesina, A. and R. Perotti (1995), "The Political Economy of Budget Deficits," *IMF Staff Papers*, vol. 42, no. 1, 1-31.

Carlsen, F. (1998), "Central Regulation of Local Authorities," *Public Finance Review*, vol. 26, no. 4, pp. 304-326.

Courchene, T. J. (1999), "Subnational Budgetary and Stabilization Policies in Canada and Australia," in Poterba, J. M. and J. von Haghen (1999), pp. 301-348.

---

[7] For an analysis of international experience that gives support to this thesis see Pisauro (2001).

De Mello, L. R. (1999), "Intergovernmental Fiscal Relations: Coordination Failures and Fiscal Outcomes," *Public Budgeting & Finance*, vol. 19, no. 1, pp. 3-25.

Hallerberg, M. and J. von Hagen (1999), "Electoral Institutions, Cabinet Negotiations, and Budget Deficits in the European Union," in Poterba, J. M. and J. von Haghen (1999), pp. 209-232.

Keen, M. (1998), "Vertical Tax Externalities in the Theory of Fiscal Federalism," *IMF Staff Papers*, vol. 45, no. 3, 454-485.

Milesi- Ferretti, G. M. (1997), "Fiscal Rules and the Budget Process," *Giornale degli Economisti e Annali di Economia*, vol. 56, no. 1-2, 5-40.

Musgrave, R. A. (1959), *The Theory of Public Finance*, McGraw-Hill, New York.

Muskin, E. S. (1999), "Recent Theoretical Work on the Soft Budget Constraint," *American Economic Review*, vol. 89, no. 2, pp. 421-425.

Oecd (1997), *Managing Across Levels of Government*, Paris.

Pisauro, G. (2001), "Intergovernmental relations and Fiscal Discipline: Between Commons and Soft Budget Constraint", IMF Working Paper no. 01/65, May.

Poterba, J. M. and J. von Haghen (1999) (eds.), *Fiscal Institutions and Fiscal Performance*, University of Chicago Press, Chicago.

Prud'homme, R. (1995), "The Dangers of Decentralization," *The World Bank Research Observer*, vol. 10, no. 2, pp. 201-220.

Sewell, D. O. (1996), "The Dangers of Decentralization' According to Prud'homme: Some Further Aspects," *The World Bank Research Observer*, vol. 11, no. 1, pp. 143-150.

Tanzi, V. (1996), "Fiscal Federalism and Decentralization: A Review of Some Efficiency and Macroeconomic Aspects," *Proceedings of the World Bank Annual Conference on Development Economics*, *1995*, World Bank, Washington, D.C., pp. 295-316.

Ter-Minassian, T. (1997a), (ed.), *Fiscal Federalism in Theory and Practice*, International Monetary Fund, Washington DC.

Ter-Minassian, T. (1997b), "Intergovernmental Fiscal Relations in a Macroeconomic Perspective: An Overview," in Ter-Minassian (1997a), pp. 3-24.

Velasco, A. (1999), "A Model of Endogenous Fiscal Deficits and Delayed Fiscal Reforms," in Poterba, J. M. and J. von Haghen (1999), pp. 37-57.

Velasco, A. (2000), "Debt and Deficits with Fragmented Fiscal Policymaking," *Journal of Public Economics*, vol. 76, no. 1, pp. 105-125.

von Hagen, J. and B. Eichengreen (1996), "Federalism, Fiscal Restraints, and European Monetary Union," *American Economic Review*, vol. 86, no.2, 134-138.

von Hagen, J. and I. J. Harden (1995), "Budget Processes and Commitment to Fiscal Discipline," *European Economic Review*, vol. 39, no.3/4, 771-779.

Weingast, B. R., K. A. Shepsle, and C. Johnsen (1981), "The Political Economy of Benefits and Costs: A Neoclassical Approach to Distributive Politics," *Journal of Political Economy*, vol. 89, no. 4, 642-664.

Wildasin, D. E. (1997a), (ed.), *Fiscal Aspects of Evolving Federations*, Cambridge University Press, Cambridge UK.

Wildasin, D. E. (1997b), "Fiscal Aspects of Evolving Federations: Issues for Policy and Research," in Wildasin (1997a), pp. 14-37.

Wildasin, D. E. (1997c), "Externalities and Bailouts. Hard and Soft Budget Constraints in Intergovernmental Fiscal Relations," Policy Research Working Paper no. 1843, World Bank, November.
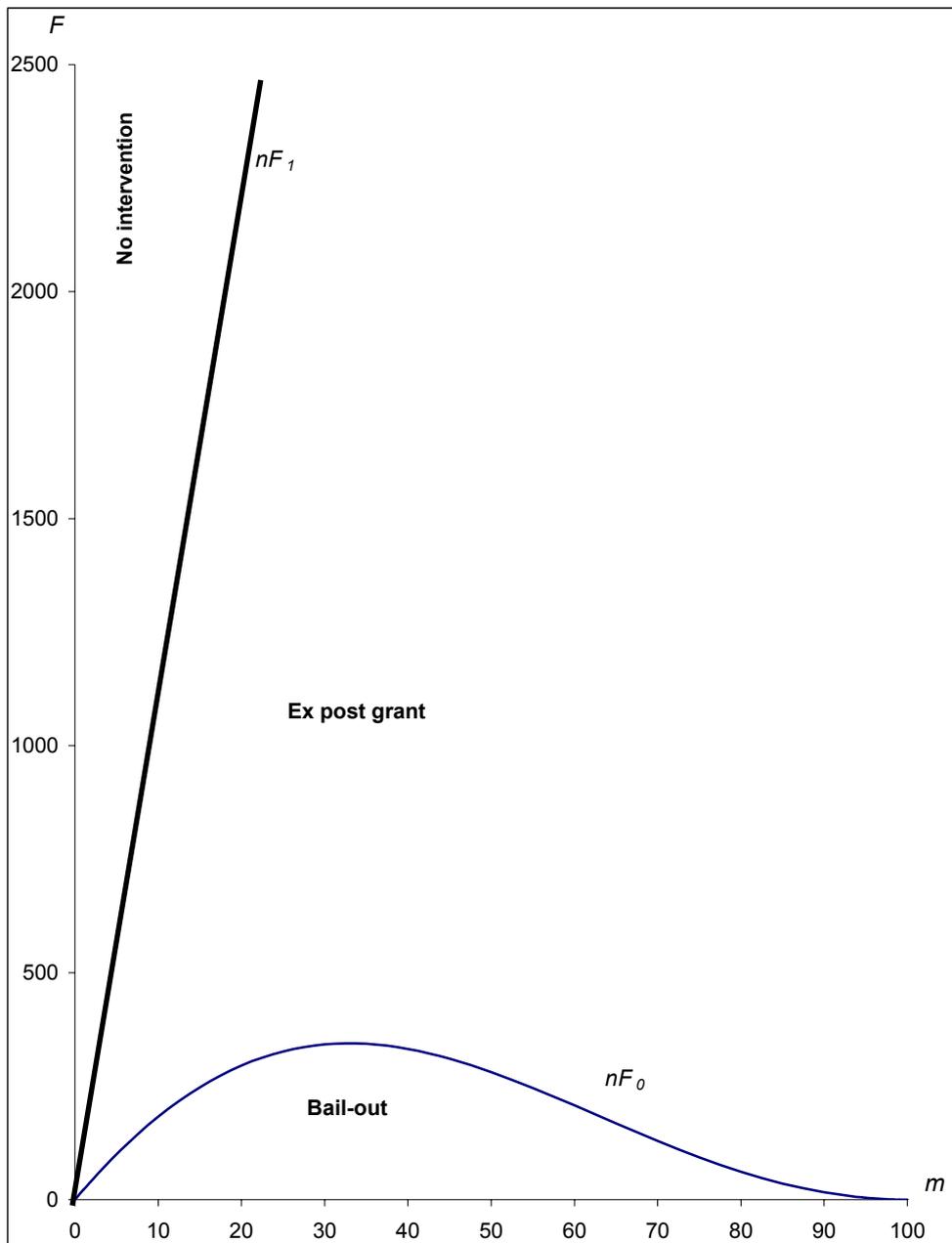
Figure 1
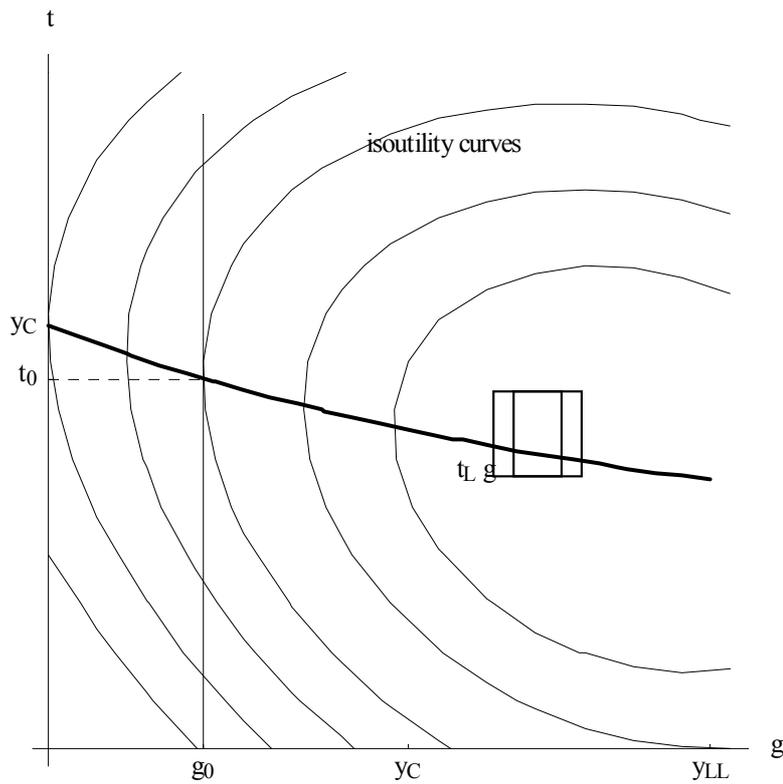
In the pure common pool case (no local tax autonomy), local expenditure would reach the level y_{LL}, corresponding to the tangency between the horizontal axis and the isoutility curve. With tax autonomy, the local government, faced with a given level of central government grant, say g_0, will set local taxes to maximize its utility. In order to induce the efficient level of local expenditure, y_C, the central government, taking into account the reaction function of the local government, will set the grant to zero.

Figure 2
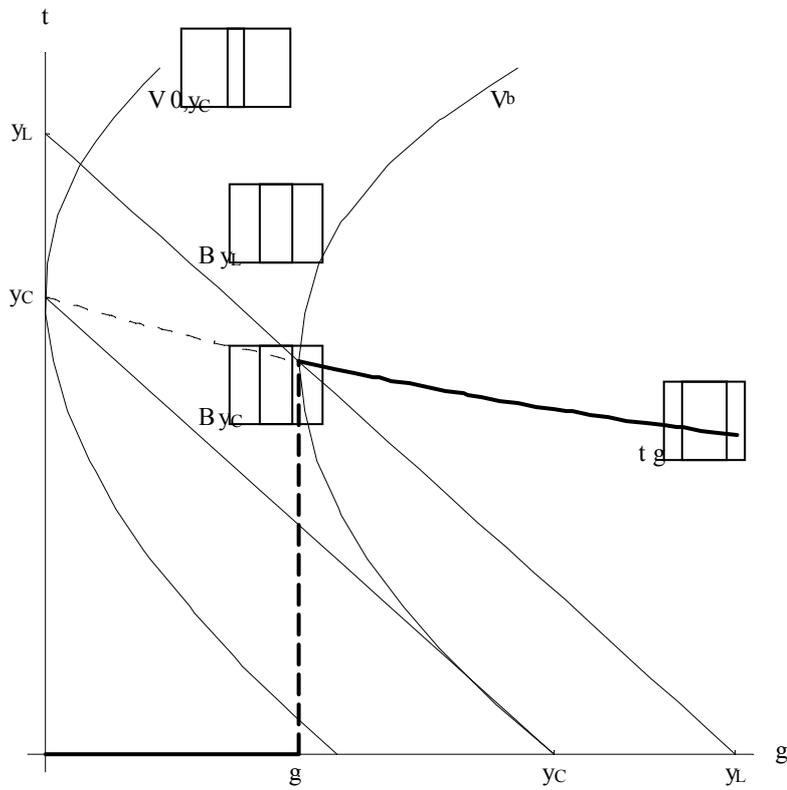
The possibility of a bailout determines a kink in the reaction function of the local government (bold line). In order to avoid a bailout, the central government has to give a grant equal to g^* so that the local government can enjoy the same level of utility it would get under a bailout (V^b). Local expenditure y_L will then be higher than the efficient level y_C.

Figure 3

F

2500

No intervention

nF_1

2000

1500

Ex post grant

1000

500

nF_0

Bail-out

0

0   10   20   30   40   50   60   70   80   90   100

m

Given the cost of a bailout, F, the type of intervention by the central government depends on the size of the local government (m is the share of national population in the local jurisdiction). If $F > nF_1$, the local government is too small to elicit a bailout and the central government will not give any grant. If $nF_1 > F > nF_0$, the central government will avoid a bailout by giving an ex ante grant such that local expenditure will be higher than the efficient level. If $F < nF_0$, there will be a bailout: the central government will intervene giving an ex post grant.