WHY DO DIFFERENCES IN THE DEGREE OF FISCAL DECENTRALIZATION ENDURE?

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Abstract

Differences in the degree of fiscal decentralization observed between the U.S. and many countries in Europe cannot be explained within the standard theory of fiscal decentralization. By introducing preferences for solidarity – equality in the provision of public goods and services across regions – we show that different decentralization schemes can coexist as efficient choices. We develop a model of fiscal decentralization that incorporates tastes for solidarity, multiple levels of government, and various tax and transfer instruments. We find that when solidarity is added to the traditional fiscal-federalism framework, the choice along the decentralized-to-centralized spectrum shifts toward a more centralized system.

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1 Introduction

A notable difference between the U.S. and many countries in Europe is in the degree of fiscal decentralization.[1] Regional (and local) governments in the U.S. have significant autonomy in setting their own taxes and determining how to spend their revenues. This is not true of their counterparts in Spain, France, the United Kingdom, Germany, Norway and other European countries. In recent years, countries formerly subject to dictatorships or communism have been considering decentralization of fiscal responsibility to sub-national governments as part of the process of democratization (see Bird and Ebel, forthcoming 2006). Yet, much of Europe remains immune to adopting effective decentralization in which sub-national units have true taxing authority.

As Oates (1972, 1999) has argued, there can be significant efficiency gains to having a federal system with fiscally empowered sub-national levels of government. In particular, a decentralized system can accommodate varying demands for public goods across regions. The arguments for a centralized system include economies of scale in the production of the public good, consumption spillovers across regions, and the difficulty of accomplishing income redistribution at the local level (see, for example, Brown and Oates, 1987). When it is recognized that education and health are among the most important (in terms of budget share) publicly provided goods in the developed world,[2] it is difficult to explain within the traditional framework differences in the degree of fiscal decentralization between the U.S. and many European countries. Education and health are private goods (services) for which demand is likely to vary across regions and localities due to differences in income and preferences; both economies of scale in production and spillover benefits are arguably small; and there is choice over how redistributive to make the delivery of these services. For these two goods/services, Oates' decentralization theorem (Oates, 1972, page 35) would seem to validate the choices made in the U.S. to decentralize provision. So, are the Europeans wrong?

[1] For the year 2000, the percentage of total revenues raised by the central government in the United States was 59 percent, while the average in the European Union was 83 percent (excluding Malta and Cyprus for lack of data). See International Monetary Fund, Government Finance Statistics (2005).

[2] See Gruber (2005) for figures for the United States and OECD (2003) for figures that include other countries.

Not necessarily. In this paper we approach the issue of the optimal degree of decentralization from a point of view closely related with the redistribution role of the government. There are many goods –health and education being perhaps the most compelling examples– that are private goods (in the sense that there is rivalry in consumption and agents can be excluded from consuming them) and arguably do not generate significant externalities and, yet, they are publicly provided because of what James Tobin has called "specific egalitarianism", which he defines as "the view that certain specific scarce commodities should be distributed less unequally than the ability to pay for them" (Tobin, 1970, page 264). These goods and services are viewed as important in determining the ability to compete in life. While it is feasible to (and many countries actually do) provide different levels of these services to people and regions of different means, a compelling case can be made for equal provision of these two services with the goal of achieving equal opportunity.[3]

In Garcia-Milà and McGuire (2004), the authors explore the idea of a taste for equality in the public provision of certain goods and services across regions, what the authors call solidarity. These preferences might stem from a desire to bring or hold a country together after an upheaval or from a desire to provide access to essential public goods to all residents of the country. The authors demonstrate that inter-regional transfers aimed at reducing the variance across regions in public provision of these goods are desirable if preferences for solidarity are strong. Rich regions will voluntarily transfer resources to poor regions to bring public spending up in the poor region (and, concomitantly, down in the rich region). This transference of resources is done at the local level–there is no need for central government involvement, other than as a coordinating device, perhaps.

The notion of solidarity includes two aspects. The first aspect is the determination of the set of goods and services that are the object of specific equalitarism. In countries with weak notions of solidarity this may be reduced to primary education and life-death surgery, while countries with strong notions of solidarity might include all levels of education, health and other essential

[3] Indeed, the trend in primary and secondary education provision within states in the U.S. has been toward reducing inequities across local school districts in accordance with equality clauses in state constitutions. Inequities in spending per pupil between states remain large, however. See Murray, Evans and Schwab (1998).

goods. The second aspect of solidarity is a parameter measuring the intensity of preferences for equality in the provision of these essential goods. Thus, redistribution is the consequence of preferences founded not exclusively in pure self-interest but reflecting a concern for justice or equity. Support for preferences of this type, both in surveys and experimental work, is well established (see Konow, 2003, for a comprehensive discussion of the literature on justice). Alesina, Di Tella and MacCulloch (2004) examine the idea that preferences over inequality are important and may differ between the U.S. and Europe. They find that individuals report to be less happy in the presence of inequality and that the European dislike of inequality is stronger than the American.

In the present paper, we take the argument in Garcia-Milà and McGuire (2004) a meaningful step forward by recognizing that solidarity is like a pure public good–one rich region's generosity in transferring resources to poor regions benefits other rich regions. With a pure public good, because of spillovers in consumption and the ability to free ride on the generosity of others, local provision (even if it includes interregional transfers) may be inefficient and a role for the central government may be justified. In this paper, we show that when solidarity is added to the traditional fiscal-federalism framework, the choice along the decentralized-to-centralized spectrum shifts toward a more centralized system. Differences in tastes for solidarity may well then explain different degrees of decentralization.

In contrast with the standard approach, the inequality concerns herein are not imposed by a central government on to selfish agents; what drives the quest for equality in the public provision of certain goods is not a social welfare function, but rather the preferences for equality of the agents.

The present paper is formally related to recent contributions to the fiscal federalism literature in which the local governments' preferences display a concern about the provision of local public goods in other regions. Besley and Coate (2003) and Alesina, Angeloni and Etro (2005) provide two distinct models of the choice of the degree of decentralization. In contrast to our approach, Besley and Coate are interested in the inefficiencies created by the strategic behavior of locally elected representatives to a central legislature. Alesina, Angeloni and Etro build a positive model

that predicts what type of federal system will arise if regional governments have a say. Our model is normative in that we seek to characterize the best institutional design for the provision and financing of local public goods when individuals care about solidarity.

What drives redistribution among regions in our case differs from the idea of interregional transfers as a means of sharing regional idiosyncratic risk, as argued, for example, in the work of Persson and Tabellini (1996) and Lockwood (1999). Instead, we focus on redistribution among regions as a means to provide equality of opportunity in accordance with solidarity preferences.

The paper proceeds as follows. In the next section we characterize and evaluate the normative qualities of three stylized systems of fiscal federalism in a world where people have preferences for equality of provision of a set of goods and services that are the object of specific equalitarism. We then simulate outcomes under the three systems, altering the preferences for solidarity from weak to strong. In the conclusion we argue that our model helps to explain why systems with different degrees of decentralization endure.

2 A theory of fiscal decentralization with regional solidarity

We specify a model with a central government and *n* regional governments. Let region i have initial wealth ω_i and $\Omega = \sum_{j=1}^{n} \omega_j$ represent aggregate wealth. There are two commodities: a privately provided good, c_i, and a publicly provided good, g_i, which we refer to as the public good even though both goods are private goods in that consumption is rival and excludable. The "public good" is an aggregate of all private goods for which, following Tobin's terminology, the domain of inequality is restricted (Tobin, 1970). The size of this set can vary from one country to another and it is an important determinant of the scope of solidarity.

We assume that all regions are concerned with inequalities in the provision of the public good across regions, as measured by the variance

$$e = \frac{1}{n}\sum_{j=1}^{n}(g_j - \bar{g})^2 \qquad where \qquad \bar{g} = \frac{1}{n}\sum_{j=1}^{n} g_j$$

Preferences of the *i*-th region are represented by a concave utility function $u_i(c_i, g_i, e)$, where

$$\frac{\partial u_i}{\partial c_i} > 0 \quad \frac{\partial u_i}{\partial g_i} > 0 \quad \frac{\partial u_i}{\partial e} < 0$$

The idea that public goods provided in one region can directly affect the utility of another region is a common component of many economic models of the local public sector (see Rubinfeld, 1987). What differs about our approach is that the public goods we consider (education and health, for example) are in fact private goods with insignificant spillovers to distant districts. The externality comes from the fact that people care about equal provision of basic needs, such as education and health, so the level of provision in other regions affects own utility through the variance in the provision of those goods and services.

While differences in the choice of public goods across regions can occur either because of differences in preferences for those goods or because of differences in wealth, we are particularly concerned about the differences that occur because some regions are rich and can afford high levels of public goods, and other regions are poor and do not have the resources to provide similar levels of public goods.

If the allocation $(\tilde{c}_j, \tilde{g}_j)_{j=1}^n$ is Pareto optimal, then for any $i \in \{1,2,...,n\}$ it is a solution to the problem:

$$\max \quad u_i(c_i, g_i, e) \tag{1}$$

$$s.t. \; u_j(c_j, g_j, e) \geq u_j(\tilde{c}_j, \tilde{g}_j, \tilde{e}) \quad j \neq i \tag{2}$$

$$\sum_{j=1}^{n} c_j + \sum_{j=1}^{n} g_j = \sum_{j=1}^{n} \omega_j \tag{3}$$

$$c_i \geq 0 \quad i \in \{1,2,...,n\} \tag{4}$$

$$g_i \geq 0 \quad i \in \{1,2,...,n\} \tag{5}$$

The first order necessary conditions for this problem are therefore necessary conditions for Pareto-optimality.

The Lagrangian expression for this problem is

$$L(c_1, c_2, ..., c_n, g_1, g_2, ..., g_n, \lambda) = u_i(c_i, g_i, e) + \sum_{j \neq i}^{n} \alpha_j (u_j(c_j, g_j, e) - u_j(\tilde{c}_j, \tilde{g}_j, \tilde{e})) - \lambda \left(\sum_{j=1}^{n} (c_j + g_j) - \sum_{j=1}^{n} \omega_j \right)$$

and since constant terms can be ignored it can be written as

$$L(c_1, c_2, ..., c_n, g_1, g_2, ..., g_n, \lambda) = \sum_{j=1}^{n} \alpha_j u_j(c_j, g_j, e) - \lambda \left(\sum_{j=1}^{n} (c_j + g_j) - \sum_{j=1}^{n} \omega_j \right)$$

with $\alpha_i = 1$. The Kuhn-Tucker first order necessary conditions are:

$$\frac{\partial L}{\partial c_i} = \alpha_i \frac{\partial u_i}{\partial c_i} - \lambda \leq 0 \qquad i \in \{1, 2, ..., n\} \qquad (6)$$

$$\frac{\partial L}{\partial g_i} = \alpha_i \frac{\partial u_i}{\partial g_i} + \sum_{j=1}^{n} \alpha_j \frac{\partial u_j}{\partial e} \frac{\partial e}{\partial g_i} - \lambda \leq 0 \qquad i \in \{1, 2, ..., n\} \qquad (7)$$

In the case of interior solutions, each of these inequalities must hold with equality and, for any pair of regions *i*,*j*, the following equalities must hold

$$\alpha_i \frac{\partial u_i}{\partial c_i} = \alpha_j \frac{\partial u_j}{\partial c_j} \ \forall i, j \qquad (8)$$

$$\alpha_i \frac{\partial u_i}{\partial g_i} + \frac{2}{n}(g_i - \bar{g}) \sum_{k=1}^{n} \alpha_k \frac{\partial u_k}{\partial e} = \alpha_j \frac{\partial u_j}{\partial g_j} + \frac{2}{n}(g_j - \bar{g}) \sum_{k=1}^{n} \alpha_k \frac{\partial u_k}{\partial e} \forall i, j \quad (9)$$

$$\alpha_i \frac{\partial u_i}{\partial c_i} = \alpha_j \frac{\partial u_j}{\partial g_j} + \frac{2}{n}(g_j - \bar{g}) \sum_{k=1}^{n} \alpha_k \frac{\partial u_k}{\partial e} \forall i, j \quad (10)$$

Where the derivative $\frac{\partial e}{\partial g_i}$, measuring the impact of the public good on the inequality index, has been computed as follows:

$$\frac{\partial e}{\partial g_i} = \frac{1}{n} \left(2(g_i - \bar{g}) \left(1 - \frac{1}{n} \right) + \sum_{j=i} 2(g_j - \bar{g}) \left(-\frac{1}{n} \right) \right) = \frac{2}{n}(g_i - \bar{g})$$

By the usual interpretation of Lagrangian multipliers, α_j is the marginal increase in the objective function (the utility of region *i*) if the *j*-th constraint (the utility of region *j*) is relaxed. Hence α_j is the relative weight of the *j*-th region and $\alpha_j \frac{\partial u_j}{\partial c_j}$ can be interpreted as the marginal contribution of the *j*-th region's consumption to social welfare.

Equation (8) requires that the marginal contribution of the private good to social welfare be the same in all regions. Equation (9) requires the equality of the marginal contributions of the public good to social welfare in all regions. Finally, equation (10) establishes that the marginal contribution to social welfare of the private good equals that of the public good in all regions.

As can be seen in (9) and (10), the marginal contribution to social welfare of the public good in a given region *i* has two components: the direct effect, $\alpha_i \frac{\partial u_i}{\partial g_i}$, and the indirect effect of g_i on all regions' welfare through *e*

$$\frac{2}{n}(g_i - \bar{g})\sum_{k=1}^{n}\alpha_k \frac{\partial u_k}{\partial e} \qquad (11)$$

The indirect effect reflects the public-good nature of *e*: when region *i* alters its level of g_i it impacts *e* and results in spillover benefits or costs for other regions. If the provision of public goods across regions is equalized, then $g_i = \bar{g}$ and the indirect effect disappears.

We next present and characterize the choices made under three different systems of fiscal federalism:

a. *Complete centralization:* In this model, the central government imposes a uniform tax function to raise funds for provision of a uniform level of the public good across regions in the country. Intergovernmental grants from the central government to the regions are the sole source of funding for expenditures on the public good. Regional governments are essentially administrative arms of the central government. They make no decisions.

b. *Complete decentralization:* In this model, regional governments have taxing authority and revenue-raising responsibility. They are free to set the level of the public good without any interference (or assistance) from the central government. They can decide to make voluntary contributions to other regional governments to help them increase spending on the public good.

c. *Guaranteed minimum level:* This model combines some but not all attributes of the other two models. The central government imposes a uniform tax system to raise funds for a central grant to regions that supports a minimal (adequate) level of the public good in each region. Regions have local taxing authority that they can employ to adjust the spending levels above the minimal required level. Regions do not have authority to make voluntary contributions to other regions.

We compare the outcome for each system to the Pareto optimality conditions (equations 8-10) derived above.

2.1 Centralized financing of regional governments

Under this system, taxing power is solely in the hands of the central government. The central government does not discriminate among regions and thus imposes a common tax function and gives a common grant to each region. Spending on the public good is the same across regions as the only source of funding is the uniform central grant. Regions have no decision-making power in this system: once the central tax function and central grant are set, private and public goods are determined.

To simplify the analysis we assume a proportional tax on income, $\phi(\omega_i) = t\omega_i$, where t is the tax rate and is the same for all regional governments. Private consumption c_i is equal to after-tax income $(1-t)\omega_i$. We define g as the common level of public good realized in each region. Note that the variance in public good spending e is equal to zero in this case.

The decision variables of the government are the tax rate, t, and the common level of public good, g, for all regions. By the balanced budget restrictions, for every level of t, unique levels of public good g and private goods c_i are generated. Hence the set of allocations attainable through the centralized system can be parametrized by t. Not all allocations are necessarily second best Pareto-optimal: it is possible that by changing t the utility levels of all regions could increase.[4] Assume that the central government's objective function is such that it does not choose Pareto-dominated allocations. This means that, given the utility levels $u_j\left((1-\tilde{t})\omega_j, \tilde{g}, \tilde{e}\right)$ of regions $j \neq i$, the following problem is solved:

$$\max \quad u_i((1-t)\omega_i, g, e) \tag{12}$$

$$s.t. \quad u_j((1-t)\omega_j, g, e) \geq u_j\left((1-\tilde{t})\omega_j, \tilde{g}, \tilde{e}\right) \quad j \neq i \tag{13}$$

$$ng = t\sum_{j=1}^{n}\omega_j \tag{14}$$

$$g \geq 0 \tag{15}$$

$$0 \leq t \leq 1 \tag{16}$$

[4] See the simulations in section 3.

The Lagrangian for this problem is

$$L(t,g,\lambda) = u_i((1-t)\omega_i, g, e) - \sum_{j\neq i}^{n} \alpha_j(\tilde{u}_j - u_j((1-t)\omega_j, g, e)) - \lambda\left(ng - t\sum_{j=1}^{n}\omega_j\right)$$

And, since constant terms can be ignored, it can be written as

$$L(t,g,\lambda) = \sum_{j=1}^{n} \alpha_j u_j((1-t)\omega_j, g, e) - \lambda\left(ng - t\sum_{j=1}^{n}\omega_j\right)$$

where $\alpha_i = 1$

As the central government chooses to provide the same level of public good to all regions (g_i=g for all i), e=0 and all terms that involve the solidarity variable drop out.

The Kuhn Tucker conditions for a maximum are:

$$\frac{\partial L}{\partial t} = -\sum_{j=1}^{n} \alpha_j \frac{\partial u_j}{\partial c_j}\omega_j + \lambda\sum_{j=1}^{n}\omega_j \leq 0 \qquad (17)$$

$$\frac{\partial L}{\partial g} = \sum_{j=1}^{n} \alpha_j \frac{\partial u_j}{\partial g} - \lambda n \leq 0 \qquad i \in \{1,2,...,n\} \qquad (18)$$

These inequalities hold with equality in an interior solution and we obtain

$$\sum_{j=1}^{n} \alpha_j \frac{\partial u_j}{\partial c_j}\frac{\omega_j}{\sum_{j=1}^{n}\omega_j} = \frac{1}{n}\sum_{j=1}^{n} \alpha_j \frac{\partial u_j}{\partial g} \qquad (19)$$

This condition states that a weighted average of the regions' marginal contributions of the private good, where the weights are each region's relative share of total wealth, is equal to the *average* marginal contribution of the public good to social welfare. In general, this will differ from the Pareto optimality condition in equation (10) and the centralized system will lead to inefficient outcomes. The inefficiency arises from utility losses associated with the uniformity imposed by a centralized system: the central tax function does not discriminate by region of residence and a uniform level of g is chosen by the central government.

2.2 Decentralized decisions by regional governments

Under this system, each regional government has complete freedom of choice over both the private and the public good. In addition, each can set interregional transfers from region i to j, s_{ij}, which are voluntary contributions to solidarity. Thus, each regional government chooses g_i, c_i and

s_{ij} (for $j \neq i$)[5], taking all other variables as given, so as to solve the following maximization problem

$$\max \; u_i(c_i, g_i, e) \tag{20}$$

$$s.t. \quad c_i + g_i + \sum_{i \neq j} s_{ij} = \omega_i + \sum_{j \neq i} s_{ji} \tag{21}$$

$$c_i \geq 0 \qquad g_i \geq \sum_{j \neq i} s_{ji} \qquad s_{ij} \geq 0 \tag{22}$$

The Nash equilibrium is obtained by solving simultaneously the n systems of necessary conditions. Setting up the Lagrangian of the i-th region:

$$L(c_i, g_i, \{s_{ij}\}_{j \neq i}, \lambda_i) = u_i(c_i, g_i, e) - \lambda_i \left(c_i + g_i + \sum_{i \neq j} s_{ij} - \omega_i - \sum_{j \neq i} s_{ji} \right)$$

and taking first derivatives we obtain:

$$\frac{\partial L}{\partial c_i} = \frac{\partial u_i}{\partial c_i} - \lambda_i \leq 0 \qquad \textit{with equality if } \; c_i > 0 \tag{23}$$

$$\frac{\partial L}{\partial g_i} = \frac{\partial u_i}{\partial g_i} + \frac{\partial u_i}{\partial e}\frac{\partial e}{\partial g_i} - \lambda_i \leq 0 \qquad \textit{with equality if } \; g_i > \sum_j s_{ji} \tag{24}$$

$$\frac{\partial L}{\partial s_{ij}} = \frac{\partial u_i}{\partial e}\frac{\partial e}{\partial g_j} - \lambda_i \leq 0 \qquad \textit{with equality if } \; s_{ij} > 0 \; \textit{ for } \; j \neq i \tag{25}$$

Assuming interior solutions for c_i and g_i, and noting that $\frac{\partial e}{\partial g_i} = \frac{2}{n}(g_i - \overline{g})$, from (23) and (24) we get

$$\frac{\partial u_i}{\partial c_i} = \frac{\partial u_i}{\partial g_i} + \frac{2}{n}(g_i - \overline{g})\frac{\partial u_i}{\partial e} \tag{26}$$

The marginal contributions of c_i and g_i to i's utility are equalized, but, because each region acts independently to maximize its own utility, the indirect effect *does not* take into account the impact of g_i through e on other regions' utilities as required in equation (10) for a Pareto optimum. Hence, the Nash equilibrium is inefficient because regions do not take into account the spillover effect of their contributions to other regions' welfare when setting their interregional

[5] We assume $s_{ii} = 0$.

transfers. At the same time, regions have an incentive to free-ride on the generosity of other regions thereby resulting in an inefficient level of transfers to other regions.

Inter-regional transfers will be positive only under reasonable and intuitive conditions. If $s_{ij} > 0$, then from (23) and (25) we get

$$\frac{\partial u_i}{\partial e}\frac{2}{n}(g_j - \bar{g}) = \frac{\partial u_i}{\partial c_i} \qquad (27)$$

By assumption, $\frac{\partial u_i}{\partial e} < 0$ and $\frac{\partial u_i}{\partial c_i} > 0$ and therefore the interregional transfer from *i* to *j* will only be positive if $g_j - \bar{g} < 0$, in other words, if *j* is a region with below average public expenditure.

Moreover, if $s_{ij} > 0$, both (24) and (25) hold with equality and therefore:

$$\frac{\partial u_i}{\partial g_i} + \frac{\partial u_i}{\partial e}\frac{2}{n}(g_i - \bar{g}) = \frac{\partial u_i}{\partial e}\frac{2}{n}(g_j - \bar{g}) \qquad (28)$$

and since $\frac{\partial u_i}{\partial g_i} > 0$

$$\frac{\partial u_i}{\partial e}\frac{2}{n}(g_i - \bar{g}) < \frac{\partial u_i}{\partial e}\frac{2}{n}(g_j - \bar{g}) \qquad (29)$$

and since $\frac{\partial u_i}{\partial e} < 0$

$$\frac{2}{n}(g_i - \bar{g}) > \frac{2}{n}(g_j - \bar{g}) \qquad (30)$$

we obtain

$$g_i > g_j \qquad (31)$$

That is, region *i* sends transfers to region *j* if $g_i > g_j$ and $g_j < \bar{g}$. Obviously, a corner solution for s_{ij} may arise, and in that case these conditions are not met.

2.3 Decentralized decisions with a centrally guaranteed minimum level

We finally consider a mixed model in which the central government finances a uniform, minimum expenditure on the public good and the regions are then free to tax themselves if they want to spend more than the centrally funded minimum. We model a sequential game in which

the central government is a Stackelberg leader. In the first stage, the central government sets a common tax rate *t* for all regions. The revenue is equally distributed so that the grant *b* is equal to $\frac{1}{n} t \sum_{j=1}^{n} \omega_j = \frac{t}{n} \Omega$. This grant sets up a minimum public good level in all regions.

At a later stage, knowing the tax rate and the corresponding grant, the regions are free to choose a higher level of the public good by raising additional revenue from local taxes. The second phase is modeled as a simultaneous game with the regions as players. The strategic variables are the levels of the private good, c_i , and the locally financed public goods, $gr_i \geq 0$. The level of the i-th region's public good is $g_i = gr_i + b$.

Given the value of the central government's strategic variable, the tax rate *t*, and taking the values of the other region's strategic variables as given, the i-*th* regional government chooses c_i and gr_i so as to solve

$$\max \; u_i(c_i, gr_i + \frac{t}{n}\Omega, e) \qquad (32)$$

$$s.t. \; c_i + gr_i \leq (1-t)\omega_i \qquad (33)$$

$$c_i \geq 0 \qquad gr_i \geq 0 \qquad (34)$$

The Lagrangian expression for this problem is:

$$L(c_i, gr_i, \lambda_i) = u_i(c_i, gr_i + b, e) - \lambda_i(c_i + gr_i - (1-t)\omega_i)$$

and taking the first derivatives we obtain the Kuhn-Tucker first order necessary conditions:

$$\frac{\partial L}{\partial c_i} = \frac{\partial u_i}{\partial c_i} - \lambda_i \leq 0 \qquad \textit{with equality if } \; c_i > 0 \quad (35)$$

$$\frac{\partial L}{\partial gr_i} = \frac{\partial u_i}{\partial g_i} + \frac{\partial u_i}{\partial e}\frac{\partial e}{\partial g_i} - \lambda_i \leq 0 \qquad \textit{with equality if } \; gr_i > 0 \quad (36)$$

If the minimum public good level guaranteed by the central government is below the level that the regional government would like to provide of that public good, we will have an interior solution for gr_i. Assuming also an interior solution for c_i , from (35) and (36) we obtain

$$\frac{\partial u_i}{\partial c_i} = \frac{\partial u_i}{\partial g_i} + \frac{2}{n}(g_i - \overline{g})\frac{\partial u_i}{\partial e} \qquad (37)$$

At the margin, the decision of allocating resources between the private and the public good is identical to the decision in the decentralized case, and, as in that case, while the marginal contributions of the private and the public good to the region's utility are equalized, the indirect effect *does not* take into account the impact of g_i through e on other regions' utilities as required for a Pareto optimum (equation (10)). In other words, regions do not take into account the effect of their decisions upon other regions' welfare when setting their strategic variables.

Still, assuming an interior solution for c_i, if the minimum public good level guaranteed by the central government is equal or above the level that the regional government would like to provide of the public good, there will be no local provision of the public good, and thus we will have a corner solution with $gr_i = 0$. In this case from (35) and (36) we obtain

$$\frac{\partial u_i}{\partial c_i} \geq \frac{\partial u_i}{\partial g_i} + \frac{2}{n}(g_i - \bar{g})\frac{\partial u_i}{\partial e} \qquad (38)$$

Although (38) differs from (10) for the same reasons as (37) does - regions do not take into account the effect of their decision upon other regions' welfare - the central government guaranteed minimum level may result in an allocation that gets closer to, or could even reach, the optimal allocation as characterized in (10).

Summing up, this case differs from the decentralized case in that the central government provides a given level of the public good, thereby potentially mitigating the free-rider problem, but, at the same time, potentially taking regions further away from their desired levels of the public good. Whether one system results in a more efficient outcome than the other will depend on the level of the grant (minimum level of public good) set by the central government.

3 Simulation results

The insights from the theoretical results are clear. When solidarity is present and demands for the public good vary by region, then both centralized and decentralized systems are inefficient. The centralized solution is inefficient because it involves utility losses associated with a common tax function and a uniform level of public good across all regions. The decentralized solution is inefficient because of the free-rider problems associated with local provision of the public good

solidarity. The solution involving a guaranteed minimum is a combination of both, and therefore reflects both types of inefficiencies (as well as the corrective aspects of both). Which system dominates will depend on the relative importance of the inefficiencies that arise under each system. These inefficiencies in turn depend on the strength of the solidarity preferences and on the differences in preferences and incomes across regions.

In this section we simulate the three systems presented above. Our goal is to characterize the relationship between the strength of solidarity preferences and the choice of the degree of decentralization. We will see that, as preferences for solidarity strengthen, more centralized systems perform better.

We consider a simple multilevel government consisting of two regions,[6] each with preferences represented by Cobb-Douglas utility functions:

$$u(c_1, g_1, e) = Kc_1^{\alpha} g_1^{1-\alpha} \frac{1}{1+\gamma e}$$

$$u(c_2, g_2, e) = Kc_2^{1-\alpha} g_2^{\alpha} \frac{1}{1+\gamma e}$$

where $c_i \geq 0,\ g_i \geq 0$ and e is the variance of $\{g_1, g_2\}$.

The parameter γ is a nonnegative number capturing the strength of the solidarity preferences. When γ=0 preferences for solidarity are nonexistent. To clarify the nature of the class of utility functions, decompose the utility function into two parts: the *standard utility*, $K c_i^{\delta} g_i^{1-\delta}$, representing preferences between the privately provided good and the publicly provided good, and the *solidarity effect*, $\frac{1}{1+\gamma e}$. When there is no inequality, the variance e equals zero and the solidarity effect takes its maximum value, 1. Also, total utility coincides with the standard utility. When there is inequality (the variance e is positive), the solidarity effect is less than one and total utility is less than the standard utility. The solidarity effect (and therefore utility) tends to zero as the variance grows to infinity.

[6] The extent of free riding will naturally be limited in this simple model because of the small number of regions.

For the simulations that follow we fix $K = 10,\ \alpha = \frac{1}{4}$. There is a rich region with wealth $\omega_1 = 80$, and a poor region with wealth $\omega_2 = 20$.

Our simulation results are qualitatively the same for various values of the parameter α, including when preferences are identical (α=1/2). We have also performed simulations with identical Stone-Geary utility functions, with no major changes in the simulation results and conclusions. What is central for our problem are the inequalities generated by differences in wealth between regions, not any differences in taste.

We evaluate each system by comparing graphically the outcomes under each system to the set of Pareto optimal utility allocations represented by the utility frontier. For each simulation we derive the utility frontier and the following.

a. *Locus of centralized allocations.* For each possible central tax rate and its corresponding level of public good, there is a resulting pair of utility levels. We vary the central tax rate from zero to one and plot each of the resulting pairs of utility levels to form the locus of all possible centralized allocations.

b. *Decentralized equilibrium D*. The decentralized system results in a unique point that reflects a Nash equilibrium among the regions. The regions choose the levels of their own private and public goods along with the levels of transfers to other regions.

c. *Locus of allocations guaranteeing a minimum*. For each possible central tax rate, which finances a minimal level of public good in each region, the regions choose their own levels of private and public goods resulting in a Nash equilibrium. Thus, for each central tax rate, a Nash equilibrium pair of utilities is plotted. As above, we vary the central tax rate from zero to one to trace out the locus of all possible allocations under the guaranteed minimum system.

3.1 No taste for solidarity

In the case where regions do not have a preference for solidarity, γ=0, the utility functions take the form:

$$u(c_1, g_1, e) = 10\ c_1^{1/4} g_1^{3/4}$$

$$u(c_2, g_2, e) = 10\ c_2^{3/4} g_2^{1/4}$$

In Figure 1 we represent the utility levels attained under the three different systems. The decentralized solution *D* lies on the utility possibility frontier with optimal voluntary contributions at zero. This result is a finding of the standard theory of fiscal decentralization: if all goods are private and demands vary across regions, the decentralized solution is optimal.

The locus of possible allocations under a centralized system is represented by the solid, elliptical line. We find it useful to take as references two particular points on the locus: *P*, where, in the Rawlsian tradition, the utility of the poor region is maximized; and *R,* the allocation that maximizes the utility of the rich region. The set of allocations between *P* and *R* are not "second best" Pareto dominated and therefore are possible choices for the central government. These allocations fall short of the utility frontier.

Finally, under a guaranteed minimum system, the locus of possible allocations is represented by the dashed line, which starts with the point *D* reflecting a central tax rate of zero. Virtually the entire locus is closer to the utility frontier than any of the feasible centralized outcomes. Indeed, if the centrally provided public good is not too high and both regions choose positive amounts of additional public good, the locus is on the frontier. This can easily be seen by checking that, in this case, where solidarity preferences do not exist (and thus $\frac{\partial u}{\partial e} = 0$), the necessary conditions for an interior solution (37) are also sufficient for Pareto optimality (see equations (8)-(10)).

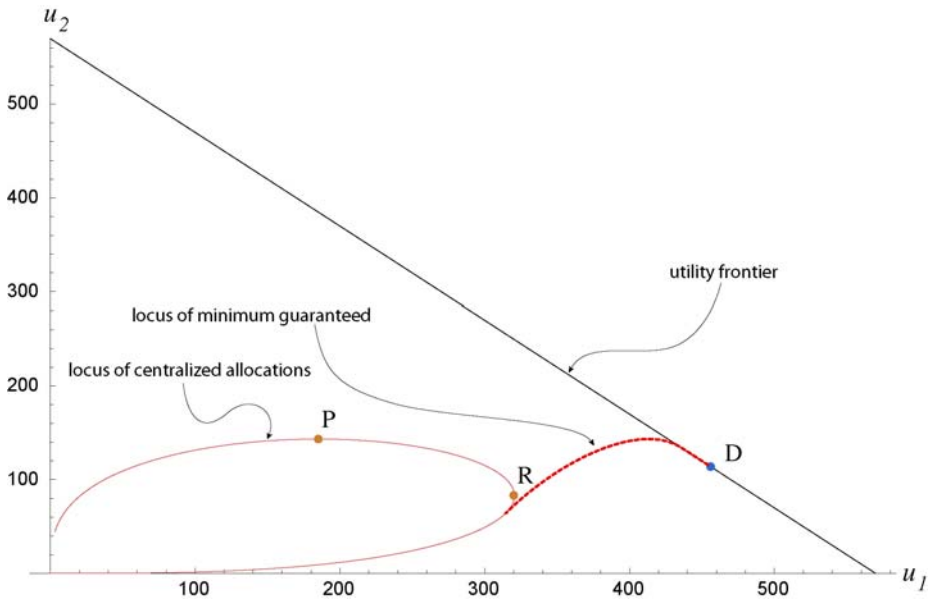

Figure 1: Utility allocations with no taste for solidarity

The centralized solutions are outperformed, in the sense that they are further away from the utility frontier, by a large range of the guaranteed minimum solutions, as well as by the decentralized solution, which is on the utility frontier.

3.2 Weak taste for solidarity

Consider now the case where preferences for solidarity are weak (γ=0.0003). Figure 2 illustrates the possible allocations under all three systems. The decentralized outcome is no longer on the utility frontier, however it is closer to the utility frontier than the relevant portion of the locus of centralized allocations.

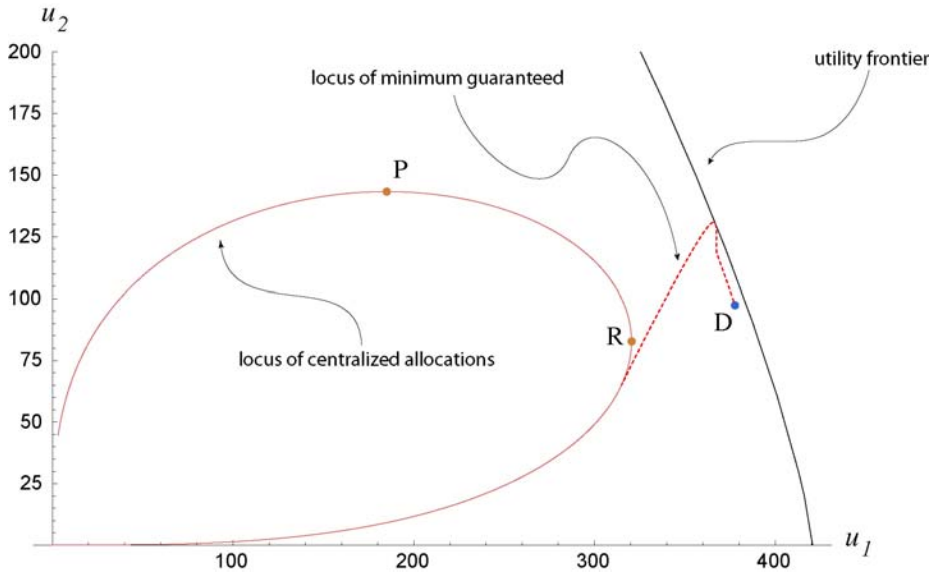

Figure 2: Utility allocations with weak solidarity preferences

For a significant range of central government tax rates, the guaranteed minimum system outperforms, in the sense of being nearer the utility frontier, both the centralized and the decentralized systems. The guaranteed minimum system performs well because it addresses the free-rider problem at the same time that it allows for regional variation.

3.3 Strong taste for solidarity

We now consider the case of strong solidarity preferences (γ=0.005), with the allocations under all three systems represented in figure 3.

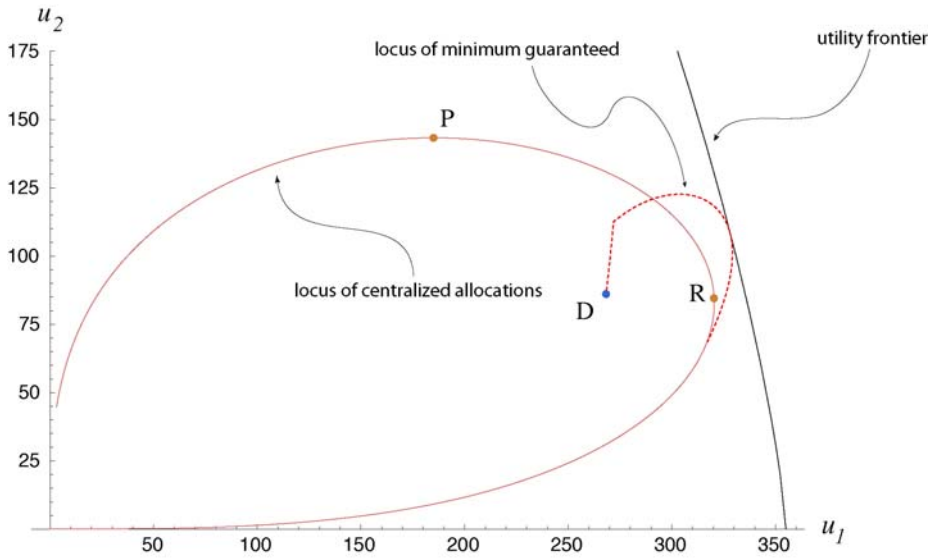

Figure 3: Utility allocations with strong solidarity preferences

In this case, the relevant range of centralized allocations is very close to the utility frontier and clearly dominates the decentralized solution *D*, which is far from the utility frontier. The centralized system performs well relative to the decentralized system because the free-rider problem associated with local provision of the public good solidarity looms large when regions care deeply about solidarity. The guaranteed minimum system also performs well. In fact, for a range of central tax rates, its allocations are closer to the utility frontier than any allocations under the other two systems.

In summary, we find that in the presence of weak solidarity preferences, the decentralized allocation is closer to the utility frontier than any of the centralized solutions. When solidarity preferences are strong, many centralized solutions outperform the decentralized solution. In addition, in the presence of solidarity preferences, weak or strong, some allocations under the guaranteed minimum system are quite close to the utility frontier and trump allocations under either the centralized or decentralized system.

4 Conclusion

Health and education are two of the largest components of subnational public sectors in developed countries today. These publicly-provided goods are essentially private goods by nature, exhibiting arguably small spillover benefits; the production of these services is labor

intensive and not subject to strong economies of scale; and, because incomes and tastes vary, the demand for these services is likely to vary across regions. Thus, a decentralized system would seem to be called for in order to achieve a more efficient match between demand and supply of these publicly-provided goods.

The contribution of this paper is to shift the emphasis of the decentralization debate from the allocative role of the government in solving market failures generated by the existence of public goods and externalities to the distributional role. Our treatment of the concern for equality differs from the standard approach in two respects. First, there is no social welfare function incorporating egalitarian principles: the objective of the central government is to reach a Pareto-efficient allocation when the sub-national governments care about inequalities. Second, as Tobin indicates, to the extent that economists are egalitarians at all, they are general egalitarians: if an unequal distribution of food and shelter is deemed undesirable economists tend to look to changing the distributions of wealth and income. Efforts at equalizing the consumption of specific commodities will inevitably generate inefficiencies. In this paper, we depart from the standard view and advocate Tobin's idea of specific egalitarianism: we find socially appealing the idea that the distribution of certain goods and sevices should be less unequal than that of income and wealth. [7] Our main contribution is to show that when people care about the distribution of these publicly provided goods, indeed, if they get disutility from there being an unequal distribution across regions, a more centralized system can Pareto dominate a decentralized system. This is the case because equality in the provision of publicly provided goods (i.e., solidarity) is a pure public good and a centralized system will internalize the associated externalities and address the free rider problem. Where preferences for solidarity are strong, as apparently they are in many European countries and with respect to education in many U.S. states, centralizing the provision of publicly provided goods and services can increase social welfare. We thus provide a possible explanation for the endurance of very different systems of fiscal federalism in countries with seemingly similar economic, political and historical traditions.

[7] A radical example presented by Tobin (1970) is the political power contained in a vote: in this case, strict equality is such an important social objective that a voluntary transfer of this political power from one individual to another in exchange for money is forbiden in spite of the fact that this would be a Pareto-improving trade. Stiglitz (2000)

We analyze an intermediate system that involves elements of the centralized system (a centrally financed minimum level of public good) and the decentralized system (regional taxing authority). This system often outperforms the polar systems because it combines the externality internalizing aspects of one with the regional authority to adjust spending levels of the other. Countries with either weak or strong preferences for solidarity may be well served by such a system.

The conclusion that a system that combines the involvement of the different levels of government outperforms the polar cases is similar to the superiority of flexible over rigid unions obtained in Alesina, Angeloni and Etro (2005) in their study of supranational jurisdictions. Our model differs from theirs in that we consider a very different type of externality – they consider spillovers of public good spending; we introduce a concern for equality in the provision of certain goods, solidarity – and we allow for voluntary contributions among regions (a decentralized response) and show that such contributions do not solve the problem. An interesting implication of our results is that, although preferences display a concern for equality, it is often the case that the optimal system is one in which the central government assures universal minimum levels in all regions rather than imposing complete equalization.

Several important questions are left unanswered. Perhaps the most important question concerns the *origin* of strong and weak preferences for solidarity. The U.S. and Europe share many commonalities in terms of tradition, culture, political philosophy, demographics, and values. Yet fundamental choices related to solidarity, such as how much to rely on market mechanisms to deliver various goods and services and how much emphasis to place on individual freedom and responsibility, are often quite different. A second set of questions involves the *evolution* of preferences for solidarity and the implications for changes in the degree of fiscal decentralization. In Spain, immediately after the fall of Franco a centralized system was needed to keep the country together and to bring the different regions closer in alignment in terms of public finances and public services. Today, after more than 25 years of experience with a stable democracy, regional redistribution, and various levels of regional competencies in delivering

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discusses the idea of specific egalitarianism as a justification for public provision of health care.

public goods, the argument for a centralized system to deliver solidarity seems less compelling. In Germany, centralized redistribution of resources was harder to achieve and garnered less popular support once the regions of the much poorer East joined the richer regions of the West. The efficiency losses associated with centralized redistribution became more difficult to tolerate. Our model offers a new lens through which to view and to gain a better understanding of the demands for changes in intergovernmental fiscal systems.

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