

THE ECONOMIC JOURNAL

JULY 1998

The Economic Journal, 108 (July), 989–1008. © Royal Economic Society 1998. Published by Blackwell Publishers, 108 Cowley Road, Oxford OX4 1JF, UK and 350 Main Street, Malden, MA 02148, USA.

ECONOMIC RISK AND POLITICAL RISK IN FISCAL UNIONS*

Alberto Alesina and Roberto Perotti

A fiscal programme that redistributes income from rich to poor individuals indirectly redistributes tax revenues from regions hit by a favourable shock to regions hit by an unfavourable one. Centralised fiscal redistribution has therefore been advocated as a way to insure individuals against region-specific shocks. In this paper, we argue that a centralised fiscal policy, while reducing the uncertainty on the tax base, may create additional uncertainty on the tax rate. Using a simple model we show that the higher uncertainty on the policy instrument might more than offset the lower uncertainty on the tax base.

Several countries around the world are breaking up (e.g., the former Soviet Union), and in others regional movements are becoming more vocal in demanding more autonomy (e.g., Italy, Spain); at the same time, several Western European countries are integrating in a supernational community. Fiscal policy issues, and, in particular, the level of centralisation of fiscal decisions are important considerations in the formation or collapse of political jurisdictions or of federations of regions and countries.¹

A long tradition in public finance argues that a centralised fiscal system can reach more efficient outcomes by better internalising the numerous externalities associated with both the expenditure and the revenue sides of fiscal policy, particularly when factors are mobile. This line of argument applies to both the provision of public goods (Gordon, 1983) and to redistributive fiscal policy (Pauli, 1973; Ladd and Doolittle, 1982; Brown and Oates, 1987). A counter argument to this conclusion is developed in Perotti (1997), who shows that in the presence of differences in, say, labour markets or the administration of fiscal policy, centralised redistribution can lead to a more inefficient allocation of resources.

A second argument in favour of centralised fiscal policy is based on the insurance properties of redistribution. When different countries are hit by

* This research was supported by NSF grant No. SBR-9414719. We thank Tim Besley, Jeffrey Sachs and two anonymous referees for useful comments.

¹ We use the words 'country' and 'region' interchangeably in this paper. The reference to 'countries' is more natural in a discussion of issues concerning the process of European integration. The reference to 'regions' is more appropriate in the context of the debate on fiscal policy within individual countries. From now on, and only for brevity's sake, we will refer to the basic jurisdiction in our model as a 'country'.

idiosyncratic shocks, they can stabilise the tax base by running a common fiscal policy: the taxable income in the 'unlucky' countries decreases, but it increases in the 'lucky' countries. Thus, *for a given tax rate* the revenues available for redistribution are more stable in a centralised system. It follows that a centralised system of redistribution, that encompasses several countries, can better stabilise post-tax incomes and insure individuals against country-specific shocks (see Persson and Tabellini (1996) and Sachs and Sala-I-Martin (1992)). However, this powerful argument does not take into account the fact that fiscal policy is endogenous, and that the voting process leading to the choice of a tax rate is different depending on whether the system is centralised or decentralised.

The basic idea of this paper is that in a centralised regime more individuals from more countries participate in the decision-making process; consequently, the diversity of the decision-makers may increase, implying in some cases more, rather than less, uncertainty about the policy instrument. In turn, this might lead to more, rather than less, instability in income and consumption. In other words, large jurisdictions can achieve the benefits of a centralised redistribution system, but these benefits may be offset (partially or completely) by the increase in the diversity and, thus, in potential conflicts of interests among the citizens of larger jurisdictions.

We do not argue that decentralisation is always superior to centralisation, nor even that tax variability always increases for every type of shock or distribution of preferences. We simply point out that it is possible (and, we argue, not unlikely) that the variability of the policy instrument—in our example, the tax rate—will increase in a centralised system. If this is the case, then it is possible that this increase in the variability of the instrument more than compensates for the insurance effect of fiscal policy at a given tax rate.

The argument of this paper is related to that by Alesina and Spolaore (1997). They analyse the trade-off between the economies of scale in providing public goods in large political jurisdictions, versus the costs of diversity of preferences over types of public goods. While Alesina and Spolaore focus on 'first moments', i.e. average utility levels, here we emphasise the role of 'second moments', i.e. the variability of income and of policy and how they affect utility.

Although we have cast this paper in the framework of redistributive fiscal policy, it points toward a more general set of issues. The basic idea is that heterogeneous entities can reap numerous advantages from integration: mutual insurance (on which we focus in the present paper), economies of scale, more bargaining power, are only a few of them. However, these benefits must be weighed against the increased diversity of preferences over public policies, which increases the variability of policy (as in this paper) or the average distance of each individual's preferred public good from the one that is provided in equilibrium (as in Alesina and Spolaore). In principle, the effects of increased diversity might offset the advantages of integration.

1. The Model

1.1. *Technology, Preferences and Endowments*

The model has one period and two countries, 1 and 2. In each country a single factor, labour, can produce a single good with a constant returns to scale production function: $y = n$, where y denotes units of output and n denotes units of labour. The price of the good is normalised at 1.

The *per capita* endowments of the two countries are the same, and equal to \bar{n} . If we allowed for different *per capita* incomes between the two countries, a centralised system that redistributes income *across income classes* would at the same time systematically transfer income *between countries*, from the richer one to the poorer one—an issue that is not the focus of this paper.

Individuals can belong to one of three income classes, A , B and C , characterised by endowments of labour n_A , n_B and n_C respectively. For simplicity, the endowment of labour of an individual of, say, class A is the same in the two countries. The assumption of three income classes is also made only for convenience: its advantage is that it allows us to characterise the equilibrium as a function of two parameters, n_A and n_B (note that, given the *per-capita* income and the sizes of each class, n_C is determined residually). Conceptually, the model can be easily generalised to the case of N classes, where N can be arbitrarily large, at the cost of a more frequent recourse to numerical solutions.²

Letting $p_{i,j}$ represent the fraction of the population in the income class i in country j , we assume that (i) $p_{i,j} < 0.5 \forall i, j$ and (ii) $n_A < n_B < \bar{n} < n_C$. Assumption (i) avoids trivial voting equilibria. In what follows, only for simplicity and with no loss of generality we further assume that the three income classes are of equal size: $p_{i,j} = 1/3 \forall i, j$. Together with the first, assumption (ii) implies that in each country the median voter is a member of the income class B ; furthermore, the distribution of endowments is skewed to the right, i.e. the median endowment is below the average. In addition to being empirically valid, this assumption implies that, given the fiscal system that we specify below, the median voter votes for a positive tax rate.

In order to avoid 'ties' in voting, the only asymmetry between the two countries is in the total mass of their population: the total mass is $1 + \delta$ in country 1 and 1 in country 2, with δ being arbitrarily small. Without this assumption, the voting outcome would depend on the rules one assumes to break the ties: for instance, the average of the two tax rates, the status quo (0 tax rate), etc. However, even in this case our results are robust to alternative assumptions about how ties are broken.³

An individual of type i in country j has a concave utility function $U(C_{i,j})$. We illustrate our model using a quadratic utility function, which allows us to

² It is more difficult to find an analytical solution when the distribution of endowments is continuous. The reason is that, as we show below, the tax rate in the centralised regime is in general the ratio of two random variables that are functions of the median and the average of a function of the original distribution. All these functions are extremely difficult to determine analytically, and we have not been able to find a distribution that lends itself to an analytical solution in this context.

³ Results are available upon request.

provide an analytic solution of the model. We also briefly summarise the case of a constant relative risk aversion utility function. More details on this case, solved by simulation, are available in the working paper version.

Finally, in order to avoid strategic issues in the choice of the tax rate and problems of tax competition, we assume that individuals are not mobile across countries.

1.2. *The Productivity Shock*

The only source of uncertainty in the model is a country-specific productivity shock, ϵ_j , $j = 1, 2$. The shocks in the two countries have 0 mean, the same variance σ_{ϵ}^2 , and covariance $\sigma_{\epsilon_1\epsilon_2}$. The shock is multiplicative and affects all agents in a country in the same proportion. Thus, when country j is hit by the shock ϵ_j , an individual of type i effectively provides $n_i(1 + \epsilon_j)$ units of labour. We refer to the quantity n_i as the *endowment* of an individual of type i in country j , while the quantity $n_i(1 + \epsilon_j)$ denotes his *income*. Therefore, the realised average income of country j is $\bar{n}(1 + \epsilon_j)$.

1.3. *Fiscal Policy*

Fiscal policy consists of a proportional income tax, at rate t , whose proceeds are redistributed lump-sum to all individuals.⁴ We study the trade-off between two aspects of this redistributive policy: its role in *decreasing* the uncertainty of the economic environment by sharing risk among individuals and countries, and its role in *creating* uncertainty due to the endogeneity of the policy instrument.

Taxation is distortionary. When the total taxable income is X and the tax rate is t , the total tax revenues that can be redistributed are $(t - \frac{1}{2}t^2)X$: the quantity $\frac{1}{2}t^2X$ is wasted in the process of collecting taxes or redistributing them.⁵ As we show later, this assumption implies that the tax rate preferred by each individual is a continuous function of his endowment.

The tax rate is chosen by majority voting. Our main goal is to study the impact of different fiscal policy arrangements on the two effects of redistribution that we highlighted above, the uncertainty-enhancing and uncertainty-reducing effect. In particular, we focus on two arrangements, that we define as follows:

DEFINITION 1.

Decentralised fiscal policy: each country runs its own programme, by taxing its own citizens and redistributing the proceeds lump-sum to them. In each country, the tax rate is chosen by majority voting.

Centralised fiscal policy: the same tax rate applies to all the individuals of the two

⁴ This is a standard formalisation of a progressive tax and subsidy system: see e.g. Meltzer and Richard (1981). With nonlinear tax systems, it is not always possible to find a stable majority in the voting process, as shown by Romer (1975) and Roberts (1977).

⁵ We can think of these costs as the distortionary effects of income taxes on labour supply.

countries. The proceeds from taxation in the two countries are pooled and redistributed lump-sum to all individuals in the two countries. The common tax rate is decided by majority voting among the citizens of the two countries, voting together.

Voting on the tax rate takes place after the shock occurs. Two reasons justify this choice. First, if voting occurred before the shock is realised, the two countries would be identical *ex-ante*, generating uninteresting results. Second, even the second role of redistributive fiscal policy, sharing risk, makes sense only with this timing. A centralised system shares risk among countries because, when it redistributes income from rich individuals to poor individuals, indirectly it redistributes some income from the 'lucky' to the 'unlucky' country.⁶

If the shock were temporary and serially uncorrelated, in a dynamic version of this model a country could smooth out most of its effects by lending or borrowing on the world capital market. The mutual insurance afforded by a centralised system would be irrelevant. Issues of mutual insurance therefore become relevant only when the shock is permanent. The assumption that voting on tax rates occurs after the shock is precisely equivalent to considering 'large', permanent shocks, rather than shocks at the business cycle frequency. A major fiscal or financial crisis, a large supply shock that requires a major reallocation of resources and a large shift in the industrial structure, a monetary unification, a change in the exchange rate regime, etc., are all examples of the types of shock that we have in mind.

1.4. *Absence of Private Insurance and of Direct Transfers*

In our model, any insurance against fluctuations in income occurs through the same fiscal programme that redistributes income. In principle, however, individuals could insure themselves privately, without the intermediation of a programme that redistributes income across different groups. Alternatively, the two countries could agree on a system of direct transfers from the 'lucky' country to the 'unlucky' one.

In practice, there are a host of well-known reasons—from adverse selection to imperfect monitoring of outcomes—why private insurance schemes might not be viable. Similarly, it might be difficult for two governments to implement a direct system of mutual insurance through inter-country transfers. After the shock is realised, clearly the 'lucky' country stands to lose from the implementation of the agreement, and it has strong incentives to renegotiate it.

Clearly, the same problem arises even in the context of a centralised programme of inter-personal redistribution of income. By its nature, this programme also redistributes income from the lucky country to the unlucky one. However, because it also entails some interpersonal redistribution of

⁶ It should also be clear that, since there is no individual-specific risk, a redistributive scheme cannot have any insurance property if carried out at the national level.

resources, it might well obtain the support of a majority of agents even in the country that, on net, loses resources to the other country.⁷

Thus, for a variety of reasons, public redistributive programmes are widely regarded as having insurance properties against individual *and* country-specific shocks over and above whatever is provided by the market or other government insurance schemes.⁸

2. Equilibrium Fiscal Policy

The disposable income (which is equal to consumption in this static model) of an individual of type i in country j in the decentralised regime is:

$$C_{i,j}^d = (1 - t^d) n_i(1 + \epsilon_j) + (t^d - \frac{1}{2}t^{d^2}) \bar{n}(1 + \epsilon_j) \quad (1)$$

where the superscript d stands for 'decentralised'. In (1), the first term, $n_i(1 + \epsilon_j)(1 - t^d)$, is the 'after-tax earned income'. The second term in (1) is the lump-sum transfer received by the same individual: the average tax revenue is $t^d \bar{n}(1 + \epsilon_j)$ and a fraction $\frac{1}{2}t^{d^2} \bar{n}(1 + \epsilon_j)$ is lost in the collection or redistribution process.

The disposable income and consumption level of an individual of type i in country j in the centralised regime is equal to

$$C_{i,j}^c = (1 - t^c) n_i(1 + \epsilon_j) + (t^c - \frac{1}{2}t^{c^2}) \bar{n} \left(1 + \frac{\epsilon_1 + \epsilon_2}{2} \right) \quad (2)$$

where the superscript c stands for 'centralised'. Expression (2) has the same interpretation as (1), except that now the tax base from which the subsidies are drawn is $\bar{n}(2 + \epsilon_1 + \epsilon_2)$. Also, in a centralised regime the total mass of recipients of the subsidy is now 2, i.e. all the individuals in the two countries, rather than 1.

Expressions (1) and (2) highlight a crucial feature of our model: the two regimes affect the variability of consumption through their effects on the variability of the tax base and of the tax rate. We now study how these two components of the variability of consumption compare in the two regimes.

2.1. Decentralised Fiscal Policy

In a decentralised regime, each country decides by majority voting on its own tax rate. Since voting takes place after the shock has occurred, there is no uncertainty at the moment of voting: an agent of type i in country j prefers the tax rate t^d that maximises $C_{i,j}^d$ as given in expression (1). The solution to this problem is a linear function of the endowment of individual of type i relative to the average:

⁷ See Persson and Tabellini (1996) for an analysis of the interaction between interpersonal redistribution and inter-country transfers.

⁸ For instance, Sachs and Sala-I-Martin (1992) calculate that in the U.S. states, because of the progressivity of the income tax, disposable income decreases by 56 to 65 cents when state GDP falls by 1 dollar.

$$t_i^d = \begin{cases} 1 - \frac{n_i}{\bar{n}} & \text{for } n_i < \bar{n} \\ 0 & \text{for } n_i \geq \bar{n}. \end{cases} \quad (3)$$

This result is intuitive. Consider the first order condition of the problem of an individual of type i :

$$-n_i + (1-t)\bar{n} = 0. \quad (4)$$

The first term on the l.h.s. is the marginal cost of taxation: this cost is independent of the tax rate, but depends positively on the pre-tax income of an individual. The second term is the marginal benefit of an increase in taxation—i.e., the marginal increase in the subsidy—which decreases with the tax rate because of the convex costs of taxation. It follows that individuals with lower income will vote for a higher tax rate. However, individuals with income above the average always pay more in taxes than they receive as a subsidy. Thus, their preferred tax rate is always 0. Note that, because the tax rate is chosen after the shock, and the latter affects all individuals in the country in the same proportion, the ratio of individual i 's income to the average income is independent of the shock. Consequently, each agent always prefers the same tax rate irrespective of the realisation of the shock.

Since preferences are single-peaked, the policy preferred by the median voter, an individual of type B , prevails. Hence, the tax rate adopted in equilibrium is the same in both countries, and remembering that the median voter is an agent of type B , it is equal to

$$t^d = 1 - \frac{n_B}{\bar{n}}. \quad (5)$$

Note that, on one hand, there is no uncertainty about policy: the tax rate is constant in all states of the world. On the other hand, the subsidy is stochastic because the tax base is; thus, by its nature a decentralised fiscal policy cannot provide any insurance against the only exogenous source of risk in this model, the country-specific shock ϵ_j .

2.2. Centralised Fiscal Policy

Consider now the voting process of the centralised regime. Individual i in country j prefers the tax rate t that maximises $C_{i,j}^c$ as given in expression (2). Although the tax base is now independent of the shock, the income of individual i still depends on the shock. Thus, and in contrast to the decentralised regime, the tax rate that an individual prefers is now a function of the shock:

$$t_{i,j}^c = \begin{cases} 1 - \frac{n_i(1 + \epsilon_j)}{\bar{n}[1 + (\epsilon_1 + \epsilon_2)/2]} & \text{for } n_i(1 + \epsilon_j) < \bar{n}[1 + (\epsilon_1 + \epsilon_2)/2] \\ 0 & \text{for } n_i(1 + \epsilon_j) \geq \bar{n}[1 + (\epsilon_1 + \epsilon_2)/2]. \end{cases} \quad (6)$$

The tax rate that prevails in the voting process is the one preferred by the individual with median pre-tax income in the combined population of the two countries. Who exactly this individual will be depends on the specific assumption one makes on the shape of the distribution of endowments, an issue that

we explore in Section 4 below. However, one point is already clear from (6): *in contrast to the decentralised regime, the tax rate in the centralised regime is stochastic, that is, it depends on the realisation of the shock.*

We can further clarify the difference between the two regimes, while at the same time greatly simplifying the analysis, by assuming that the productivity shocks in the two countries are perfectly negatively correlated: $\epsilon_1 = -\epsilon_2$. Under this assumption the tax base in the centralised regime becomes deterministic and equal to $2\bar{n}$, since:

$$\bar{n}(1 + \epsilon_1) + \bar{n}(1 + \epsilon_2) = \bar{n}(1 + \epsilon_1) + \bar{n}(1 - \epsilon_1) = 2\bar{n}. \quad (7)$$

The assumption of perfect negative correlation between ϵ_1 and ϵ_2 is clearly extreme, and much stronger than we need in order to develop our argument. Its first advantage has to do with analytical tractability. As we have shown above, the tax rate resulting from the voting process is a function of the ratio of the median income to the average income. Our assumption then means that the denominator of this ratio in a centralised regime is always constant. This avoids having to deal with the ratio of two random variables, and greatly facilitates the analysis of the model.

The second advantage of this assumption is that it highlights in a stark way the main differences between the decentralised and the centralised regime. Under this assumption the tax base in the centralised regime is constant, while the tax rate is stochastic. Hence, the centralised regime has opposite characteristics to the decentralised regime: it has no uncertainty on the tax base, but a higher uncertainty on the policy instrument.

In addition, note that this assumption does not bias the results in favour of decentralisation: in fact, the benefits and feasibility of mutual insurance are actually maximised when the productivity shocks are perfectly negatively correlated.

3. Economic Risk and Political Risk

The difference in the expected utility in the two regimes, $E[U^d(t^d)] - E[U^c(t^c)]$, can be decomposed into three main components, each with an intuitive interpretation:⁹

$$\begin{aligned} E[U^d(t^d)] - E[U^c(t^c)] &= \{E[U^d(\bar{t}^d)] - E[U^c(\bar{t}^d)]\} \\ &\quad + (\{E[U^d(t^d)] - E[U^d(\bar{t}^d)]\}) \\ &\quad + \{E[U^c(\bar{t}^c)] - E[U^c(t^c)]\} \\ &\quad + \{E[U^c(\bar{t}^d)] - E[U^c(\bar{t}^c)]\}. \end{aligned} \quad (8)$$

For future reference, note that a *positive* value of the expected utility differential means that an individual is better off in the *decentralised* regime.

⁹ For notational convenience, we drop the indices i and j from the expressions for the expected utilities.

This decomposition is useful purely for expositional purposes. It identifies three components that have a natural interpretation. Obviously, nothing in our results depends on this or any other decomposition of this expression.

The first component of (8) is equal to the difference in utility between the two regimes when the tax rate is held constant at its expected value in the decentralised regime, \bar{t}^d (note that in this model $t^d = \bar{t}^d$ since t^d is always constant; however, conceptually it is useful to distinguish between the two tax rates.) At this tax rate, the expected value of consumption is the same in the two regimes, but the variance is higher in the decentralised regime because the tax base is more variable. Therefore, the first component of our decomposition, $E[U^d(\bar{t}^d)] - E[U^c(\bar{t}^d)]$, is negative and captures the difference between the two regimes that can be attributed to the different variability of their tax bases. We call this term the *economic risk utility differential*, since this is the component emphasised in the economics literature on fiscal unions, which typically does not consider political effects.

The second component of (8) captures the effects of different patterns of variation of the tax rate in the two regimes about their expected values. This component can be written as $\{E[U^d(t^d)] - E[U^d(\bar{t}^d)]\} - \{E[U^c(t^c)] - E[U^c(\bar{t}^c)]\}$, where \bar{t}^c is the expected tax rate in the centralised regime. Clearly, the first term in brackets in this expression is 0, since in the decentralised regime the equilibrium tax rate is constant. What is left in the expression then captures the fact that the higher diversity of voters in the centralised regime leads to a more variable tax rate than in the decentralised regime. Therefore, we call this component the *political risk utility differential*. Note that this component can be positive or negative, depending on the covariance of t^c with the income of an individual.

Finally, the third component, $E[U^c(\bar{t}^d)] - E[U^c(\bar{t}^c)]$, captures the effects of systematic differences in the fiscal policies of the two countries. These can arise for instance because the median voters are different in the two regimes, and therefore the average tax rates that they prefer are different. Because different average degrees of redistributions are associated with different average tax rates, this component will be positive or negative, depending on the pre-tax income of an individual. We call this component the *systematic fiscal policy utility differential*.

To summarise, and recalling that $t^d = \bar{t}^d$, we can define each of the three terms on the r.h.s. of (8) according to the following

DEFINITION 2.

We define:

- (i) $E[U^d(t^d)] - E[U^c(t^d)]$ as the *economic risk utility differential* of the two regimes;
- (ii) $E[U^c(\bar{t}^c)] - E[U^c(t^c)]$ as the *political risk utility differential* of the two regimes;
- (iii) $E[U^c(\bar{t}^d)] - E[U^c(\bar{t}^c)]$ as the *systematic fiscal policy utility differential* of the two regimes.

The traditional argument that a centralised fiscal policy allows some form of insurance against country-specific shocks (as in Sachs and Sala-I-Martin (1992)) is implicitly based on the first item in our decompositions (8). In other words, the argument only considers the relative economic risk of the two regimes by comparing them at the same tax rate. The point of what follows is to show that, when one considers the other components, and in particular the political risk component, the results concerning the relative merits of centralisation and decentralisation may change. Our point is particularly clear in those regions of parameter values such that

$$E[U^d(t^d)] - E[U^c(t^c)] > 0 \quad (9)$$

and

$$E[U^d(t^d)] - E[U^c(\bar{t}^c)] < 0. \quad (10)$$

In other words, suppose that the total utility differential (the l.h.s. of (9)) is positive, but the sum of the economic risk utility differential and of the systematic utility differential (the l.h.s. of (10)) is negative. This implies that the individual prefers the decentralised regime (inequality (9)), *but would prefer the centralised regime if the centralised tax rate did not vary about its expected value*, that is, if there were no political risk (inequality (10)). In other words, the *only* reason why the individual prefers the decentralised regime is that the political risk is higher in the centralised regime, and this more than compensates for the effects of the other two factors.

We can now anticipate the results that we will show in the next two sections:

RESULT 1:

There exists a non-empty set S of parameter values, including in particular income distribution values, such that a majority of individuals in *each* country prefer the decentralised regime *only* because of the higher political risk of the centralised regime. There exists a non-empty set \tilde{S} of parameter values for which a majority of voters in each country prefers the decentralised regime because of the combined effect of the political risk and the systematic utility differential; $S \subset \tilde{S}$.

We show below that the sets S and \tilde{S} are in fact quite wide and Result 1 does not have a 'knife edge' feature. In other words, for a wide range of parameter values *both* inequalities (9) and (10) are realised for a majority of individuals in *each* country. Because of the endogeneity of the policy instrument, the centralised regime might not be able to fulfill any insurance role. The 'political risk', namely the additional variability of the policy instrument in the centralised regime, for some parameter values more than compensates for the reduction in the 'economic risk', namely the reduction in the variability of the tax base in the centralised regime.

From Result 1, it follows immediately that for a wide range of parameter values *at least one country will veto a centralised fiscal policy regime because of its higher political risk*.

Because the size of the political risk is a function of the variability of the tax rate, it is important to ask what are the conditions that are conducive to a higher variability of the tax rate. The answer is in the following definition and result:

DEFINITION 3:

For any given n_B , a *polarised distribution* is characterised by a large distance between n_A and n_C .

Thus, according to Definition 3, an increase in polarisation, holding constant n_B , corresponds to a mean- and median-preserving spread.

RESULT 2:

If, for a certain degree of polarisation, a majority of agents in each country prefer the decentralised regime, the centralised regime is not preferred by a majority for any higher level of polarisation.

In the next section we illustrate Results 1 and 2 for the case of equal expected equilibrium tax rates in the two regimes. This allows us to obtain a closed form solution of the model and prove our results analytically when the utility function is quadratic. In Section 5 we briefly discuss the more general case that does not impose any condition on the equilibrium tax rate, assuming a constant relative risk aversion utility function.

Before proceeding, it might be useful to repeat what we are trying to accomplish, and what we are not. We do *not* intend to show that centralisation is always inferior to decentralisation. What we want to show is that the ‘mutual insurance’ effect of centralisation can be partially, and even completely, compensated by a more dispersed distribution of preferences in a larger population. Since we are essentially developing a counterexample to the commonly held view that centralisation is superior because of the mutual insurance it provides, our argument can be made using a simple and very stylised model. Clearly, the results we obtain from this stylised model would be uninteresting if the range of parameter values for which the increase in political risk is greater than the reduction in economic risk is small or even ‘knife-edge’. However, we show below that, in fact, this is not the case.

4. Quadratic Utility with Equal Expected Tax Rates

We consider the case when, in equilibrium, the average tax rates in the two regimes are equal: $\bar{t}^d = \bar{t}^c$. From Definition 2, any difference in their expected utility can then be attributed entirely to the relative importance of the economic risk and of the political risk. In other words, under the assumption of equal expected tax rates between the two regimes inequality (10) is always satisfied, since its l.h.s. represents the economic risk utility differential only. We know that the economic risk utility differential is always negative: if the tax rate were fixed at its common average value, every individual would certainly

prefer the centralised regime. Therefore, if inequality (9) is realised and the individual prefers the decentralised regime, *necessarily this must be because of the higher political risk in the centralised regime.*, i.e. because the policy instrument is more unpredictable.

For simplicity, we assume that the shock ϵ can take only two values, x and $-x$, each with probability 0.5. It follows that there is only one possible configuration of parameters that deliver the condition of equality of the expected tax rates in the two regimes:

$$\begin{aligned} (a) \quad & n_A(1+x) < n_B(1-x), \quad n_B(1+x) < n_C(1-x) \\ (b) \quad & n_B(1+x) < \bar{n}. \end{aligned} \tag{11}$$

This condition has a rather intuitive interpretation. Part (a) implies that the relative position of any two income groups in different countries is independent of the shock: for instance, when the shock is negative in country 1 and positive in country 2, the income of a member of group B in country 1 is still higher than the income of a member of group A in country 2. This ensures that the median voter in the centralised regime is always a member of group B in country 1, the larger country (obviously we could rewrite the conditions to make the median voter a member of group B in country 2).¹⁰ Part (b) requires that the tax rate proposed by the median voter is never 0. As we show below, this ensures that the tax rates proposed by the median voter in the centralised regime under the two realisations of the shock are symmetric about the decentralised tax rate, so that their average is exactly the decentralised tax rate.

Because the median voter is always a member of group B in country 1, and preferences are still single-peaked, the tax rate adopted in equilibrium, t' , is now:¹¹

$$t' = 1 - \frac{n_B(1 + \epsilon_1)}{\bar{n}}. \tag{12}$$

The crucial result here is that the equilibrium tax rate is no longer constant: it covaries negatively with the shock in country 1. In fact, when ϵ_1 is positive (negative), the income of the median voter, $n_B(1 + \epsilon_1)$, is high (low), while as we know the average income of the two countries remains constant; thus, from (6), the tax rate preferred by the median voter is low (high). On the other hand, the tax base is constant.

Assume now that individuals maximise a utility function of the type:

$$U(C_{i,j}) = \alpha C_{i,j} - C_{i,j}^2. \tag{13}$$

¹⁰ Clearly, this is a special feature of the model. More generally the shock might have distributional implications, by changing relative positions in the income ladder of different individuals. This feature would affect the variability of both the equilibrium in the centralised and the decentralised regime. In general one cannot tell in which direction the difference in variability of tax rates in the two regimes (centralised and decentralised) would be affected. Thus, while the case considered here (for tractability reasons) is somewhat special, it does not necessarily bias the results in favour of decentralisation.

¹¹ Recall that we have assumed for simplicity $\epsilon_1 = -\epsilon_2$, so that the *per capita* income of the economies combined that appears at the denominator of (12) is always constant at \bar{n} .

We present the main intuition underlying Results 1, 2 and 3, leaving the formal analytical solution to the Appendix. We do so by considering the expected utility of each type of individual in each country as a function of the parameters of the distribution of income. For notational simplicity, and without loss of generality, from now on we normalise the average income of the economy, \bar{n} , to 1.

Type-A individuals, country 1.

Consider first individuals of type A for the case of $n_A = 0$. These agents prefer the decentralised regime for the more realistic values of n_B . The intuition is as follows. As we know, the economic risk utility differential is negative:¹² when the tax rate is constant at the common expected value, clearly $E[U^d(t^d)] < E[U^c(t^c)]$; on the other hand, the political risk utility differential is unambiguously positive: $E[U^c(\bar{t}^c)] > E[U^c(t^c)]$ since the expected value of the subsidy in the centralised regime is higher and the variance is lower when the tax rate is constant at \bar{t}^c than when it depends on the shock.

The economic and political risk utility differentials therefore have opposite signs. To determine the sign of the overall utility differential, consider the variance and the expected value of the subsidy. Let s^c and s_j^d be the subsidy in the centralised and decentralised regimes, respectively. Some simple algebra shows that the expected value of the subsidy is always higher in the decentralised regime:

$$E(s_j^d) > E(s^c) \quad (14)$$

which simply reflects the fact that the increased variability of the tax rate in the centralised regime leads to higher deadweight losses. On the other hand, the variance of the subsidy in the two regimes depends on the value of n_B :

$$\text{Var}(s^c) > \text{Var}(s_j^d) \Leftrightarrow 3n_B^4 + 2n_B^2 - 1 > 0. \quad (15)$$

Thus, the variance of the subsidy is higher in the centralised regime when $n_B > 1/\sqrt{3}$, and it is higher in the decentralised regime when $n_B < 1/\sqrt{3}$. Therefore, when $n_B > 1/\sqrt{3}$, in the decentralised regime both the expected value of the subsidy is higher and its variance is lower. Conversely, when n_B is below $1/\sqrt{3}$, the variance of the subsidy is higher in the decentralised regime. Hence, for all values of n_B higher than a certain value n_{B_1} (which in turn is less than $1/\sqrt{3}$), in both countries members of group A with no labour endowment prefer the decentralised regime. Typically, the median income is above a fraction $1/\sqrt{3}$ of the average income, and therefore, *a fortiori*, above n_{B_1} . Hence, for the more realistic values of the distribution of income, an individual with no labour endowment prefers the decentralised regime in both countries.

As the endowment of poor agents increases from 0, the importance of the subsidy as a source of consumption decreases while that of the after-tax earned

¹² Once again, recall that a 'positive' differential indicates that the decentralised regime gives a higher expected utility, and a 'negative' differential that the centralised regime gives a higher expected utility.

income increases. As their endowment increases, individuals of type A in country 1 will be increasingly better off in the centralised regime, because the tax rate is countercyclical there and applies to a positive pre-tax income. Therefore, for any given n_B individuals of type A with endowment lower than a certain value of n_A prefer the decentralised regime in country 1.

Type-A individuals, country 2.

Since the tax rate in the centralised regime is procyclical in country 2, poor agents in country 2 prefer the decentralised regime for an even wider range of values of n_A . In fact, this is a general feature of the model: the range of parameter values such that individuals of any given type prefer the decentralised regime in country 1 is a subset of the same range in country 2. This is a consequence of the fact that the median voter is always in country 1. Thus, taxes are countercyclical in country 1 and procyclical in country 2.

In conclusion, there exists a wide range of configurations of the distribution of income, characterised by high values of n_B and low values of n_A , such that individuals of type A in *both* countries prefer the decentralised regime. In addition, this range is larger in country 2.

Type-B individuals, country 1.

Individuals of type B in country 1 always prefer the centralised regime: indeed, they are always the decisive voters and therefore cannot do worse in the centralised regime, which has the same expected tax base but a lower variance.

Type-B individuals, country 2.

As we discussed above, since the median voter is always in country 1, the range of parameter values for which a given type prefers decentralisation is always greater in country 2 than in country 1. This holds for both group A —as shown above—but also for group B . It follows that while group B in country 1 is always in favour of centralisation, for any parameter value, there exists a non empty set of parameter values for which group B in country 2 prefers decentralisation. Note that for the reason derived above (see equation (15) and the discussion associated with it) the region in which group B of country 2 prefers decentralisation is characterised by high values of n_B .

Type-C individuals, country 1.

Individuals of type C too are better off in the decentralised regime in a region characterised by high values of n_B and low values of n_A . The intuition is as follows. Using the expressions for the equilibrium tax rates, in the decentralised regime the after-tax earned income is $(1 + \epsilon_1)n_C n_B$, while in the centralised regime it is $(1 + \epsilon_1)^2 n_C n_B$.¹³ Therefore, in the centralised regime the expected value of the after-tax earned income is larger, but on the other

¹³ The expression for the decentralised regime can be obtained by substituting the decentralised tax rate, $t^d = (1 - n_B/\bar{n})$, into the expression for the after-tax earned income, $(1 + \epsilon_1)n_C(1 - t)$. The expression for the centralised regime can be obtained similarly, using the formula for the centralised tax rate, $t^c = [1 - n_B(1 + \epsilon_1)/\bar{n}]$.

hand its variance is four times as large. Because with quadratic utility risk aversion increases with the level of consumption, i.e. with n_B and n_C , the higher n_C and n_B (therefore, the lower n_A and the higher n_B), the better off an individual of type C will be in the decentralised regime.

Type-C individuals, country 2.

In country 2 there are two basic differences. First, now the after-tax earned incomes are $(1 + \epsilon_2) n_C n_B$ in the decentralised regime and $(1 - x^2) n_C n_B$ in the centralised regime.¹⁴ Hence, the expected value of the after-tax earned income is now higher in the decentralised regime, but its variance too is higher. Second, as usual the cyclical behaviour of the tax rate is more unfavourable in the centralised regime. As it turns out, this second effect more than offsets the effects of the higher variance of the after-tax earned income in the decentralised regime; as a result, individuals C in country 2 are better off in the decentralised regime for an even larger range of parameters than in country 1. Thus, individuals of type C in both countries are better off in the decentralised regime for configurations of income distribution characterised by high values of n_B and low values of n_A (i.e., high values of n_B and of n_C).

Figs. 1 and 2 illustrate the regions where a majority of individuals prefer the

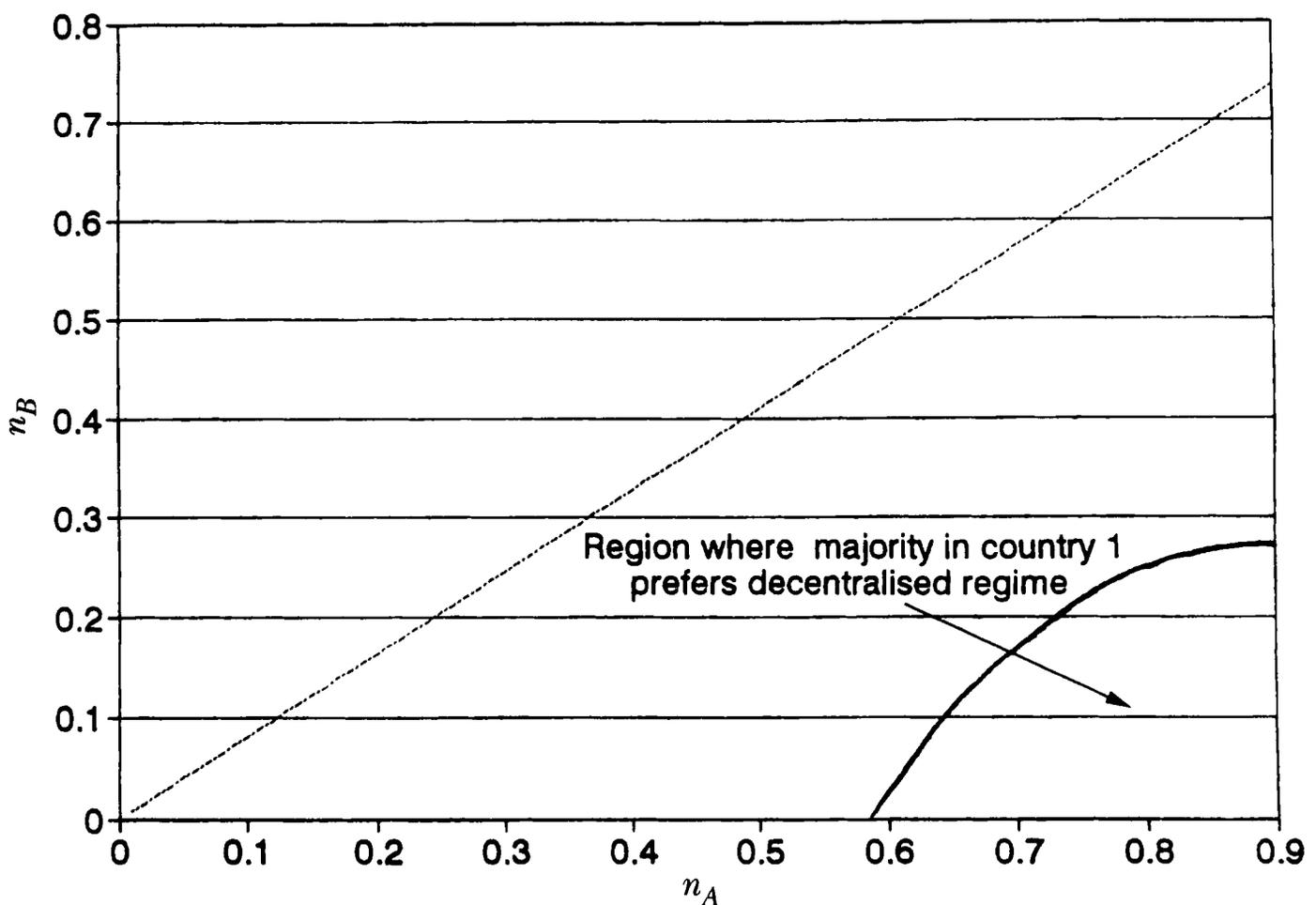


Fig. 1. *Region where majority in country 1 prefers decentralised regime*

¹⁴ The after-tax earned income in the centralised regime is $n_C(1 + c_2)(1 - t')$. From $t' = 1 - n_B(1 + c_1)$ and $c_1 = -c_2$ one obtains the expression $(1 - x^2) n_B n_C$ in the text.

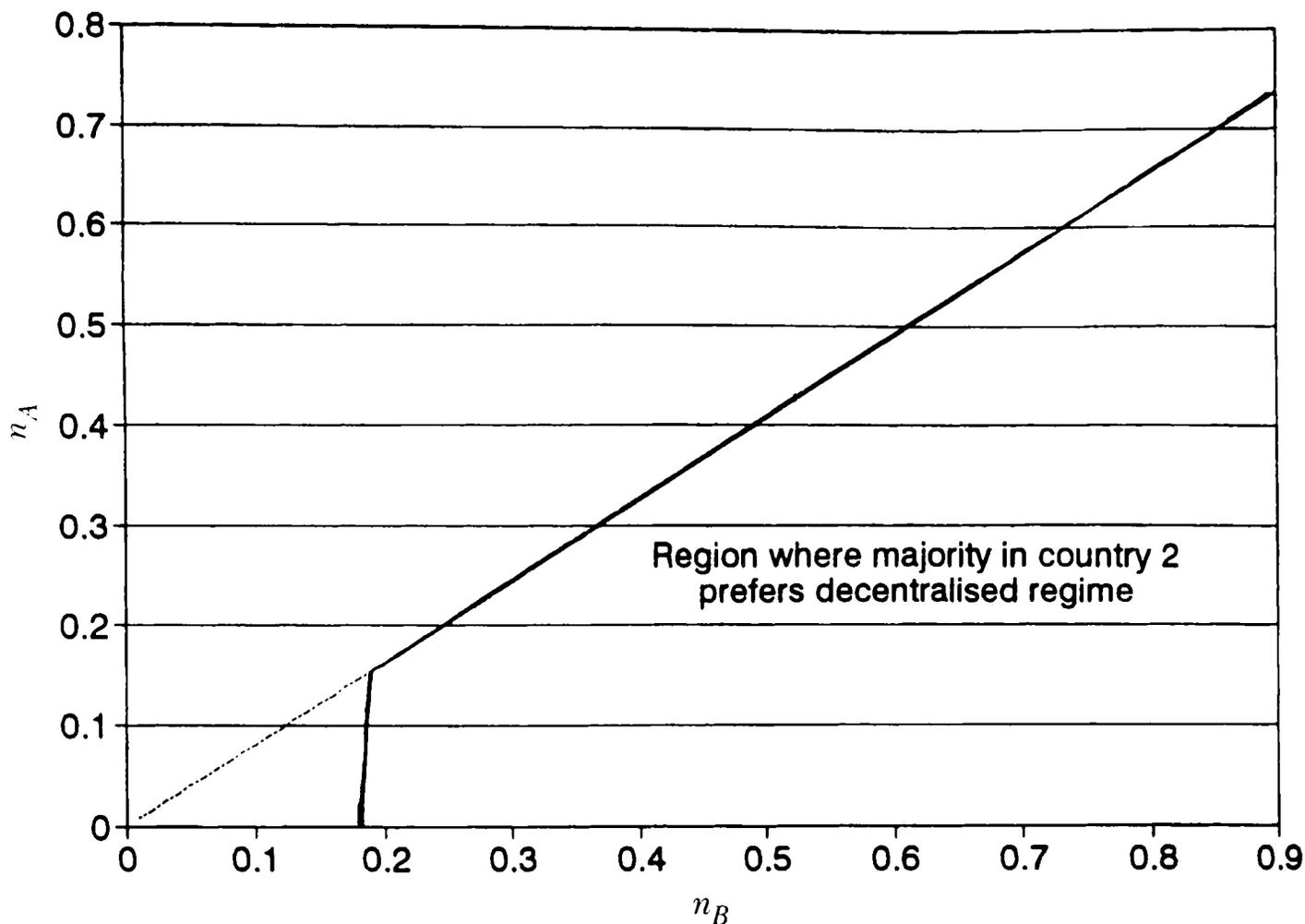


Fig. 2. *Region where majority in country 2 prefers decentralised regime*

decentralised regime in country 1 and 2, respectively. The admissible values of n_A and n_B must lie below the dotted line, which has equation $n_A = n_B(1-x)/(1+x)$ (from condition (11), part (a)). In these figures, we assumed a value of x equal to 0.1. Below the solid line, a majority of agents prefer the decentralised regime. As one can see, in country 1 this occurs for values of n_B larger than 0.58, and values of n_A that are between 0 and an increasing function of n_B . In country 2, this occurs for values of n_B greater than 0.18 and values of $n_A \leq n_B(1+x)/(1-x)$. Thus, as stated in Result 1, there is a range of values of the parameters of income distribution (in our example, in the region below the solid line in Fig. 1), where a majority of individuals in each country (individuals of type A and C in country 1 and all individuals in country 2) are better off in the decentralised regime. Thus, for a wide range of parameters ($n_B > 0.18$, $n_A \leq n_B(1+x)/(1-x)$), a majority of individuals in country 2 are better off in the decentralised regime and therefore veto a centralised regime. Note that this result is not an artifact of the assumption that the median voter is always in the same country. In fact, even a majority in country 1, where the median voter resides, prefer the decentralised regime for a wide range of parameter values. Finally, Result 2 is clearly verified, since a decentralised regime prevails in a region characterised by a highly polarised distribution (low values of n_A and therefore high values of n_C).

In addition, in this model where the expected tax rates are the same in the two regimes, the higher variability of the tax rate in the centralised regime

unambiguously reduces the expected value of aggregate consumption by increasing the expected value of the costs of collecting or redistributing taxes.

RESULT 3:

In the centralised regime the expected aggregate consumption is lower, because the expected value of distortions is higher.

Proof:

Recalling that the average endowment in each economy is 1 by normalisation, the aggregate consumption of the two countries in each regime is $2[1 - t^i + (t^i - \frac{1}{2}t^{i^2})] = 2(1 - \frac{1}{2}t^{i^2})$, $i = d, c$. Because the average tax rates are the same in the two regimes but the variance is higher in the centralised regime, the result follows immediately.

Thus, this result highlights a sort of consumption inefficiency of the centralised regime.

5. Discussion and Conclusions

A rather unappealing feature of the quadratic utility function is that it implies increasing absolute risk aversion. However, our results do not hinge on this feature. In fact, we have also derived our conclusions for the case of the constant relative risk aversion utility function:

$$U_{ij} = \frac{C_{ij}^{1-\gamma}}{1-\gamma}; \quad \gamma > 0 \quad (16)$$

where γ is the coefficient of relative risk aversion.

With this utility function, in general it is not possible to solve our model analytically. Numerical simulations show that for a wide range of parameter values at least one country would veto the centralised regime: for a majority of its citizens, the increased political risk more than compensates the benefits of higher insurance.¹⁵

In summary, this paper has highlighted a simple trade-off. Fiscal integration in large political jurisdictions has its advantages: for example, economies of scale in the provision of public goods and the possibility of mutual insurance, which is the point emphasised in our paper. On the other hand, integration comes at a cost. The most general way of capturing this cost is the idea that, when the size of a political jurisdiction increases, policy becomes more uncertain because the outcome results from the aggregation of preferences of a more diverse population. The larger and more heterogeneous the political jurisdiction, the higher are these costs.

In our model we considered only two countries. What happens when the number of countries in the union increases? If we maintain the assumptions

¹⁵ A detailed discussion of these simulations is included in the NBER working paper version of this paper.

that all the countries have the same average endowment, that the systematic utility differential is 0, and that the relative income ranking of the three groups is not affected by the shock (condition (11)), then the variance of the tax rate decreases as the number of countries increases. However, the assumption of equal average endowments and of no systematic utility differentials become less and less tenable as the number of countries increases. For example, if the dispersion of average endowments increases with the number of countries, then the richer countries become more likely to object to a centralised system, for obvious reasons. In addition, in larger unions, more countries have a polarised distribution of income. This increases the political risk, and makes fiscal unions less likely to be beneficial to a majority of individuals.

As we mentioned in the introduction, we believe that the basic idea of this paper extends beyond the specific case we have analysed. Expressed in more colourful terms than we used so far, this basic idea is that political integration, beyond the establishment of a free-trade regime, might backfire as the participating countries discover that they cannot agree on important common policies. The case of European integration is, perhaps, a good example. Supporters have often emphasised its economic benefits. Sceptics often mention the risk associated with integrating countries with important politico-economic differences. The point of this paper is, hopefully, to clarify in a unified framework one of the trade-offs leading to these conflicting views.

An important topic for future research is a 'normative' one, namely how to set up voting mechanisms which limit the effects of political risk but, at the same time, preserve the benefits of mutual insurance. In fact, it is conceivable that certain voting rules may be more effective than others in reducing (or eliminating) the political risk inherent in the centralised regime while at the same time allowing the participants to enjoy the advantages, in terms of reduced economic risk, of that regime. The next step therefore consists in studying how different voting rules may improve upon the trade-off between economic and political risk that we have emphasised in this paper.

Harvard University, NBER and CEPR

Columbia University and CEPR

Date of receipt of first submission: July 1996

Date of receipt of final typescript: November 1997

Appendix

We now prove Results 1 and 2 for the case of a quadratic utility function and equal expected tax rates in the two regimes:

$$U = \alpha C - C^2. \quad (\text{A.1})$$

Because $p_i = 1/3 \forall i$, the highest possible income of an agent of type C then is $n_C = 3$, which occurs when $n_A = n_B = 0$. $\alpha \geq 6$ is therefore a necessary condition for the first derivative of the utility function to be positive for all possible configurations of the distribution of income. Again to simplify the exposition, in what follows we assume that

$\alpha = 6$. Also, in country 1 the total mass of the population is infinitesimally higher than in country 2, so that the median voter is always a member of group B in country 1.

Now let Δ_i be the difference between the expected utility in the decentralised regime and the expected utility in the centralised regime for an individual of type i in country 1. Using the equilibrium values of the tax rates in the two regimes, we can write:

$$\Delta_i = x^2 \left[3n_B^2 - 6n_i n_B + 5n_i^2 n_B^2 + \frac{5}{4}n_B^4 - 5n_i n_B^3 - \frac{1}{4} + x^2(n_i^2 n_B^2 + \frac{1}{4}n_B^4 + n_i n_B^3) \right]. \quad (\text{A.2})$$

Whenever Δ_i is positive, an agent of type i prefers the decentralised regime. To simplify the analysis, in (A.2) we ignore the terms multiplied by x^4 . Note that consideration of these terms would increase the region where each type of agents prefers the decentralised regime, as all these terms are positive.

Consider first individuals of type A in country 1. Some simple but tedious algebra establishes the following properties of Δ_A : (i) $\Delta_A(n_A = 0) > 0$ for $n_B > n_{B_1}$; (ii) $\Delta_A(n_A = n_B) < 0$ always; (iii) $\Delta_A(n_B = 1) > 0$ for $n_A < n_{A_1}$; (iv) $\partial\Delta_A/\partial n_A < 0$ always. These properties of Δ_A imply that in a region characterised by high values of n_B and low values of n_A Δ_A is positive.

As we already know, individuals of type B in country 1 always prefer the centralised regime because they are the decisive voters and the tax base is less variable there.

Finally, consider individuals of type C in country 1. Substituting $n_C = 3 - n_B - n_A$ for n_i in (A.1), one obtains the following properties for Δ_C : (i) $\Delta_C(n_A = 0) > 0$ for $n_B > n_{B_2}$; (ii) $\Delta_C(n_A = n_B) < 0$ always; (iii) $\Delta_C(n_B = 1) > 0$ for $n_A < n_{A_2}$; (iv) $\partial\Delta_C/\partial n_A$ is increasing in n_A .

(ii) and (iv) together imply that $\partial\Delta_C/\partial n_A$ must always be negative for all $n_B \geq n_{B_2}$. Hence, for any given $n_B \geq n_{B_2}$, Δ_C starts out positive for low values of n_A and then becomes negative. This establishes that, for agents of type C too, Δ_C is positive in a region characterised by low values of n_A and high values of n_B .

A similar method can be utilised to show that all agents in country 2 (including agents of type B) prefer the decentralised regime in a region around $n_A = 0$ and $n_B = 1$. In fact, for each type of agent this region is larger than for the same type of agent in country 1.

As illustrated in Section 4, Figs. 1 and 2 display the regions of values of n_A and n_B where a majority of agents in countries 1 and 2, respectively, prefer the decentralised regime.

References

- Alesina, A. and Spolaore, E. (1997). 'On the number and size of nations', forthcoming, *Quarterly Journal of Economics*.
- Brown, C. and Oates, W. (1987). 'Assistance to the poor in a federal system', *Journal of Public Economics*, vol. 32, pp. 307–30.
- Gordon, R. H. (1983). 'An optimal taxation approach to fiscal federalism' *Quarterly Journal of Economics*, vol. 97, pp. 567–86.
- Ladd, H. F. and Doolittle, F. C. (1982). 'Which level of government should assist the poor?', *National Tax Journal*, vol. 35, pp. 323–36.
- Meltzer, A. H. and Richard, S. F. (1981). 'A rational theory of the size of government', *Journal of Political Economy*, vol. 89, pp. 914–27.
- Pauli, M. V. (1973). 'Income redistribution as a local public good', *Journal of Public Economics*, vol. 2, pp. 35–58.
- Perotti, R. (1997). 'Inefficient redistribution', mimeo, Columbia University.
- Persson, T. and Tabellini, G. (1996). 'Federal fiscal constitutions. Part 1: Risk sharing and moral hazard', *Econometrica*, vol. 64, pp. 623–46.

- Roberts, K. W. S. (1977). 'Voting over income tax schedules', *Journal of Public Economics*, vol. 18, pp. 329–40.
- Romer, T. (1975). 'Individual welfare, majority voting, and the properties of a linear income tax', *Journal of Public Economics*, vol. 14, pp. 163–85.
- Sachs, J. and Sala-i-Martin, X. (1992). 'Fiscal federalism and optimum currency areas: evidence for Europe from the United States', in (M. Canzoneri, P. Masson and V. Grilli, eds.). *Establishing a Central Bank: Issues in Europe and Lessons from the U.S.*, London: Cambridge University Press.

Copyright of Economic Journal is the property of Blackwell Publishing Limited and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.