FEDERAL FISCAL CONSTITUTIONS
Part I: Risk Sharing and Moral Hazard*

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Abstract

Inspired by the current European developments, we study equilibrium fiscal policy under alternative constitutional arrangements in a "federation" of countries. There are two levels of government: local and federal. Local policy redistributes across individuals and affects the probability of aggregate shocks, while federal policy shares international risk. Policies are chosen under majority rule. There is a moral hazard problem: federal risk–sharing can induce the local governments to enact policies that increase local risk. We investigate this incentive problem under alternative fiscal constitutions. In particular, we contrast a vertically ordered system like the EC with a horizontally ordered federal system like the US. These alternative arrangements are not neutral, in the sense that they create different incentives for policymakers and voters, and give rise to different political equilibria. A general conclusion is that, centralization of functions and power can be welfare improving under appropriate institutions. However, this conclusion only applies to the moral hazard problem and a federation where the countries are not too dissimilar.

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1. Introduction

What incentive problems arise when two countries want to share macroeconomic risks? How should institutions be designed to cope with these problems? These are the issues we address in this paper. The ongoing policy discussions within the European Community in the wake of the Maastricht agreement provide two motivations for addressing these issues.

One is a sense that the future of the policy–making institutions in the Community is in a state of flux. What is questioned is how to divide the policy tasks between the different levels of government as well as how to appoint and impose political accountability on the central policy–making bodies.

The other motivation is the loss of macroeconomic policy autonomy for individual countries implied by the draft treaty for European Monetary Unification (EMU). This treaty entails an important loss of sovereignty over national monetary policies. In the face of temporary shocks national governments could still self insure by borrowing. But in the face of permanent shocks borrowing provides no insurance. Furthermore, the borrowing ability of individual countries may also become constrained within the EMU. Many observers claim that the lesser ability to cushion shocks at the national level ought to be replaced by some risk–sharing scheme at the Community level, such as a federal tax–transfer system, particularly given the low labor mobility among European regions (see for instance Sala–i–Martin and Sachs (1992)). But, supposing we accept that argument, how should such a scheme be designed? And what political checks and balances should be imposed on it?

Our analysis is inspired by the literature on contract theory and principal–agent relations. It departs from that literature in that the institutional design problem that we address (a risk–sharing arrangement among countries) differs in some important respects from a risk–sharing contract among individuals. Ultimately, of course, we care about the

risk borne by individual citizens. The risk–sharing arrangements that we study, however, are among collective bodies (elected representatives or winning majorities of voters). A positive analysis of *collective* decisions both within individual localities and within federal institutions is an integral part of our analysis. The institutions we study are typically hierarchical structures, involving voters/economic agents, national governments and a federal government.

Despite these differences, the basic issues we study are clearly familiar from the theory of contracts. National governments retain access to domestic national policies. Through these policies they can redistribute among individuals, but they can also affect the aggregate risk borne by the country as a whole. Because of the latter role for policy, there is a moral–hazard problem: a risk–sharing arrangement among countries can reduce the incentives for national governments to enact national policies that decrease national risk, or help the economy adapt to national shocks.[1] A likely trade off between risk sharing and moral hazard emerges. It is this trade off that we focus on in the present paper.

These incentive problems may be more or less pronounced under alternative federal institutions, because different institutions may entail different policy incentives at the central level as well as at the local level. The general positive question that we address is therefore how policies will be chosen under alternative federal constitutions. In addressing this question, we will try to model different features of two kinds of federal arrangements that we observe in the real world. One is the EC system, the other the US system. (To simplify, we refer to the European Community figuratively as a "federation", even though it is much more of a confederation.)

These two systems differ in several important respects. The US federal government redistributes directly to and from individual citizens, whereas in the EC there is mainly a system of intergovernmental transfers. Similarly, in the US the federal government is

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1 Similar incentive problems can arise even if the risk sharing would rely on borrowing rather than on a federal tax–transfer scheme.

directly appointed by and directly accountable to individual voters, whereas political appointments and accountability is only indirect in the EC .[2] In both these respects the federal and local governments are vertically ordered in the EC, while they are more horizontally ordered in the US. The two systems differ also in their task allocation, in that the federal government controls a much larger set of policy tasks in the US than in the EC. Finally, they differ in the relative strength of the two levels of government: US federal legislation having precedence over local legislation in many areas.

The existing literature on fiscal federalism and European integration has identified two reasons for centralizing some policy decisions at the federal level. They are: mobility of tax bases and protective policies (i.e., policies that distort private competition within the confederation).[3] Because these two issues are relatively well understood, we disregard them in this paper. Hence we study a simple environment in which resources are immobile internationally and there is no international trade at the private level.

Despite these simplifications, a central theme of the paper is that, under appropriate institutions, centralization of functions can be welfare improving. The reason is that the incentive problems that we study distort local government decisions. Centralization can offset these distortions, even though the central government operates under informational constraints. Naturally this conclusion only applies to the incentive problems that we address in the paper, and certainly does not apply to other incentive issues that may arise in a federation.

To address more precisely how these differences in constitutional structures affect policy outcomes, we study different versions of a simple model of fiscal policy. In line with the discussion above, fiscal policy can do two things: share risk between individuals and between countries and affect the probability (or the consequences) of aggregate shocks.

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2 This contrast hinges on the assertion that the European parliament is a relatively powerless body under the present EC arrangements, where instead the Council of Ministers makes the important policy decisions.

3 See, for instance, Wildasin (1990) and Bureau and Champsaur (1992).

The distinctive feature of the positive analysis is that policy is endogenously determined by a collective choice process at both levels of government. Based on this positive analysis of different political equilibria, we can also start thinking about the normative question of which federal institutions are most desirable in that they curtail the incentive problems in fiscal policy.

Throughout the paper we make simplifying assumptions so as to rule out policies that imply an *ex ante* redistribution of resources across countries (states). We make these assumptions to focus on the trade off between risk sharing and moral hazard, not because we think they are realistic. On the contrary, we think that the interplay between risk sharing and *ex ante* redistribution is a key feature of fiscal policy. However, we relegate the analysis of this interplay at the international level to a sequel to this paper, Persson and Tabellini (1992b). At the domestic level, policies do redistribute *ex ante* across individuals. Here there are genuine political conflicts over which policies to set.

In section 2 of the paper we set the stage and introduce notation by studying a model of a single country. Section 3 analyzes a federation where the federal government, like in the EC system, transacts with local governments rather than with individuals. We study non–cooperative equilibria under different timing assumptions trying to capture whether or not federal legislation has precedence over local legislation. Here the federal government cannot observe or verify certain aspects of local policy, which is the root of the moral hazard problem. In Section 4, we formulate a setup closer to the US system, where the federal government transacts directly with individual citizens. Unlike in Section 3, risk sharing between countries can no longer be cleanly separated from risk sharing between individuals, something which turns out to give a role for strategic delegation. In Section 5 we analyze another aspect of task allocation within the federation. Now the federal government can observe some local policies, but observability (verifiability) is associated with a loss of efficiency since policy cannot be tailored perfectly to local circumstances.
In Section 6 we discuss how the analysis can be extended to deal with *ex ante* redistribution

between different localities, drawing on the analysis in Persson and Tabellini (1992b). In Section 7 we summarize our findings and try to draw some general conclusions. Some mathematical details are relegated to an appendix.

2. A Single Country

2.1. The Basic Model

Consider first a single country. Individuals are risk averse, they all have the same basic preferences for consumption, $U(\cdot)$, live only one period and are indexed by i. Their income is 1 with probability p^i and 0 with probability $(1-p^i)$. Individuals with income are called "lucky"; those with no income are called "unlucky". Individual income is not verifiable, which means that individuals cannot self-insure through the market. This is a strong assumption, but it has two advantages. First, it provides a role for a government policy of risk sharing. Second, because the model is so simple, we will be able to handle the Lucas critique when studying policy under very different institutions, while retaining simplicity and tractability.[4]

There is both aggregate and idiosyncratic risk. Moreover, individuals differ in their idiosyncratic risks: some individuals are exposed to more risk than others. This assumption insures that the political equilibrium is not trivial, in the sense that individuals differ over their preferred policy.

Specifically, we assume that $p^i = p + \pi^i$, where π^i is distributed in the population according to a known distribution with 0 mean and median $\pi^m \geq 0$. Thus, p denotes the fraction of lucky individuals in the population, and hence it also denotes average income.

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4 There are other informational problems that would lead to less stark capital market imperfections and yet provide a case for government risk—sharing policies. In the present context p^i could be private information, which would generate a conventional adverse—selection problem. A model of this type, with endogenous private contract formation, would be much harder to handle analytically, however.

The assumption that the distribution of π^i is skewed is realistic. It implies that the risk of receiving a bad shock to income is concentrated in a relatively small number of individuals in the population. To allow for aggregate risk in the simplest possible way, we assume that p can take one of two values:

$$p = \gamma \text{ with probability } Q, \tag{2.1}$$
$$p = \beta \text{ with probability } 1 - Q,$$

where $\gamma > \beta$. Hence, γ denotes the good aggregate state, while β denotes the bad aggregate state.

Policy is chosen under majority rule before the state of nature is observed. It consists of two things. First, a "social insurance" policy contingent on the state of nature, which redistributes among individuals. We leave the exact nature of the policy unspecified and we take the outcome of the policy to be an allocation of consumption between the lucky and unlucky individuals. This allocation can be implemented by the government for instance by means of a simple linear income tax accompanied by a lump sum transfer, and thus it has only limited informational requirements.[5] Thus, the government chooses an allocation of consumption between the lucky and unlucky individuals, $c(p)$ and $b(p)$ respectively, contingent on the realization of the state of the world, p.

Second, the government also chooses how much resources to devote to "public investment", g. By that we mean the quantity of resources allocated to making the good aggregate state more likely. Hence, we postulate that the probability Q that enters in (1) is a function $Q = Q(g)$, such that $Q_g > 0$, $Q_{gg} < 0$, $Q(0) = 0$, $\lim_{g \to \infty} Q(g) < 1$.

Under these assumptions, the resource constraint can be written as:

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5 This policy does not require that individual income be observable to the government. For instance, suppose that production takes place within constant-returns-to-scale firms. The government only observes and taxes firm output (for example by means of a sales tax) and transfers an equal lump sum to every individual. Some individuals are employed, and receive a salary equal to their net of tax marginal product. Other individuals are unemployed, and receive no income. The employment status of individuals is not verifiable and is not observed by the government. Under these assumptions, a private market for unemployment insurance cannot operate, and yet the government redistributive policy is informationally feasible.

(2.2) $$p = pc(p) + (1-p)b(p) + g$$

for all values of p.

This highly stylized set up can be thought of as representing the individual risks of unemployment, as well as possible aggregate shocks to the unemployment rate. In this interpretation, the policies represent the government's ability to run an unemployment insurance program or provide other forms of income support, and its ability to educate, retrain and facilitate job–seeking of workers.

2.2. Policy Equilibrium

It is easy to characterize the political equilibrium. Even though the policy space is multidimensional, we can apply a median–voter argument. This is because the voters' policy preferences—their expected utilities—are linear in the parameter π^i and this parameter is the only source of heterogeneity. Under these circumstances, policy preferences has a "median in all directions" in the multidimensional policy space, alternatively: they can be mapped into a one–dimensional parameter space.[6] Therefore, the political equilibrium is the policy preferred by the median voter, which is the individual with the median value of π, π^m. So the equilibrium can be computed as the solution to the problem of maximizing:

(2.3) $$v^m \equiv Q(g)\,V^m(\gamma) + (1-Q(g))\,V^m(\beta)$$

subject to (2.2), where $V^m(p)$ is the expected utility of the median voter in state p,

(2.4) $$V^m(p) \equiv p^m\, U(c(p)) + (1-p^m)\,U(b(p))$$

and where $p^m = p + \pi^m$. The choice variables are g and the functions $c(p)$ and $b(p)$.

Two first–order conditions characterize the solution. One determines the <u>social insurance</u> desired by the median voter, that is the equilibrium allocation of consumption between lucky and unlucky individuals:

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6 Policy preferences formally belong to the class of intermediate preferences, discussed by Grandmont (1978).

$$\frac{U_c(c(p))}{U_b(b(p))} = \frac{p}{1-p}\,\frac{(1-p^m)}{p^m} \tag{2.5}$$

where a subscript denotes a derivative. (To pin down both $c(p)$ and $b(p)$ we also need the budget constraint (2.2), of course.) Since by assumption $p^m \geq p$, the equilibrium policy must satisfy $c(p) \geq b(p)$ for all p. That is, a majority of the voters prefers incomplete risk sharing across individuals, even though full risk sharing through the government would be feasible at no loss of efficiency. The reason is that individual risk is concentrated in a few "high risk" subjects.[7] More generally, the smaller is p^m (i.e., the closer is π^m to 0) the greater is the equilibrium extent of social insurance.

The second condition determines the public investment desired by the median voter:

$$Q_g(g)\,(V^m(\gamma) - V^m(\beta)) = \lambda^m \tag{2.6}$$

where $\lambda^m \equiv \lambda^m(\gamma) + \lambda^m(\beta)$, $\lambda^m(p)$ being the Lagrange multiplier associated with the resource constraint (2.2) in state p. In equilibrium the median voter wants to equate the expected marginal benefit of public investment (the left hand side of (6)) to its expected resource cost, λ^m. The equilibrium level of g thus depends on the productivity of public investment (the size of $Q_g(\cdot)$), the risk aversion of the median voter (the concavity of $V^m(\cdot)$), and the difference between the good and bad aggregate states, γ and β.

3. A Federation

3.1. The Extended Model

Next, consider the case with two regions which we continue to refer to as countries, although they could well be local regions within a country. Both countries have the same structure described above, and for now they are assumed to be identical. In particular,

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7 See Wright (1986) for a related result with respect to unemployment insurance.

they have the same size, face the same probability distribution for their aggregate shocks (given public investment), and the median value of π is the same in both countries. Foreign–country variables are denoted by an asterisk "*". The aggregate states in the two countries are assumed to be independently distributed. Federal output is $Y(p,p^*) = p + p^*$. It is distributed according to:

$$
\begin{aligned}
Y(\gamma,\gamma) &= 2\gamma \quad \text{with probability} \quad Q(g)Q(g^*) \\
Y(\gamma,\beta) &= \gamma+\beta \quad \text{with probability} \quad Q(g)(1-Q(g^*)) \\
Y(\beta,\gamma) &= \beta+\gamma \quad \text{with probability} \quad Q(g^*)(1-Q(g)) \\
Y(\beta,\beta) &= 2\beta \quad \text{with probability} \quad (1-Q(g))(1-Q(g^*))
\end{aligned}
\tag{3.1}
$$

In the second and third states the output of the countries is different. Hence, there are opportunities for sharing risk among them. The question is how to design a risk–sharing contract paying attention to the moral hazard problem mentioned in the introduction.

We plan to consider several alternative arrangements. One such arrangement mimics the existing European institutions in some respects. Suppose a "federal" government is formed, who is in charge of a tax-transfer scheme dealing directly with the national governments. A tax proportional to national income is levied on each government, and a lump sum is distributed to each national government. Thus, the budget constraint of the federal government can be written as:

$$\tau(p,p^*)\,Y(p,p^*) = 2m(p,p^*), \tag{3.2}$$

where m is the state contingent lump sum transfer to each national government and $\tau(p,p^*)$ is the income tax rate. If the tax rate $\tau(p,p^*)$ is not equal across the mixed states (γ,β) and (β,γ) the international risk–sharing scheme would entail *ex ante* redistribution. While we believe the interplay between risk sharing and redistribution is an important and exciting topic we want to leave it to a sequel to this paper. Here, we want instead to focus on the incentive problems more directly tied to risk sharing. In that vein, we restrict the federal tax rate to be non–state contingent and simply write it τ, without

(p,p^*).[8] The Federal policy cannot be made contingent on public investment, because the latter is not observable, or at least not verifiable.[9]

By the symmetry of the model and using (3.2), we can write the budget constraint faced by the home–country government—which coincides with the country's resource constraint—as:

$$g + pc(p,p^*) + (1-p)b(p,p^*) = p - \tau(p-p^*)/2. \tag{3.3}$$

Thus, as expected, when $p = p^*$ the national budget constraints are exactly as before, since no risk sharing is possible. On the other hand, when $p > p^*$ (and $\tau > 0$) the home country effects a transfer to the foreign country, while the opposite is true if $p < p^*$. The resource constraint for the foreign–country government is analogous to (9).

3.2. The First Best

Consider first of all the benchmark equilibrium in which the two countries cooperate with each other. This equilibrium can be achieved through the political system in the following way. Domestic and foreign voters first elect a national government in each of the two countries. Since there is no incentive constraint, the elected governments have the preferences of the median voters in their respective countries. The two elected governments then cooperate with each other, and thus maximize the sum of their expected utilities:[10]

$$v^m + v^{*m} \tag{3.4}$$

subject to (3.3) and to the analogous constraint for the foreign country. The function v^m

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8 Since there is no resource transfer in the states (γ,γ) and (β,β) and taxation is not distortionary, the countries are indifferent to the tax rate in those states.

9 In the unemployment interpretation of the model, mentioned in Section 2.1, we could think of the federal government as being able to observe the total expenditures for labor market policies, but being inable to observe the precise breakdown into "consumption" expenditures (e.g. income support) and "investment" expenditure (e.g. genuine retraining and job–matching programs).

10 Alternatively, the legislatures (or even the voters) could directly cooperate without any delegation to an elected representative. The results would be identical and the first best equilibrium would still be the maximum of (3.4).

is now given by:

$$v^m = Q(g)Q(g^*)V^m(\gamma,\gamma) + Q(g)(1-Q(g))V^m(\gamma,\beta) + \tag{3.5}$$
$$+ (1-Q(g))Q(g^*)V^m(\beta,\gamma) + (1-Q(g))(1-Q(g^*)V^m(\beta,\beta),$$

where $V^m(p,p^*)$ is defined like in (2.4), except that now consumption is a function of the aggregate state (p,p^*), and symmetrically for the foreign country. The choice variables are g,g^*,τ and the functions $c(p,p^*)$, $b(p,p^*)$, $c^*(p,p^*)$ and $b^*(p,p^*)$.

This first–best equilibrium is characterized by three conditions. The first concerns social insurance within each country. Since the voters' tradeoff is not affected by the international environment, this condition is still given by (2.5).

Second, there is the extent of international risk sharing desired by the median voters:[11]

$$\frac{U_c(c(p,p^*))}{U_c(c^*(p,p^*))} = \frac{p}{p^*}\,\frac{p^{*m}}{p^m}. \tag{3.6}$$

If $p = p^*$, (3.6) implies that $c = c^*$ (recall that by assumption $\pi^m = \pi^{*m}$). If on the other hand if $p \neq p^*$, $c = c^*$ only if $\pi^m = \pi^{*m} = 0$. To implement such an allocation of complete international consumption smoothing obviously requires setting $\tau = 1$. However, if $\pi^m = \pi^{*m} > 0$, $c \neq c^*$ in those mixed states. Intuitively, there is still complete international risk sharing in the sense that marginal utility is equalized across the two median voters (alternatively, marginal utility of each country's median voter is equalized across the states (γ,β) and (β,γ)). But because median and average risks are different, the individual and market odds do not cancel out as they do in the representative consumer case. The first–best allocation may therefore require a tax rate $\tau \neq 1$

Finally, the third condition defines the first-best amount of public investment within each country:

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11 The direct first–order condition for τ is:

$$(\gamma-\beta)[\lambda^m(\beta,\gamma) - \lambda^m(\gamma,\beta)] = 0,$$

where $\lambda^m(p,p^*)$ is the Lagrange multiplier on (3.3) in state (p,p^*), as defined in Appendix 1.

$$
\begin{aligned}
&2Q_g(g)\Big[Q(g^*)V^m(\gamma,\gamma) - (1-Q(g^*))V^m(\beta,\beta) + \\
(3.7)\qquad &+ (1-Q(g^*))V^m(\gamma,\beta) - Q(g^*)V^m(\beta,\gamma)\Big] \\
&+ Q_g(g)[V^m(\beta,\gamma) - V^m(\gamma,\beta)] = \lambda^m
\end{aligned}
$$

where $\lambda^m = \sum_{p,p^*} \lambda^m(p,p^*)$ and where the assumption of symmetry has been used. Equation (3.7) has the same interpretation as (2.6) in the previous section, except that now the benefits of domestic public investments also accrue to the foreign country. In this cooperative equilibrium these benefits are fully internalized; hence the left hand side of (3.7) is basically the left hand side of (2.6) multiplied by 2, (the last term on the left hand side disappears when $\pi^m = 0$).

3.3. Nash Equilibrium: The Third Best

If public investment is not observable (verifiable) by both countries, enforcement of the first best may be impossible. A more plausible descriptive hypothesis is thus that the two countries act non-cooperatively and do not internalize the effect of their choices on the other member of the Federation.

Specifically, consider the following set up. Voters in the two countries vote so as to choose the following policies: (i) A federal policy, τ. (ii) A set of domestic policies within each country $(g,c(p,p^*), b(p,p^*))$ at home, $(g^*,c^*(p,p^*),b^*(p,p^*))$ abroad. Citizens of both countries vote on the federal policy, while the national policies are chosen only by citizens of that country. Two separate votes are cast, one at the federal level, the other at the national level. All votes are simultaneous. An equilibrium is defined as: (i) a federal policy that cannot be beaten under majority rule, given the national policies; (ii) two vectors of national policies, one in each country, that cannot be beaten under majority rule, given the federal policy and the national policy in the other country.

As before, the voters' preferences are single peaked. Moreover, by symmetry, voters with the same π^i vote alike in the two countries and at the federal level. The

equilibrium is therefore, again, the policy preferred by the median voter under the relevant constraints. In particular, the same median voter chooses the national and the federal policies. The equilibrium policies are thus: (i) The values of g, $c(p,p^*)$ and $b(p,p^*)$ that maximize v^m, subject to (2.3), (2.4), (3.3) and given g^* and τ—and analogously for the foreign country. (ii) The value of τ that maximizes v^m (or equivalently v^{*m}), subject to (2.3), (2.4), (3.3), and given g and g^*.

It is straight forward to characterize this Nash equilibrium. Social insurance within each country $(c(p,p^*), b(p,p^*))$ and international risk sharing (τ) are exactly like in the first–best equilibrium described in the previous section and given by (2.5) and (3.6). Equilibrium public investment is instead given by:

$$Q_g(g)\Big[Q(g^*)V^m(\gamma,\gamma) - (1-Q(g^*))V^m(\beta,\beta) + \\ + (1-Q(g^*)V^m(\gamma,\beta) - Q(g^*)V^m(\beta,\gamma)\Big] = \lambda^m. \tag{3.8}$$

We see that the term on the left hand side is equal to the first term on the left hand side of (3.7) except that it is not multiplied by 2. Clearly, in a Nash equilibrium domestic voters do not internalize the benefits of public investments that accrue to the other country. As a result they invest less than in the first best equilibrium: a typical moral hazard problem. Because each country is partly insured against a bad aggregate state by the transfers received from abroad, the equilibrium level of g is smaller than in the case of a single country, as well as than in the first best equilibrium.

Equation (3.8) implicitly defines public investment at home as a function of foreign investment and of the Federal policy: $g = G(g^*,\tau)$. More federal risk sharing reduces the difference between $V^m(\gamma,\beta)$ and $V^m(\beta,\gamma)$, as it redistributes more income from the state (γ,β) to state (β,γ). That is to say, for any g^*, a higher value of τ reduces the left–hand side of (3.8). The effect of τ on the right–hand side of (3.8) is instead ambiguous.[12]

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12 $\delta\lambda^m/\delta\tau = \delta\lambda^m(\gamma,\beta)/\delta\tau + \delta\lambda^m(\beta,\gamma)/\delta\tau$, where the first term is positive while the second one is negative. It is impossible to say in general which derivative is larger in absolute value.

Throughout the paper we will assume that λ^m is non-decreasing in τ in a neighborhood of the equilibrium.[13] With this assumption, and using the second–order conditions, (3.8) implies that g is decreasing in τ for any value of g^*, and similarly that g^* is decreasing in τ for any value of g. Hence, we can express the (symmetric) Nash-equilibrium levels of public investment as functions $g = H(\tau)$, $g^* = H(\tau)$, with $H_\tau < 0$.[14]

This discussion suggests a way to overcome the moral hazard problem, namely, to reduce the amount of international risk sharing provided by the federal government. This issue is addressed in the next subsection.

3.4. The Second Best

Suppose that the sequence of events described in the previous section is altered in such a way that the vote on the federal policy is taken before that on the national policies. When choosing public investment voters still act non-cooperatively and take the foreign policy as given. However, now the vote at the federal level takes into account the incentive effects on the national choices. This timing assumption captures a setup in which the federal policy choice has more commitment power and is less easily reversible than the national choices. We could think of this assumption as capturing the situation when federal legislation has precedence over local legislation.

We now study the subgame–perfect equilibrium under this new timing. At the second stage of the game, voters' choices at the national level are still described by the social insurance and the public investment conditions, (2.5) and (3.8) respectively. However, the vote on the federal policy at the first stage no longer takes g and g^* as given. Instead, this decision is subject to the incentive constraints $g = H(\tau)$, $g^* = H(\tau)$.

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13 This involves restrictions on the third derivative of $U(\ )$. A weaker assumption (that the left hand side of (3.8) decreases in τ more rapidly than λ^m) is actually sufficient for our results.

14 This result holds irrespective of whether g and g^* are strategic complements or strategic substitutes, since g is decreasing in τ for any g^*, and analogously for g^*.

Taking the first–order condition of v^m with respect to τ, subject to (3.3) and these additional incentive constraints, and after some algebra, we obtain the equilibrium degree of international risk sharing under this new timing (see Appendix 1 for the derivation)[15]:

$$\frac{U_c(c(p,p^*))}{U_c(c^*(p,p^*))} = \frac{p}{p^*}\frac{p^{*m}}{p^m}\,(1 + \varphi(p,p^*)H_\tau(\tau)), \tag{3.9}$$

where

$$\varphi(p,p^*) = 0 \quad \text{if} \quad p = p^*,$$

$$\varphi(p,p^*) = \frac{p^*}{p^{*m}}\,\frac{2}{(p-p^m)}\,\frac{Q_g(g^*)\ \mathrm{A}}{Q(1-Q)\,U_c(c^*(p,p^*))} \quad \text{if} \quad p \neq p^*,$$

and

$$A \equiv \Big[\, Q(V^m(\gamma,\gamma) - V^m(\gamma,\beta)) + (1-Q)(V^m(\beta,\gamma) - V^m(\beta,\beta))\Big] > 0.$$

Thus, if $p > p^*$, $\varphi(p,p^*) > 0$ and (3.9), together with (3.6), implies that $c(p, p^*)$ is higher than in the Nash equilibrium while $c^*(p, p^*)$ is lower. If $p < p^*$, $\varphi(p,p^*) < 0$ and the opposite holds. In either case, the median voter chooses to provide incomplete international risk sharing so as to reduce the moral hazard problem.[16]

Intuitively, the federal decision internalizes the fact that a higher level of τ induces the national governments to react with a lower level of g and g^* (since $H_\tau < 0$). Hence, it is optimal to provide less than full international risk sharing, so as to induce the national governments to undertake a larger amount of public investment.

This equilibrium brings about a higher welfare for the median voters compared to the Nash equilibrium. In the present context, a desirable feature of a federal fiscal constitution is thus that the federal government should have some commitment power relative to the national governments. A consequence of this commitment power is that the

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15 The federal vote is also subject to the constraint that c and b are related to each other according to the social insurance condition, (2.5). However, this constraint is never binding if the median voter at the national and federal level have the same preferences.

16 If the restrictions necessary to have $H_\tau < 0$ (see Footnote 7) are violated, equation (3.9) would still hold, but its implications for τ would be different.

federal government (or equivalently a majority of the federal voters) will refrain from exploiting all opportunities from risk sharing, in the interest of all the countries in the federation. That result is similar to standard results found in the principal–agent literature (see, for example Laffont (1989)). But to our knowledge it is novel in this context. Drawing further on the principal–agent literature, we know that the allocation we have derived is a true second–best allocation that cannot be improved under our informational assumptions. This follows since the principal in our game (the decisive voter in the federal election) maximizes subject to the first–order condition of the agents (the subsequent decisive voters in the national elections): see the discussion about the "first–order approach" in Jewitt (1988).

Enforcing the commitment of the federal government may be difficult though. *Ex post*, once national policies have been chosen, it is Pareto efficient for the domestic majorities to recontract and provide more federal insurance. The anticipation that this will happen will bring the economy back to the Nash equilibrium of the previous subsection. The following sections describe institutional arrangements under which the incentives or the scope for such *ex–post* recontracting are eliminated, and which are capable to sustain second–best outcomes.

4. Federal Social Insurance

The set up described so far mimics the existing European institutions, in the sense that transfers across countries take place through the national governments, while the social insurance system is entirely run at the local level. An alternative arrangement is the US system, where the social insurance system is at least partially centralized. That system directly redistributes across individuals, and only indirectly across localities.

The main point we highlight in this section is that a system with federal social

insurance may provide more commitment capacity and hence better possibilities to handle the incentive problems. If international risk sharing is achieved through intergovernment transfers, like in section 3, these transfers can be easily recontracted at the will of the government representatives. But if international risk sharing is achieved indirectly, through a system that primarily redistributes across individuals, recontracting would be more difficult for at least two reasons. First, changing complicated federal legislation may require time and resources. Second, and more importantly, coalitions could form to block the changes. In particular, individuals with low risk would oppose providing more social insurance. The fact that a federal social insurance program simultaneously redistributes across individuals and localities suggests a way to achieve commitment capacity. The second–best allocation could be implemented by delegating the federal social insurance system to a body run by "conservative" (i.e. low risk) individuals. This intuition is more fully analyzed in this section.

4.1 The Model

Individual income and preferences are exactly like in the previous sections. Suppose however that now lucky individuals pay a tax to both the local and the federal government, and everybody receives a lump sum transfer also from both levels of government. Thus there is social insurance at both levels of government. To facilitate comparisons with our previous results, the federal tax rate is not contingent and the federal transfer to individuals is residually determined (and thus contingent on aggregate output in the federation). The local tax rate on the other hand is state contingent, and so is the state transfer to individuals. There are no intergovernmental transfers.

Appendix 2 shows that under these assumptions, consumption of the lucky and unlucky individuals in the home country can be written as:

$$
\begin{aligned}
c(p,p^*) &= 1 - t(p,p^*)(1-p) - \tau(1-\hat{p}) - g \\
b(p,p^*) &= t(p,p^*)p + \tau\hat{p} - g
\end{aligned}
\tag{4.1}
$$

where t and τ denote the local and federal tax rates, respectively, $\hat{p} = (p+p^*)/2$ is average income in the federation, and g is local public investment like in previous sections. The foreign country is analogous in all respects. Besides (4.1), both levels of government are subject to constraints on t and τ that correspond to non–negativity constraints on c, b and g. These additional constraints are also described in Appendix 2. Throughout the section we only consider interior equilibria where these corner constraints are not binding. But other equilibria may exist, in which one or both levels of government are at a corner.

What is the non–cooperative policy equilibrium in this setup? That depends on the political institutions. One can show that an arrangement of direct democracy with simultaneous voting on the federal and local policy instruments, like in section 3.3, replicates the allocation of the Nash equilibrium in that section. Under that arrangement, a system of federal social insurance thus does not add anything substantial.

4.2 Delegation

As discussed in section 3.4, the moral hazard problem can be partly overcome by changing the timing and giving priority to federal over the local policy. For then the federal government takes into account the adverse incentive effects of international risk sharing on local public investment, and provides less redistribution across countries. What we now want to show is that this commitment capacity arises naturally in a federal social insurance system.

Consider the following setup. The extent of federal social insurance—that is the level of τ—is determined by a federal "president", an individual who maximizes her own expected utility function. If the president is from the home country she assigns a probability weight $p^f = p + \pi^f$ to the utility of consumption when lucky, while the weight is $p^{*f} = p^* + \pi^f$ if she is from the foreign country. Since the policy choices will be made before the resolution of uncertainty and the countries are symmetric, the nationality of the

president does not matter. The only thing that matters is her risk parameter π^f. The voters appoint the president through federal elections held before any policy decisions at the local level. These election amount to a choice of π^f. The elected president then chooses τ simultaneously with the vote over national policies. In line with our previous assumptions, local policies are chosen under direct democracy. An equilibrium is then a value of π^f that is preferred to any other by a majority of the voters in both countries, a federal policy which is optimal for the elected president, given national policies, and a vector of national policies that cannot be beaten under majority rule in each countries, given the federal policy and the policies in the other country.

Two remarks about this setup are in order. First, this arrangement presupposes only a limited form of commitment, namely that federal elections are held before national economic policies are chosen. But the actual choice of the federal and national policies are simultaneous.[17] Second, our federal presidential institution is not biased in favor of one locality or the other. A possible interpretation is that federal policy is chosen by an institution that contains explicit checks and balances to prevent one locality to exploit another . Even though we refer to the elected federal representative as a President, it may therefore be more accurate to interpret it as a federal legislative body with such checks and balances.

Consider the last stage of this game, in which policies are chosen at the national and federal level, given a value of π^f. The reaction functions of the national median voters are exactly as in the Nash equilibrium in section 3.4. Thus, there is a first–order condition for public investment, given by (3.8), and one for locally provided social insurance , given by (2.5). As in section 3, the equilibrium level of public investment is decreasing in the extent

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17 Allowing national policymakers to be chosen through elections would give rise to a more complicated delegation game. Voters in both countries would vote strategically in the national elections, in the sense that they would appoint a national government also with the aim of inducing more public investment in the foreign country. Since similar issues have already been studied in Persson and Tabellini (1992a), and we want to keep the present analysis as simple as possible, we assume that national policies are chosen under direct democracy.

of international risk sharing provided by the federal government. The reaction function of the elected president—assuming for concreteness that the president is from the home country—is given by

$$
\begin{aligned}
&QQ^* \left[-\gamma^f U_c(c(\gamma,\gamma))(1-\gamma) + (1-\gamma^f) U_b(b(\gamma,\gamma))\gamma\right] + \\
&Q(1-Q^*)\left[-\gamma^f U_c(c(\gamma,\beta))(1-\frac{\beta+\gamma}{2}) + (1-\gamma^f) U_b(b(\gamma,\beta))\frac{\beta+\gamma}{2}\right] + \\
&Q^*(1-Q)\left[-\beta^f U_c(c(\beta,\gamma))(1-\frac{\beta+\gamma}{2}) + (1-\beta^f) U_b(b(\beta,\gamma))\frac{\beta+\gamma}{2}\right] + \\
&(1-Q)(1-Q^*)\left[-\beta^f U_c(c(\beta,\beta))(1-\beta) + (1-\beta^f) U_b(b(\beta,\beta))\beta\right] = 0
\end{aligned}
\tag{4.2}
$$

The central question now is whether there exists a value of π^f such that equation (4.2) implies the second–best international risk–sharing condition, (3.9), while still respecting the domestic social insurance conditions (2.5). If the answer is positive, then there is a federal president that can implement that second best allocation. Under the assumed timing, this is the risk type that would win the federal elections in equilibrium.

To answer the question, we take the following steps. First, we replace $U_b(\cdot)$ in (4.2) by expressions derived from the domestic social insurance conditions (2.5). This implies that these conditions are satisfied in all states. Second, we replace $U_c(\gamma,\beta)$ in (4.2) by an expression derived from the second–best international risk–sharing condition (3.9). This implies that the second–best condition is also satisfied. Third, we simplify the resulting expression. These three steps lead to the following condition:

$$
\begin{aligned}
&QQ^* \; U_c(c(\gamma,\gamma))(1-\gamma)\,(\pi^m - \pi^f)/(1-\gamma^m) + \\
&(1-Q)(1-Q^*) \; U_c(c(\beta,\beta))(1-\beta)\,(\pi^m - \pi^f)/(1-\beta^m) + \\
&Q(1-Q^*) \; U_c(c(\beta,\gamma))\beta \; J(\pi^m, \pi^f, \epsilon(\gamma,\beta))/\beta = 0,
\end{aligned}
\tag{4.3}
$$

where

$$
\begin{aligned}
&J(\pi^m, \pi^f, \epsilon(\gamma,\beta)) = \\
&\epsilon(\gamma,\beta)\,\{(1-\gamma-\pi^f)(\beta+\gamma)(1-\gamma)/2(1-\gamma-\pi^m) - \gamma[1-(\beta+\gamma)/2](\gamma+\pi^f)/(\gamma+\pi^m)\} + \\
&\{(1-\beta-\pi^f)(\beta+\gamma)(1-\beta)/2(1-\beta-\pi^m) - \beta[1-(\beta+\gamma)/2](\beta+\pi^f)/(\beta+\pi^m)\}
\end{aligned}
$$

and where $\epsilon(\gamma,\beta) = (1 + \varphi(\gamma,\beta)H_\tau(\tau))$ is a term that appears already in (3.9).

By construction, the expression (4.3) implicitly defines the value of π^f that implements the second–best allocation, as a function of π^m: $\hat{\pi}^f = \Pi(\pi^m)$. The function $\Pi(\cdot)$ thus depends on the remaining parameters of the economy and on the underlying utility functions. A federal president with probability weight $p^f = p + \hat{\pi}^f$ would find it optimal to choose a federal social insurance system, which—given the behavior of local policymakers—helps implement the second–best allocation. Under the assumed timing, such a president wins the federal election.

Intuition suggests that $\hat{\pi}^f > \pi^m$. That is, the president who implements the second–best allocation is a lower risk type than the median voter. To demonstrate that this is the case, we note that: (i) if $\epsilon = 1$, (4.3) holds for $\pi^f = \pi^m$; (ii) $J(\cdot)$ is decreasing in ϵ, at $\pi^f = \pi^m$; (iii) the left hand side of (4.3) is decreasing in π^f; (iv) it follows from the discussion in Section 3.4 that $\epsilon(\gamma,\beta) < 1$. Results (i) – (iv) imply that the risk type who implements the second best in non–cooperative equilibrium indeed satisfies $\hat{\pi}^f > \pi^m$. Moreover, such a value of $\hat{\pi}^f$ certainly exists. Both results hold at least in a neighborhood of $\epsilon = 1$; that is, when the moral hazard problem is not too severe and the second–best amount of international risk sharing does not differ a great deal from the first–best amount.[18]

The intuition is straightforward. The second best entails less international risk sharing, to induce more public investment. Therefore, it requires a smaller federal social insurance program, compared to the first best or the Nash equilibrium in Section 3. To bring this about, the voters appoint a lower risk type, that is an individual with a higher probability of being lucky.[19] In equilibrium, the federal president enacts a smaller social

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18 As stated in the beginning of the section, the whole analysis assumes an interior equilibrium for the tax rates. For small values of ϵ, we could very well run into corner solutions which would cause jumps in the function $\Pi(\cdot)$.

19 The result that an individual with biased preferences can improve the outcome in the presence of incentive problems in policy bears an obvious resemblance to Rogoff (1985) "conservative central banker". In Rogoff's analysis the delegation is exogenous. Endogenous delegation, through a political equilibrium, was studied by Persson and Tabellini (1991), in the context of capital taxation, and by Alesina and Grilli (1992), in the context of monetary policy.

insurance program and the local government reacts by increasing the extent of its social insurance program. The net effect is less international risk sharing, but the same amount of redistribution between lucky and unlucky individuals within each locality. The delegation mechanism that implements the second–best allocation thus amounts to an allocation of tasks between the two levels of government, which emerges endogenously through the voters' choices.

These results have two novel implications. The first is positive and specific to this issue. If the moral–hazard problem described in this paper is relevant, we should observe that federal bodies are less willing to enact social insurance programs than local governments.[20] That is, we should observe that federal social insurance programs are indeed supplemented by additional local programs. This is consistent with US evidence. (This implication only holds in a symmetric equilibrium, and may disappear if the regions differ from each other.)

The second implication is normative and more general. The gain from having social insurance *cum* delegation at the federal level is essentially that it becomes possible to appoint different individuals at the federal and local levels. That is, by having a horizontal system of political control we gain an additional instrument with which to overcome the incentive problem. In principle, the possibility of appointing different policymakers at the two levels of governments also exists in a system of intergovernmental transfers.[21] Vertical economic ordering and horizontal political control thus could also be combined. The delegation game in a system of intergovernmental transfers, however, would be less transparent and the federal type that implements the second best could be on either side of the median voter, depending on fine details of the model such as higher–order derivatives

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20 This result may not hold if there are incentive (information) problems at the individual level, as well.

21 Beacause the probability of being lucky depends on the aggregate state, individual attitudes towards international risk sharing depend on their idiosyncratic risk parameter in this system, too.

of the utility function.[22] This suggests that horizontal economic and political ordering go naturally hand in hand.

This insight has general implications besides the moral hazard problem addressed in this paper. When there are incentive problems in policy, having multiple levels of government creates more opportunities to delegate and hence creates more instruments with which to offset the incentive problems.

5. Federal Public Investment

We have seen how the moral–hazard problem leads to underprovision of public investment. A standard method of dealing with the resulting inefficiency is a federal subsidy–scheme to local public investment. That requires public investment to be observable (verifiable) at the federal level. In this section we expand the set of policy instruments available in the federation, by allowing for two kinds of national public investment: one observable to the federal government, the other not. Alternatively, we can think of the observable investment as carried out directly at the federal level of government. Throughout the section we will use observable and unobservable as synonymous with federal and local investment.

To make the analysis of task allocation in the federation more interesting—and more realistic—we assume that federal public investment is more inefficient, as it cannot be tailored exactly to the specific circumstances of each locality. In other words, observability or verifiability by the federal government acts as a constraint that reduces efficiency. It will turn out that federal public investment can serve a useful role even

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22 The equilibrium of such a delegation game would be formally reminiscent of the equilibria in Persson and Svensson (1989) and Tabellini and Alesina (1990), where different policymakers are in office at different points in time.

though it is only an imperfect substitute for local public investment. Throughout the section we assume that the federal government cannot commit to a federal decision before the national policies are chosen.

5.1 A modified model

For simplicity, we revert now to the simpler setup of Section 3, where the federal government only carries out intergovernmental transfers. (The same kind of argument would go through also in the setup of the preceding section, however.) We modify this underlying model, such that public investment in each country is the sum of national (local), n, and federal, f, investment:

$$g = n + \alpha f, \tag{5.1}$$

where $\alpha \leq 1$ is a parameter capturing the inefficiency of federal investment. Federal public investment has strictly localized physical effects, in that it only changes the probability of the good state in the country where the investment takes place, in the same way as national public investment. Public investment in the foreign country can also be expressed as a sum of n^* and αf^*, where f^* denotes federal investment in the foreign country. For the rest, the model is identical to the one in Section 3. Obviously, if $\alpha < 1$ in (5.1), a first–best allocation would never entail any federal public investment.

Federal public expenditure now include the investment levels—or, equivalently a subsidy to each country equal to f and f^* respectively—and, as before, a state–dependent lump–sum transfer to each national governments. Like in section 3, these expenditures are financed by "taxing" each national government with a non–contingent tax rate. The resulting federal government budget constraint is:

$$\tau Y(p, p^*) = 2m(p, p^*) + f + f^*. \tag{5.2}$$

We assume that federal policy decisions are made over τ, and that $m(\cdot)$ is determined residually by (5.2). Hence, the national resource constraint can be written as:

$$pc(p, p^*) + (1-p)b(p, p^*) + g = p + \tau(p - p^*)/2 - (f + f^*)/2, \tag{5.3}$$

which is equivalent to the prior constraint (3.3) except for the last term.

Policy is chosen non–cooperatively by majority rule. As in section 3.3, individuals vote simultaneously at the national and at the federal level, meaning that the federal government has no commitment capacity. At the federal level they vote over τ. At the national level they vote over c, b, n and f in the domestic country, and over c^*, b^*, n^* and f^* in the foreign country.

The important institutional assumption we are making is that f and f^* are chosen at the local level, even though they are subsidized by the federal government.[23] This assumption accurately reflects the current European arrangements, where the Community level of government can provide local investment subsidies and perhaps can monitor local public investment, but certainly neither has the authority nor the technical capacity to directly undertake investments in the member countries.

A more centralized setup, in which investments are chosen and undertaken by a federal body can also be captured by the same formalism, however. Consider for instance a federal institution with representatives for each region, who each have a lot of clout over federal decisions tied to their own region. This notion is not only related to the popular idea of "pork–barrel politics". There is also a literature on distributive politics, where many political scientists maintain that this is essentially the way the US congress works. Indeed, our assumed setup for federal policy choices is formally similar to the setup in the seminal papers on congressional distributive politics by Weingast (1979) and Weingast, Shepsle and Johnsen (1981).

Whatever the rationale, the implication of the assumed setup is that the pivotal voter in the home country chooses f taking f^* as given. By (5.3) he thus internalizes only half the cost of expanding federally provided public investment. As in the

---

23 The federal voters could choose a ceiling on the investment subsidies to the national governments. As we shall see below, however, in equilibrium they have no incentive to set a binding ceiling. Without loss of generality we can therefore disregard this federal choice.

political–science literature, this will clearly generate overprovision of f, *ceteris paribus*. But in this case, *ceteris* are not *paribus*. Since national public investment is being underprovided, some overprovision of federal public investment may not be such a bad an idea.

5.2 Policy equilibrium

Formally, the analysis of a political equilibrium follows the same lines of Section 3. In each country and at the federal level, the voter with median risk is decisive. The median voters in the two countries agree on the optimal level for τ and take g and g^* as given, so there is complete international risk sharing as in the Nash Equilibrium of Section 3.3 and in the first best. Similarly, the medians' first–order conditions for social insurance are identical to those in the Nash Equilibrium of Section 3.3—and hence those in the first–best as well.

The differences relative to the previous section concern public investment. We now have two first–order conditions. One for national public investment, n, which is analogous to (3.8):

$$Q_g(n+\alpha f)\Delta^m - \lambda^m \leq 0, \tag{5.4}$$

where Δ^m is defined as the term that multiplies $Q_g(g)$ in (3.8). Equation (5.4) is satisfied with equality if $n > 0$. The other condition is for federal public investment, f:

$$\alpha Q_g(n+\alpha f)\Delta^m - \lambda^m/2 \leq 0, \tag{5.5}$$

which is satisfied with equality if $f > 0$. This equation differs from (5.4) in two respects. The marginal benefit of public investment is lower, because it is discounted by α. But the marginal cost to the national voter is also lower, because each country is free riding on the other.

Combining (5.4) and (5.5), we see immediately that (except in the limit case $\alpha = 1/2$), only one kind of investment will be chosen in equilibrium. If $\alpha < 1/2$, the observable investment is so inefficient that it will not be chosen $(f = 0)$ and (5.4) holds

with equality. In this case the equilibrium is identical to the Nash equilibrium of section 3.3. If instead $\alpha > 1/2$, then the opposite is true. National investment is too costly to finance relative to federal investment. Then $n = 0$ while (5.5) holds with equality and determines the equilibrium level of federal investment. In this case, equilibrium investment is higher than in the Nash equilibrium (since Q is decreasing in g). It follows that the moral hazard problem has been partly overcome.

In the limit, if $\alpha = 1$ so that local and federal investment are perfect substitutes, the non–cooperative political equilibrium turns out to sustain the first best! In this model there is only one source of inefficiency: the risk of the bad state is inefficiently high because the moral hazard problem makes g and g^* too low. However, if f and f^* act as perfect substitutes of n and n^*, the majority in each country faces exactly the right marginal incentives: while the perceived benefit of f to the national voters is only half its true social benefit, the perceived cost is also half its true social cost.[24]

In the more realistic case in which $\alpha < 1$, the equilibrium amounts of f and f^* fall short of the first best. But in equilibrium there is never overprovision of federal public investment, so the outcome is still pushed in the direction of the first best.

We believe these results provide a new perspective on institution design and task allocation in a federation. Seen in isolation, the idea of subsidizing an inefficient local expenditure with federal funds, while giving the local majority full discretion over the amount of local expenditure, sounds pretty ridiculous. But if this kind of institution is added to an existing federal constitution which already incorporates other incentive problems, the end result may be an improvement in efficiency.[25]

Another way to think about these results is to appeal once again to the

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24 The argument is only exactly true if $p^m = p$, in which case the second term on the left hand side of (3.7) disappears. Otherwise, there is a slight difference between the non–cooperative political equilibrium and the first best.

25 Another example of this kind of efficiency–improving, second–best institution design is given in Persson and Tabellini (1991).

principal–agent literature. The discussion in Tirole (1990) illustrates that allowing two agents within an organization to collude may actually improve the performance of the organization. Here we may think of the two national governments (legislatures) as colluding with each other, in the sense that they both exploit the federal funds to do what is best for them individually. The federal government could prevent this from happening by putting a ceiling on the investment subsidies or shutting them altogether, but it would not find it efficient to do so.

The specific result we have derived is that creating a federal risk–sharing scheme may also give a rationale for creating a federal public investment scheme, since these two policies are complements from an incentive point of view. We don't want the reader to take this as a general result on task allocation within a federation, however. Other types of policies may instead be "incentive substitutes" calling for a decentralization of certain tasks.

We still think that a general point emerges. In the current policy discussions about the future European institutions, there is a great deal of emphasis on the so called "subsidiarity principle". This principle says that policy decisions should not be taken centrally if they can be carried out equally well at a local level. This section suggests that a myopic application of this principle to one policy issue at the time can lead astray. Instead, when allocating a particular task to a particular level of collective decision making, it is necessary to consider the spill–over effects on incentives in other areas of policy.

6. Asymmetries

So far we assumed the two countries to be identical. What issues arise when instead the countries differ in important economic or political aspects? This question is fully addressed

in a sequel to this paper. In this section we anticipate some preliminary results.

We consider three kinds of asymmetries: In the probabilities of being in a good aggregate state, (i.e. in Q and Q^*), in the distribution off voters preferences (i.e., in the median probabilities, π^m and π^{*m}); and in population size (specifically, we denote the domestic and foreign total population by s and s^* respectively, with $s + s^* = 2$). For simplicity, we disregard the moral hazard problem and we treat the probabilities Q and Q^* as given parameters. Hence, public investments g and g^*, drop out of the model. For the rest, the model is as described above.

6.1 A modified model

Suppose that risk sharing is achieved by a system of intergovernmental transfers as the one in Section 3. The resource constraints are thus still given by (3.3), except that g drops out and the federal tax rate τ is not multiplied by 1/2 but instead multiplied by a parameter that reflects relative population size, $\theta = 1/(1+s/s^*)$ and $\theta^* = 1/(1+s^*/s)$, respectively.

Like in Section 3, we assume that policy is chosen under direct democracy. Voters choose the domestic allocation of consumption between lucky and unlucky individuals, and they simultaneously vote on the federal policy τ. If the two countries differ, the median voters in each country and in the federation may now be different individuals.

The domestic policies are set exactly as before: the social insurance condition (2.5) (and the resource constraint (3.3)) determine the allocation of consumption between lucky and unlucky individuals. To determine the equilibrium federal policy, consider a federal voter who lives in a home country and has a probability parameter π^f (possibly different from π^m). That voter realizes that the allocation of consumption at home is determined by the domestic median voter so as to satisfy (2.5). Let $c^m(p,p^*;\tau)$ and $b^m(p,p^*;\tau)$ be the resulting consumption allocation in state (p,p^*), given the federal policy τ and the identity of the domestic median, π^m. Then the value of τ preferred by the federal voter

π^f maximizes her own expected utility function, and thus has to satisfy the first–order condition:[26]

$$
\begin{aligned}
&- Q(1-Q^*)[\gamma^f U_c(c^m(\gamma,\beta;\tau))c^m_\tau(\gamma,\beta;\tau) + \\
&+ (1-\gamma^f)U_b(b^m(\gamma,\beta;\tau))b^m_\tau(\gamma,\beta;\tau)] - \\
&- Q^*(1-Q)[\beta^f U_c(c^m(\beta,\gamma;\tau))c^m_\tau(\beta,\gamma;\tau) + \\
&+ (1-\beta^f)U_b(b^m(\beta,\gamma;\tau))b^m_\tau(\beta,\gamma;\tau)] = 0
\end{aligned}
\tag{6.1}
$$

If $\pi^f = \pi^m$, and the two countries are identical, then (6.1) reduces to the international risk sharing condition (3.6). But if $\pi^f \neq \pi^m$, the federal voter must take into account how the federal policy changes the domestic consumption allocation, as captured by the terms c^m_τ and b^m_τ.[27] Using (2.5) and the resource constraints, it is possible to find analytic expressions for the terms c^m_τ and b^m_τ. These expressions are particularly simple with logarithmic utility. In this case, and using (2.5), equation (6.1) reduces to:

$$
\frac{U_c(c^m(\gamma,\beta;\tau))}{U_c(c^m(\beta,\gamma;\tau))} = \frac{Q^*(1-Q)}{Q(1-Q^*)}\,\frac{\gamma}{\gamma^m}\,\frac{\beta^m}{\beta}
\tag{6.2}
$$

The left–hand side of (6.2) is the marginal rate of substitution between consumption when lucky in the two possible states in which international risk sharing is possible. Thus, this expression plays a role similar to the <u>international risk–sharing</u> condition (3.6). In fact, it reduces to (3.6) in a symmetric equilibrium. In the more general case of constant relative risk aversion the right–hand side (of 6.2) is multiplied by a function of π^f and π^m.

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26 (6.1) is identical to the first–order condition for a maximum with respect to τ in (3.5), except that $V^m(\cdot)$ in (3.5) is replaced by $V^f(\cdot)$ everywhere.

27 In this respect, the model is similar to the analysis of strategic borrowing in Persson and Svensson (1989) and Tabellini and Alesina (1990).

A striking result emerges from (6.2): with logarithmic preferences, all domestic voters are unanimous, irrespective of their probability parameter π^f. They all want the federal policy to be set so as to satisfy (6.2); the only thing that matters to them is who chooses domestic social insurance (i.e. who π^m is). Once this is known, all domestic voters agree on the optimal value of τ.

This unanimity of all federal voters who live in the same country, however, contrasts sharply with the disagreement among federal voters who live in different countries. If the two countries differ in their stochastic structure as captured by Q and Q^*, or in their domestic political majorities as captured by π^m or π^{*m}, or in size, then they also disagree over the federal policy.[28] Under direct democracy, this disagreement cannot be easily resolved, in the sense that no coalition of voters forms across borders. All citizens of one country vote in one way, all citizens of the other country vote in the opposite way. If preferences are not logarithmic, the contrast between domestic unanimity and international disagreement is not so stark. Citizens of different countries still generally disagree over federal policy. But now domestic voters also disagree among themselves, and some coalition of voters across borders can be formed. The exact nature of these coalitions however depends on the details of the voters preferences.

6.2 Discussion

The result in Section 6.1 suggests that direct democracy is not a good way to choose a system of intergovernmental transfers, since it exacerbates international conflict and implies that the largest country dictates the federal policy. There are two ways out. One is to achieve international risk sharing via a system of federally provided social insurance. That is, to match a "horizontal" form of political control with a "horizontal" federal fiscal

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28 Asymmetries in size imply that (6.2) holds identically for the two countries but the values of τ that would be necessary to satisfy (6.2) at home and abroad are different. This follows from the resource constraint.

policy, that directly redistributes across individuals. In such system, as discussed in Section 4, coalitions of voters are formed also across borders; hence the federal political equilibrium is more "balanced", in the sense that it pleases at least some citizens in both countries. The other way out is to retain a system of intergovernmental transfers, but to choose the federal policy through a direct bargaining process among the two countries or their political representatives. That is, to match a "vertical" fiscal policy setup with a "vertical" mechanism for choosing federal policies.

These two arrangements are explored in detail in our companion paper, Persson and Tabellini (1992b). Here we anticipate some of the main findings.

(i) Under both regimes, if only the domestic voters were in charge of the federal policy, they would always set it so as to satisfy (6.2) in equilibrium, irrespective of whether their preferences are logarithmic. Hence, if the countries differ in some dimension, the home and foreign median voters disagree and the nature of the disagreement is captured by (6.2) (and the corresponding expression for the foreign country).

(ii) Under both regimes, the federal political equilibrium implements an international risk–sharing arrangement (i.e. an allocation of consumption in different aggregate states) <u>in between</u> those preferred by the domestic and foreign medians. This also implies that the equilibrium federal policy (i.e. the tax rate τ) is also in between that preferred by the domestic and foreign medians. In this respect, both regimes yield a "balanced" federal political equilibrium.

(iii) What determines the position of the federal equilibrium policy differs across regimes. If the federal policy is an intergovernmental transfer program chosen through a bargaining process, it is the relative bargaining power of the two countries that pins down equilibrium policy. Thus, for instance, if the probability of being in the good aggregate state is higher at home then abroad (if $Q > Q^*$), the domestic country has more bargaining power because it is less likely to need federal transfers. This brings the federal policy closer to that preferred by a majority of domestic voters. On the other hand, if the federal policy is

a centralized social insurance system chosen directly by voting, it is the relative population size and the distribution of voters preferences in the two countries that pin down equilibrium federal policy. For instance, if the home country is very polarized such that its median voter is unrepresentative of the domestic preferences, then the federal political equilibrium is very distant from the policy preferred by a majority of voters in the home country. Intuitively, in a very polarized country the voters are more likely to form a coalition with the citizens of the foreign country than with their fellow citizens. Hence, it is "as if" a polarized country had little bargaining power.

(iv) A second difference between the two regimes concerns the participation constraint. In the regime with bargaining and intergovernmental transfers, a majority of the voters is always better off if their country belongs to the federation than if it is out of it. This is because the threat point of the bargaining process is autarky; hence the participation constraint never binds in equilibrium.[29] In a system of federal social insurance with direct democracy, on the other hand, there is no guarantee that the participation constraint is satisfied. The federal equilibrium is "balanced", in the sense that it is in between the bliss points of the domestic and foreign medians. But this is not sufficient to guarantee that both countries are better off in the federation. This suggests that when countries differ, centralization of fiscal policy functions at the federal level needs to be accompanied by checks and balances on the collective process for choosing federal policies.

In summary, when countries differ, the design of a federal fiscal constitution involves many additional and intriguing issues. Two general lessons emerge from the analysis. First, there is a sense in which vertical or horizontal economic and political structures go hand in hand. A vertical instrument assignment (such as a system of intergovernmental transfers) is not appropriately matched with a horizontal form of political control (such as direct voting on the policy), because it exacerbates international

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29 Naturally, this holds only under specific assumptions about the nature of the bargaining process.

conflict. With reference to the ongoing European integration, this suggests that the role of legislative institutions such as the European Parliament can be enhanced only if policy assignments to the Community versus national levels are also reconsidered.

The second general lesson is that alternative procedures for choosing federal policies matter a great deal for how specific asymmetries get reflected in the federal equilibrium policy. Investigating in detail the properties of alternative federal fiscal constitutions, also paying attention to the exact nature of the asymmetries within the EEC, is an important future research topic.

7. Concluding Remarks

Inspired by current events in Europe, we have studied fiscal policy choices under alternative federal institutional arrangements. We have tried to model different aspects of existing federations and found some institutional features more conducive to efficient outcomes than others. In Section 3, we found that precedence (commitment) in federal policy relative to local policy helped limit the incentive problems and sustain a second–best outcome in non–cooperative political equilibrium. In sections 4 and 5, we found that introducing a federal social insurance scheme or a federal investment scheme could also help tackle the incentive problems and sustain second–best outcomes. The specific conclusions all point in one direction, namely that centralizing tasks and power from the local to the federal level is efficient.

We want to stress that we don't look upon this as a general result. Clearly, it stems from the basic formulation of the model which stresses incentive (moral–hazard) problems at the *local* level of government. A plausible conjecture is that a formulation which stresses incentive problems at the *central* level of government would lead to overall conclusions in the opposite direction, pointing towards the virtues of decentralization of

tasks and power.

We think incentive problems of this opposite kind are intimately connected with redistribution at the federal level and this comes out in the extensions discussed in Section 6. Ex ante redistribution arises in the model we have studied above as soon as we allow for asymmetries between countries. The countries in our model could differ in size, in their individual or aggregate risk structures, and in national or individual income in the various states. Because the latter types of asymmetries reflect differences in industry structures or educational levels, they are particularly interesting from the viewpoint of the current European discussion. So are size asymmetries in that they raise questions about the relative political power of large and small countries in a federation. As stated earlier, we plan to explore these asymmetries further in a sequel to this paper.

A methodologically oriented contribution of the paper is perhaps that it suggests a way to study political equilibria where decisions at different levels of an organization are made by a process of collective choice. This fits well in a model of a federation, but there are also other potential applications such as multi–level (firm, industry, economy–wide) wage bargaining. We believe the study of these kinds of equilibria—which involve a nexus of economic, political and legal issues—to be a very exciting topic for further research.

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Appendix

1. The Second-Best Equilibrium: Derivation of (3.9)

Under the timing assumptions of section 3.4., the median voter in the domestic country maximizes v^m (given in (3.5)) subject to (3.3) and to $g = H(\tau)$, $g^* = H(\tau)$. Let $\lambda^m(p,p^*)$ be the Lagrange multiplier of (3.3) in state (p,p^*). Using (3.8) to simplify, the first–order condition with respect to τ can be written as:

$$\text{(A.1)} \qquad \frac{\gamma-\beta}{2}\left[\lambda^m(\beta,\gamma) - \lambda^m(\gamma,\beta)\right]$$
$$+ H_\tau Q_g(g^*)\Big[Q(g)(V^m(\gamma,\gamma)-V^m(\gamma,\beta))+(1-Q(g))(V^m(\beta,\gamma)-V^m(\beta,\beta))\Big] = 0.$$

In a symmetric equilibrium, $g = g^*$, and $Q(g) = Q(g^*)$. Moreover, if $p \neq p^*$,

$$\text{(A.2)} \qquad \lambda^m(p,p^*) = \frac{p^m}{p} U_c(c(p,p^*))Q(1-Q)$$

also in a symmetric equilibrium. Using (A.2) in (A.1) and simplifying, we obtain (3.9) in the text.

2. Federal Social Insurance: Derivation of (4.1)

The individual budget constraints are:

$$\text{(A.3a)} \qquad c(p,p^*) = 1 - t(p,p^*) - \tau + m(p,p^*) + x(p,p^*)$$

$$\text{(A.3b)} \qquad b(p,p^*) = m(p,p^*) + x(p,p^*),$$

where x is the lump–sum transfer from the federal government. The home country's government's budget constraint is

$$\text{(A.4)} \qquad pt(p,p^*) = g + m(p,p^*)$$

and the federal government's budget constraint is

$$\text{(A.5)} \qquad \tau(p + p^*)/2 = x(p,p^*).$$

Combining these equations we get (4.1) in the text.