Fiscal Externalities Over Long Horizons

by

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Abstract

The fiscal externality model is extended to an infinite horizon setting with stochastic technologies. With imperfect population mobility some gains from risk sharing are not exploited by the regional authorities. Nevertheless, regional authorities who care about their reputation may be able to commit to an efficient allocation. For this to happen the present value of the gains from coordination to each region should be larger than the instantaneous costs to the region of making the transfers necessary for risk sharing. It is not possible to say *a priori* whether improvements in the degree of mobility will make this more likely.

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remaining errors are my own.

I. Introduction

There is a large literature in public finance which is concerned with identifying the sources of inefficiency in a federal system with population mobility.[1] One strand in the literature is concerned with the fiscal externality economy, which involves multiple jurisdictions and freely mobile population in a static setting without uncertainty.[2] In this setting there is a need for interregional transfers in order to obtain an efficient distribution of population in the federation. Flatters, Henderson and Mieszkowski (1974) argued that these transfers should be administered by a central authority. Recently, however, Myers (1990) and Mansoorian and Myers (1993) (henceforth referred to as MM) have shown that in the fiscal externality economy the regional authorities will make the interregional transfers that are necessary for efficiency. Thus, in that environment there is no efficiency role for a central authority. The central authority's role is to decide on the degree of redistribution in the federation.

The MM model allows for imperfect population mobility by assuming that individuals in the economy derive different degrees of non-pecuniary benefits from residing in the two regions (attachment to home) that form the federation. This is a realistic characterization of a federation consisting of culturally diverse communities, and allows a discussion of the importance of the degree of population mobility on the equilibrium.

An important implication of the MM results is that their model needs to be extended in various directions in order to identify the genuine sources of inefficiency in a federation with

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1 See Wildasin (1986), and Mieszkowski and Zodrow (1989) for recent surveys.

2 Hercowitz and Pines (1991) provide an interesting exception to this.

mobile population. Their model has been extended by Burbidge and Myers (1994) to include capital tax competition, and by Wellisch (1994) to include spillouts of public goods.

The purpose of this paper is to extend the MM model to an infinite horizon setting with stochastic technological shocks. There are two important reasons for this. First, in a stochastic environment there is scope for risk sharing among the regions. Second, in an infinite horizon setting reputation of the regional authorities plays an important role in the determination of their policies.[3]

The role of risk sharing arrangements in an a federal system is discussed by Persson and Tabellini (1992a, b) in a model with no population mobility. Their model has been extended by Mansoorian (1995) to allow for population mobility. These models are static, however, and they are different from the fiscal externality economy.

I assume that at the beginning of each period, before the state of productivity in each region is revealed, the regional authorities announce the policies that will be carried out in that period. After the levels of productivity in the two regions are revealed the individuals in the economy decide where to reside. After this the policies that were announced are carried out. With stochastic technological shocks there is some scope for interregional risk sharing. This requires a coordinated set of state contingent transfers that flow from one region to another in some states, and vice versa in other states. With imperfect population mobility the regional authorities disagree over the sizes of these state contingent transfers. Since each regional authority chooses the transfers in the states in which it experiences a more favourable shock,

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[3] The importance of reputation has received a lot of attention in macroeconomics. See Persson and Tabellini (1990) for a survey.

the disagreement among them precludes coordination of these state contingent transfers that are necessary for risk sharing. Without attachment to home, however, the regional authorities do not disagree over the sizes of the state contingent transfers. In that case there are no gains from policy coordination.

In an infinite horizon setting, the regional authorities will take account of the effects of their policies on their reputation. Thus, if the gains from policy coordination are sufficiently large then the regional authorities will be able to commit to an efficient set of state contingent transfers. To illustrate the point consider the game in which if one player deviates from the efficient allocation it permanently loses its reputation. Also suppose the efficient allocation under consideration is the one that places equal weights on the objectives of the regional authorities. In that case, in a symmetric model, a regional authority will have to make a transfer to the other region only if it has experienced a more favourable shock. Once such a state is revealed the region will make the necessary transfers voluntarily if the present value of the losses it suffers if it loses reputation (i.e., the present value of its gains from risk sharing) are larger than the instantaneous gains from not making the transfers.

It is not possible to say *a priori* whether improvements in the degree of population mobility will make it more likely that the regional authorities will be able to commit to an efficient allocation. As the degree of population mobility improves the disagreement between the regional authorities narrows, reducing the present value of the benefits from coordination. This reduces the costs to the region which experiences a more favourable shock of losing its reputation by not making the transfers necessary for risk sharing. On the other hand, an improvement in the degree of mobility reduces the size of the transfer that the region has to make beyond those without coordination, while at the same time increasing the emigration that is associated with the transfer. These reduce the gains to a region that has experienced a more favourable shock from withholding the necessary transfers that it has to make for risk sharing.

The paper is organised as follows. The model and the Nash equilibrium is discussed in section II. Gains for the regional authorities resulting from policy coordination are discussed in section III. Some concluding remarks are made in section IV.

II. The Model

The federation consists of two regions indexed by i (i=1,2). There are two factors of production, labour and land. Each region is endowed with the same (T) units of land. Population size in the federation is normalised to unity. Each individual is endowed with one unit of labour, and can reside in any region that he desires. Thus, if N_t denotes the population size in region 1 in period t, then the population size in region 2 for the same period will be $1 - N_t$.

Households are infinitely lived. They derive utility from consumption of a single private good. They also derive non-pecuniary benefits from residing in a region. Individuals are heterogeneous only with respect to their degrees of attachment to the two regions. There is one individual of each type, denoted by n; and individuals are distributed uniformly over the interval [0,1]. Specifically, the preferences of individual n are given by

$$E\left\{\sum_{t=0}^{\infty}(1+\delta)^{-t}\left[U(x_t^n)+I_t^n\right]\right\}, \tag{1}$$

where x_t^n is consumption of the private good by this individual at time t, $U(\cdot)$ is a von

Neumann-Morgenstern utility function, **2** is the rate of time preference, and I_t^n measures the non-pecuniary benefit the individual derives solely from its residence in a region. I_t^n is equal to $k(1 ! n)$ if this individual resides in region 1 in period t, and it is kn if he resides in region 2 at time t. k measures the degree of population mobility: $k=0$ implies perfect mobility, and $k=4$ implies no mobility.

Output is perishable, and is produced in each region by competitive firms with a constant returns to scale production function. This production function for region i is $A_i f(N_i,T)$, where A_i is a productivity parameter and N_i is the population size in the region (i.e., N for region 1 and $1 ! N$ for region 2). The productivity parameter A_i can take on one of two values, A^L or A^H (where $A^L < A^H$) with probabilities Q and $1 ! Q$, respectively. Productivity in the two regions in any period is assumed to be independent of each other, and independent of productivity in other periods. The state of nature in any period is denoted by (A_1, A_2) (i.e., the levels of productivity in regions 1 and 2, respectively). Clearly, there are four possible states in each period, with probabilities denoted by $\mathbf{B}(A_1, A_2)$.[4] All variables will be functions of the state (A_1, A_2), unless specified otherwise.

As in Persson and Tabellini (1992a, b), we abstract from borrowing and lending by private individuals, and concentrate on the incentives of the regional authorities to share risk with each other. The regional authorities are assumed to be endowed with the land in their regions. They balance their budgets in each period and state. As in MM, we allow the regional authorities to make voluntary interregional transfers to control the population size in their

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4 Thus, for example, $\mathbf{B}(A^L, A^H)=(1 ! Q)Q$.

regions. The state contingent transfer from region i to j in period t is denoted by S_{it}. The regional authority i faces the budget constraints

$$S_{it} = N_{it}\tau_{it} + R_{it} + S_{jt}, \quad \forall \ (A_1, A_2) \tag{2}$$

where τ denotes head taxes, and R total land rents.[5]

An individual residing in region i in period t receives a wage equal to the marginal product of labour, denoted by $A_{it}F(N_{it}, T)$, and pays a head tax of τ_{it}. Thus, his budget constraint is $x_{it} = A_{it}F(N_{it}, T) - \tau_{it}$. From this and (2) we obtain the integrated budget constraint for region i in period t:

$$x_{it} = \frac{A_{it}\, f(N_{it}, T) - (S_{it} - S_{jt})}{N_{it}} \quad (i = 1, 2). \tag{3}$$

The sequence of events in each period is as follows. At the beginning of the period, before the state is revealed, the regional authorities announce the policies that they will be carrying out in each state. After the state is revealed individuals decide where to locate and the promised policies are carried out, as in MM. Because there are no predetermined variables in the model, and the technological shocks are purely transitory, the same problem is faced by every agent in the economy in every period. Thus, from now on we will drop the time subscripts to simplify notation.

Individuals are free to choose their region of residence. Thus, in equilibrium in each period after the state is revealed only one individual, denoted by N, will be indifferent between living in either region. Thus, for this marginal individual we will have

$$U(x_1) + k(1 - N) = U(x_2) + kN. \tag{4}$$

[5] As shown by MM (footnote 15), in this model with no public goods τ will always be negative.

All individuals with n < N will choose to reside in region 1, while the others will reside in region 2. Thus, the population size in region 1 will be N.

Substituting for x_i from (3) into (4) and totally differentiating the resulting system, we obtain the migration responses

$$\frac{MN}{MS_1} \;'\; \& \frac{MN}{MS_2} \;'\; \frac{U^{)}(x_1)/N \,\%\, U^{)}(x_2)/(1 \& N)}{U^{)}(x_1)\,(A_1 F_1 \& x_1)/N \,\%\, U^{)}(x_2)\,(A_2 F_2 \& x_2)/(1 \& N) \,\&\, 2k}, \tag{5}$$

which is negative because the denominator should be negative for stability of the migration equilibrium, as in Boadway (1982) and MM. The regional authorities will take complete account of these migration responses when choosing their policies.

The regional authority i is assumed to be maximizing W_i, where

$$W_i \;'\; \underset{(A_1, A_2)}{\mathbf{j}} \mathbf{B}(A_1, A_2)\, U\big(x_i(A_1, A_2)\big). \tag{6}$$

Thus, W_i is the instantaneous expected utility from consumption for a permanent resident of region i. A permanent resident of region i is an individual that decides to reside in region i in every state of nature. The lifetime expected utility of such an individual will be $W_i(1 + 1/\mathbf{2})$ + I^n, which is maximized by maximizing W_i.

There are various reasons for this choice of the objective function for the regional authorities. First, this is the simplest objective function, and it allows me to compare my results with those of MM, where the regional authorities also maximize the part of the utility of their residents that is from consumption alone. Second, in the two extreme cases of no attachment (k = 0) and complete attachment (k = 4) this is the most sensible objective function for the regional authorities. In either of these cases by maximizing W_i the regional authority will be maximizing the utility of a representative resident. Finally, below (in footnote 6) I give a set of assumptions which will ensure that by maximizing W_i the regional authority i will be maximizing the utility of its median voter in every period.

Apart from the regional feasibility condition (3), there are two important constraints that the regional authorities face. First, they are constrained to choose only non-negative transfers ($S_i \geq 0$ for $i=1,2$). Thus, they cannot force the other region to make transfers to them. Second, the authorities will take complete account of the effects of their policies on the distribution of population in the federation, through (4).

To obtain the optimality conditions for regional authority i substitute for x_i from (3) into (6) for each state (A_1, A_2) and differentiate to get

$$\frac{\partial W_i}{\partial S_i} + \frac{\partial W_i}{\partial N}\frac{\partial N}{\partial S_i} \leq 0, \qquad S_i \geq 0, \qquad \text{and} \tag{7}$$

$$\left[\frac{\partial W_i}{\partial S_i} + \frac{\partial W_i}{\partial N}\frac{\partial N}{\partial S_i}\right] S_i = 0, \qquad \forall\ (A_1, A_2), \tag{8}$$

Evaluating these derivatives and using (5), it can be shown that (7) for region 1 implies

$$(A_1 F_1 - x_1) - (A_2 F_2 - x_2) \geq \frac{-2k(1-N)}{U'(x_2)}, \qquad S_1 \geq 0 \quad \forall\ (A_1, A_2). \tag{9}$$

Similarly, (7) for region 2 implies

$$(A_1 F_1 - x_1) - (A_2 F_2 - x_2) \leq \frac{2kN}{U'(x_1)}, \qquad S_2 \geq 0 \quad \forall\ (A_1, A_2). \tag{10}$$

Conditions (9) and (10) are the same as in the deterministic model of MM (equations (8) and (10)), and have the same interpretations.[6] Thus, in each period after the state is revealed the

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[6] By the symmetry of the model, when the regions experience the same level of productivity then $N=0.5$, and $U(x_1)=U(x_2)$. In that case, the marginal individual in each region would prefer his region to make a larger transfer to the other region, because then he can migrate and consume the transfer without paying for it. Similarly, when a region experiences a more favourable shock and, thus, makes a transfer the marginal individual in that region would prefer his region to make a larger transfer. Now suppose that in each state

policies that are promised are carried out: they are time consistent policies.

III. Gains from Policy Coordination

In this section I ask the question: Is it possible for both regional authorities to gain from coordinating their policies? To answer this question I will maximize a weighted sum of the objective functions of the two authorities by choosing the net state contingent transfers from region 1 to 2, S ($\equiv S_1 - S_2$), subject to (3) and (4).[7] Then I will ask the question as to whether it is possible to choose a set of weights which will make coordination acceptable to both regional authorities.

Thus, the problem is to choose the state contingent transfers S to maximize

$$\delta W_1 + (1-\delta)W_2 \tag{11}$$

subject to (3) and (4), where $\delta \in [0, 1]$.

The optimality conditions for this problem are

$$\delta\left[\frac{\partial W_1}{\partial S} + \frac{\partial W_1}{\partial N}\frac{\partial N}{\partial S}\right] + (1-\delta)\left[\frac{\partial W_2}{\partial S} + \frac{\partial W_2}{\partial N}\frac{\partial N}{\partial S}\right] = 0, \quad \forall\ (A_1, A_2), \tag{12}$$

Now note that $\frac{\partial W_i}{\partial S} = \frac{\partial W_i}{\partial S_1}$ and $\frac{\partial N}{\partial S} = \frac{\partial N}{\partial S_1}$. Thus, (12) implies that

$$(A_1F_1 - x_1) - (A_2F_2 - x_2) = \delta\,\frac{-2k(1-N)}{U'(x_2)} + (1-\delta)\,\frac{2kN}{U'(x_1)}, \quad \forall\ (A_1, A_2). \tag{13}$$

(A_1, A_2) individual $N(A_1, A_2)/2$ in region 1 and individual $[1+N(A_1, A_2)]/2$ in region 2 prefer the transfers by their respective regions derived here to larger transfers. Suppose, further, that at the most only one third of the population in the whole federation migrates from one region to the other after a productivity change. With these two assumptions region i, by maximizing W_i, would be maximizing the expected utility of its median voter in all periods.

[7] This problem will give us the set of constrained efficient allocations from which it is not possible to increase the utility of the permanent residents of one region without reducing the utility of the permanent residents of the other region.

It is impossible to find a * which will make (13) consistent with (9) and (10) for all (A_1, A_2) with imperfect mobility (i.e., with $k > 0$). To see this note that by the symmetry of the model in the states (A^L, A^L) and (A^H, A^H) no region will make a transfer in the Nash equilibrium, and (9) and (10) will hold with inequalities. On the other hand, in the state (A^H, A^L) region 1 will make a transfer, because it has experienced a more favourable shock. Thus, for that state (9) will hold with equality, while (10) will hold with inequality. Similarly, in the state (A^L, A^H) (9) will hold with inequality, while (10) will hold with equality. There is no * that will be consistent with these results. If *=0 then we would have (9) holding with equalities for *all* (A_1, A_2), and (10) with inequalities for *all* (A_1, A_2). The reverse will be true if *=1. Finally, if 0<*<0 then (9) and (10) will have to hold with inequalities for *all* (A_1, A_2).

Thus, with imperfect population mobility it is possible to increase both W_1 and W_2 by policy coordination. The reason for this is as follows. For interregional risk sharing we need some *coordinated* state contingent transfers that flow from region 1 to 2 in some states, and from 2 to 1 in some other states. With imperfect mobility the regional authorities disagree over the sizes of the state contingent transfers: each region wants a larger transfer in favour of its residents in every state. In the Nash equilibrium each region determines the size of the transfer in the states in which it experiences a more favourable shock than the other region. The authorities' disagreement leads to a failure to coordinate the state contingent transfers, leading to an inefficient degree of interregional risk sharing.

However, with no attachment to home ($k = 0$) (13) will be completely consistent with (9) and (10). In that case both authorities know that with free mobility the same level of utility should prevail throughout the federation. They, therefore, do not disagree over the sizes of the state contingent transfers.

The next question is whether there is a need for a central authority in order to administer the state contingent transfers. If the gains from coordination are sufficiently large then there is no need for a central authority: the regional authorities will be able to commit to an efficient set of allocations. The efficient allocation we will be concerned with here will be the one that attaches equal weights on the objectives of both regional authorities. This will be the allocation most acceptable to both authorities, and will also preserve the symmetry of our model. Consider the simplest reputation game. Assume that if a region (region i, say) that has experienced a more favourable shock than the other (region j) does not make the necessary transfers for risk sharing then it will lose its reputation and will never obtain the cooperation of the other region.[8] Thus, in that case if region i does not make the necessary transfers then the expected utility of its residents for all the following periods will be W_i^N (the expected utility with no coordination). On the other hand, if the necessary transfers are made then region j will cooperate in all successive periods, and the expected utility of region i residents for all those periods will be W_i^C (the expected utility with coordination). Thus, the present value of the losses the regional authority i will suffer if it refrains from making the necessary transfers in the state in which it experiences a more favourable shock will be $(W_i^N - W_i^C)/\mathbf{2}$. On the other hand, the instantaneous gains from withholding the transfers necessary for risk sharing is $U(x_i^N) - U(x_i^C)$, where x_i^C and x_i^N are, respectively, consumption in region i with and without coordination if that region experiences a more favourable shock than the other. Clearly, if $\mathbf{2}$ is

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[8] This type of reputation game is discussed by Blanchard and Fischer (1989, pp. 602-603) in the context of monetary policy.

sufficiently large then the present value of the losses will dominate the instantaneous gains from withholding the transfers necessary for risk sharing. In that case, the necessary state contingent transfers will be made voluntarily.[9]

The next question is whether improvements in the degree of population mobility will make it more likely that the regional authorities will be able to commit to an efficient allocation. To answer this question first note that as the degree of attachment to home decreases (k falls) the disagreement between the regional authorities narrows. This then reduces the gains from risk sharing $(W_i^N - W_i^C)$. Thus, a fall in k reduces the costs to a region of losing reputation (i.e., $(W_i^N - W_i^C)/\mathbf{2}$) by not making the necessary state contingent transfers when it experiences a more favourable shock. On the other hand, as k falls the gains to such a region from withholding the transfers which are over and above those without coordination also fall for the following two reasons. First, the size of the transfer that the region has to make beyond those without coordination falls with k, because the disagreement between the regional authorities narrows. Second, from (5), as k decreases the emigration associated with a transfer increases. Thus, both the costs and benefits of withholding the transfers necessary for risk sharing fall as the degree of population mobility increases. It is, therefore, not possible to say *a priori* whether improvements in the degree of population mobility will make it more likely that the regional authorities will be able to commit to an efficient allocation.

To illustrate the complexities involved in establishing the effects of changes in the

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[9] When we consider risk sharing among individuals (not governments) we think of contracts which are enforced by the government. In contrast, the problem here involves regional authorities. When the state contingent transfers are made voluntarily there is no need for a contract; and, therefore, no need for a central authority to enforce it. Equivalently, in that case there is no need for a central authority to administer the state contingent transfers.

degree of population mobility on the likelihood of the regional authorities being able to commit to an efficient equilibrium consider the following numerical solution to the model. Suppose $u(x_i)=\ln(x_i)$, $A_i f(N_i, T)=A_i N_i^{0.7}$, $A^L=1$, $A^H=2$, and $Q=0.5$. Then, by the symmetry of the model, with or without cooperation, no transfers are made when the same productivity is experienced in both regions.[10] To obtain the allocations when the regions experience different productivity shocks in the Nash equilibrium first note that (3) for $i=1, 2$ implies

$$N x_1 \% (1 \; ! \; N) x_2 \; ' \; A_1 f(N,T) \% A_2 f(1 \& N,T). \tag{14}$$

Solving (4), (14) and (9), with the first condition holding as an equality, and with $A_1=A^H$ and $A_2=A^L$, we obtain the allocations in the Nash equilibrium when region 1 experiences a more favourable shock than region 2. By the symmetry of the model, the x_1 and x_2 from this problem also give us, respectively, the x_2 and x_1 for the case in which region 2 experiences a more favourable shock than region 1. We can then calculate the two important variables that we will be using below, W_i^N and x_i^N.

Next consider the problem of obtaining the allocations with policy coordination when equal weights are placed on the objectives of the regional authorities. Then in the case in which $A_1=A^H$ and $A_2=A^L$ solve (4), (14) and (13) with $*=0.5$. Again, by the symmetry of the model, the x_1 and x_2 from this problem also give us, respectively, the x_2 and x_1 for the case in which region 2 experiences a more favourable shock than region 1. We can then calculate W_i^C and x_i^C.

To illustrate the effects of changes in k on the likelihood of the regional authorities

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[10] Recall that we continue to assume that equal weights are attached to the objectives of both regions with cooperation.

being able to commit to the efficient allocation with *****=0.5 let **2*** denote the largest value of **2** which makes commitment feasible. Thus, **2*** is the solution to

$$\frac{W_i^C \,\&\, W_i^N}{\mathbf{2}^{(}} \;{}'\; U(x_i^N) \,\&\, U(x_i^C).$$

Figure (1) plots the values of **2*** for different k. Any value of **2** below **2*** will enable the regional authorities to commit to the efficient allocation. Ironically, in this example as the degree of population mobility improves it becomes less likely for the regional authorities to commit to the efficient allocation. In the limit, when k=0, there are no gains from risk sharing, and hence no need for transfers beyond that implied by the Nash equilibrium (i.e., no need for commitment).

IV. Conclusions

In this paper the standard fiscal externality model is extended to an infinite horizon setting with stochastic technological shocks. This was done in the simplest possible way because the purpose here was very modest. The purpose was simply to point out some of the important issues that may arise once such an extension is made.

It was shown that there is some scope for interregional risk sharing that is not fully exploited by the regional authorities when population is only imperfectly mobile. It was also shown that in the infinite horizon setting there may be no need for a central authority to administer the state contingent transfers that are implied by policy coordination. The reason is that in such a setting the regional authorities will worry about the effects of their policies on their reputation. Then, if gains from policy coordination are sufficiently large the regional authorities will be able to commit to an efficient allocation.

There are various directions in which this basic model could be extended. The reputation game that was used in this paper was the simplest possible game. More elaborate games have been used with regard to monetary and fiscal policies, as surveyed by Persson and Tabellini (1990). One could allow the regional authorities to run budget deficits. The technological shocks were assumed to be purely transitory. It would be interesting to work out the importance of policy coordination when shocks persist. Finally, it would be fruitful to consider the possibility of capital accumulation. This would add a predetermined variable to the model, and also allow the possibility of capital tax competition.

References

Blanchard, Olivier J., and Stanley Fischer (1989): *Lectures on Macroeconomics*. Cambridge, Mass.: the MIT Press.

Boadway, R. W. (1982): "On the Method of Taxation and the Provision of Local Public Goods: Comment". *American Economic Review*, 74: 846-851.

Burbidge, J.B., and G.M. Myers (1994): "Population Mobility and Capital Tax Competition." *Regional Science and Urban Economics*, 24: 441-459.

Flatters, F., V. Henderson, and P. Mieszkowski (1974): "Public Goods, Efficiency, and Regional Fiscal Equalization". *Journal of Public Economics*, 3: 99-112.

Hercowitz, Z., and D. Pines (1991): "Migration with Fiscal Externalities." *Journal of Public Economics*, 46: 163-180.

Mansoorian, A. (1995): "Risk Sharing and Redistribution in a Federal System with Population Mobility". Mimeo, York University, Toronto.

Mansoorian, A. and G.M. Myers (1993): "Attachment to Home and Efficient Purchases of Population in a Fiscal Externality Economy." *Journal of Public Economics*, 52: 117-132.

Mieszkowski, P., and G.R. Zodrow (1989): "Taxation in the Tibout Model: The Differential Effects of Head Taxes, Taxes on Land Rents, and Property Taxes." *Journal of Economic Literature*, 43: 107-121.

Myers, G.M. (1990): "Optimality, Free Mobility, and the Regional Authority in a Federation". *Journal of Public Economics*, 43: 107-121.

Persson, T., and G. Tabellini (1990): *Macroeconomic Policy, Credibility, and Politics*. London, Harwood Publishers.

Persson, T. and G. Tabellini (1992a): "Federal Fiscal Constitutions: Risk Sharing and Moral Hazard". Mimeo, Institute for International Economic Studies, University of Stockholm, Sweden.

Persson, T. and G. Tabellini (1992b): "Fiscal Policy in a Federation: Risk Sharing and Redistribution". Mimeo, Institute for International Economic Studies, University of Stockholm, Sweden.

Wellisch, D. (1994): "Interregional Spillovers in the Presence of Perfect and Imperfect Household Mobility." *Journal of Public Economics*, 55: 167-184.

Wildasin, D.E. (1986): *Urban Public Finance*. New York: Harwood Academic Publishers.