

Factor mobility and redistribution: a survey

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Abstract

This chapter presents a survey of the theoretical literature on tax competition. Specifically, it reviews recent work on the effect of factor mobility and the ensuing tax competition on the capacity of governments to raise revenue and redistribute income. It focuses on three issues: the relevance and limitations of the “raise against the bottom” result, the benefits and pitfalls of partial coordination and the incidence of factors mobility on social security systems.

Contents

1	Introduction	2
2	The benchmark model and the “race to the bottom” result	4
2.1	Setting and closed economy solution	4
2.2	Small open economy	6
2.3	Strategic interaction: Nash equilibrium	7
3	Qualifications	10
3.1	National asymmetries	10
3.2	Objective function with varying population	12
3.3	Benevolent governments	14
3.4	Constant returns to scale	16
3.5	Full employment	17
4	Tax competition and tax cooperation	19
4.1	Tax competition and tax cooperation with two mobile factors	21
4.2	Partial tax cooperation	25
4.3	Centralization and/or coordination: further discussion	28
4.3.1	Fiscal federalism versus Tiebout hypothesis	28
4.3.2	Redistribution as a local public good	29
4.3.3	Centralization versus cooperation	30
5	Intergenerational redistribution and tax competition	32
5.1	Capital mobility	33
5.2	Mobility of labor and capital	36
6	Conclusion	38

1 Introduction

One of the main alleged pitfalls of European construction is that it would impede redistributive policies at the national level and threaten the future of the “welfare state”. This allegation is widespread in political circles and in the media and the recently decided addition of ten new member states is likely to foster its intensity. A major theme in that debate is the potential loss in tax revenues as a result of tax competition. Accordingly, the integration process would exert a negative influence on the ability of member states to generate an “adequate” level of tax revenues. Over the last two decades, this debate has spawned a significant amount of academic research and the literature continues to grow at an impressive speed. While the underlying problem involves a number of different ramifications, it seems that the literature has exploded in even more directions. The purpose of this chapter is to provide a selective survey of this literature and to focus on some issues that we consider as crucial for the future of redistributive policies and social protection.¹

Economic integration can affect redistribution in a variety of ways. In this paper we focus on one of the implications of economic integration, namely the increase in mobility of factors of production, of capital and labor. The basic idea is that mobile factors can adjust their location to any interregional differentials in taxation or in benefits. National governments cannot abstract from such potential reaction when designing redistributive policies. By focusing on factor mobility, we deliberately abstract from other implications of economic integration, such as increased mobility of goods, that can also affect redistribution.

The literature on factor mobility and redistribution covers two aspects of reality. Earlier work was based on the fiscal federalism literature and was

¹There exists several surveys which focus on other aspects of that impressive literature. [see Wilson (1999), Haufler (2002), Wellich (2000), Wildasin (1994a), Cremer *et al.* (1998)].

exclusively devoted to the setting of a federal state. More recently, an increasing number of studies have been concerned with economic unions, also called confederations. The main difference between the two settings is that there is a central authority in a federation while such a central government typically does not exist in confederations.² Consequently, the two settings have different implications for the modelling of the relationship between redistribution and mobility. Our main concern being the redistributive capacities of European Union national governments, we shall concentrate on the case where no strong central government exists. However, our results also apply to a federation with a sufficient degree of decentralization. Furthermore, we shall also discuss some transversal issues like the appropriateness of centralization or cooperation and, in particular the potential benefits of competition between national (or regional) governments.

We will first present our benchmark model of tax competition and its implications as to reductions of tax rates and redistributive efforts; see Section 2. We show that the “race to the bottom” result arises in a most dramatic way in a small open economy setting. In such a framework, mobility and redistribution appear to be essentially incompatible. Mobility has a less extreme impact in a strategic Nash equilibrium setting with a “limited” number of countries: redistribution is adversely affected, but does not disappear altogether. In Section 3 we then review the most evident qualifications which pertain to assumptions made in the benchmark model. They concern the assumption of symmetry, constant returns to scale technology, full employment, benevolent governments and the political economy approach instead of a normative one. In the following section, we deal with the issue of tax cooperation and show its pitfalls. In particular, we study the issue of partial cooperation policies, i.e., cooperation agreements which are limited to a subset of the available tax instrument. A prominent example of such a reform is currently under debate and consists in imposing a minimum tax

²Or, at least, has more limited prerogatives.

on capital incomes. Finally, we consider the incidence of labor mobility on social security schemes. This issue is likely to be of considerable importance during the next decades. It goes beyond the scope of traditional tax competition model in particular because it involves inter-generational (and thus dynamic) issues. It has only recently started to received some attention in the literature.

2 The benchmark model and the “race to the bottom” result

2.1 Setting and closed economy solution

Consider a confederation of J identical countries, indexed $j = 1, \dots, J$. For the sake of simplicity, we shall often concentrate on the case where J is large, so that each individual country becomes (roughly speaking) a small open economy. However, in some instances we allow for any level of $J \geq 2$. Within each country, competitive firms produce a single output using three factors of production: capital, K , and two types of labor, e.g. skilled, M , and unskilled L . Each country has a capital endowment of \bar{K} and the number of native skilled and unskilled workers is given by \bar{M} and \bar{L} respectively; each worker supplies one unit of his type of labor. For the time being, we assume that both capital and skilled labor are immobile while unskilled labor is mobile. Consequently, we have $K = \bar{K}$ and $M = \bar{M}$, but L can differ from \bar{L} . We thus distinguish the number of natives \bar{L} from the number of residents L . In other words, $\bar{L} - L$ is the net emigration if any. Once production takes place the output is sold to residents as a final consumption. The consumption of each type of worker is equal to his net of tax income and is denotes by c^s and c^u for the skilled and unskilled respectively. Skilled workers own the stock of capital; their income consists of earnings and capital income. The objective of each national government is utilitarian over the population of *natives*. National welfare it then given by:

$$W = \bar{M} u(c^s) + \bar{L} u(c^u) \quad (1)$$

Finally we have a constant returns to scale (CRS) production function

$$Y = F(\bar{M}, \bar{K}, L). \quad (2)$$

Using Euler's law we can write:

$$Y = w^s \bar{M} + w^u L + r \bar{K}, \quad (3)$$

where r is the marginal productivity of capital and w^s and w^u denote the marginal productivities of skilled workers and of unskilled workers respectively. We assume that $w^s > w^u$ is satisfied at the relevant solution.

Tax instruments consist of (positive or negative) per unit taxes on skilled workers, τ^M , on unskilled workers τ^L and on capital τ^K . Assuming purely redistributive taxation (with no revenue requirement) the budget constraint of the government is given by:

$$\tau^M \bar{M} + \tau^L L + \tau^K \bar{K} = 0. \quad (4)$$

With perfectly competitive markets, the gross return of each factor equals its marginal product. Recalling that capital is owned by the skilled workers, the net income and consumption levels of the two types of workers are then given by:

$$c^s = w^s - \tau^M + (r - \tau^K) \bar{K} / \bar{M}, \quad (5)$$

$$c^u = w^u - \tau^L. \quad (6)$$

Let us first of all consider the closed economy solution which is a useful benchmark. To obtain this case, we impose $L = \bar{L}$ as additional constraint. Using (1), (4), (5) and (6) we can then write the government's problem as

follows.

$$\begin{aligned} \max_{\tau^K, \tau^M, \tau^L} \quad & \bar{M} u(w^s - \tau^M + (r - \tau^K) \bar{K}/\bar{M}) + \bar{L} u(w^u - \tau^u) \\ & + \mu [\tau^M \bar{M} + \tau^L \bar{L} + \tau^K \bar{K}]. \end{aligned}$$

The first-order conditions yield $u'(c^s) = u'(c^u)$, which implies $c^s = c^u$. A utilitarian national government would use the taxes to equate disposable income or consumption. This extreme solution arises because all factors are supplied inelastically and, for the time being, immobile. Consequently, all tax instruments are effectively lump-sum. Note that we just need two instruments. As long as τ^M is unrestricted we can set the tax on immobile capital at any arbitrary level, including $\tau^K = r$.³ In any case we will have $\tau^L < 0$, while the sign of τ^M is ambiguous. However, we know that the total tax paid by skilled workers (including the capital tax) is positive.

2.2 Small open economy

Let us now open the economy and allow unskilled workers to move. Assuming perfect mobility at no cost, their utility is then equated across countries. Here equality of utility is equivalent to equality of disposable income. We have thus:

$$c_j^u = \omega \quad \forall j.$$

In the small economy case ($J \rightarrow \infty$) any individual country considers ω as given and the problem for the government can thus be written as

$$\max_{\tau^L} \quad \bar{M} u\left(\frac{F(\bar{M}, \bar{K}, L) - \omega L}{\bar{M}}\right) + \bar{L} u(\omega), \quad (7)$$

where $L = L(\omega + \tau^L)$ is the labor demand function.⁴ The specification of this welfare function reflects the assumption that the social planner takes

³The results in this section would not change if K were dropped altogether. We have nevertheless included it to make the model consistent with the specification used in Section 4.

⁴Which are derived in the usual way from profit maximization so that L solves $F_L(\bar{K}, \bar{M}, L) = \omega + \tau^L$.

into account the welfare of its citizens before migration (the natives) and not that of the final residents. We come back to this assumption in the next section. It is not crucial but makes the exposition simpler. With this specification, maximizing social welfare amounts to just maximizing $\bar{M}c^s = F(\bar{M}, \bar{K}, L) - \omega L$. One easily checks the first order condition:

$$\bar{M} \frac{\partial c^s}{\partial \tau^L} = (F_L - \omega) \frac{\partial L}{\partial w^u} = \tau^L \frac{\partial L}{\partial w^u}$$

which implies $\tau^L = 0$.

In the small economy setting, mobility thus has a dramatic impact on redistribution: we move from perfect income equalization achieved in the closed economy to a no redistribution equilibrium when the economy is open. This extreme conclusion is of course due to the specific assumptions we have made. In particular, the idea that the national government takes the mobile factor's income as given is a bit extreme and can be qualified.

2.3 Strategic interaction: Nash equilibrium

To do so we shall now move away from the small open economy case and consider a setting of strategic interaction with a “small” number of countries ($J < \infty$). More precisely, we consider a (non-cooperative) game where the players are the J countries and where the strategic variables are tax rates, τ_j^L . A country's payoffs is welfare given by (1), where consumption levels are evaluated at the migration equilibrium induced by the profile of tax rates. We study the Nash-equilibrium of this game.

For any given profile of tax rates, mobility (and perfect competition in the labor market) imply that the allocation of low skilled workers amongst countries must satisfy:

$$\sum_{j=1}^J L(\omega + \tau_j^L) = J \bar{L} \tag{8}$$

where τ_j^L are given and ω is endogenously determined.⁵ Solving (8) yields ω as a function of the profile of tax rates: $\omega = \omega(\tau_1^L, \dots, \tau_J^L)$. Differentiating (8) yields

$$\frac{\partial \omega}{\partial \tau_j^L} = - \frac{dL(\omega + \tau_j^L)/dw^u}{\sum_k dL(\omega + \tau_k^L)/dw^u}. \quad (9)$$

In a symmetric setting wherein $\tau_j^L = \tau^L$ for all j , this reduces to

$$\frac{\partial \omega(\tau^L, \dots, \tau^L)}{\partial \tau_j^L} = -\frac{1}{J}, \quad (10)$$

and one has $\partial \omega / \partial \tau_j^L = 0$ (i.e., the small economy assumption) only for J tending to infinity.

The payoff function of national government j is now obtained by substituting $\omega = \omega(\tau_1^L, \dots, \tau_J^L)$ into the objective function considered in expression (7), yielding :

$$\begin{aligned} & \bar{M} u \left(\frac{F(\bar{M}, \bar{K}, L_j) - \omega(\tau_1^L, \dots, \tau_J^L)L_j}{\bar{M}} \right) \\ & + \bar{L} u(\omega(\tau_1^L, \dots, \tau_J^L)), \end{aligned} \quad (11)$$

where $L_j = L[\omega(\tau_1^L, \dots, \tau_J^L) + \tau_j^L]$. To determine country j 's best reply, we maximize (11) with respect to τ_j^L . The first order condition is given by:

$$u'(c^s) \tau_j^L \frac{dL_j}{dw^u} \left(\frac{\partial \omega}{\partial \tau_j^L} + 1 \right) + [\bar{L}u'(c^u) - L_j u'(c^s)] \frac{\partial \omega}{\partial \tau_j^L} = 0, \quad (12)$$

and the Nash equilibrium is defined by the system of J identical equations specified by (12), $j = 1, \dots, J$. Assuming a symmetric equilibrium with $\tau_j^L = \tau^L$ (and thus $L_j = \bar{L}$) for all j , making use of (10) and rearranging yields the following characterization of the solution:⁶

$$\frac{\tau^L}{\bar{L}} \frac{dL}{dw^u} \left(\frac{J-1}{J} \right) - \frac{1}{J} \left[\frac{u'(c^u) - u'(c^s)}{u'(c^s)} \right] = 0. \quad (13)$$

⁵Each individual worker treats ω as given, but the countries now realize that a change in taxes will affect ω .

⁶Existence of equilibria has been studied by Laussel and Le Breton (1998) and Bayindir-Upmann and Ziad (2002).

The first implication of (13) is that complete ($c^u = c^s$) or “excessive” redistribution ($c^u > c^s$) cannot occur at a symmetric equilibrium. To see this, observe that with $c^u \geq c^s$, the term in brackets is negative so that with $dL/dw^u < 0$ we must have $\tau^L > 0$, which in turn contradicts $c^u \geq c^s$.⁷ Consequently, the term in brackets is positive as $c^u < c^s$ and (with finite J) we obtain $\tau^L < 0$ so that there is some redistribution. Regarding the other two tax instruments, τ^M and τ^K , we have again one degree of freedom exactly like in the closed economy case. With $\tau^L < 0$ we know from the budget constraint that the skilled have to pay a positive total tax. However, to levy this total amount we need just one instrument and the other tax can be set at any arbitrary level. When J tends to infinity, τ^L tends to 0 and we obtain the small open economy as a limit case of this Nash equilibrium setting. Similarly, when J “tends to 1”, we obtain the closed economy solution with $u'(c^u) - u'(c^s)$ as a “limit” case.⁸ Under some additional assumptions one can also show that $|\tau^L|$ increases as J decreases. Put differently, the equilibrium transfer to the unskilled decreases as the number of countries increases. Observe also that the elasticity $(\partial L/\partial w^u)(w^u/\bar{L})$ plays a Ramsey-type role: the higher it is (in absolute value), the lower will be the transfer.

To sum up, we have seen that in the case of a small economy (or at a Nash equilibrium when J tends to infinity) there is a race to the bottom and the bottom implies no tax and thus no redistribution at all. The race is not that radical when the number of countries is reduced and there is strategic interaction among countries. Nevertheless, the basic conjecture that mobility puts downward pressure on redistribution goes through. We have obtained this result in a setting where the unskilled and thus the beneficiaries of redistribution are mobile. The same conclusion would however emerge if instead the skilled (net tax payers) or capital were mobile.⁹

⁷Recall that $w^u < w^s$ and that capital is owned by the skilled.

⁸This statement has of course to be qualified because J is a discrete variable in our setting. The property we announce is based on taking the limit of the equilibrium condition (13) while taking J as a continuous variable.

⁹Among the often cited papers which have discussed the race to bottom as resulting

We shall now review a number of qualifications which have to be made to assess the practical relevance of this result. Before proceeding, however, it is important to stress that the downward pressure on redistribution does not arise because of mobility per se. It arises first and foremost because of the non-cooperative behavior of the countries. Like most of the tax competition literature, we have considered a Nash equilibrium and it is well known that Nash equilibria are typically not optimal. This problem can be overcome, at least in principle, through cooperation. In Section (4) we come back to this issue and show how to reach an optimal solution in an open economy through cooperation. There we will also introduce two mobile factors (L and K), thereby allowing for the possibility of “partial cooperation”.

3 Qualifications

Our benchmark model is highly stylized. It is solely meant to be illustrative and to bring across the main points in the simplest possible way. To assess its relevance and its policy implications a certain number of qualifications pertaining to some of the basic assumptions are in order. We start with the assumption of symmetry.

3.1 National asymmetries

In the benchmark model we have adopted an assumption of identical countries. It is clear that if we relax this assumption, the solution is likely to be asymmetrical as well and this brings in the added complication that productive efficiency can be violated (marginal products of mobile factors may differ between countries). Furthermore, and most significantly from our perspective, under asymmetry it is no longer necessarily true that mobility leads to less redistribution, at least not in all countries. To see this, consider a two-country setting and assume that country 1 does not care about income

from factor mobility: Christiansen *et al.* (1994), Gordon (1983), Oates and Schwab (1988), Lopez *et al.* (1998), Schjelderup (1997), Sinn (1990), Wildasin (1992,1997), Wilson (1980, 1982).

inequality and thus maximizes total (or equivalently *per capita*) income of its natives. Country 2, on the other hand, is averse to inequality (it has an objective function similar to (1)). Except for this difference in preferences, countries are identical. Both are concerned by the welfare of their native citizens whether or not they move away. Further, we assume here that the skilled workers are mobile whereas the unskilled are not. In this case, it is clear that upon integration, country 2 will find it very difficult to redistribute income and in any case, it will end up with less skilled workers than it started with. In other words for this country redistribution decreases as a result of mobility. However, country 1 may very well end up with more redistribution than it would do in autarky. To see this note that country 1 simply sets a zero tax under autarky. Under mobility, it will then tend to “import” skilled workers. Consequently, it may find it interesting to impose a positive tax on the skilled albeit for strategic reasons rather than for redistributive ones. This is because part of the taxed skilled are immigrants who do not count in the welfare functions. Put differently, part of the tax is exported and total revenue of the natives is maximized if the skilled are taxed while proceeds are redistributed to the unskilled.

This type of “peculiar” outcome has been obtained by a number of authors in different settings. Leite-Monteiro (1994), Wildasin (1994a & b) and Epple and Romer (1991) all provide examples of cases where mobility can induce one of the two regions to effect more redistribution than in autarky.

Asymmetry in objective functions is not the only one. There can also be asymmetry in population size and also in capital endowment. Contributions on that question are generally cast in a model of capital mobility. Bucovetsky (1991) and Wilson (1991) both consider the case of countries that have the same capital labor ratio but differ in population size. They show that the less populated country enjoys a higher level of welfare following capital integration. This is known as the *small region advantage*. Peralta and van Ypersele (2002) obtain the same result in a setting when both population

size and capital labor ratio are different at the start. They also show that when the population is the same, a country with a smaller capital labor ratio tends to loose from tax competition.

3.2 Objective function with varying population

When labor is mobile, one faces the problem of varying population size. With endogenous population, measuring social welfare has always been a controversial issue. Population economists are very familiar with the debate between Mills and Bentham or, more specifically, between aiming at maximum total utility or at maximum *per capita* utility. With the former, there is a bias towards favoring a population as large as possible; on the contrary, with the latter there is a Malthusian bias. To circumvent this difficulty several approaches have been used in the literature.

First of all, there is the approach used in the Tiebout tradition, wherein the regional government – in fact a municipality – maximizes land value. Alternatively, a number of authors have adopted a public choice view (median voter approach). Residents vote for the regional tax spending package. Assuming that most people do not move, the majority is hardly concerned with the welfare of the migrants – in or out – and if they are, this will be out of altruism. Brown and Oates (1987) and Wildasin (1991) have adopted this view.

Another way to circumvent the difficulty raised by an endogenous population is to assume a mobility-free criterion such as citizenship. In our benchmark model, we have assumed that national governments are exclusively concerned by the welfare of the "native citizens" whether or not they stay in their region of origin. In that vein, Leite-Monteiro (1994) uses an utilitarian social welfare function involving only the natives regardless of location.

If we take $u(\cdot)$ as the utility function of either types of worker in country

j , one can have two types of utilitarian social objectives:

$$W = \overline{M} u(c^s) + \overline{L} u(c^u), \quad (B)$$

like in our benchmark model, or alternatively

$$W = \overline{M} u(c^s) + L u(c^u), \quad (M)$$

where the government cares about residents irrespective of their origin. Recall that \overline{L} is the number of unskilled citizens (natives or initial residents) and L that of unskilled workers (residents after mobility takes places). One can easily show that those two objectives yield different solutions. When the weight is endogenous as in (M) and migration is costless, the initial distribution of the population across countries (i.e., the value of \overline{L}) is irrelevant and the solution tends to be closer to aggregate efficiency.

One clearly faces a rather difficult problem with objective (B). What makes a nation is a dynamic and complex process. It takes years for new immigrants to receive the same weight as long term residents in the political process of a region. In that respect, Michel *et al.* (1998) consider an important feature of countries with immigration, that is the progressive process of adjustment and assimilation. In the beginning, newcomers have little, if any, weight in the social welfare function. After some time (a decade or a generation), they become full fledged citizens; they can vote and have the same weight as any other national. This specification offers the advantage of being quite realistic and makes redistribution evolve over time, which is consistent with what can be observed. In autarky one can have a lot of redistribution. If the country opens to immigration of unskilled workers, the new migrants have no weight at the beginning and this implies less redistribution. After a while, when they become full fledged citizens, redistribution develops anew.

The possibility of differential tax treatment of immigrants makes a big difference. This is essential to preserve the efficacy of redistributive policies that involve only nationals. In Western European countries, there is a

significant immigration from outside of the economic union. Some of it is illegal and of course there is considerable potential for much more. Those immigrants do receive unequal treatment compared with those from the European Union area, and this is specially true for illegal ones. Indeed, the denial of fiscal and social benefits to illegal migrants seems to be part of a deliberate employment policy.

This is not an abstract issue. The Scientific Council of the German Ministry of Finance has recently proposed to replace the traditional employment principle with a "delayed" integration principle in the assignment of individuals to jurisdictions in terms of taxation, social insurance and social assistance in Europe.¹⁰

Moving from the employment principle to the origin principle implies that individuals are taxed and received benefits in their home country. It has obvious efficiency advantages and safeguards the welfare state. It has also serious disadvantages; in particular, it is much harder to enforce and it raises ethical problems.

3.3 Benevolent governments

The tax competition literature generally assume national governments that are benevolent maximizers of social welfare. At times it assumes decision making based on majority voting in which case the median voter essentially "becomes" the social planner.¹¹ In either case what matters are the preferences of citizen or residents and national authorities always choose a Pareto-efficient outcome (from their perspective and conditional on the behavior of other countries). In such a world, tax competition tends of course to be a bad thing for it imposes additional constraints on otherwise welfare maximizing authorities. Mobility in itself may of course be efficiency enhancing,

¹⁰See Richter (2001) and Sinn (1994).

¹¹The classical paper on this is Epple and Romer (1991). More recently Hindriks (2001) analyzes also a model with imperfect mobility of the poor and the rich and with redistribution chosen by majority. He shows that greater mobility of the poor can increase the extent of redistribution.

but the lack of cooperation between national tax policies unavoidably tends to lower welfare.

The public choice literature, in contrast, has a radically different perception of how the policy making process works. In particular, Brennan and Buchanan (1980) suggest that governments generally lack accountability, especially higher levels of government. Therefore, there is room for policy makers to pursue their own personal goals, rather than serving the interest of the public. The personal interest of policy makers will typically result in too high levels of public expenditures. To account for the possibility of non benevolent behavior on behalf of public authorities, public choice economists often assume a Leviathan-type government that is an untrustworthy revenue maximizer. Accordingly, governments have the tendency to set tax rates that are too high from a social point of view. In that case, tax competition will serve the valuable task of taming the Leviathan. In particular, it forces governments to reduce taxes, which improves the conditions for an efficient mix of taxes and public expenditures (McLure, 1986).

Edwards and Keen (1996) try to reconcile the two opposing views on governments. They develop a model of tax competition where the government is characterized by properties of both the benevolent maximizer of social welfare and the Leviathan revenue maximizer. Consequently, the cost of tax competition related to fiscal externalities should be weighed in the Edwards-Keen model against the gains of tax competition associated with the disciplining impact on the Leviathan. Within their setting Edwards and Keen derive an explicit condition regarding government behavior the under which tax competition harms social welfare. In particular, welfare increases only if the fraction of government spending that represents "pure waste" exceeds the responsiveness of the mobile factor (capital in their case) to taxes. Hence, if capital is very elastic, tax competition is unlikely to be beneficial for this would require a very high fraction of the Leviathan-component of

public spending.¹²

3.4 Constant returns to scale

The tax competition literature usually starts from the assumption that technology has constant returns to scale. As a consequence one ends up with interior solutions and avoids the unpleasant outcome of empty communities or depopulated countries. In the two factor case, one mobile and one immobile, it is clear that with constant returns to scale production function one cannot have all mobile factors flowing into a single country. Their marginal productivity would vanish relative to what it is in the other countries.

There is however an increasing awareness that in both national and supranational area there are such things as core regions, heavily populated and technically very modern, and peripheral regions, retaining only traditional and local activities and being progressively depopulated. The question is then raised of whether such an outcome is socially desirable and if not, how to correct it.

To account for interregional disparities, economist geographers depart from the neoclassical world of constant returns to scale and perfect competition in which economic integration does neither amplify nor dampen geographical discrepancies. With increasing returns to scale and imperfect competition, labor mobility generates the emergence of modern and traditional sectors. Unskilled workers are assumed to be much less mobile than skilled workers. The latter will move to the modern sector where they produced a differentiated good which is monopolistically competitive and costly traded.

In these models mobility and transport costs are introduced and play an important role. For example, Ottaviano and Thisse (2002) have a model in which the market outcome is socially desirable when transport costs are ei-

¹²In the same line, see Keen and Kotsogiannis (2002) and Kelders and Köllhenbürger (2003) who argue that tax competition does not necessarily imply undertaxation in federal systems with tax incentives arrangements.

ther high or low. In the first case, activities are dispersed and this is efficient. In the second case, they are agglomerated and again this is efficient. In contrast, with intermediary transport costs, the market leads to a polarization between modern and traditional sectors whereas optimality recommends a balanced allocation of activities.

3.5 Full employment

In tax competition literature, full employment is generally assumed and redistribution is typically epitomized by income tax-transfer schemes and, more rarely, by social insurance schemes. This is somewhat surprising as there is a huge debate in political circles on the issue of attracting foreign investment to boost domestic employment and on the robustness of social insurance schemes to tax competition. More specifically, the belief is widespread that fostering employment through wage subsidies and providing unemployed with generous compensations are conflicting objectives in a setting of factor mobility and tax competition.

There exists some papers trying to integrate unemployment in tax competition models. They typically focus on capital mobility. Lejour and Verbon (1994, 1996), for instance, develop a two-country model where wages are determined through a union-firm bargaining process, and where capital is imperfectly mobile across countries. A payroll tax is levied to finance an unemployment benefit. The government chooses the payroll tax which in turn determines the unemployment benefits, so as to maximize a weighted sum of the utility of workers and capital owners. Their setting relies on a number of specific assumptions. In particular, it assumes, that the wage elasticity of labor demand is larger than one. Lejour and Verbon show that opening borders to capital reduces the payroll tax and that, with mobile capital, a coordinated rise in the countries' payroll tax would increase the countries' weighted sum of individual utilities.

In a more recent paper, Fuest and Huber (1999b) also assume that wages

are subject to union-firm bargaining. However, contrary to Lejour and Verbon (1996) individuals' labor supply is elastic. Accordingly the wage bargaining process results in all individuals being employed but rationed in their labor supply (underemployment). In each country a wage tax and a source-based capital tax are used along with a 100% profit tax to finance the provision of a public good rather than an unemployment benefit. Taking into account the mobility of capital across countries, each country's government chooses its fiscal instruments so as to maximize the utility of its representative citizen. Huber and Fuest show that if governments do not account for the effects of their policy on the wage bargaining process, a coordinated increase in either the wage tax or the capital tax (the other tax being kept constant) results in a reduction of welfare. However, if they account for the effect of their policy, the result is shown to depend upon the wage elasticity of labor demand; the cooperation measures considered above lead to a fall in welfare if this elasticity is smaller than one and to a rise in welfare otherwise.

Lozachmeur (2001) develops a model in the vein of Harris and Todaro in which there is unemployment and potential migrants equate their expected utility across countries. Mobility and fiscal competition lead to underprovision of unemployment benefits. Using a common framework of analysis, Richter and Schneider (2001) and Koskela and Schöb (2000) show that the optimal tax on mobile capital need not be zero if there are distortions in the labor market. This conclusion holds under both unemployment and underemployment. In particular they show that, if wages are the result of bargaining between unions and firms, the tax on capital depends not only on the properties of the production function but also on the restrictions on other fiscal instruments, such as profit and wage taxes.

The issue of fiscal competition with distorted labor markets has also been investigated by Gabszewicz and van Ypersele (1996). They develop a political economics model where some minimal wage is chosen by majority voting and results in unemployment. They show that opening borders to

capital flows has a depressing effect on the minimal wage.

Finally, Leite Monteiro *et al.* (2002) analyze how capital income taxation can be used to fight structural unemployment. In a model that generalizes Lejour and Verbon (1996) they consider a setting of wage bargaining, where each country has to decide on employment-enhancing policies and on redistributive policies aimed at the unemployed. Contrary to the case where wages are exogenously given, the chosen level of employment subsidy may be lower with capital mobility. This result, which seems counter-intuitive, is explained by the fact that unions do not fully account for all the effects of their wage choice on the expected utility of their members. In particular, the change in the interest rate induced by the choice of the union's wage affects the elasticity of labor demand. The choice of the country's employment subsidy in a closed economy setting will then account for this myopic behavior of unions. Opening the borders to capital flows may then lower the employment subsidy.

4 Tax competition and tax cooperation

We have seen that under mobility, net factor returns are linked so that the redistribution of income becomes a public good the benefits of which extend to the enlarged factor market itself. From there, a number of authors starting with Stigler (1957), view redistribution as a responsibility of the central (federal) government. Accordingly, grants from the central government to lower-level governments, or preferably direct taxation of households by the central government, can be used to internalize the fiscal externalities associated with income redistribution and, hence, to achieve a more satisfactory outcome.

In terms of our benchmark model, full redistribution can be achieved by entrusting the central government with the appropriate tax instruments. The proposition that central governments should take primacy in equity aspects of tax polity, and be assigned the tax bases that are mobile at lower

levels, is directly inspired by the theory of fiscal federalism. It clearly calls for several qualifications particularly when applied to an economic union without powerful central authority rather than to a standard federal state.

As a matter of fact, the centralization of the redistributive functions has been questioned even in the fiscal federalism setting where a central government does exist, in particular on informational grounds. It raises further objections in a confederate setting without any central authority. The relevant issue then becomes one of cooperation to overcome the inefficiencies created by non-cooperative behavior.

We have already mentioned in Section 2 that a globally first-best optimal outcome can be reestablished through “full cooperation” on all relevant policy instruments. This is of course a somewhat naive view for it neglects the problem of enforceability of cooperation agreements as well as possible informational problems.¹³ Another limitation of this result is that in reality an across the board cooperation on *all* relevant tax instruments may be quite difficult to achieve. A piece-meal approach involving only partial cooperation (or harmonization) appears to be more reasonable to expect. But then the welfare impact of the cooperation policy is less straightforward to assess. For instance if the EU countries were to agree on minimum tax rates on capital incomes, this might lead to fiercer tax competition for the setting of other tax instruments.

The potential pitfalls of partial cooperation were first discussed by Cremer and Gahvari (2000) in a setting with a single tax but with the possibility of tax evasion. These authors have shown that the harmonization of statutory tax rates, may induce countries to cut down on enforcement policies, thereby reintroducing tax competition through the back-door. More recently, the same authors have a setting of tax competition with two instruments in the context of environmental taxation; see Cremer and Gahvari

¹³An alternative suggested by Cardarelli *et al.* (2002) is to adopt a repeated games setting. They show that under some assumptions full efficiency can be achieved.

(2002a–2002b). They show that when countries agree on minimum taxes on polluting (final) goods, tax competition may be shifted to emission taxes (collected at the production level).

To address the issue of tax cooperation in particular that of partial cooperation, we will now slightly complicate our canonical model. This brings us close to the specification recently used by Marchand *et al.* (2002) by which our analysis in this section is inspired. To make room for tax competition on more than one instrument, we now consider two mobile factors: capital and unskilled workers. We show that tax competition along with the small open economy assumption leads to a zero tax on *both* mobile factors. With tax cooperation this can be avoided. Then we show that partial cooperation can be harmful.¹⁴ Finally, we discuss some other issue of tax cooperation.

4.1 Tax competition and tax cooperation with two mobile factors

We consider the benchmark model with a *large* number identical countries $j = 1, \dots, J$. To reflect the assumption that capital K , is now mobile, along with unskilled labor, L , the CRS production function (2) is rewritten as:

$$Y_j = F(\bar{M}_j, K_j, L_j),$$

The country index j which so far was dropped for simplicity will be systematically used in this section to avoid confusions. Since \bar{M} is immobile and identical across countries, one can normalize to 1 and write:

$$Y_j = F(1, K_j, L_j). \tag{14}$$

where the earnings of skilled labor is:

$$F_M^j = Y_j - K_j F_K^j - L_j F_L^j \tag{15}$$

¹⁴See also Fuest (1995) and Fuest and Huber (1999a).

The (initial) capital stock \bar{K} continues to be held by the skilled, it is identical in all countries. Similarly, the number of native unskilled is \bar{N} in all countries. As seen in Section 2, without mobility we have full redistribution with $c^s = c^u$.

Perfect mobility of factors L and K implies that their net returns are equated across countries. Namely

$$F_K^j - \tau_j^K = \varrho, \quad j = 1, \dots, J \quad (16)$$

and

$$F_L^j - \tau_j^L = \omega, \quad j = 1, \dots, J. \quad (17)$$

where ϱ and ω denote the net interest rate and net wage respectively in the world markets. This implies the following factor demands:

$$K_j = K_j(\varrho + \tau_j^K, \omega + \tau_j^L) \quad (18)$$

and

$$L_j = L_j(\varrho + \tau_j^K, \omega + \tau_j^L). \quad (19)$$

We distinguish in each country the initial endowments of factors, denoted by \bar{K} and \bar{L} , that are the same across countries and the actual levels of factors used, denoted by K_j and L_j . At the equilibrium of the world factor markets, we must have the following equalities:

$$\sum_j K_j(\varrho + \tau_j^K, \omega + \tau_j^L) = J\bar{K} \quad (20)$$

and

$$\sum_j L_j(\varrho + \tau_j^K, \omega + \tau_j^L) = J\bar{L}. \quad (21)$$

Since countries are identical, the following properties hold at the symmetric equilibrium:¹⁵

$$\frac{\partial \omega}{\partial \tau_j^L} = -\frac{1}{J} \quad \frac{\partial \varrho}{\partial \tau_j^K} = -\frac{1}{J},$$

which generalizes (10). When J tends to infinity,

$$\frac{\partial \omega}{\partial \tau_j^K} = \frac{\partial \varrho}{\partial \tau_j^L} = 0$$

so that ω and ϱ are taken as given by each country. This is once again the small economy case on which we concentrate for the rest of this section.

We now turn to the implication of factor mobility on the redistributive tax policy. Each national government maximizes:

$$W_j = u(c_j^s) + \bar{L} u(\omega).$$

>From each country's perspective maximizing W_j amounts to maximizing c_j^s :

$$c_j^s = F_j - \varrho K_j - \omega L_j + \varrho \bar{K}. \quad (22)$$

This yields the following first-order conditions:

$$\frac{\partial c_j^s}{\partial \tau_j^K} = \tau_j^K \frac{\partial K_j}{\partial \tau_j^K} + \tau_j^L \frac{\partial L_j}{\partial \tau_j^K} = 0, \quad (23a)$$

$$\frac{\partial c_j^s}{\partial \tau_j^L} = \tau_j^K \frac{\partial K_j}{\partial \tau_j^L} + \tau_j^L \frac{\partial L_j}{\partial \tau_j^L} = 0. \quad (23b)$$

Since ϱ and ω are taken as given the effect of a change in τ_j^K on either K_j or L_j is the same as the effect of a change in $r_j \equiv \varrho + \tau_j^K$ and the same holds

¹⁵To show this, let us first totally differentiate the optimality conditions (16) and (17). It yields: $K_r^j \equiv \partial K_j / \partial r_j = S_j^{-1} F_{LL}^j(1, K_j; L_j)$, $L_w^j = S_j^{-1} F_{KK}^j(\cdot)$ and $K_w^j = L_r^j = -S_j^{-1} F_{KL}^j(\cdot)$, where $S_j = F_{KK}^j(\cdot) F_{LL}^j(\cdot) - (F_{KL}^j(\cdot))^2 > 0$. In order to determine $d\varrho/d\tau_j^K$ and $d\omega/d\tau_j^K$, we then differentiate (20) and (21) with respect to ϱ, ω and τ_j^K , which gives $\sum_i K_r^i d\varrho + \sum_i K_w^i d\omega = -K_r^j d\tau_j^K$ and $\sum_i L_r^i d\varrho + \sum_i L_w^i d\omega = -L_r^j d\tau_j^K$. Solving this system of two equations yields $d\varrho/d\tau_j^K = -1/J$ and $d\omega/d\tau_j^K = 0$ at the symmetric equilibrium where $K_j = \bar{K}$ and $L_j = \bar{L}$, $j = 1, \dots, J$. The other derivatives, $\partial \varrho / \partial \tau_j^L = 0$ and $\partial \omega / \partial \tau_j^L = -1/J$, are obtained in the same way.

for τ_j^L with $w_j \equiv \omega + \tau_j^L$. We can thus rewrite:

$$\frac{\partial c_j^s}{\partial \tau_j^K} = \tau_j^K K_r^j + \tau_j^L L_r^j = 0, \quad (24a)$$

$$\frac{\partial c_j^s}{\partial \tau_j^L} = \tau_j^K K_w^j + \tau_j^L L_w^j = 0. \quad (24b)$$

where the partial derivatives $K_r^j, L_r^j, K_w^j, L_w^j$ are derived in footnote 15 and are given by:

$$K_r^j \equiv \frac{\partial K_j}{\partial r_j} = \frac{F_{LL}(1, \bar{K}, \bar{L})}{\bar{S}}, \quad L_w^j \equiv \frac{\partial L_j}{\partial w_j} = \frac{F_{KK}(1, \bar{K}, \bar{L})}{\bar{S}}, \quad (25)$$

$$K_w^j = \frac{\partial K_j}{\partial w_j} \equiv L_r^j = \frac{\partial L_j}{\partial r_j} = \frac{-F_{KL}(1, \bar{K}, \bar{L})}{\bar{S}}, \quad (26)$$

with $\bar{S} = F_{KK}(\bar{1}, \bar{K}, \bar{L})F_{LL}(1, \bar{K}, \bar{L}) - F_{KL}^2(1, \bar{K}, \bar{L}) > 0$. Note for future reference that at the symmetric equilibrium the derivatives of the demand functions for K_j and L_j in (23a) and (23b) are identical across countries and only depend upon \bar{K} and \bar{L} .

With $\bar{S} > 0$, the solution to (24a)–(24a) is given by $\tau_j^K = \tau_j^L = 0$. In the small open economy setting adopted here where the world prices of mobile factors are taken as given by each country, redistributive taxes and subsidies are equal to zero.

This solution is to be contrasted with that obtained in autarky. It is also to be compared with that obtained in a cooperative framework in which national governments agree on (and commit to) a policy which maximizes the utility of a representative country. In our setting of identical countries, this cooperative solution would be the same as the autarchic one, that is, it would imply equal disposable income for the two types of individuals within and across countries; see Section 2. Observe that to achieve this solution, the agreement must concern all tax instruments, or, to be more precise as many tax instruments as there are degrees of freedom. In our setting this would require for instance a uniform subsidy ($-\tau^L$) on earnings and a tax on capital income (τ^K) that would be set so as to equate disposable incomes.¹⁶

¹⁶Recall that there is a third instrument, namely τ^M which is determined as residual

For a number of reasons pertaining mainly to political economy, it is often difficult to find an agreement on all tax instruments. At best, one can expect that there will be an agreement around what is the most shocking consequence of tax competition, the fact that some "symbolic" sources of income, typically capital, fully escape taxation.¹⁷ To account for this difficulty, we shall now study partial cooperation measure. In particular, study the implications of agreement on a certain level (strictly positive) of taxation of capital, while the other tax instruments continue to be set non-cooperatively.

4.2 Partial tax cooperation

Starting from the *laissez-faire* situation we thus now turn to the case where only some partial cooperation is possible. We consider the implications of a coordinated increase in τ_j^K to a "minimum rate", denoted $\hat{\tau}^K > 0$, while the other tax τ_j^L is free to vary the way the countries decide. Let be this minimum rate that all countries are forced to apply. This means that condition (24b) remains relevant and determines each countries choice of τ_j^L :

$$\hat{\tau}^K K_w^j + \tau_j^L L_w^j = 0 \quad (27)$$

while equation (24a) relative to the choice of τ_j^K does not hold anymore. Consequently, the equilibrium level of τ_j^L is now conditional on $\hat{\tau}^K$, the tax rate on capital. Under symmetry this level is obtained from a single equation, namely (27). Furthermore, in this equation K_w^j and L_w^j are effectively constants; see equations (25) and (26). This is because as long as the equilibrium remains symmetric, each country uses \bar{K} units of capital and \bar{L} unskilled workers.¹⁸ This simplifies the analysis considerably.

to achieve budget balance. While this third instrument does not explicitly appear in our analysis, its availability is accounted for in the expressions. In particular it ensure that there are effectively two degrees of freedom so that the study of partial coordination is meaningful in the first place.

¹⁷See on this Huizinga (1995).

¹⁸Put differently, while the possibility of factor mobility has a dramatic impact on tax rates, there will be no effective mobility *at the symmetric equilibrium*.

To determine the effect of a small coordinated increase in $\widehat{\tau}^K$ on τ_j^L , we totally differentiate (27) with respect to the tax rates:

$$K_w^j d\widehat{\tau}^K + L_w^j d\tau_j^L = 0.$$

which yields:

$$\frac{d\tau_j^L}{d\widehat{\tau}^K} = -\frac{K_w^j}{L_w^j} = \frac{F_{KL}(1, \overline{K}, \overline{L})}{F_{KK}(1, \overline{K}, \overline{L})} \quad (28)$$

Consequently, and with $F_{KK} < 0$, $d\tau_j^L/d\widehat{\tau}^K$ has the *opposite* sign of $F_{KL}(1, \overline{K}, \overline{L})$. Also recall that in the small open economy case we start from $\tau_j^L = 0$. Consequently, when capital and low skilled labor are complements ($F_{KL}(1, \overline{K}, \overline{L}) > 0$) imposing a positive tax on capital will result in a negative tax (a subsidy) on the low skilled. This appears to be a move in the right direction for it brings us closer to the optimum. On the other hand when the two factors are substitutes ($F_{KL}(1, \overline{K}, \overline{L}) < 0$), we will have $\tau_j^L > 0$ so that the low skilled now pay taxes which will benefit the high skilled. In other words we have a case of reverse redistribution. This suggests that the cooperation on the capital tax can be expected to have a positive impact on welfare only in the case where lower skilled labor and capital are substitutes. When they are complements, the cooperation appears to have perverse effects on redistribution.

To confirm this, let us study the impact on consumption levels and on welfare. Recall that the consumption of unskilled workers is $c_j^u = \omega$ so that the consumption of the skilled workers (and capital owners) is given by $c_j^s = F(1, \overline{K}, \overline{L}) - \overline{L}\omega$. Using (17) along with the property that F_L^j does not change we obtain

$$\frac{dc_j^u}{d\widehat{\tau}^K} = -\frac{d\tau_j^L}{d\widehat{\tau}^K} = -\frac{F_{KL}(1, \overline{K}, \overline{L})}{F_{KK}(1, \overline{K}, \overline{L})} \quad (29)$$

and

$$\frac{dc_j^s}{d\widehat{\tau}^K} = \overline{L} \frac{d\tau_j^L}{d\widehat{\tau}^K} = \overline{L} \frac{F_{KL}(1, \overline{K}, \overline{L})}{F_{KK}(1, \overline{K}, \overline{L})}. \quad (30)$$

To understand these expressions it is important to realize that while each country considers ω as constant (and independent of the policy decisions of a single country), the net wage ω does change following the increase in capital taxation (which applies to all countries). This is brought out clearly by expression (17).

Turning to social welfare we then obtain:

$$\begin{aligned} \frac{dW_j}{d\hat{\tau}^K} &= \bar{L}u'(c_j^u) \frac{dc_j^u}{d\hat{\tau}^K} + u'(c_j^s) \frac{dc_j^s}{d\hat{\tau}^K}, \\ &= \bar{L} [u'(c_j^s) - u'(c_j^u)] \frac{F_{KL}(1, \bar{K}, \bar{L})}{F_{KK}(1, \bar{K}, \bar{L})}. \end{aligned}$$

By assumption we have in the *laissez-faire* with no tax $c_j^s > c_j^u$ and thus $u'(c_j^s) < u'(c_j^u)$. When moving away from that situation by increasing marginally τ^K in a coordinated way ($d\hat{\tau}^K > 0$) we conclude that

$$dW_j \leq 0, \quad dc_j^u \leq 0 \text{ and } dc_j^s \geq 0 \quad \text{if } F_{KL}(1, \bar{K}, \bar{L}) \leq 0.$$

This confirms our conjecture made above. In particular, when $F_{KL}(1, \bar{K}, \bar{L}) < 0$, namely when the two mobile factors are substitutes, a minimum tax on capital income proves to be welfare decreasing. With complements, on the other hand welfare increases.

To understand the intuition behind these results we have to return to the impact of capital tax harmonization on τ_j^L as shown by (28). The bottom line is that when the two mobile factors are complements, reducing tax competition on one of the taxes creates a spillover for the other tax as it also relaxes tax competition there. To be more precise, when $\hat{\tau}^K$ is increased (above the Nash equilibrium level) each country would like to unilaterally decrease the tax on capital and thus to increase the net return of this factor. This can be achieved indirectly by subsidizing the complementary factor namely unskilled labor. With substitutes, on the other hand, we get the opposite effect: the cooperation just shifts the tax competition from one instrument to the other. Each individual country will now be tempted to indirectly increase the return on capital by *increasing* the tax

on the substitute (unskilled labor). Consequently countries compete in another tax instrument instead and the overall outcome is worse than the *laissez-faire*.¹⁹

4.3 Centralization and/or coordination: further discussion

We have pointed out in section 3.3 that tax competition may be welfare improving when governments are not benevolent. When this is the case, coordination will of course not have a positive impact on welfare. To conclude our review of the issue of coordination, we shall now sketch a few additional potential pitfalls to coordination and/or centralization. The issues we review arise because of informational problems. First, we shall contrast the tax competition literature with the Tiebout hypothesis under which mobility (and competition between local governments) plays an important role for preference revelation. Second, we shall discuss Pauly's application of the Tiebout model to the context of redistributions. In these two settings the underlying information failure is that individual preferences (willingness to pay) for public goods (or redistribution) are not observable. Our third and last point is based on a different type of information asymmetry, namely that between central and local authorities. Consequently, redistribution between regions or countries by a central (supra-national) authority may be problematic, even when policy makers are benevolent.

4.3.1 Fiscal federalism versus Tiebout hypothesis

By assuming at the outset that regions consist of heterogeneous individuals, the theory of fiscal federalism brings a bias towards the centralization of the redistributive functions. One could assume instead that people freely move across regions looking for the pattern of taxes and services fitting their tastes and their income. Such a process by which mobility alone would be enough

¹⁹The interpretation is complicated by the fact that one factor (capital) should be taxed, while the other one (unskilled labor) should be subsidized. Reinforced tax competition then translates into a *higher* tax (lower subsidy) on unskilled labor (which each country would like to "repel").

to secure efficiency in patterns of local public expenditure and taxation is known as the Tiebout hypothesis. Under some assumptions, it does not only imply efficiency but also homogeneity of communities.

If the Tiebout hypothesis were verified, it would mean that the main question of this paper, that is of the efficacy of redistributive policies within regions being challenged by fiscal competition would appear groundless. There would be no need for redistribution at the regional level if before tax income were equalized by mobility. Yet, there is another issue which is that of redistribution across regions. Such redistribution calls for a central authority. Coming back to Tiebout's hypothesis and without engaging a long and intricate debate, it suffices to note that it makes sense in the context of mobility within and to a lesser extent between municipalities but not between regions or nations. Further, even within that particular setting, it relies on quite unrealistic assumptions that have not been empirically validated. This does not mean that people do not express their discontent with the pattern of regional fiscal policy by moving to regions they find more congenial. It implies that this process does not in general yield an efficient outcome.

4.3.2 Redistribution as a local public good

The traditional fiscal federalism setting implies heterogeneity within regions and the conventional wisdom is that redistribution should be centralized. Two main questions can be raised. First, does there exist a central government capable of such redistribution? If not, what are the alternative policies? Second, are there not any arguments in favor of decentralizing redistribution? We first answer this latter question.

The arguments in favor of giving the central government exclusive responsibility for redistribution are indeed not clear-cut. Pauly (1973) makes a case for entrusting regional governments with some redistributive functions. He assumes a particular type of utility interdependencies. The utility

of the rich is an increasing function of the poor's income. Further, higher weight is given to the poor belonging to the region than to those living elsewhere. In other words, income redistribution is of the nature of a local public good. Differences in tastes and incomes may dictate a different amount of redistribution over regions. In this case, as in the case of any other local public good, decentralization might be desirable. Pauly considers various levels of mobility. The case for decentralizing redistribution is stronger the less mobile are individuals, the more dissimilar are tastes for redistribution over regions, and the more redistribution it implied by Pareto-efficiency. In other words, his model seems to fit the European Union more than federal countries such as the United States.

To sum up, both Tiebout and Pauly provide arguments for letting regional governments achieve their own redistribution, but neither one addresses the other important issue of redistribution across regions which clearly calls for some centralization. For Tiebout, equality of income results from mobility; for Pauly, mobility is limited and redistribution is a local public good better supplied at the regional level. In a sense, both of these arguments provide additional support for the idea that competition between local authorities may have positive effects. In Subsection 3.3 we have reviewed the arguments that plead in this direction on the basis of rent seeking behavior on behalf of governments. The arguments presented here are different for they continue to apply when governments are benevolent. Instead they point to the idea that competition may be an effective way for preference revelation in a context of asymmetric information.

4.3.3 Centralization versus cooperation

We now come to the question of whether a central government is capable of redistribution. In that regard, it is again important to underline the differences between a federal setting, such as that of the United States, and a confederal one, such as the European Union. In a confederation the costs of

mobility (particularly labor mobility) are higher than in a federation. More importantly, in the European Union case, there is no real central government. In other words, one cannot discuss the issue of centralization versus decentralization in the same way as in a federal state. Reforms towards efficiency or equity have to be approached from the viewpoint of negotiation, cooperation and above all Pareto-improving moves. Welfare improvements are not sufficient, as the prevailing decision rule is most often unanimity. Thus the usual debate over centralization versus decentralization is changed into a debate over Pareto-improvement with and without compensations.

In the perfectly symmetric case, the first-best allocation can easily be achieved by cooperative agreement. Alternatively, if the central government imposes some minimum standards of taxation that yield the optimal solution, these ought to be unanimously agreed upon. Most often, however, there is no perfect symmetry. Then, it is likely that moving towards the first-best optimal solution involves different gains across countries or even losses in some. In this case, compensatory schemes or logrolling procedures have to be considered. Note however that even in asymmetric cases, some minimum standards can be Pareto-improving.

Wildasin (1991) examines an economic union within what he calls a common labor market such as assumed here. He allows for corrective subsidies by a central government and reaches the striking result that with optimal subsidies the tax rates on mobile taxpayers should be equalized across regions. This implies that regions with weaker preferences for redistribution should receive larger subsidies. There is however a problem with Wildasin's argument. Even if one restricts the corrections of Nash equilibria to Pareto corrections, they imply side payments. In other words, the optimal scheme is such that in a two region setting the less redistributive one is compensated so as to allow for productive efficiency and impose the same tax as the more redistributive region. Even though such a scheme ought to be unanimously supported, its actual implementation might be difficult. In a subsequent pa-

per, Wildasin (1994a) considers a setting with mobile recipients of income transfers and shows that a region subject to labor immigration may gain by paying some transfers to workers in the source region so as to reduce the level of immigration.

Also related to the debate of centralization versus cooperation is the availability of information for different levels of governments. It is argued that lower levels authorities (being "closer" to these tax base) have better information to implement the tax system, and this is a point in favor of decentralization. But once again this advantage seems to be different in federal and confederal systems.²⁰

5 Intergenerational redistribution and tax competition

Tax competition such as usually approached (and reviewed in the preceding sections) suggests that countries underprovide public goods and reduce redistributive policies. This is because the threat of capital flight and of loss of skilled labor along with the risk of unskilled labor inflow would prompt individual countries to set tax rates that are too low from a supranational welfare perspectives. More recently economists have started investigating the open economy aspects of intergenerational redistribution and particularly those of pension schemes. This raises interesting questions which go beyond the scope of the traditional tax competition literature. For example, there is issue of the co-existence of pay-as-you-go (PAYG) and of fully funded (FF) pension systems within an economic union. Can the co-existence be sustained and if yes, what type of adjustments will be induced by economic integration. These question arises for two reasons. First, the two systems

²⁰The role of asymmetric information between central and local governments has been discussed over the last decades. The idea that local governments have better knowledge of needs, preference or resources of individuals that the central government is often advanced in favor of some decentralization. See on this Bucovetsky *et al.* (1998), Cremer and Pestieau (1996a,b), Cremer *et al.* (1996).

have different implications in terms of capital accumulation and in autarky the rate of return on capital will thus tend to differ between countries. Under mobility this will give rise to capital movements which will may have a significant impact on the individual countries. Second, under a PAYG system, individuals are effectively born with a debt towards the previous generation(s). Their contributions will have to pay for the retirement benefits of their (grand) parents. When they are mobile, young workers can, however, escape from this liability by moving to a country with a FF system.

We shall now briefly discuss some of these problems. There are two main streams of literature which differ mainly by the underlying source of mobility: capital only or capital and labor. We start with a setting where capital the only mobile factor.

5.1 Capital mobility

To illustrate the issue that arise, consider a two-country two-overlapping generation model.²¹ In country $j = A, B$ at time t identical consumers maximize

$$u(c_t^j, d_{t+1}^j)$$

subject to the budget constraints

$$c_t^j = w_t^j - \tau_t - s_t^j,$$

and

$$d_{t+1}^j = s_t^j (1 + r_{t+1}^j) + p_{t+1}^j,$$

where τ is the payroll tax; p , the pension benefit; c and d , first and second period consumption; s , savings; and w and r , wage and interest rate. Initially both countries are identical but for one aspect, namely the type of pension system. Country A has a “pay-as-you-go” (PAYG) pension system.

²¹We closely follow Casarico (2002).

Consequently, it offers an implicit rate of return of which equals the rate of population growth n . The relationship between contributions and benefits is then given by:

$$(1 + n) \tau_t = p_t^A$$

Country B has a “fully-funded” system so that pension benefits are determined according to:

$$(1 + r_{t+1}^B) \tau_t = p_{t+1}^B.$$

For the sake of simplicity we use a log linear utility function which has the nice property that consumers spend a fixed proportion, $(1 - \sigma)$, of lifetime income on first period consumption and a proportion σ on second period consumption. Consequently, savings in country A are given by:

$$s_t^A = \sigma \left[w_t^A - \tau \frac{r_{t+1}^A - n}{1 + r_{t+1}^A} \frac{1 - \sigma}{\sigma} \right].$$

In country B , on the other hand saving is simply

$$s_t^B = \sigma w_t^B.$$

Production is represented by a CRS production function. In *per capita* terms, we have:

$$y^j = f(k^j)$$

with y^j is output per worker and k^j , capital per worker. Assuming perfect competition, equilibrium factor prices are:

$$r_t^j = f'(k_t^j) \quad \text{and} \quad w_t = \omega(k_t^j) = f(k_t^j) - f'(k_t^j) k_t^j. \quad (31)$$

Finally in a closed economy we have the equality between saving and capital accumulation:

$$(1 + n) k_{t+1}^j = s_t^j.$$

In the steady-state we have

$$(1+n)k^j = \sigma \left[\omega(k^j) - \tau^j x^j \frac{f'(k) - n}{1 + f'(k)} \frac{1 - \sigma}{\sigma} \right]$$

where $x^A = 1$ and $x^B = 0$.

Assuming dynamic efficiency, namely $r^j > n$, one obtains:

$$k^A < k^B, r^A > r^B \quad \text{and} \quad w^A < w^B, \quad (32)$$

as well as, $u^A < u^B$. In words, capital stock, wage rate and utility will be smaller, while the interest rate will be larger in the country with the PAYG system. These are standard properties which are mainly due to the fact that with $r > n$, PAYG offers a lower return than FF.

Let us now introduce perfect capital mobility with the consequence that both rates of interest must be equal. This quite clearly requires capital flows from B to A . In the new steady-state, we have $k^A = k^B = k^w$ and thus equality between interest rates and wages. We use the superscript w for the perfect capital mobility steady-state solutions. We thus have:

$$k^A < k^w < k^B \quad ; \quad r^B < r^w < r^A \quad ; \quad w^A < w^w < w^B.$$

In terms of welfare, outcomes vary between countries and generations. In country A , future generations are positively affected by capital mobility; in country B , the effect is ambiguous.

This analysis is of limited scope: it simply shows the incidence of economic integration on two countries with different pension system. In terms of output countries with PAYG seem to gain relative to countries with FF. In that reasoning we take the basic parameter τ , the payroll tax as given. Pemberton (1999, 2000) goes one step further. He assumes that a PAYG system is redistributive and thus generates welfare gains up to a certain limit for a given capital stock. He then distinguishes two settings. In the first one, countries are isolated or equivalently, they are integrated but play cooperatively. In this setting the optimal choice of τ is made considering its direct

impact on social welfare (redistribution) and its indirect impact through capital decrease (production). If we write social welfare in the steady-state as a function of τ and k , the social planner's problem is

$$\max_{\tau} V(\tau, k(\tau)),$$

which yields

$$V_{\tau} + V_k \frac{\partial k}{\partial \tau} = 0,$$

with V_{τ} and V_k positive and $\partial k / \partial \tau < 0$.

Let us come to the second setting, that of a small open economy with given rate of interest and thus, from (31) also given (steady-state per-capita) capital stock. Put differently, k is no longer a function of τ . The planner's problem then becomes

$$\max_{\tau} V(\tau, k)$$

and the optimal level of taxation is given by $V_{\tau} = 0$. Consequently, we obtain a value of τ which is higher than in autarky or in a cooperative solution. Pemberton (1999) compares the effect of a go-it-alone shift to FF in a single country with a world-wide shift. He shows that an isolation paradox may arise: each country may not switch to a FF system because some of its residents may loose. Yet the switch would be Pareto improving if all the countries simultaneously switched. The isolation paradox can be interpreted, once again, as a coordination failure.

5.2 Mobility of labor and capital

We now add the mobility of labor and assume that young workers (and payroll taxpayers) can choose their country of residence. Mobility of labor and capital with pensions systems is particularly interesting because it implies two equilibrium conditions that are likely to be incompatible. The first one is the consequence of capital mobility. Assuming a CRS technology, the

equality of rate of return on capital leads to the equality of wage across regions. Using the above notation, one has $r^A = r^B = r$ and thus

$$w^A = w^B = w.$$

Then, we also have the labor mobility equilibrium which is satisfies:

$$\left. \begin{array}{l} 0 < L^A, L^B < N^A + N^B \text{ for } w^A - \tau^A \frac{r-n}{1+r} = w^B \\ L^A = 0 < \\ L^A = N^A + N^B > \end{array} \right\} \quad (33)$$

where N^j is the population of workers in region j before migration and L^j is the population of workers after migration. Recall that country A has a PAYG system while pensions are FF in country B .

It is clear from these conditions that to obtain an interior solution we need $\tau^A = 0$, so that the PAYG system will have to disappear: taxes are zero or they are positive and all potential payroll taxpayer leave the country. Either way, no revenue can be raised to finance the PAYG pensions. For the young generation this effectively implies a switch to a FF system. Older individuals, however, and especially those who are already retired when integration occurs are bound to loose in the process as the financing of their retirement benefits is jeopardized.

We can easily extend our analysis to the case of two PAYG systems of possibly different size. When A and B both have PAYG systems the condition for an interior migration equilibrium is given by

$$w^A - \tau^A \frac{r-n}{1+r} = w^B - \tau^B \frac{r-n}{1+r},$$

which in turn requires $\tau^A = \tau^B$ so that contribution rates (and thus benefits) must be equalized. Otherwise one of the two countries, that with the higher τ^j will be emptied of its young workers, the old retirees being left behind without pension benefits. Consequently, we have the result by Homburg and Richter (1993) [see also Breyer and Kolmar (2002)] that harmonization is necessary on efficiency grounds when households can freely migrate between regions. To avoid such extreme solutions, a number of authors have

introduce additional features: differential fertility rates, decreasing returns to scale, mobility costs, public goods.²²

With labor mobility, differentials in the net benefits that individuals can expect from public pensions [in the above example $-\tau^j (r - n) / (1 + r)$] alter the payoff to migration and can influence the international allocation of labor. Wildasin (1999) estimates the change in the present value of lifetime wealth for representative workers in 7 European Union countries that results from switching from one public pension program to another. He shows that moving between certain countries can result in an increase of 15% or even more in lifetime wealth. As he points out, differentials in net benefits create fiscal incentives for inefficient labor allocation. We expect increased mobility to lead to a reduction in differences in intergenerational redistribution over time.

6 Conclusion

In this survey, we have focused on the effect of factor mobility on the capacity of national governments to redistribute income. As emphasized in most studies surveyed, mobility makes it difficult to efficiently tax or subsidize mobile factors, whatever they are, capital or labor. To a certain extent, the effects of labor and capital mobility are alike, which is a bit surprising. There are however some differences. First, labor income tax base tends to be empirically much broader than that of capital income. Second, and more importantly, the similarity hinges upon the assumption that the national governments are concerned all the welfare of all mobile nationals regardless of their location.

Another distinction concerns the possibility of formal or informal discrimination between an incoming factor of production and a long time established one. In the case of capital mobility and given the source based principle, it often happens that foreign capital income is subject to a lower

²²See also Jousten and Pestieau (2002).

tax , if any, than domestic capital income. In the case of labor mobility, and specifically of low skill labor, the residence based principle applies and differential tax treatment is hardly conceivable except in the treatment of illegal migration.

Regardless of these differences, we have seen that in general, factor mobility makes it difficult to conduct the same redistribution policies as would be conducted in autarky. This is where one thinks of centralization or cooperation. We have seen that in a number cases the type of equilibrium with lower redistribution was of the Pareto-inferior type. In other words, cooperation is feasible. However, in many real-life asymmetrical situations, the non-cooperative solution is not of that type. Further, besides regional income redistribution, there is another issue, namely that of redistribution across regions for which a certain centralized compelling authority is unavoidable.

We have also pointed out another possible pitfall of cooperation which arises because a coordinated setting of *all* relevant tax instruments may not be a realistic perspective. A piece-meal approach involving only partial cooperation (or harmonization) appears to be more reasonable to expect. But then the welfare impact of the cooperation policy is less straightforward to assess. For instance, if the EU countries were to agree on minimum tax rates on capital incomes, this might lead to fiercer tax competition for the setting of other tax instruments.

Finally, we have briefly reviewed some recent contributions which go beyond the scope of the traditional tax competition literature. These papers study for example, the issue of the co-existence of PAYG and of fully funded FF pension systems within an economic union. The question is whether such a co-existence can be sustained and if yes, what type of adjustments will be induced by economic integration.

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