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ABSTRACT: In Europe there are countries whose welfare system is more in the tradition of Beveridge (based on universal flat benefits) and others whose system is mainly Bismarkian (based on benefits related to past contributions). Labor mobility across different countries raises concerns about the sustainability of the most generous and redistributive insurance systems. We address the sustainability of more redistributive insurance systems in a context of labor mobility. In a two/countries setting We find out that a Bismarkian insurance policy is never affected by migration but that the Beveridgean one is. Moreover, our results suggest that the race-to-the-bottom affecting tax rates may be more important under Beveridge-Beveridge competition than under Beveridge-Bismarck competition. Additionally, Bismarkian governments may find it beneficially to adopt a Beveridgean policy.

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1 Introduction

European Commission set the year 2006 as the European year of worker's mobility. Even though currently workers' mobility within Europe is not substantial it is expected to gain importance in the years to come. Indeed, politicians are pushing it through as they think that "job mobility is one of the crucial factors in Europe's economic success" (Špidla, 2006). Moreover, younger people are the most mobile with 5% of the age groups 25-34 having moved at least once across EU countries. Finally, the 2004 EU enlargement allowed migration of more mobile citizens with 5% of the 2004 new member states individuals expecting to move to another EU country in the next five years (Vandenbrande et al., 2006).

Mobility across different countries affects the coexistence of different social insurance systems. As a matter of fact, one finds in Europe countries whose welfare system is more in the tradition of Beveridge (based on universal flat benefits) and others whose system is mainly Bismarkian (based on benefits related to past contributions). Since social contributions are related to individual incomes, the more Beveridgean welfare systems have a higher implicit income redistribution. Consequently, mobility raises concerns about the sustainability of the most generous and redistributive systems. The reason is that it can be expected that the most generous and redistributive systems, when facing mobility, will attract the lowest incomes and the highest risks and will repeal the highest incomes and the lowest risks (Sinn, 1990). Therefore, redistribution and the size of benefits would be substantially decreased.

The aim of this project is precisely to conclude about the sustainability of more redistributive insurance systems in a context of labor mobility. The novelty of our approach is twofold. First, we introduce migration costs in the analysis in view of getting more realistic interior solutions. While this assumption is commonly used in a tax competition setting (Hindriks, 1999 and Leite-Monteiro, 1997) to our knowledge it hasn't yet been used in a social competition setting. Second, we will consider a strategic interaction between governments in setting the type, i.e., Beveridge versus Bismark, and the level of social insurance benefits, i.e., the generosity of the system. We will contrast

the equilibrium arising from if both governments have concerns for redistribution and insurance, if both countries have concerns for insurance only, and if one government has concerns for redistribution and insurance while the other only cares for insurance.

The issue of tax competition in a context of factors mobility has already been widely studied (see Cremer and Pestieau (2004) for a survey). However much needs to be assessed in what concerns social insurance competition. There are mainly two papers closely related to our project. Cremer and Pestieau (1998) study the strategic interaction between benevolent social planners in a two-country setting. They suppose a three-stage decision process where in the first stage, the constitutional stage, social planners decide the degree of redistribution of social insurance (the Bismarkian factor). At the second stage native individuals decide through majority voting on the level of payroll taxes, i.e., the level of benefits. At the third stage individuals decide upon migration. They get the result that if rich are mobile they end up all living in the same country. This implies that one of the countries would insure but not redistribute. Another result is that, when countries adopt the same level of redistribution, the level of benefits is greater the less redistributive (less Bismarkian) is the social insurance system. Finally, at stage one the equilibrium is symmetric, i.e., the planners choose the same level of redistribution. Consequently, all countries would end up with the same Bismarkian factor in contrast to what we observe in reality. Still, that is not what is observed in reality. For this reason in a following paper, Cremer and Pestieau (2003) have analyzed social insurance competition between Bismarkian and Beveridgean systems. Decisions are taken in two stages: the benevolent social planner decides upon the level of benefits, anticipating the migration flows of the second stage. They get the result that all poor may end up migrating towards the Bismarkian country. In both Cremer and Pestieau (1998, 2003) papers bang-bang solutions with all poor/rich migrating towards the same country is due to the absence of migration costs.

Other authors have as well contributed to the literature on social insurance in a context of labour mobility. As Cremer and Pestieau (2003), Lejour and Verbon (1994) also get the result that the impact of economic integration on social insurance depends very much on the type of mobility assumed. However, they have assumed high-risk and

low-risk individuals rather than high income and low income individuals. Bureau and Richard (1997) get an analogous result.¹

In the present paper we consider a two country setting where individuals are endowed with either low or high income and face the risk of loosing it. They are born in one of the countries and can decide their country of residence. Although they have a preference for living in their home country (Leite-Monteiro, 1997 and Hindriks, 1999). This preference for the home country enables to get rid off the bang bang solutions, present for example in Cremer and Pestieau (1998, 2003). The social planner aims at maximizing the welfare of its natives (in contrast of its residents).

The timing of decisions is as follows. The type of social insurance benefits is, at first, given and governments implement either a Bismarkian or a Beveridgean social insurance policy. At a first stage of interaction, governments choose noncooperatively the level of payroll taxes, i.e., the size of the system. Knowing the type and size of the system, individuals decide about their country of residence. Governments care for their natives only and when setting the payroll tax they anticipate the migration equilibrium. We will consider three scenarios: one in which both countries adopt a Beveridgean social policy, another in which both adopt a Bismarkian one, and finally one in which one country adopt a Beveridgean and the other a Bismarkian policy. An important contribution of the present paper is that we justify the adoption of different types of system by considering different types of governments' preferences. Therefore we allow for governments to care for redistribution and insurance or insurance only. Finally, given governments' preferences we illustrate the role of a strategic choice of the type of the system.

Our paper is organized as follows. In Section 2 we introduce the model and in Section 3 we characterize the governments' choices under autarky; it constitutes thus our benchmark. In Section 4.1 we characterize the tax competition among Bismarkian governments, in Section 4.2 between Beveridgean governments and in Section 4.3 we

¹ Another line of research has dealt with the effect of social insurance incentives on human capital investment. Poutvaara (2007) gets the result that labor mobility increases investments in human capital in the Beveridgean country but reduces that of migrants from Bismarkian towards the Beveridgean country.

consider the third possibility in which one government implements a Beveridgean policy and the other a Bismarkian one. In Section 5 we provide numerical examples for our theoretical results. Section 6 considers the strategical choice of the type of system. Finally, Section

2 Setup

There are two countries, indexed by A and B . Individuals differ in their wage, w_i , with $i = L, H$ and $w_L < w_H$. Labor supply is inelastic and normalized at one so that w_i also represents exogenous income. The size of high-income (also referred to as “rich”) and low-income (also referred to as “poor”) populations are each set at one. Individuals also differ with respect to their preference for living in a country. Their taste is captured by the parameter $x \in [0, 1]$ (Monsoorian and Myers, 1993, and Hindriks, 1999), uniformly distributed over $[0, 1]$ for both high- and low-income individuals. Preferences of an individual i , who lives in country A or B are respectively defined by

$$U_i^A = \ln[w_i^A] + 1 - x \quad (1)$$

$$U_i^B = \ln[w_i^B] + x, \quad (2)$$

where w_i^j , is the individual’s disposable income when residing in country $j = A, B$. Country A ’s natives are individuals with a taste parameter $x \leq 1/2$ and country B ’s natives those with a taste parameter $x > 1/2$. Consequently both countries have a native population of 1, equally composed of low- and high-income individuals.

<FIGURE 1 about here>

For the ease of exposition we suppose for the time being that only low-income individuals face the risk to loose their income, with a probability of $1/2$. In Section 5 we shall relax this assumption and consider that all individuals face the risk to loose their income. National governments provide social insurance which gives poor individuals a benefit in the bad state of nature (when they loose their earning ability). Social insurance is financed by taxes, with the tax base depending on the *type* of system. When the system is Bismarckian there is no redistribution and benefits to the low-income individuals are financed by taxes levied on low-income individuals. Under a

Beveridgean system, on the other hand, the benefits to the low income individuals are financed by a proportional tax levied on both income classes at a uniform rate.

We assume, for the time being, that the system which is adopted and the preferences of the respective government go hand in hand. In other words, a Bismarckian government implements a Bismarckian system, while a Beveridgean government selects a Beveridgean system. Governments are labeled according to their preferences, which may or may not reflect a concern for redistribution.²

We adopt a specification of social welfare which explicitly distinguishes between redistribution across income classes and the provision of insurance (which can be thought about as redistribution between states of nature). To do so, define the certainty equivalent of a low-income individual, CE_L^j , who lives in country $j = A, B$, as

$$\begin{aligned}\ln [CE_L^j] &= \frac{1}{2} \ln [w_L(1 - t_L^j)] + \frac{1}{2} \ln [b^j] \\ CE_L^j &= \left(w_L(1 - t_L^j)b^j \right)^{1/2},\end{aligned}\tag{3}$$

where t_L^j is the tax rate for low income individuals in country j , and b^j the benefit they receive in case of income loss. High income individuals do not face any uncertainty, and their certainty equivalent is simply given by

$$CE_H^j = w_H(1 - t_H^j),\tag{4}$$

where t_H^j is the tax rate applied to rich individuals in country j . For simplicity, we concentrate at this point on the case when no migration occurs, so that there is no need to distinguish between residents and natives. Preferences of country A 's and B 's governments are respectively given by

$$SWF^A = \int_0^{1/2} \frac{(CE_L^A)^{1-\rho^A} - 1}{1 - \rho^A} + \frac{(CE_H^A)^{1-\rho^A} - 1}{1 - \rho^A} + 2 \int_0^{1/2} (1 - x) dx\tag{5}$$

$$SWF^B = \int_{1/2}^1 \frac{(CE_L^B)^{1-\rho^B} - 1}{1 - \rho^B} + \frac{(CE_H^B)^{1-\rho^B} - 1}{1 - \rho^B} dx + 2 \int_{1/2}^1 x dx,\tag{6}$$

where $\rho^j \geq 0$ represents the government's "preference for redistribution". When $\rho^j = 0$, redistribution across income groups does not provide any social benefits (while insurance does). At the other extreme, $\rho^j \rightarrow \infty$ yields a Rawlsian social welfare function.

²This assumption will be relaxed in Section 6.

The last term on the RHS of both expressions accounts for low and high income individuals' utility for living in the home country. We consider two specifications of social preferences. The first assumes $\rho^j = 0$ and reflects the absence of income redistribution concerns characteristic of Bismarckian countries. The second assumes $\rho^j = 1$, reflecting some income redistribution concern characteristic of Beveridgean countries (and being conveniently simplified to logarithmic). To sum up government A 's preferences are given by either of the following two expressions

$$SWF^A = \int_0^{1/2} \ln(CE_L^A) + \ln(CE_H^A) dx + 2 \int_0^{1/2} (1-x) dx, \text{ if } \rho^A = 1 \quad (7)$$

$$SWF^A = \int_0^{1/2} (CE_L^A - 1) + (CE_H^A - 1) dx + 2 \int_0^{1/2} (1-x) dx, \text{ if } \rho^A = 0 \quad (8)$$

with analogous expressions applying for government B .³ Observe that expression (7) can also be interpreted as a simple utilitarian welfare function (sum of individual utilities) defined without the detour of certainty equivalents. When mobility and the possibility of tax competition are introduced, three different cases can arise: (i) Both countries have Bismarckian type of preferences (insurance concerns only, with $\rho^A = 0$, and $\rho^B = 0$); (ii) Both countries have Beveridgean type of preferences (insurance and redistribution concerns, with $\rho^A = 1$, and $\rho^B = 1$); and (iii) Government A has Beveridgean type of preferences while Planner B has Bismarckian ones ($\rho^A = 1$ and $\rho^B = 0$).

3 Autarky

To have a benchmark we first look at the optimal choices of Bismarckian and Beveridgean governments when migration is not possible. We adopt the perspective of country A , but similar results are easily obtained for country B .

In the case of a Bismarckian system, the poor individuals insure among themselves while rich individuals do not contribute ($t_H^A = 0$). This means that the only implicit redistribution is within the class of low income individuals, from those in the good state of nature (no income loss) towards those in the bad one (income loss). With a loss

³Both of these expressions are valid under autarky; they may have to be amended once mobility is introduced.

probability of 1/2 budget-balancing benefits are given by

$$b^A = w_L t_L^A. \quad (9)$$

Substituting (9) into (3) and simplifying yields

$$CE_L^A = w_L(1 - t_L^A)t_L^A,$$

while $t_H^A = 0$ implies $CE_H^A = w_H$. Substituting into (8) and rearranging we obtain

$$SWF^A = \frac{1}{2}[w_L(1 - t_L^A)t_L^A + w_H] + 2 \int_0^{0.5} (1 - x) dx. \quad (10)$$

Maximizing this expression with respect to t_L^A

$$t_L^{BIS} = \frac{1}{2}. \quad (11)$$

This result does not come as a surprise: under autarky, the Bismarckian planner provides full insurance at the actuarially fair price.⁴

Turning to the Beveridgean government, it provides insurance to the low income individuals financed by a tax levied on both income classes at a uniform rate $t_L^A = t_H^A = t^A$. The government's budget constraint requires

$$\frac{1}{4}b^A = \frac{1}{4}w_L t^A + \frac{1}{2}w_H t^A,$$

so that benefits are given by

$$b^A = (w_L + 2w_H) t^A.$$

Using this condition along with equation (7) the Beveridgean government's welfare function can be rewritten as

$$SWF^A = \frac{1}{2} \ln [w_L(1 - t^A)] + \frac{1}{2} \ln [(w_L + 2w_H) t^A] + \ln(w_H(1 - t^A)) + 2 \int_0^{1/2} (1 - x) dx.$$

Maximizing this expression with respect to t^A yields the solution $t^{BEV} = 1/4$.

⁴This property holds for any (strictly) concave utility function (and not just the logarithmic specification).

4 Migration of low income individuals

We now introduce the possibility of the poor migrating to the other country. The timing is the following. At Stage 1 both governments simultaneously choose taxes. Then, at Stage 2 low income individuals decide upon their country of residence. Finally, at Stage 3 the state of nature is realized for poor individuals (who may or may not loose their earning ability).

We suppose that a country's type of system (Beveridgean or Bismarckian) is given and determined by its government's preferences. Low income individuals' migration flows are defined with respect to native populations. Consequently, as long as there is some migration flow, the low income resident populations differ from the native ones. This affects both the budget constraint and the welfare functions. Although governments only care about their natives they supply social insurance to *all* their residents. On the other hand, governments do care also for their natives who are living abroad and subjected to other social insurance systems.

Let \hat{x}_L denote the index of the marginal individual, who is indifferent between living in country A or in country B . It is defined as solution to

$$\frac{1}{2} \ln [w_L(1 - t_L^A)] + \frac{1}{2} \ln [b^A] + (1 - \hat{x}_L) = \frac{1}{2} \ln [w_L(1 - t_L^B)] + \frac{1}{2} \ln [b^B] + \hat{x}_L, \quad (12)$$

if such a solution exists. Poor individuals with a taste parameter lower than \hat{x}_L decide to live in country A . When (12) has no solution we set $\hat{x}_L = 1$ when $U_L^A > U_L^B$ for all x and $\hat{x}_L = 0$ in the opposite case. Throughout the paper we concentrate on the case where \hat{x}_L is interior. This is necessarily true in a symmetric equilibrium, but it may or may not be true in asymmetric settings. Still, we focus precisely on interior solutions as bang bang solutions, with all individuals migrating towards a same country, have already been addressed in the literature (see for instances Cremer and Pestieau, 2003).

We now study how the possibility of migration affects competition among different types of insurance systems.

4.1 Bismarck Bismarck tax competition

Recall that when migration is not possible, Bismarckian governments tax their low income individuals at $1/2$ providing them with full insurance. Under migration a government's policy choice affects the residential decision of both countries natives. To study a symmetric equilibrium we focus on country A 's perspective and assume without loss of generality that $\hat{x}_L \geq 1/2$.⁵ The budget constraint is

$$\frac{1}{2}\hat{x}_L b^A = \frac{1}{2}\hat{x}_L t_L^A. \quad (13)$$

As long as $\hat{x}_L > 0$ this condition simplifies to

$$b^A = w_L t_L^A, \quad (14)$$

which is exactly identical to (9), the Bismarckian budget constraint under autarky. This does not come as a surprise. As low income residents insure among themselves (pay an actuarially fair rate), migration does not affect the budget constraint of the social insurance system. Furthermore, for $\hat{x}_L \geq 1/2$ government A 's welfare function continues to be given by

$$SWF^A = \int_0^{0.5} (CE_L^A - 1) + (CE_H^A - 1)dx + 2 \int_0^{0.5} (1 - x) dx, \quad (15)$$

which is the same as under autarky, because no native of country A has migrated to the other country. Substituting for CE_L^A and CE_H^A from equations (3) and (4), and using the budget constraint it is then plain that we return to equation (10), the expression of welfare under autarky. Consequently we obtain the same solution, namely $t_L^A = t_L^B = t_L^{BISBIS} = 1/2$, (where the subscript *BISBIS* stands for country A 's and country B 's type of insurance policy, respectively, Bismarckian and Bismarckian). Since $t_L^A = t_L^B$, there is no migration in equilibrium ($\hat{x}_L = 1/2$).

4.2 Beveridge Beveridge Tax Competition

We examine how migration affects Beveridge Beveridge tax competition. Each government charges the same tax rate to both resident income classes, so that $t_L^A = t_H^A = t^A$,

⁵To avoid a tedious exposition, and anticipating the migration equilibrium, we focus on $\hat{x}_L \geq 1/2$, but the analogous exercise can be done to $\hat{x}_L < 1/2$.

and $t_L^B = t_H^B = t^B$. As before we focus on Planner A with $\hat{x}_L \geq 1/2$. In contrast to the Bismarck-Bismarck competition case, migration now affects the budget constraint

$$\frac{1}{2}\hat{x}_L b^A = \frac{1}{2}\hat{x}_L w_L t^A + \frac{1}{2}w_H t^A, \quad (16)$$

so that the level of benefits are now given by

$$b^A = \left(w_L + \frac{w_H}{\hat{x}_L} \right) t^A. \quad (17)$$

Note surprisingly, for a given tax rate, the level of benefit in country A decreases as the size of the poor population increases (as \hat{x}_L raises). Substituting (17) into (12), the definition of \hat{x}_L , yields

$$\begin{aligned} & \frac{1}{2} \ln [w_L(1 - t^A)] + \frac{1}{2} \ln \left[\left(w_L + \frac{w_H}{\hat{x}_L} \right) t^A \right] + (1 - \hat{x}_L) = \\ & \frac{1}{2} \ln [w_L(1 - t^B)] + \frac{1}{2} \ln \left[\left(w_L + \frac{w_H}{1 - \hat{x}_L} \right) t^B \right] + \hat{x}_L. \end{aligned} \quad (18)$$

Totally differentiating this expression and rearranging, we obtain

$$\frac{\partial \hat{x}_L}{\partial t^A} = \frac{\frac{1}{2t^A} - \frac{1}{2(1-t^A)}}{2 + \frac{\frac{w_H}{w_L + \frac{w_H}{1-\hat{x}_L}}}{(1-\hat{x}_L)^2} + \frac{\frac{w_H}{w_L + \frac{w_H}{\hat{x}_L}}}{\hat{x}_L^2}}, \quad (19)$$

which is positive provided that $t^A < 1/2$. In words, the size of the low income population increases with the tax rate as long as the price of insurance is below the actuarial fair price. Conversely, when a country cuts its tax rate, it will incite some of its poor residents to move to the other country. For future reference, note that when $t^A = t^B$, we have $\hat{x}_L = 1/2$ and expression (19) simplifies to

$$\frac{\partial \hat{x}_L}{\partial t^A} = \frac{\frac{1}{2t^A} - \frac{1}{2(1-t^A)}}{2 + \frac{2w_H}{w_L + 2w_H}}. \quad (20)$$

Using the budget constraint, welfare of the Beveridgean government A (for $\hat{x}_L \geq 1/2$), defined by equation (7), can be expressed as follows

$$\begin{aligned} SWF^A = & \frac{1}{4} \ln [w_L(1 - t^A)] + \frac{1}{4} \ln \left[\left(w_L + \frac{w_H}{\hat{x}_L(t^A, t^B)} \right) t^A \right] \\ & + \frac{1}{2} \ln [w_H(1 - t^A)] + 2 \int_0^{0.5} (1 - x) dx. \end{aligned} \quad (21)$$

To understand this expression, recall that with $\hat{x}_L \geq 1/2$ all natives of country A live in country A . The first term on the RHS concerns the poor who do not experience an income loss, while the second term accounts for the poor who suffer an income loss (and receive social benefits). The third term represents the utility of consumption of the rich whereas the last terms measures the utility from living in country A , derived through the taste parameter x .

Differentiating welfare with respect to t^A yields the following FOC

$$F^{BEVBEV} = \frac{-3}{4(1-t^A)} + \frac{1}{4t^A} + \frac{w_H}{4(w_L + \frac{w_H}{\hat{x}_L})} \frac{-\partial \hat{x}_L / \partial t^A}{\hat{x}_L^2} = 0. \quad (22)$$

Using (20), setting $t = t^A = t^B$ and $\hat{x}_L = 1/2$ and solving show that in a symmetric equilibrium the tax rate is given by

$$t^{BEVBEV} = \frac{1}{4} \left(\frac{4w_H + 2w_L}{5w_H + 2w_L} \right) < \frac{1}{4}. \quad (23)$$

To interpret this result, recall that the tax rate under autarky is equal to $1/4$; see Section 3. In the Beveridgean case, migration and the induced tax competition thus results in a lower tax rate and a reduced level of social insurance. Not surprisingly, this result obtains even when there is effectively no migration in equilibrium, and it is in sharp contrast to the outcome of Bismarckian systems.

Summing up our results for the symmetric cases, we show that tax competition represents no threat to Bismarckian systems, while it leads to a lower (but positive) level of social protection with Beveridgean systems. These results are quite in line with conventional wisdom but they are of limited interest for practical policy issues because they only concern symmetric settings. The most interesting issues arise for the asymmetric cases to which we now turn.

4.3 Beveridge Bismarck Tax Competition

Suppose now that country A is Beveridgean while country B is Bismarckian. Benefits in country A continue to be given by equation (17) and those in country B are determined by

$$b^B = w_L t_L^B, \quad (24)$$

which is the counterpart to equation (14). The marginal individual, \hat{x}_L , is then determined by the condition

$$\begin{aligned} \frac{1}{2} \ln [w_L(1 - t^A)] + \frac{1}{2} \ln \left[\left(w_L + \frac{w_H}{\hat{x}_L} \right) t^A \right] + (1 - \hat{x}_L) = \\ \frac{1}{2} \ln [w_L(1 - t^B)] + \frac{1}{2} \ln [w_L t^B] + \hat{x}_L, \end{aligned} \quad (25)$$

stating that he enjoys the same level of utility in both countries.

Differentiating this expression, we obtain

$$\frac{\partial \hat{x}_L}{\partial t^A} = \frac{\frac{1}{t^A} - \frac{1}{(1-t^A)}}{4 + \frac{w_H}{\left(w_L + \frac{w_H}{\hat{x}_L} \right) \hat{x}_L^2}}. \quad (26)$$

This equation shows that country A 's resident population continues to be increasing in its own marginal tax rate (for $t^A < 1/2$) like in the case where the competing country was Beveridgean. Consequently, the direction of the migration response to a country's tax increase is independent of the other country's type. However, its magnitude is larger than under Beveridge-Beveridge competition. This property follows immediately from the comparison of (26) with (20) which implies

$$\left(\frac{\partial \hat{x}_L}{\partial t^A} \right)^{BEVBIS} > \left(\frac{\partial \hat{x}_L}{\partial t^A} \right)^{BEVBEV}. \quad (27)$$

Let us now determine best replies of each of the countries concentrating on the case where $\hat{x}_L \geq 1/2$, *i.e.*, some of the poor from the Bismarckian country move to the Beveridgean country. This is the case one would intuitively anticipate to occur and this expectation is confirmed in the numerical examples reported below. To study government B 's best response we now have to write its objective explicitly (a complication we have been able to avoid in the symmetric cases above). The specification under autarky, (6) with $\rho^B = 0$, is easily generalized to account for migration and $\hat{x}_L \geq 1/2$. Rearranging and simplifying this yield

$$\begin{aligned} SWF^B = & \left(\hat{x}_L - \frac{1}{2} \right) (CE_L^A - 1) + \int_{1/2}^{\hat{x}_L} (1 - x) dx + (1 - \hat{x}_L) (CE_L^B - 1) + \int_{\hat{x}_L}^1 x dx \\ & + \frac{1}{2} (CE_H^B - 1) + \int_{1/2}^1 x dx. \end{aligned} \quad (28)$$

The first two terms on the RHS of this expression concerns those poor natives of B which have moved to country A (*i.e.*, poor individuals with taste parameters in the range $[1/2, \hat{x}_L]$), while the next two terms account for the poor who remain in their native country B . Finally, there are the two terms representing the utility of the rich (who do not move, incur no risk and pay no taxes). The derivative of this expression with respect to the tax rate can be decomposed as follows:

$$\frac{\partial SWF^B}{\partial t^B} = \frac{\partial SWF^B}{\partial \hat{x}_L} \frac{\partial \hat{x}_L}{\partial t^B} + (1 - \hat{x}_L) \frac{\partial CE_L^B}{\partial t^B},$$

where we use the property that CE_L^A and CE_H^B do not depend on t^B . Observe that equation (25) implies $\partial SWF^B / \partial \hat{x}_L = 0$; because \hat{x}_L is by definition indifferent between both countries of residence, a small change in this marginal individual has no first-order effect on welfare. Consequently, the first-order condition for t^B reduces to

$$\frac{\partial CE_L^B}{\partial t^B} = \frac{\partial w_L(1 - t_L^B)t_L^B}{\partial t^B} = 0, \quad (29)$$

where we have used equations (3) and (24) to express CE_L^B as a function of t^B . Solving yields $t^B = 1/2$ irrespective of the tax of the other country. In other words, providing full and actuarially fair insurance remains the dominant strategy of the Bismarckian country and we have $t_L^{B^{BEVBIS}} = 1/2$.

Turning to government A , it maximizes its natives expected utility according to Beveridgean preferences. The problem (for $\hat{x}_L \geq 1/2$) is

$$SWF^A = \frac{1}{4} \ln [w_L(1 - t^A)] + \frac{1}{4} \ln \left[\left(w_L + \frac{w_H}{\hat{x}_L(t^A, t^B)} \right) t^A \right] \quad (30)$$

$$+ \frac{1}{2} \ln [w_H(1 - t^A)] + 2 \int_0^{0.5} (1 - x) dx, \quad (31)$$

and the FOC is given by

$$F^{BEVBIS} = \frac{-0.75}{1 - t^A} + \frac{0.25}{t^A} + 0.25 \frac{w_H}{w_L + \frac{w_H}{\hat{x}_L}} \frac{-\partial \hat{x}_L / \partial t^A}{\hat{x}_L^2} = 0. \quad (32)$$

First-order conditions (22) and (32) are too complicated to permit a clear-cut comparison between country A 's tax rate under Beveridge-Beveridge and that under Beveridge-Bismarck competition. With $\partial \hat{x}_L / \partial t^A > 0$, equation (27) then implies that for the same

migration level \hat{x}_L we have $F^{BEVBIS} < F^{BEVBEV}$. Consequently, for a given migration equilibrium (\hat{x}_L), government A sets a higher tax rate when it is competing with a Bismarckian country than when the other country is Beveridgean ($t^{BEVBIS} > t^{BEVBEV}$, for the same \hat{x}_L). This result suggests that, surprisingly, the Beveridgean country's social insurance system could be more generous when it competes with a Bismarckian country than with a Beveridgean country. Put differently, the race-to-the-bottom affecting tax rates and level of social protection could be less intense under a Beveridge-Beveridge competition than under a Beveridge-Bismarck competition.

Unfortunately the problem remains too complex to obtain analytical results beyond this somewhat speculative argument, even with our logarithmic specification. The following two sections present numerical examples to illustrate the conclusions obtained so far and to obtain some additional results.

5 Numerical examples

We now present numerical examples assuming $\{w_L, w_H\} = \{1, 2\}$. Columns 2 and 3 of Table 1 present the outcome for a Beveridgean and a Bismarckian country under autarky. In accordance with the analytical results, the Beveridgean government imposes a uniform tax rate of $1/4$, while poor residents of a Bismarckian country face a tax rate of $1/2$. Observe that welfare levels among planners with different preferences are not comparable.

Columns 4–6 present the results for the three types of tax competition when low income individuals have the possibility to migrate. We can draw the following conclusions. First, *migration affects Beveridgean insurance policies only*; Bismarckian countries keep offering actuarially fair full insurance. Beveridgean countries, on the other hand, are forced to reduce their marginal tax rates. Second, the Beveridgean tax is greater when the other country is Bismarckian planner than when it is Beveridgean (0.224 vs. 0.219). This numerical result confirms the conjecture expressed in the analytical part, that *the race-to-the-bottom affecting tax rates may be more important under Beveridge-Beveridge competition than under Beveridge-Bismarck competition*. Third, *a more significant tax-race-to-the-bottom is not necessarily bad news*. The Beveridgean

country attains a higher welfare under the Beveridge-Beveridge competition than under Beveridge-Bismarck competition, even though the tax rate is lower. This is because under Beveridge-Bismarck competition the cost of receiving migrants from country B (poor individuals with a taste parameter x in the range $[0.5, 0.74]$) is not offset by a slightly higher marginal tax rate. On the other hand, under Beveridge-Beveridge competition, the symmetry of the problem ensures no migration flows in equilibrium. Fourth, competition with a Beveridgean country may *increase the welfare of a Bismarckian country*, even when the social insurance policy is unchanged. This is because the low income migrants are better off in the Beveridgean country A (recall that welfare depends on the natives). All the other low-income individuals ($x > 0.74$) are as well off as under autarky. They have the option to move to the other country but for them the benefit of a Beveridgean insurance policy does not offset the cost of migration (because the high level of x represents a large degree of attachment to the home country).

So far we have concentrated on case where only the poor face and earnings risk and are mobile. The last three columns of Table 1 present some results for the case where the rich are mobile (while the earnings risk continues to be restricted to the poor). When the high income individuals are mobile, the tax-race-to-the-bottom under Beveridge-Beveridge competition is more significant than when the poor are mobile. Consequently, at the no migration equilibrium of the Beveridge-Beveridge competition low income individuals are worse-off and high income ones are better-off (Column 4 and Column 7). However, under Beveridge-Bismarck competition the mobility of high income individuals generates a higher welfare for both income classes than the mobility of the poor (Column 6 and Column 9). The reason is that being low income individuals immobile, the natives of the Bismarckian country cannot migrate towards the Beveridgean one, and, at the same time, high income individuals natives of the Beveridgean country can migrate towards the Bismarckian country and enjoy a higher utility.

Finally, let us consider the case where rich individuals also face an income risk that may be insured by social insurance. Table 2 presents the results. We suppose that all individuals may lose their entire income with probability $1/2$ (the same for all). The Beveridgean country taxes low and high income individuals at the same rate and

provides a flat benefit to all individuals experiencing a loss. The Bismarckian planner provides actuarially fair full insurance to each income class.

The results show that, with only one exception, there is no tax-race-to-the-bottom, so that mobility has no impact on social insurance and welfare. The only exception concerns the Beveridge-Bismarck tax competition. With low income individuals being mobile, even though taxes do not decrease, there is migration towards the Beveridgean country. When instead high income are mobiles, the Beveridgean government is forced to lower the tax from 0.5 to 0.445 to avoid a greater migration towards the Bismarckian country. Nevertheless, the Beveridgean country attains its highest level of welfare when it competes with a Bismarckian country and when high income individuals are mobile.

<Table 1 about here>

<Table 2 about here>

6 Choice of the system

Up to this point, we have assumed that preferences and type of system go hand in hand. We shall now explicitly separate governments' preferences from the type of system. Under autarky, such a separation is of course not very relevant. When there is no mobility it is plain that a Beveridgean government will prefer a Beveridgean social insurance system over a Bismarckian one. Similarly, a Bismarckian government would never opt for a Beveridgean system. When there is competition, the choice of the system may in itself be part of a government's strategy. The question is if a government of a given type may find it beneficial to adopt a system for the other type for strategic reasons (*i.e.*, considering the tax competition game to be played with the other country). Our analysis is purely illustrative and we make use of a numerical example developed in the previous section. Formally, We add a stage to the game where governments decide which type of system to adopt. This decision is made (simultaneously) by both governments before tax competition game considered in the previous section is played and there is full commitment. We focus on the case where only the poor face an income risk and are mobile. insurance and mobility of the poor only. Table 3 describes the three possible games that may be played, depending on the type of governments. They can both have

Beveridgean preferences (Sub-game 1), one government (say that of country A) can have Beveridgean preferences while the other has a Bismarckian objective (Sub-game2). Finally, they can both have Bismarckian preferences (Sub-game3). For each type of preferences they may choose to implement either a Beveridgean insurance system or a Bismarckian one.

Our results suggest that when both governments have identical preferences, they choose the social insurance system associated with their type. A more interesting and surprising outcome emerges in the asymmetric case where government A has Beveridgean preferences and government B Bismarckian ones. In this case the Nash equilibrium implies that both players choose a Beveridgean insurance policy. Table 4 presents the detailed results for this case. It shows that government B finds it optimal to adopt a Beveridgean insurance policy with a low tax (of 11% as opposed to the 22% tax in country A). In this way the best response of Planner A is to increase slightly the tax since the threat of migration is not as strong as compared to the equilibrium one when in competition with a Bismarckian policy. Of notice that also country A is better off.

<Table 3 about here>

<Table 4 about here>

7 Conclusion

We address the question of social insurance systems integration in a two-country setting where countries choose simultaneously and non-cooperatively the tax to be charged. We analyze three possibilities: both governments provide Bismark-type of insurance, both governments provide Beveridge-type of insurance, and one government provides a Beveridge-type of insurance and the other a Bismark one. We conclude that a Bismarkian insurance policy is never affected by migration but that the Beveridgean one is. Moreover, our results suggest that the race-to-the-bottom affecting tax rates may be more important under Beveridge-Beveridge competition than under Beveridge-Bismarck competition but that still the Beveridgean country attains a higher welfare under the Beveridge-Beveridge competition than under Beveridge-Bismarck competition. We also considered the strategic choice of the type of the system and illustrated that, when in

competition to Beveridgean governments, Bismarkian governments may find it beneficially to adopt a Beveridgean policy.

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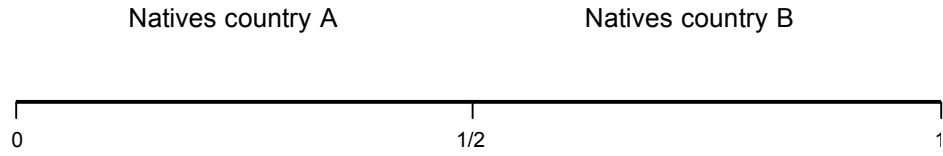


Figure 1 – Natives of country A and country B.

Table 1 – Insurance of the poor

| No Mobility | | | Mobility of the poor | | | Mobility of the rich | | |
|-------------|-------------|-------------|----------------------|-------------|-------------|----------------------|-------------|-------------|
| Country A | BEV | BIS | BEV | BIS | BEV | BEV | BIS | BEV |
| Country B | | | BEV | BIS | BIS | BEV | BIS | BIS |
| t^A | 0.25 | 0.50 | 0.219 | 0.50 | 0.2224 | 0.208 | 0.50 | 0.2223 |
| t^B | | | 0.219 | 0.50 | 0.50 | 0.208 | 0.50 | 0.50 |
| x^c_L | | | 0.500 | 0.50 | 0.74 | | | |
| x^c_H | | | | | | 0.50 | 0.50 | 0.37 |
| SWF^A_L | 0.36 | 0.13 | 0.336 | 0.13 | 0.26 | 0.327 | 0.13 | 0.28 |
| SWF^A_H | 0.58 | 0.88 | 0.598 | 0.88 | 0.60 | 0.605 | 0.88 | 0.61 |
| SWF^A | 0.94 | 1.00 | 0.934 | 1.00 | 0.86 | 0.932 | 1.00 | 0.89 |
| SWF^B_L | | | 0.336 | 0.13 | 0.14 | 0.327 | 0.13 | 0.13 |
| SWF^B_H | | | 0.598 | 0.88 | 0.88 | 0.605 | 0.88 | 0.88 |
| SWF^B | | | 0.934 | 1.00 | 1.02 | 0.932 | 1.00 | 1.00 |

Table 2 – Insurance for all.

| No Mobility | | | Mobility of the poor | | | Mobility of the rich | | |
|-------------|--------------|--------------|----------------------|--------------|--------------|----------------------|--------------|--------------|
| Country A | BEV | BIS | BEV | BIS | BEV | BEV | BIS | BEV |
| Country B | | | BEV | BIS | BIS | BEV | BIS | BIS |
| t^A | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 0.445 |
| t^B | | | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 | 0.500 |
| x^c_L | | | 0.500 | 0.500 | 0.594 | | | |
| x^c_H | | | | | | 0.500 | 0.500 | 0.417 |
| SWF^A_L | 0.130 | 0.125 | 0.130 | 0.125 | 0.123 | 0.130 | 0.125 | 0.119 |
| SWF^A_H | 0.303 | 0.375 | 0.303 | 0.375 | 0.296 | 0.303 | 0.375 | 0.345 |
| SWF^A | 0.433 | 0.500 | 0.433 | 0.500 | 0.418 | 0.433 | 0.500 | 0.464 |
| SWF^B_L | | | 0.130 | 0.125 | 0.126 | 0.130 | 0.125 | 0.125 |
| SWF^B_H | | | 0.303 | 0.375 | 0.375 | 0.303 | 0.375 | 0.375 |
| SWF^B | | | 0.433 | 0.500 | 0.501 | 0.433 | 0.500 | 0.500 |

Table 3 - Strategical choice of the type of system, given government's preferences

| Government A | Type of preferences | | Government B | | | |
|--------------|---------------------|-----|---------------------|--------------|---------------------|---------------------|
| | | | BEV | | BIS | |
| | Type of policy | | BEV | BIS | BEV | BIS |
| | | | BEV | BIS | BEV | BIS |
| Government A | BEV | BEV | 0.934; 0.934 | 0.860; 0.806 | 0.906; 1.019 | 0.860; 1.016 |
| | | BIS | 0.860; 0.806 | 0.750; 0.750 | 0.900; 0.103 | 0.750; 1.000 |
| | BIS | BEV | 1.019; 0.906 | 0.103; 0.900 | 0.994; 0.994 | 0.961; 1.002 |
| | | BIS | 1.016; 0.860 | 1.000; 0.750 | 1.002; 0.961 | 1.000; 1.000 |

Table 4 - Beveridge Beveridge tax competition versus Beveridge Bismark tax competition when Government A has Beveridgean type of preferences and Government B has Bismarkian ones. Insurance of the poor, mobility of the poor.

| Government A | | |
|---------------------------|--------------|--------------|
| Beveridgean | BEV | BEV |
| Bismarkian preferences | BEV | BIS |
| t^A | 0.225 | 0.222 |
| t^B | 0.110 | 0.500 |
| x_L | 0.579 | 0.736 |
| | | |
| SWF^A_L | 0.312 | 0.265 |
| SWF^A_H | 0.594 | 0.596 |
| SWF^A | 0.906 | 0.860 |
| SWF^B_L | 0.255 | 0.084 |
| SWF^B_H | 0.765 | 0.722 |
| SWF^B | 1.019 | 0.806 |

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