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PONENCIA

Redistribution, capital income taxation and tax evasion.

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REDISTRIBUTION, CAPITAL INCOME TAXATION AND TAX EVASION.

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ABSTRACT

Factor mobility and tax evasion are two phenomena that constraint the effectiveness of redistributive policies now used by the member countries of the European Union. In this paper, a normative analysis of this fact is undertaken using a simple model with two countries and two social classes, where capital is perfectly mobile and labour is immobile. Each country complements the income of its workers, assumed to be poor, with transfers. The latter are financed with two taxes on capital income. The first one, following the origin principle, alters the return and international allocation of capital. The second one, following the residence principle, induces the evasion of capitalists' incomes. Each government chooses the optimal mix of capital taxes that maximizes the welfare of its citizens with no regard on the repercussions on its neighbour country. A numerical exercise is built to examine the sensitivity of the resulting non cooperative equilibrium to the aversion to inequality exhibited by the different governments as well as to the factor endowments of their respective countries.

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1. INTRODUCTION

Over the last decades, member countries of the E.U. have experienced increasing capital and to a lesser extent labor mobility. This along with the process of economic integration lead and still leads to a number of positive effects. However, it has also the effect of making increasingly difficult redistributive policies at the national level. The basic idea is that mobile factors can react to any international differentials in taxation or benefits. National governments cannot abstract from such potential reaction when designing redistributve policies.

In this paper we concentrate on the effect of international mobility of capital on the capacity of nations to redistribute income. To make the problem more realistic we allow for tax evasion, which is an issue of great concern for E.U countries. Our treatment of tax evasion is, however, rudimentary . We follow Boadway-Marchand-Pestieau (1994) in using a cost of tax evasion (or income concealment), which depends on the amount of income evaded. It is assumed that once incurred, the tax evader is certain to escape detection by tax authorities. In other words, he does not face any uncertainty. Alternatively, our model could be interpreted as one of tax avoidance with compliance costs.[1]

To cope with this issues, we consider in this paper a two-country model with mobile capital and immobile labor. Even though such a setting fits the European reality, it has not been extensively studied.[2] In our model, we assume that each country consists of two classes: the workers and the capital owners. Two taxes on capital income are introduced to finance transfers towards the workers, assumed to be the poor.These taxes exhibit different evasion characteristics. The first one, following the origin principle, alters the return and international allocation of capital and cannot be evaded. The second one, following the residence principle, induces the evasion of capitalists' incomes.

We show that national governments acting without coordination will find it difficult to distribute resources from mobile capital to immobile labor. We construct a numerical experiment in order to examine the sensitivity of the resulting non cooperative equilibrium to the aversion to inequality exhibited by the different governments as well as to the factor endowments of their respective countries. Taking as the starting point the case of no evasion, then we examine two cases of decreasing difficulty for tax evasion. Their comparison proves that as tax evasion becomes

[1] See Mayshar (1991).

[2] See however Gabszewicz and van Ypersele (1994) and the survey by Cremer et alii (1995). The present paper constitutes an extension of López-Marchand-Pestieau (1995) allowing for tax evasion

easier, redistribution worsens . When the evasion cost is lowered capitalists become richer, workers become poorer, and national income falls. The cost of evasion is wasteful loss of resources. As for the tax instruments, the residence-based taxes fall whereas the source-based taxes rise (from a negligible level).

2. THE MODEL

Consider a world economy composed of two nations (indexed by $i = A, B$). In country i there are N_i workers each endowed with one unit of labor and M_i capitalists, each endowed with $\overline{K}_i / M_i$ units of capital. Both agents supply their endowments inelasticially. We assume that labor is immobile whereas capital is mobile. Capital mobility allows capitalists to invest in any country so that if we denote by K_i the capital invested in country i we will typically have $K_i \neq \overline{K}_i$.

Production

Both countries use the same constant returns to scale technology. In any country i capital and labor are used as inputs by an aggregate domestic perfectly competitive firm to obtain a nontraded commodity according to the production function

$$(1) \qquad Z_i = F(K_i, N_i) = N_i f(k_i) \quad \text{with} \quad k_i = \frac{K_i}{N_i} \quad i = A, B$$

This output may be seen as the Gross Domestic Product of country i. Normalizing the price of output to equal one, we have the familiar profit-maximization conditions:

$$(2) \qquad f'(k_i) = r + \tau_i \quad \text{and} \quad f(k_i) - k_i f'(k_i) = w_i,$$

where w_i denotes the prevailing wage rate in country i and τ_i is a source-based capital tax. Notice that τ_i inserts a wedge between the cost of capital to domestic firms, $r + \tau_i$, and the domestic return on capital, r. The latter is common to both countries due to the existence of an international capital market. Conditions (2) can be used to obtain the demand for capital and the factor-price frontier:

$$(3) \qquad k_i(r + \tau_i) \quad \text{and} \quad w_i(r + \tau_i) \quad \text{with} \quad w_i' = -k_i;$$

to be employed below.

Workers

All individuals are assumed to have the same well behaved utility function defined on income. Incomes are however different. For a worker, it is the sum of his wage income and a lump sum transfer, that is

$$(4) \qquad u_i(y_{wi}) \quad \text{with} \quad u_i' > 0,\ u_i'' < 0 \quad \text{and} \quad y_{wi} = w_i + T_i .$$

Capitalists

For a capitalist, with utility function

$$(5) \qquad v_i(y_{ci}) \quad \text{with} \quad v_i(\cdot) = u_i(\cdot)$$

his income is given by the sum of his domestic income plus his foreign income minus the cost of evasion in which he incurs, that is

$$(6) \qquad y_{ci} = (r - t_i)\cdot s_i + r\cdot(\bar{k}_i - s_i) - \sigma_i(\bar{k}_i - s_i) = r\bar{k}_i - t_i s_i - \sigma_i(\bar{k}_i - s_i).$$

Some extra notation has been introduced in (6). For any capitalist in country i we denote $\bar{k}_i \equiv \bar{K}_i / M_i$: his capital endowment, s_i : his domestic investment, $(\bar{k}_i - s_i) \geq 0$: his capital invested abroad (totally evaded), r : per unit return on capital in the world economy, t_i : residence-based unitary capital tax levied in country i, $(r - t_i)$: per unit net return on capital in country i, $(r - t_i)s_i$: his domestic income, $r\cdot(\bar{k}_i - s_i)$: his foreign income, and $\sigma_i(\bar{k}_i - s_i)$: his evasion cost.

Our formulation of tax evasion is deliberately exploratory (rudimentary, if you wish). We assume, following Boadway-Marchand-Pestieau (1994), that any capitalist bears a cost of tax evasion which is increasing in the capital evaded and that, once incurred, he is certain to escape detection by tax authorities. In other words, no attempt is made to model the capitalist decision of how much income to evade as a decision under uncertainty with a probability of getting caught and a penalty for being caught.

Contrary to workers, capitalists are not income takers. Any capitalist chooses the domestic investment that maximizes (6)[3]. The FOC is as follows:

$$(7) \qquad 0 = \frac{dy_{ic}}{ds_i} = (r - t_i) - (r - \sigma_i') \Rightarrow t_i = \sigma_i'$$

and has a simple interpretation. The capitalist will evade up to the point where the net return on capital is the same in his domestic country as abroad. Or equivalently, until the point in which the unitary tax equals the marginal cost of tax evasion.

As for the SOC :

[3] Or (5) s.t. (6)

(8) $$0 > \frac{d^2 y_{ic}}{ds_i^2} \Rightarrow 0 > \frac{d\sigma_i'}{ds_i}$$

it requires the cost of evasion, σ_i, to be an increasing ($\sigma_i' > 0$) and convex ($\sigma_i'' > 0$) function of the capital evaded, $\bar{k}_i - s_i$ (see Figure 1). We also impose $\sigma_i(0) = 0$ to prevent any fixed cost of evasion.

Remark: The optimality condition $t_i = \sigma_i'(\bar{k}_i - s_i)$ permits to derive an individual "supply of domestic capital" depending on the unitary tax (but not on the world return on capital):

(9) $$s_i = s_i(t_i).$$

assumed to be decreasing in t_i to reflect the (popular) view that increasing evasion is a direct consequence of increasing marginal tax rates.

For example, in the evasion cost function we use below, namely

$$\sigma_i(\bar{k}_i - s_i) = (1/c_i)(\bar{k}_i - s_i)^\gamma, \ \gamma > 1,$$

condition $t_i = \sigma_i'$ entails $s_i = \bar{k}_i - (t_i c_i/\gamma)^{1/(\gamma-1)}$, which is decreasing in t_i and c_i. Moreover $\gamma = 2$ implies the linear supply function $s_i = \bar{k}_i - (1/2)t_i c_i$ (see Figure 2).

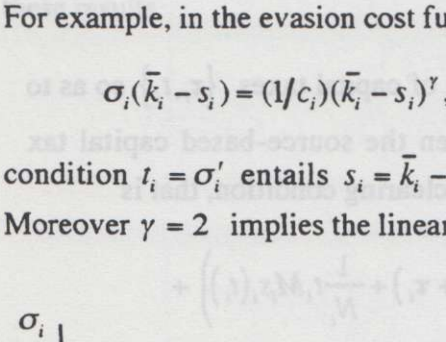

Figure 1. The cost of evasion as a function of the capital evaded.

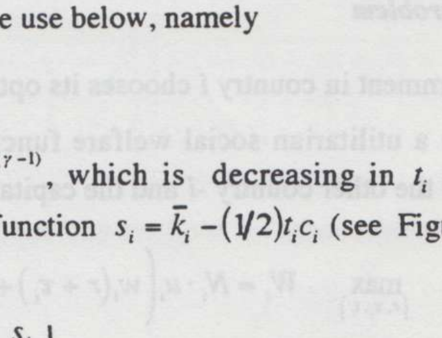

Figure2. The domestic supply of capital as a function of the residence-based tax on capital.

As for the parameter c_i, it scales the cost of tax evasion. Ceteris paribus, the greater c_i the lower the cost of evasion and the more attractive this ilegal activity.

Government

In any country i, the domestic government wishes to undertake some redistribution in favour of their workers, assumed to be poor in contrast with capitalists. To that effect, it levies a per-unit tax, τ_i, on the capital employed in the domestic country, K_i, and a per-unit tax t_i on the domestic investment of its capitalists,. Tax revenues are then transferred to its is workers, via N_i lump-sum transfers T_i so as to increase their incomes. The government budget constraint is therefore

$$(10) \qquad \tau_i N_i k_i(r+\tau_i) + t_i M_i s_i(t_i) = N_i T_i$$

where $N_i k_i(r+\tau_i) \equiv K_i(r+\tau_i)$ is the domestic demand for capital, and $M_i s_i(t_i) \equiv S_i(t_i)$ is the domestic "supply" of capital. The former is influenced by the source-based capital tax and the latter by the residence-based capital tax.

Welfare problem

The government in country i chooses its optimal mix of capital taxes $\{\tau_i, t_i\}$ so as to maximize a utilitarian social welfare function, given the source-based capital tax chosen by the other country $-i$ and the capital market clearing condition, that is

$$(11.1) \qquad \max_{\{r,\tau_i,t_i\}} \quad W_i = N_i \cdot u_i\left(w_i(r+\tau_i) + \tau_i \cdot k_i(r+\tau_i) + \frac{1}{N_i} t_i M_i s_i(t_i)\right) + M_i \cdot v\left(r\bar{k}_i - t_i s_i(t_i) - \sigma_i(\bar{k}_i - s_i(t_i))\right)$$

s.t.

$$(11.2) \qquad M_i\bar{k}_i + M_{-i}\bar{k}_{-i} = N_i k_i(r+\tau_i) + N_{-i} k_{-i}(r+\overline{\tau}_{-i}) \qquad (\rho_i)$$

Forming the Lagrangean, Λ_i, we obtain the first order conditions:

$$(12.1) \qquad \partial\Lambda_i/\partial r = N_i u_i' \cdot (w_i' + \tau_i k_i') + M_i v_i' \bar{k}_i - \rho_i \cdot (N_i k_i' + N_{-i} k_{-i}') = 0,$$

$$(12.2) \qquad \partial\Lambda_i/\partial\tau_i = N_i u_i' \cdot (w_i' + \tau_i k_i' + k_i) - \rho_i N_i k_i' = 0,$$

$$(12.3) \qquad \partial\Lambda_i/\partial t_i = u_i' \cdot (M_i s_i + t_i M_i s_i' \cdot) - v_i' M_i \cdot s_i = 0,$$

where use has been made of $t_i = \sigma_i'$ in (12.3).

Using $w_i' = -k_i$ we get from (12.2) $\rho_i = u_i' \cdot \tau_i$. This together with $w_i' = -k_i$ in (12.1) yields

$$(13) \qquad \frac{u_i'}{v_i'} = \frac{M_i\bar{k}_i}{N_i k_i + \tau_i N_{-i} k_{-i}'} \qquad \forall i = A, B.$$

Finally, we can restate (12.3) as follows

$$(14)\qquad \frac{u_i'}{v_i'} = \frac{s_i}{s_i + t_i s_i'}$$

$$= \frac{1}{1-\eta_i} \text{ with } \eta_i \equiv -\frac{t_i}{s_i}\frac{ds_i}{dt_i} > 0 \quad \forall i = A, B$$

FOC (12.1) and (12.2) (and consequently equation (13)) also arise in a world with no tax evasion. FOC (12.3) (and consequently equation (14)) concerns tax evasion. With $\eta_i \in (0,1)$ we have $u_i' > v_i'$ so that at the optimum the distribution of income is not egalitarian at the national level. The comparison of (13) and (14) implies:

$$(15)\qquad \frac{1}{1-\eta_i} = \frac{M_i \bar{k}_i}{N_i k_i + \tau_i N_{-i} k_{-i}'}.$$

In the section below we construct a numerical experiment to gain some insight on these results.

3. A NUMERICAL EXPERIMENT

Assumptions:

(A1) A CRS Cobb-Douglas production function $Z_i = N_i^{\alpha} K_i^{1-\alpha} = N_i k_i^{1-\alpha}$, $k_i \equiv K_i / N_i$ leading to the demand for capital $k_i = \left[(1-\alpha)/(r+\tau_i)\right]^{1/\alpha}$ and the factor-price frontier $w_i = \alpha\left[(1-\alpha)/(r+\tau_i)\right]^{(1-\alpha)/\alpha}$. The RHS of (13) becomes

$$\frac{M_i \bar{k}_i}{N_i k_i + \tau_i N_{-i} k'_{-i}} = \frac{\bar{K}_i}{N_i k_i - \alpha^{-1}(1-\alpha)^{-1}\left((1-\alpha)k_i^{-\alpha} - r\right)N_{-i} k_{-i}^{1+\alpha}}$$

(A2) A tax evasion cost function $\sigma_i(\bar{k}_i - s_i) = (1/c_i)(\bar{k}_i - s_i)^{\gamma}$, $\gamma > 1$, which together with the equilibrium condition (7), $t_i = \sigma'_i$, lead to the domestic supply of capital $s_i = \bar{k}_i - (t_i c_i/\gamma)^{1/(\gamma-1)}$. The latter expression permits to restate $\sigma_i = (1/c_i)(t_i c_i/\gamma)^{\gamma/(\gamma-1)}$.

The incomes of capitalists and workers become, respectively:

$$y_{Ci} \equiv r\bar{k}_i - t_i s_i - \sigma_i = (r - t_i)\bar{k}_i + ((\gamma-1)/c_i)(t_i c_i/\gamma)^{\frac{\gamma}{\gamma-1}},$$

$$y_{Wi} \equiv w_i + \tau_i k_i + (t_i M_i s_i / N_i) = (k_i^{-\alpha} - r)k_i + (M_i/N_i)\left(\bar{k}_i t_i - (c_i/\gamma)^{\frac{1}{\gamma-1}} t_i^{\frac{\gamma}{\gamma-1}}\right)$$

(A3) Same preferences for workers and capitalists: $u_i = v_i = y_i^{\beta_i}$, implying in view of (A2)

$$\frac{u'_i}{v'_i} = \left(\frac{y_{Ci}}{y_{Wi}}\right)^{1-\beta_i} = \left(\frac{(r-t_i)\bar{k}_i + ((\gamma-1)/c_i)(t_i c_i/\gamma)^{\frac{\gamma}{\gamma-1}}}{(k_i^{-\alpha} - r)k_i + (M_i/N_i)\left(\bar{k}_i t_i - (c_i/\gamma)^{\frac{1}{\gamma-1}} t_i^{\frac{\gamma}{\gamma-1}}\right)}\right)^{1-\beta_i}.$$

(A4) Using $s_i = \bar{k}_i - (t_i c_i/\gamma)^{1/(\gamma-1)}$ we have $\eta_i = -(t_i/s_i)s'_i = \dfrac{(t_i c_i/\gamma)^{1/(\gamma-1)}}{(\gamma-1)\left[\bar{k}_i - (t_i c_i/\gamma)^{1/(\gamma-1)}\right]}$

so that the RHS of (14) becomes

$$\frac{1}{1-\eta_i} = \frac{(\gamma-1)\left(\bar{k}_i - (t_i c_i/\gamma)^{\frac{1}{\gamma-1}}\right)}{(\gamma-1)\bar{k}_i - \gamma(t_i c_i/\gamma)^{\frac{1}{\gamma-1}}}.$$

Using (A1) to (A4) conditions (11.2), (15) and (13) form a five-equation system in the five unknowns $\{k_A, k_B, r, t_A, t_B\}$, namely:

$$(16.1)\qquad N_A k_A + N_B k_B = \overline{K}_A + \overline{K}_B,$$

$$(16.2)\qquad \frac{\overline{K}_A}{N_A k_A - \alpha^{-1}(1-\alpha)^{-1}\left[(1-\alpha)k_A^{-\alpha} - r\right] N_B k_B^{1+\alpha}} = \frac{(\gamma-1)\left[\frac{\overline{K}_A}{M_A} - \left(\frac{t_A c_A}{\gamma}\right)^{\frac{1}{\gamma-1}}\right]}{(\gamma-1)\left(\frac{\overline{K}_A}{M_A}\right) - \gamma\left(\frac{t_A c_A}{\gamma}\right)^{\frac{1}{\gamma-1}}},$$

$$(16.3)\qquad \frac{\overline{K}_B}{N_B k_B - \alpha^{-1}(1-\alpha)^{-1}\left[(1-\alpha)k_B^{-\alpha} - r\right] N_A k_A^{1+\alpha}} = \frac{(\gamma-1)\left[\frac{\overline{K}_B}{M_B} - \left(\frac{t_B c_B}{\gamma}\right)^{\frac{1}{\gamma-1}}\right]}{(\gamma-1)\left(\frac{\overline{K}_B}{M_B}\right) - \gamma\left(\frac{t_B c_B}{\gamma}\right)^{\frac{1}{\gamma-1}}},$$

$$(16.4)\qquad \left[\frac{(r-t_A)\left(\frac{\overline{K}_A}{M_A}\right) + \left(\frac{\gamma-1}{c_A}\right)\left(\frac{t_A c_A}{\gamma}\right)^{\frac{\gamma}{\gamma-1}}}{k_A\left(k_A^{-\alpha} - r\right) + \frac{M_A}{N_A}\left(\left(\frac{\overline{K}_A}{M_A}\right)t_A - \left(\frac{c_A}{\gamma}\right)^{\frac{1}{\gamma-1}} t_A^{\frac{\gamma}{\gamma-1}}\right)}\right]^{1-\beta_A} = \frac{(\gamma-1)\left(\frac{\overline{K}_A}{M_A} - \left(\frac{t_A c_A}{\gamma}\right)^{\frac{1}{\gamma-1}}\right)}{(\gamma-1)\left(\frac{\overline{K}_A}{M_A}\right) - \gamma\left(\frac{t_A c_A}{\gamma}\right)^{\frac{1}{\gamma-1}}},$$

$$(16.5)\qquad \left[\frac{(r-t_B)\left(\frac{\overline{K}_B}{M_B}\right) + \left(\frac{\gamma-1}{c_B}\right)\left(\frac{t_B c_B}{\gamma}\right)^{\frac{\gamma}{\gamma-1}}}{k_B\left(k_B^{-\alpha} - r\right) + \frac{M_B}{N_B}\left(\left(\frac{\overline{K}_B}{M_B}\right)t_B - \left(\frac{c_B}{\gamma}\right)^{\frac{1}{\gamma-1}} t_B^{\frac{\gamma}{\gamma-1}}\right)}\right]^{1-\beta_B} = \frac{(\gamma-1)\left(\frac{\overline{K}_B}{M_B} - \left(\frac{t_B c_B}{\gamma}\right)^{\frac{1}{\gamma-1}}\right)}{(\gamma-1)\left(\frac{\overline{K}_B}{M_B}\right) - \gamma\left(\frac{t_B c_B}{\gamma}\right)^{\frac{1}{\gamma-1}}}.$$

Once this system is solved we compute for each country i a number of concepts, viz.:

- the optimal source-based tax on capital: $\tau_i = (1-\alpha)k_i^{-\alpha} - r, \quad i = A, B$
- the capitalist's income: $y_{Ci} = (r - t_i)(\overline{K}_i/M_i) + ((\gamma-1)/c_i)(t_i c_i/\gamma)^{\frac{\gamma}{\gamma-1}}$,
- the capitalist's domestic investment: $s_i = (\overline{K}_i/M_i) - (t_i c_i/\gamma)^{\frac{1}{\gamma-1}}$
- the worker's income: $y_{Wi} = (k_i^{-\alpha} - r)k_i + (M_i/N_i)\left(\bar{k}_i t_i - (c_i/\gamma)^{\frac{1}{\gamma-1}} t_i^{\frac{\gamma}{\gamma-1}}\right)$
- the national income: $Y_i = N_i y_{Wi} + M_i y_{Ci}$
- the gross domestic product: $Z_i = N_i k_i^{1-\alpha}$

The above formulation is pretty general in the sense of depending on a vector of parameters $\{\alpha, \beta_i, \gamma, c, N_i, M_i, \overline{K}_i\}$. We choose $\alpha = 3/4$ to reflect a realistic common share of workers' income on national income of 75% in a laissez-faire equilibrium.

The parameter β_i is assumed to take one out of three possible values $\{0,\frac{1}{2},1\}$ reflecting high, intermediate and zero aversion to inequality, respectively. This parameter is allowed to change between countries. We have chosen $\gamma = 2$ to make the cost of tax evasion linear in t_i. We consider two values for c, $c = 1(\text{resp. } 100)$ reflects that tax evasion is difficult (resp. easy). The number of worker may be symmetric ($\{N_A, N_B\} = \{100,100\}$) or asymmetric ($\{N_A, N_B\} = \{50,150\}$). Similarly the number of capitalist may also be symmetric ($\{M_A, M_B\} = \{5,5\}$) or asymmetric ($\{M_A, M_B\} = \{2,8\}$). Capital endowments are always $\overline{K}_A = \overline{K}_B = 100$.

Here below we give some selected examples. We take as the starting point the case of no tax evasion (Table 1). This case arises when no residence-based taxes are allowed, $t_i = 0$. Then we examine two cases where evasion is difficult, $c = 1$, (Table 2) and easy, $c = 100$, (Table 3). The comparison of the two latter cases accords to intuition: tax evasion typically worsens redistribution. When the evasion cost is reduced (c=100), capitalists become richer, workers become poorer, and national income falls. The cost of tax evasion represents a wasteful loss of resources. As for the tax instruments, the residence-based taxes fall whereas the source-based taxes rise (from a negligible level).

Discussion

We now comment on the six headings in which are divided Tables 1 to 3.

1. Symmetric countries (cases 111, 121, 131).

1.1 If taxation is constrained to be source-based $(t_i = 0 \ \forall i)$, no tax evasion arises and (13) becomes

$$(13') \qquad v_i' = u_i' \cdot \left(1 + \frac{\tau_i}{\overline{K}_i}\frac{\partial K_{-i}}{\partial r}\right) < u' \ \text{ if } \ \tau_i > 0$$

In words, if previous to intervention (laissez-faire) in country i the income of workers was lower than the income of capitalists $(y_{W_i} < y_{C_i})$, implying a higher marginal utility to workers $u_i' > v_i'$, after intervention we must still expect $u_i' > v_i'$, implying again $y_{W_i} < y_{C_i}$, since public policy is less than fully redistributive. The comparison of cases (111), (121) and (131) of Table 1 shows how the income of workers become closer to the income of capitalists as governments become more averse to inequality. The case (131) correspond to GNP maximization for governments and coincides with the laissez-faire equilibrium.

Table 1. NON COOPERATIVE EQUILIBRIA ($\alpha = 3/4$)

Case	β_A	β_B	τ_A	τ_B	r	y_{WA}	y_{CA}	y_{WB}	y_{CB}	T_{BA}	T_{AB}	ω_A	ω_B	MS
Symmetric countries: (NA, NB) = (100, 100), (MA, MB) = (5, 5), (KA, KB) = (100, 100)														
(111)	0	0	0.123	0.123	0.127	0.873	2.539	0.873	2.539	0.324	0.324	0.873	0.873	yes
(121)	1/2	1/2	0.091	0.091	0.159	0.841	3.179	0.841	3.179	0.349	0.349	0.841	0.841	yes
(131)	1	1	0	0	0.250	0.750	5	0.750	5	0.333	0.333	0.750	0.750	yes?
Asymmetric preferences														
(211)	0	1	0.094	0.037	0.188	0.800	3.765	0.819	3.765	0.451	0.333	0.810	0.813	yes
(211')	1	0	0.037	0.094	0.188	0.819	3.765	0.800	3.765	0.333	0.451	0.813	0.810	yes
(221)	0	1/2	0.115	0.100	0.143	0.852	2.858	0.861	2.858	0.352	0.340	0.856	0.858	yes
(231)	1/2	1	0.069	0.026	0.204	0.789	4.086	0.800	4.086	0.423	0.314	0.794	0.797	yes
Asymmetric number of workers: (NA, NB) = (50, 150)														
(112)	0	0	0.063	0.166	0.121	0.925	2.423	0.855	2.423	0.446	0.183	0.792	0.914	yes
(122)	1/2	1/2	0.035	0.136	0.150	0.881	3.005	0.831	3.005	0.470	0.225	0.746	0.892	yes
(132)	1	1	-0.045	0.051	0.232	0.760	4.650	0.762	4.650	0.466	0.228	0.620	0.831	no
Asymmetric number of capitalists: (MA, MB) = (2, 8)														
(113)	0	0	0.134	0.110	0.129	0.863	6.437	0.879	1.609	0.228	0.430	0.870	0.872	yes
(123)	1/2	1/2	0.105	0.083	0.157	0.838	7.834	0.848	1.959	0.317	0.393	0.842	0.844	yes
(133)	1	1	0	0	0.250	0.750	12.500	0.750	3.125	0.333	0.333	0.750	0.750	yes?
Asymmetric preferences and number of workers: (NA, NB) = (50, 150)														
(212)	0	1	0.051	0.101	0.164	0.851	3.276	0.829	3.276	0.576	0.199	0.722	0.884	yes
(212')	1	0	-0.024	0.125	0.187	0.822	3.744	0.789	3.744	0.455	0.331	0.687	0.863	no
(222)	0	1/2	0.060	0.147	0.132	0.903	2.649	0.849	2.649	0.468	0.195	0.773	0.906	yes
(232)	1/2	1	0.025	0.087	0.183	0.830	3.653	0.810	3.653	0.550	0.195	0.694	0.869	yes
Asymmetric preferences and number of capitalists: (MA, MB) = (2, 8)														
(213)	0	1	0.107	0.043	0.180	0.806	8.996	0.829	2.249	0.464	0.391	0.817	0.822	yes
(213')	1	0	0.032	0.082	0.196	0.810	9.802	0.795	2.450	0.282	0.438	0.805	0.802	yes
(223)	0	1/2	0.126	0.090	0.144	0.845	7.188	0.866	1.797	0.314	0.424	0.855	0.858	yes
(233)	1/2	1	0.086	0.034	0.193	0.797	9.670	0.813	2.418	0.442	0.357	0.805	0.808	yes

where: $T_i = dT_i / d\tau_j$, $\omega_i = N_i y_{wi} / Y_i$ and MS stands for minimal standards.

Table 1 (cont.) NON COOPERATIVE EQUILIBRIA (a = 3/4)

Case	w_A	w_B	k_A	k_B	K_A	K_B	Y_A	Y_B	Z_A	Z_B	ΔK_A	ΔK_B
Symmetric countries: (NA, NB) = (100, 100), (MA, MB) = (5, 5), (KA, KB) = (100, 100)												
(111)	0.75	0.75	1	1	100	100	100	100	100	100	0	0
(121)	0.75	0.75	1	1	100	100	100	100	100	100	0	0
(131)	0.75	0.75	1	1	100	100	100	100	100	100	0	0
Asymmetric preferences												
(211)	0.720	0.776	0.851	1.149	85.106	114.894	98.852	100.728	96.048	103.532	14.894	-14.894
(211')	0.776	0.720	1.149	0.851	114.894	85.106	100.728	98.852	103.532	96.048	-14.894	14.894
(221)	0.742	0.758	0.958	1.042	95.828	104.172	99.536	100.431	98.940	101.027	4.172	-4.172
(231)	0.728	0.770	0.886	1.114	88.634	111.366	99.351	100.406	97.029	102.728	11.366	-11.366
Asymmetric number of workers: (NA, NB) = (50, 150)												
(112)	0.830	0.717	1.500	0.833	75	125	58.362	140.288	55.334	143.317	25	-25
(122)	0.829	0.717	1.492	0.836	74.586	125.414	59.076	139.616	55.258	143.435	25.414	-25.414
(132)	0.825	0.719	1.466	0.845	73.301	126.699	61.225	137.594	55.018	143.801	26.699	-26.699
Asymmetric number of capitalists: (MA, MB) = (2, 8)												
(113)	0.737	0.762	0.934	1.066	93.448	106.552	99.164	100.756	98.320	101.599	6.552	-6.552
(123)	0.739	0.761	0.943	1.057	94.252	105.748	99.432	100.506	98.531	101.407	5.748	-5.748
(133)	0.750	0.750	1	1	100	100	100	100	100	100	0	0
Asymmetric preferences and number of workers: (NA, NB) = (50, 150)												
(212)	0.789	0.735	1.227	0.924	61.337	138.663	58.953	140.749	52.621	147.082	38.663	-38.663
(212')	0.865	0.696	1.769	0.744	88.458	111.542	59.826	137.132	67.665	139.293	11.542	-11.542
(222)	0.819	0.722	1.419	0.860	70.927	129.073	58.418	140.619	54.567	144.47	29.073	-29.073
(232)	0.798	0.732	1.284	0.905	64.198	135.802	59.764	139.777	53.224	146.317	35.802	-35.802
Asymmetric preferences and number of capitalists: (MA, MB) = (2, 8)												
(213)	0.717	0.779	0.834	1.166	83.375	116.625	98.548	100.929	95.556	103.92	16.625	-16.625
(213')	0.774	0.724	1.132	0.868	113.213	86.787	100.561	99.109	103.151	96.519	-13.213	13.213
(223)	0.731	0.767	0.905	1.095	90.452	109.548	98.895	100.933	97.522	102.306	9.548	-9.548
(233)	0.723	0.775	0.862	1.138	86.213	113.787	99.026	100.615	96.359	103.282	13.787	-13.787

where $\Delta K_i = \bar{K}_i - K_i$, $i = A, B$.

Table 2. NON COOPERATIVE EQUILIBRIA WITH TAX EVASION ($\alpha = 3/4, \gamma = 2, c = 1$)

Case	β_A	β_B	t_A	t_B	r	k_A	k_B	τ_A	τ_B	s_A	s_B	σ_A	σ_B	y_{WA}	y_{CA}	y_{WB}	y_{CB}
Symmetric countries: (NA, NB) = (100, 100), (MA, MB) = (5, 5), (KA, KB) = (100, 100)																	
(111)	0	0	0.202	0.202	0.249	1	1	0.001	0.001	19.900	19.900	0.010	0.010	0.952	0.957	0.952	0.957
(121)	1/2	1/2	0.202	0.202	0.249	1	1	0.001	0.001	19.900	19.900	0.010	0.010	0.951	0.961	0.951	0.961
(131)	1	1	0	0	0.250	1	1	0	0	20	20	0	0	0.750	5	0.750	5
Asymmetric preferences																	
(211)	0	1	0.202	0	0.250	0.999	1.001	0.001	0	19.899	20	0.010	0	0.952	0.957	0.750	4.990
(211')	1	0	0	0.202	0.250	1.001	0.999	0	0.001	20	19.899	0	0.010	0.750	4.990	0.952	0.957
(221)	0	1/2	0.202	0.202	0.249	1	1	0.001	0.001	19.899	19.899	0.010	0.010	0.952	0.957	0.951	0.961
(231)	1/2	1	0.202	0	0.250	0.999	1.001	0.001	0	19.899	20	0.010	0	0.951	0.961	0.750	4.991
Asymmetric number of workers: (NA, NB) = (50, 150)																	
(112)	0	0	0.176	0.188	0.232	1.466	0.845	-0.044	0.052	19.912	19.906	0.008	0.009	1.112	1.117	0.887	0.892
(122)	1/2	1/2	0.176	0.187	0.232	1.466	0.845	-0.044	0.052	19.912	19.906	0.008	0.009	1.111	1.121	0.887	0.896
(132)	1	1	0	0	0.232	1.466	0.845	-0.045	0.051	20	20	0	0	0.760	4.650	0.762	4.650
Asymmetric number of capitalists: (MA, MB) = (2, 8)																	
(113)	0	0	0.230	0.175	0.249	1.001	0.998	0.001	0.001	49.885	12.412	0.013	0.008	0.980	0.982	0.925	0.931
(123)	1/2	1/2	0.230	0.175	0.249	1.001	0.999	0.001	0.001	49.885	12.413	0.013	0.008	0.980	0.985	0.924	0.938
(133)	1	1	0	0	0.250	1	1	0	0	50	12.500	0	0	0.750	12.500	0.750	3.125
Asymmetric preferences and number of workers: (NA, NB) = (50, 150)																	
(212)	0	1	0.177	0	0.232	1.464	0.845	-0.044	0.052	19.912	20	0.008	0	1.112	1.117	0.763	4.641
(212')	1	0	0	0.188	0.232	1.468	0.844	-0.045	0.052	20	19.906	0	0.009	0.760	4.643	0.887	0.892
(222)	0	1/2	0.176	0.187	0.232	1.466	0.845	-0.044	0.052	19.912	19.906	0.008	0.009	1.112	1.117	0.887	0.896
(232)	1/2	1	0.176	0	0.232	1.464	0.845	-0.044	0.052	19.912	20	0.008	0	1.111	1.121	0.763	4.641
Asymmetric preferences and number of capitalists: (MA, MB) = (2, 8)																	
(213)	0	1	0.230	0	0.250	0.999	1.001	0	0	49.885	12.500	0.013	0	0.980	0.982	0.750	3.122
(213')	1	0	0	0.175	0.249	1.002	0.998	0	0.001	50	12.412	0	0.008	0.751	12.467	0.925	0.931
(223)	0	1/2	0.230	0.175	0.249	1.001	0.999	0.001	0.001	49.886	12.413	0.013	0.008	0.980	0.982	0.924	0.938
(233)	1/2	1	0.230	0	0.250	0.999	1.001	0	0	49.885	12.500	0.013	0	0.980	0.985	0.750	3.122

Table 2 (cont.). NON COOPERATIVE EQUILIBRIA WITH TAX EVASION ($\alpha = 3/4$, $\gamma = 2$, $c = 1$))

Case	w_A	w_B	K_A	K_B	ΔK_A	ΔK_B	Y_A	Y_B	Z_A	Z_B	ω_A	ω_B	T_{BA}	T_{AB}	MS
Symmetric countries: (NA, NB) = (100, 100), (MA, MB) = (5, 5), (KA, KB) = (100, 100)															
(111)			100	100	0	0	99.949	99.949	100	100	0.952	0.952	-0.435	-0.435	no
(121)			100	100	0	0	99.949	99.949	100	100	0.952	0.952	-0.204	-0.204	no
(131)			100	100	0	0	100	100	100	100	0.750	0.750	0.333	0.333	?
Asymmetric preferences															
(211)			99.873	100.127	0.127	-0.127	99.949	100	99.968	100.032	0.952	0.750	0.334	-0.437	no
(211')			100.127	99.873	-0.127	0.127	100	99.949	100.032	99.968	0.750	0.952	-0.437	0.334	no
(221)			100	100	0	0	99.949	99.949	100	100	0.952	0.952	-0.204	-0.435	no
(231)			99.873	100.127	0.127	-0.127	99.949	100	99.968	100.032	0.952	0.750	0.334	-0.206	no
Asymmetric number of workers: (NA, NB) = (50, 150)															
(112)			73.322	126.678	26.678	-26.678	61.164	137.57	55.022	143.795	0.909	0.968	-0.289	-0.487	no
(122)			73.322	126.678	26.678	-26.678	61.164	137.57	55.022	143.795	0.908	0.967	-0.056	-0.261	no
(132)			73.302	126.698	26.698	-26.698	61.225	137.594	55.018	143.801	0.620	0.831	0.466	0.227	?
Asymmetric number of capitalists: (MA, MB) = (2, 8)															
(113)			100.118	99.882	-0.118	0.118	99.974	99.939	100.03	99.970	0.980	0.925	-0.297	-0.682	no
(123)			100.118	99.882	-0.118	0.118	99.974	99.939	100.029	99.971	0.980	0.925	-0.077	-0.487	no
(133)			100	100	0	0	100	100	100	100	0.750	0.750	0.333	0.333	?
Asymmetric preferences and number of workers: (NA, NB) = (50, 150)															
(212)			73.206	126.794	26.794	-26.794	61.178	137.611	55	143.828	0.909	0.831	0.467	-0.489	no
(212')			73.418	126.582	26.582	-26.582	61.211	137.553	55.040	143.768	0.621	0.968	-0.291	0.228	no
(222)			73.322	126.678	26.678	-26.678	61.164	137.57	55.022	143.795	0.909	0.967	-0.056	-0.487	no
(232)			73.206	126.794	26.794	-26.794	61.178	137.611	55	143.828	0.908	0.831	0.467	-0.262	no
Asymmetric preferences and number of capitalists: (MA, MB) = (2, 8)															
(213)			99.942	100.058	0.058	-0.058	99.973	100	99.986	100.014	0.980	0.750	0.334	-0.686	no
(213')			100.176	99.824	-0.176	0.176	100	99.938	100.044	99.956	0.751	0.925	-0.298	0.335	no
(223)			100.118	99.882	-0.118	0.118	99.974	99.939	100.029	99.971	0.980	0.925	-0.077	-0.682	no
(233)			99.942	100.058	0.058	-0.058	99.974	100	99.986	100.014	0.980	0.750	0.334	-0.490	no

where $T_i = dT_i/d\tau_j$, $\omega_i = N_i y_{w}/Y_i$ and MS stands for minimal standards.

Table 3. NON COOPERATIVE EQUILIBRIA WITH TAX EVASION ($\alpha = 3/4$, $\gamma = 2$, $c = 100$)

Case	β_A	β_B	t_A	t_B	r	k_A	k_B	τ_A	τ_B	s_A	s_B	σ_A	σ_B	y_{WA}	y_{CA}	y_{WB}	y_{CB}
Symmetric countries: (NA, NB) = (100, 100), (MA, MB) = (5, 5), (KA, KB) = (100, 100)																	
(111)	0	0	0.115	0.115	0.174	1	1	0.076	0.076	14.254	14.254	0.330	0.330	0.907	1.520	0.907	1.520
(121)	1/2	1/2	0.100	0.100	0.187	1	1	0.063	0.063	14.997	14.997	0.250	0.250	0.888	1.998	0.888	1.998
(131)	1	1	0	0	0.250	1	1	0	0	20	20	0	0	0.750	5	0.750	5
Asymmetric preferences																	
(211)	0	1	0.138	0	0.207	0.892	1.108	0.066	0.025	13.104	20	0.476	0	0.878	1.853	0.797	4.136
(211')	1	0	0	0.138	0.207	1.108	0.892	0.025	0.066	20	13.104	0	0.476	0.797	4.136	0.878	1.853
(221)	0	1/2	0.120	0.096	0.180	0.979	1.021	0.073	0.066	14.015	15.187	0.358	0.232	0.902	1.574	0.894	1.916
(231)	1/2	1	0.114	-0	0.216	0.915	1.085	0.051	0.019	14.307	20	0.324	0	0.861	2.376	0.786	4.329
Asymmetric number of workers: (NA, NB) = (50, 150)																	
(112)	0	0	0.104	0.112	0.168	1.497	0.834	0.017	0.119	14.818	14.388	0.269	0.315	1.009	1.551	0.870	1.426
(122)	1/2	1/2	0.091	0.097	0.179	1.491	0.836	0.007	0.107	15.462	15.132	0.206	0.237	0.979	1.962	0.856	1.861
(132)	1	1	0	0	0.232	1.466	0.845	-0.045	0.051	20	20	0	0	0.760	4.650	0.762	4.650
Asymmetric number of capitalists: (MA, MB) = (2, 8)																	
(113)	0	0	0.180	0.077	0.189	1.043	0.957	0.053	0.070	40.979	8.661	0.814	0.147	0.962	1.233	0.862	1.548
(123)	1/2	1/2	0.184	0.060	0.199	1.019	0.981	0.047	0.054	40.786	9.476	0.849	0.091	0.952	1.589	0.846	1.824
(133)	1	1	0	0	0.250	1	1	0	0	50	12.500	0	0	0.750	12.500	0.750	3.125
Asymmetric preferences and number of workers: (NA, NB) = (50, 150)																	
(212)	0	1	0.121	0	0.191	1.310	0.897	0.014	0.081	13.933	20	0.368	0	0.989	1.752	0.802	3.811
(212')	1	0	0	0.137	0.201	1.681	0.773	-0.031	0.103	20	13.172	0	0.466	0.801	4.014	0.842	1.749
(222)	0	1/2	0.107	0.094	0.172	1.461	0.846	0.016	0.111	14.642	15.317	0.287	0.219	1.005	1.585	0.861	1.787
(232)	1/2	1	0.102	0	0.199	1.339	0.887	0.002	0.074	14.918	20	0.258	0	0.960	2.209	0.794	3.985
Asymmetric preferences and number of capitalists: (MA, MB) = (2, 8)																	
(213)	0	1	0.224	0	0.225	0.936	1.064	0.038	0.014	38.824	12.500	1.249	0	0.946	1.329	0.776	2.814
(213')	1	0	0	0.085	0.208	1.105	0.895	0.024	0.064	50	8.275	0	0.179	0.795	10.397	0.842	1.722
(223)	0	1/2	0.191	0.060	0.198	1.016	0.984	0.049	0.055	40.428	9.490	0.916	0.091	0.957	1.254	0.847	1.816
(233)	1/2	1	0.214	0	0.226	0.939	1.061	0.036	0.013	39.310	12.500	1.143	0	0.940	1.773	0.775	2.830

Table 3 (cont.) NON COOPERATIVE EQUILIBRIA WITH TAX EVASION ($\alpha = 3/4, \gamma = 2, c = 100$)

Case	w_A	w_B	K_A	K_B	ΔK_A	ΔK_B	Y_A	Y_B	Z_A	Z_B	ω_A	ω_B	T_{BA}	T_{AB}	MS
Symmetric countries: (NA, NB)= (100, 100), (MA, MB) = (5, 5), (KA, KB) = (100, 100)															
(111)			100	100	?	?	98.349	98.349	100	100	0.923	0.923			
(121)			100	100	?	?	98.749	98.749	100	100	0.899	0.899			
(131)			100	100	?	?	100	100	100	100	0.750	0.750			
Asymmetric preferences															
(211)			89.208	110.792	10.792	-10.792	97.039	100.364	97.185	102.595	0.905	0.794			
(211')			110.792	89.208	-10.792	10.792	100.364	97.039	102.595	97.185	0.794	0.905			
(221)			97.923	102.077	2.077	-2.077	98.061	98.982	99.477	100.515	0.920	0.903			
(231)			91.479	108.521	8.521	-8.521	98.022	100.221	97.798	102.065	0.879	0.784			
Asymmetric number of workers: (NA, NB) = (50, 150)															
(112)			74.873	125.127	25.127	-25.127	58.183	137.562	55.311	143.353	0.867	0.948			
(122)			74.566	125.434	25.434	-25.434	58.765	137.714	55.254	143.441	0.833	0.932			
(132)			73.301	126.699	26.699	-26.699	61.225	137.594	55.018	143.801	0.620	0.831			
Asymmetric number of capitalists: (MA, MB) = (2, 8)															
(113)			104.330	95.670	-4.330	4.330	98.620	98.538	101.065	98.899	0.975	0.874			
(123)			101.881	98.119	-1.881	1.881	98.394	99.170	100.467	99.526	0.968	0.853			
(133)			100	100	0	0	100	100	100	100	0.750	0.750			
Asymmetric preferences and number of workers: (NA, NB) = (50, 150)															
(212)			65.483	134.517	34.517	-34.517	58.225	139.392	53.488	145.97	0.850	0.863			
(212')			84.027	115.973	15.973	-15.973	60.135	135.119	56.929	140.656	0.666	0.935			
(222)			73.027	126.973	26.973	-26.973	58.172	138.141	54.967	143.879	0.864	0.935			
(232)			66.961	133.039	33.039	-33.039	59.078	138.985	53.788	145.567	0.813	0.857			
Asymmetric preferences and number of capitalists: (MA, MB) = (2, 8)															
(213)			93.588	106.412	6.412	-6.412	97.303	100.122	98.357	101.566	0.973	0.775			
(213')			110.525	89.475	10.525	-10.525	100.345	98.018	102.533	97.258	0.793	0.859			
(223)			101.618	98.382	-1.618	1.618	98.249	99.189	100.402	99.593	0.974	0.854			
(233)			93.907	106.093	6.093	-6.093	97.535	100.11	98.441	101.49	0.964	0.774			

where: $T_i = dT_i / d\tau_j$, $\omega_i = N_i y_{iw} / Y_i$ and MS stands for minimal standards.

1.2 If taxation is unconstrained and tax evasion is difficult (c=1), see Table 2, redistribution is very high in cases (111), $\{y_{Wi}, y_{Ci}\} = \{0.952,\ 0.957\}$, and (121), $\{y_{Wi}, y_{Ci}\} = \{0.951,\ 0.961\}$. As compared with t(131), intervention makes the share of workers income in national income, ω_i, to increase from a 75% in the LFE to a 95.2% in cases (111) and (121).

As evasion is difficult, investment is essentialy domestic, $s_i = 19.9$, in cases (111) and (121). Compare with $s_i = 20$ in the LFE. Taxes are essentially of the residence-based type in contrast with the non evasion case. The optimal mix is $\{t_i, \tau_i\} = \{20.2\%,\ 0.1\%\}$ in cases (111) and (121).

1.3 If taxation is unconstrained and tax evasion is easy (c=100), see Table 3, redistribution is not as high as in case of c = 1. The income pairs are now $\{y_{Wi}, y_{Ci}\} = \{0.907,\ 1.520\}$ in case (111) and $\{y_{Wi}, y_{Ci}\} = \{0.888,\ 1.998\}$ in case (121). Intervention increases the share ω_i from a 75% in the LFE to a 92.3% in case (111) and to a 89.9% (121). Again the comparison of cases (111), (121) and (131) shows how the income of workers become closer to the income of capitalists as governments become more averse to inequality.

As evasion is easy, domestic investment falls to $s_i = 14.254$ (resp. 14.997) in case (111) (resp. (121)). As for taxes, residence-based looses weight in favour of source-based. The optimal mix is $\{t_i, \tau_i\} = \{11.5\%,\ 7.6\%\}$ in case (111) and $\{10\%,\ 6.3\%\}$ in case (112). Finally, the cost of tax evasion means a loss of resources which translates in a national income that falls short the GDP , $Y_i < Z_i$. In case (111),

$$Z_i - Y_i = 1.651 \cong 5 \times 0.330 = M_i \sigma_i .$$

2. Asymmetric preferences (cases 211, 211', 221 and 231).

2.1 If taxation is constrained to be source-based $(t_i = 0\ \forall i)$, then the country with the higher aversion to inequality establishes the higher tax rate: $\beta_i < \beta_{-i} \Rightarrow \tau_i > \tau_{-i}$.

Let us consider, without loss of generality, the case (211) of Table 1, where $\{\beta_A, \beta_B\} = \{0,1\}$. Taxes are $\{\tau_A, \tau_B\} = \{9.4\%,\ 3.7\%\}$ and personal incomes $\{y_{WA}, y_{CA}\} = \{0.800,\ 3.765\}$ versus $\{y_{WB}, y_{CB}\} = \{0.819,\ 3.765\}$. Workers' incomes shares become $\{\omega_A, \omega_B\} = \{81\%,\ 81.3\%\}$.

2.2 If taxation is unconstrained and tax evasion is difficult (c=1), then the country with the higher aversion to inequality establishes the higher tax vector: $\beta_i < \beta_{-i} \Rightarrow \{t_i, \tau_i\} \geq \{t_{-i}, \tau_{-i}\}$.

Consider again (211), but now of Table 2. Taxes are $\{t_A, \tau_A\} = \{20.2\%,\ 0.1\%\}$ and $\{t_B, \tau_B\} = \{0\%,\ 0\%\}$. Personal incomes become $\{y_{WA}, y_{CA}\} = \{0.952,\ 0.957\}$ versus $\{y_{WB}, y_{CB}\} = \{0.750,\ 4.990\}$. Workers' incomes shares become $\{\omega_A, \omega_B\} = \{95.2\%,\ 75\%\}$. This is precisely what we had before when comparing cases (111) and (131).

2.3 If taxation is unconstrained and tax evasion is easy (c=100), then the country with the higher aversion to inequality establishes the higher tax vector: $\beta_i < \beta_{-i} \Rightarrow \{t_i, \tau_i\} \geq \{t_{-i}, \tau_{-i}\}$.

Consider again (211), now of Table 3. Taxes are $\{t_A, \tau_A\} = \{13.8\%,\ 6.6\%\}$ and $\{t_B, \tau_B\} = \{0\%,\ 2.5\%\}$. Personal incomes become $\{y_{WA}, y_{CA}\} = \{0.878,\ 1.853\}$ versus $\{y_{WB}, y_{CB}\} = \{0.797,\ 4.136\}$. Workers' incomes shares become $\{\omega_A, \omega_B\} = \{90.5\%,\ 79.4\%\}$.

The comparison of 2.2 and 2.3 reveals that decreasing difficulty for tax evasion (c↑) worsens redistribution in A and improves that of B.

3. Asymmetric number of workers (cases 112, 122, 132).

3.1 If taxation is constrained to be source-based $(t_i = 0 \ \ \forall i)$, then the country with the lower number of workers establishes the lower tax rate: $N_A < N_B \Rightarrow \tau_A < \tau_B$.

Consider case (112), in Table 1, with $\beta_A = \beta_B = 0$ and $\{N_A, N_B\} = \{50, 150\}$. Taxes are $\{\tau_A, \tau_B\} = \{6.3\%,\ 16.6\%\}$ and personal incomes $\{y_{WA}, y_{CA}\} = \{0.925,\ 2.423\}$ versus $\{y_{WB}, y_{CB}\} = \{0.855,\ 2.423\}$. In the less populated country A the income of workers become closer to the income of capitalists. This is compatible with workers' incomes shares being $\{\omega_A, \omega_B\} = \{79.2\%,\ 91.4\%\}$ as here the number of individuals count.

3.2 If taxation is unconstrained and tax evasion is difficult (c=1), then the country with the lower number of workers establishes the lower tax vector: $N_A < N_B \Rightarrow \{t_A, \tau_A\} \leq \{t_B, \tau_B\}$.

Consider again (112), now in Table 2. Taxes are $\{t_A, \tau_A\} = \{17.6\%,\ -4.4\%\}$ and $\{t_B, \tau_B\} = \{18.8\%,\ 5.2\%\}$ because investment is essentially domestic meaning a high base for residence-based taxes. Redistribution improves that of 3.1 and is almost perfect: personal incomes become $\{y_{WA}, y_{CA}\} = \{1.112,\ 1.117\}$ and $\{y_{WB}, y_{CB}\} = \{0.887,\ 0.892\}$. Again this is compatible with workers' incomes shares being $\{\omega_A, \omega_B\} = \{90.9\%,\ 96.8\%\}$ as the number of workers count.

3.3 If taxation is unconstrained and tax evasion is easy (c=100), then the country with the lower number of workers establishes again the lower tax vector: $N_A < N_B \Rightarrow \{t_A, \tau_A\} \leq \{t_B, \tau_B\}$.

Consider again (112), now in Table 3. Taxes are $\{t_A, \tau_A\} = \{10.4\%,\ 1.7\%\}$ and $\{t_B, \tau_B\} = \{11.2\%,\ 11.9\%\}$ as investment is not essentially domestic. Source-based taxes play a greater role than in 3.2. Redistribution is not as good as in 3.2 but improves that of 3.1. In effect, personal incomes become $\{y_{WA}, y_{CA}\} = \{1.009,\ 1.551\}$ and $\{y_{WB}, y_{CB}\} = \{0.870,\ 1.426\}$

4. Asymmetric number of capitalists (cases 113, 123, 133).

4.1 If taxation is constrained to be source-based $(t_i = 0\ \forall i)$, then the country with the lower number of capitalists establishes the higher tax rate: $M_A < M_B \Rightarrow \tau_A > \tau_B$.

Consider (113) in Table 1 (case 133 being the LFE), with $\beta_A = \beta_B = 0$ and $\{M_A, M_B\} = \{2,\ 8\}$. Taxes are $\{\tau_A, \tau_B\} = \{13.4\%,\ 11\%\}$ and personal incomes $\{y_{WA}, y_{CA}\} = \{0.863,\ 6.437\}$ and $\{y_{WB}, y_{CB}\} = \{0.879,\ 1.609\}$. Country A has a lower endowment of capital and although it makes a higher fiscal effort than B cannot obtain the personal distribution of the latter. This is compatible with workers' incomes shares being $\{\omega_A, \omega_B\} = \{87\%,\ 87.2\%\}$ as the number of capitalists count.

4.2 If taxation is unconstrained and tax evasion is difficult (c=1), then the country with the lower number of capitalists establishes the higher tax vector: $M_A < M_B \Rightarrow \{t_A, \tau_A\} \geq \{t_B, \tau_B\}$.

Consider (113) in Table 2. Taxes become $\{t_A, \tau_A\} = \{23\%,\ 0.1\%\}$ and $\{t_B, \tau_B\} = \{17.5\%,\ 0.1\%\}$ because investment is essentially domestic meaning a high base for residence-based taxes. Redistribution improves that of 4.1 and is almost perfect: $\{y_{WA}, y_{CA}\} = \{0.980,\ 0.982\}$ and $\{y_{WB}, y_{CB}\} = \{0.925,\ 0.931\}$. Workers' incomes shares being $\{\omega_A, \omega_B\} = \{98\%,\ 92.5\%\}$ point in the same direction.

4.3 If taxation is unconstrained and tax evasion is easy (c=100), then the country with the lower number of capitalists establishes the higher residence-based tax and the lower source-based tax: $M_A < M_B \Rightarrow t_A > t_B$ and $\tau_A < \tau_B$.

Consider (113) in Table 3. Taxes become $\{t_A, \tau_A\} = \{18\%,\ 5.3\%\}$ and $\{t_B, \tau_B\} = \{7.7\%,\ 7\%\}$ while incomes turn to be $\{y_{WA}, y_{CA}\} = \{0.962,\ 1.233\}$ and $\{y_{WB}, y_{CB}\} = \{0.862,\ 1.548\}$. Redistribution is better than in 4.1 and worse than in 4.2. Workers' incomes shares $\{\omega_A, \omega_B\} = \{97.5\%,\ 87.4\%\}$ point in the same direction.

5. Asymmetric preferences and number of workers (cases 212, 212', 222, 232).

5.1 If taxation is constrained to be source-based $(t_i = 0 \ \forall i)$, then we know from 2.1 that the country with the higher aversion to inequality establishes the higher tax rate ($\beta_i < \beta_{-i} \Rightarrow \tau_i > \tau_{-i}$) and from 3.1 that the country with the lower number of workers establishes the lower tax rate ($N_i < N_{-i} \Rightarrow \tau_i < \tau_{-i}$).

In cases (212, 222 and 232) of Table 1 we have $\beta_A < \beta_B$ pointing to $\tau_A > \tau_B$ and $N_A < N_B$ pointing to $\tau_A < \tau_B$. Which effect dominates? In all three cases $\tau_A < \tau_B$, indicating that the " number of workers" effect dominates the "aversion to inequality" effect.

Focusing on case (212), taxes are $\{\tau_A, \tau_B\} = \{5.1\%, 10.1\%\}$ and personal incomes $\{y_{WA}, y_{CA}\} = \{0.851, 3.276\}$ and $\{y_{WB}, y_{CB}\} = \{0.829, 3.276\}$. In the less populated country A the income of workers becomes closer to the income of capitalists. This is compatible with workers' incomes shares being $\{\omega_A, \omega_B\}$ = $\{72.2\%, 88.4\%\}$ as here the number of individuals count.

5.2 If taxation is unconstrained and tax evasion is difficult (c=1), we know from 2.2 that $\beta_A < \beta_B \Rightarrow \{t_A, \tau_A\} \geq \{t_B, \tau_B\}$ and from 3.2 that $N_A < N_B \Rightarrow \{t_A, \tau_A\} \leq \{t_B, \tau_B\}$. The examination of cases (212, 222 and 232) of Table 2 reveals $\tau_A < \tau_B$ but does not provide an ambiguous sign to $t_A - t_B$.

Concentrating on case (212), taxes become $\{t_A, \tau_A\} = \{17.7\%, -4.4\%\}$ and $\{t_B, \tau_B\}$ = $\{0\%, 5.2\%\}$ because investment is essentially domestic meaning a high base for residence-based taxes in country A. Redistribution improves (resp. worsens) that of 5.1 in country A (resp. B): $\{y_{WA}, y_{CA}\} = \{1.112, 1.117\}$ and $\{y_{WB}, y_{CB}\}$ = $\{0.763, 4.641\}$. Workers' incomes shares being $\{\omega_A, \omega_B\}$ = $\{90.9\%, 83.1\%\}$ point in the same direction.

5.3 If taxation is unconstrained and tax evasion is easy (c=100), we know from 2.2 that $\beta_A < \beta_B \Rightarrow \{t_A, \tau_A\} \geq \{t_B, \tau_B\}$ and from 3.2 that $N_A < N_B \Rightarrow \{t_A, \tau_A\} \leq \{t_B, \tau_B\}$. The examination of cases (212, 222 and 232) of Table 3 reveals $t_A > t_B$ and $\tau_A < \tau_B$. In words, the "aversion to inequality" effect dominates the residence-based taxes while the "number of workers effect" dominates the source-based taxes.

Taking again case (212), taxes become $\{t_A, \tau_A\} = \{12.1\%, 1.4\%\}$ and $\{t_B, \tau_B\}$ = $\{0\%, 8.1\%\}$. As for incomes, they are $\{y_{WA}, y_{CA}\} = \{0.989, 1.752\}$ and $\{y_{WB}, y_{CB}\}$ = $\{0.802, 3.811\}$. For country A, redistribution is better than in 5.1 and worse than in 5.2. For country B, the opposite occurs. Workers' incomes shares $\{\omega_A, \omega_B\}$ = $\{85\%, 86.3\%\}$ do not convey the same idea.

6. Asymmetric preferences and number ofcapitalists (cases 213, 213', 223, 233).

6.1 If taxation is constrained to be source-based $(t_i = 0 \ \forall i)$, then we know from 2.1 that the country with the higher aversion to inequality establishes the higher tax rate $(\beta_A < \beta_B \Rightarrow \tau_A > \tau_B)$ and from 4.1 that the country with the lower number of capitalists establishes the higher tax rate: $M_A < M_B \Rightarrow \tau_A > \tau_B$. Both the "aversion to inequality" effect and " number of capitalists" effect point in the same direction.

Cases (213, 223 and 233) of Table 1 confirm this fact. Focusing on case (213), taxes are $\{\tau_A, \tau_B\} = \{10.7\%, \ 4.3\%\}$ while personal incomes $\{y_{WA}, y_{CA}\} = \{0.806, \ 8.996\}$ and $\{y_{WB}, y_{CB}\} = \{0.829, \ 2.249\}$. The income of workers becomes closer to the income of capitalists in the richer country B, in spite of the higher fiscal effort of country A. Workers' incomes shares $\{\omega_A, \omega_B\} = \{81,7\%, \ 82.2\%\}$ point in the same direction.

6.2 If taxation is unconstrained and tax evasion is difficult (c=1), then we know from 2.2 that $\beta_A < \beta_B \Rightarrow \{t_A, \tau_A\} \geq \{t_B, \tau_B\}$ and from 4.2 that $M_A < M_B \Rightarrow \{t_A, \tau_A\} \geq \{t_B, \tau_B\}$. Accordingly one should expect both effects to go in the same direction.

Cases (213, 223 and 233) of Table 2 confirm this fact. Concentrating on case (213), taxes become $\{t_A, \tau_A\} = \{23\%, \ 0\%\}$ and $\{t_B, \tau_B\} = \{0\%, \ 0\%\}$. The difficulty of tax evasion makes investment essentialy domestic in country A, thus provinding an important tax base for residence-based taxes. As for incomes, they are $\{y_{WA}, y_{CA}\} = \{0.980, \ 0.982\}$ and $\{y_{WB}, y_{CB}\} = \{0.750, \ 3.122\}$. Workers' incomes shares $\{\omega_A, \omega_B\} = \{98\%, \ 75\%\}$ point in the same direction.

6.3 If taxation is unconstrained and tax evasion is easy (c=100), then we know from 2.3 that $\beta_A < \beta_B \Rightarrow \{t_A, \tau_A\} \geq \{t_B, \tau_B\}$ and from 4.3 $M_A < M_B \Rightarrow t_A > t_B$ and $\tau_A < \tau_B$.

Cases (213, 223 and 233) of Table 3 reveals $t_A > t_B$ but no anambiguos sign for $\tau_A - \tau_B$. Concentrating on case (213), taxes are $\{t_A, \tau_A\} = \{22.4\%, \ 3.8\%\}$ and $\{t_B, \tau_B\} = \{0, \ 1.4\%\}$ while incomes become $\{y_{WA}, y_{CA}\} = \{0.946, \ 1.329\}$ and $\{y_{WB}, y_{CB}\} = \{0.776, \ 2.814\}$. The same idea is conveyed by the workers' incomes shares $\{\omega_A, \omega_B\} = \{97.3\%, \ 77.5\%\}$.

The ranking of redistributions is $6.2 \succ 6.3 \succ 6.1$ in country A . and $6.1 \succ 6.3 \succ 6.2$ in country B.

4. CONCLUDING REMARKS

In this paper we have explored the consequences of capital mobility and tax evasion for the redistributive policies of a country acting under fiscal competition.

A number of future extensions deserve to be explored, namely: tax determination through a majority voting scheme in the line of Gabszewicz and van Ypersele(1994), endogenous labour supplies to deal with unemployment, endogenous savings supplies to make savings mobile while keeping invested capital immobile.

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