

Redistribution with Capital Mobility and Unions' Wage Setting*

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Abstract

Most models of tax competition assume full employment. Yet, actually one often observes that fiscal competition, particularly when it is aimed at attracting investment, is motivated by the concern of fighting unemployment and enhancing job creation. The present paper considers a multicountry model with capital mobility and unemployment. Fiscal policy has two opposing objectives: financing unemployment insurance and increasing employment. In each country there is a majority vote on this policy.

The purpose of the paper is to analyse how opening borders to capital flows modifies the median voter's choice of the employment subsidy. Assuming that capital and labour are complements, economic integration is shown to rise the employment subsidy with fixed wages. This agrees with intuition as a larger employment subsidy attracts more capital. However, when wages are set by labour unions economic integration can change the median voter's choice in either direction.

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1 Introduction

Much attention has recently been devoted to the issue of redistribution and mobility. The central question dealt with in the economic literature is whether factor mobility fostered by increasing economic integration makes redistribution by national governments more difficult if not impossible. In that literature, full employment is generally assumed and redistribution is epitomized by income tax-transfer schemes and rarely by social insurance schemes.¹ This is somewhat surprising as there is a huge debate in political circles on the issue of attracting foreign investment to boost domestic employment and the robustness of social insurance schemes to tax competition. More specifically, the belief is widespread that fostering employment through wage subsidies and providing unemployed with generous compensations are conflicting objectives in a setting of factor mobility and tax competition.

In this paper, we address these issues within a particular model whose main features can be easily defined. First, unemployment emerges from either an exogenously set wage or a wage bargaining process. Second, unemployment insurance and employment subsidies are financed by a 100% profit tax. Third, capital is the only mobile factor. Fourth, countries are small to the extent that they take factor prices as given. Fifth, each country is endowed with a fixed amount of (immobile) labour and (mobile) capital, but while each individual is endowed with one unit of labour, capital endowments are unevenly spread across the population. Sixth, when wages are set through a bargaining process, decisions are taken by majority voting at two levels: at the sector level, unions decide the wage rate and, at the national level, a ballot is organized to set the unemployment benefit and the employment subsidy. When wages are exogenously set there is only a ballot at the national level. Voters maximize their expected utility, with disposable incomes when employed and unemployed as sole arguments.

As mentioned, the policy instruments available to each government are restricted to an employment subsidy and an unemployment benefit, which (if positive) are financed by full taxation of profits. The choice of these instruments is closely related to the main purpose of this paper, i.e., to assess how capital mobility affects the trade-off between policies aimed at job creation and redistributive policies directed towards unemployed workers. The larger is indeed the unemployment benefit the smaller will be the tax revenue available to subsidize employment. While this trade-off characterizes both open and closed economies, the employment subsidy takes an additional role with capital mobility, as its magnitude also determines the attractiveness of the domestic economy to foreign capital.

In models where public policies are chosen by majority voting, it is well known that the decision space needs to be unidimensional to avoid voting cycles. As it is standard in these kind of models, the two policy tools we concentrate on are linked together through the government's budget constraint, which implies that there is actually only one independent instrument. Our political economics approach prevents us from introducing further policy tools, such as a source-based tax (or subsidy) on the capital invested in a country.² This would require to use an

¹For surveys, see Sinn (1990), Wildasin (1991,1994), Cremer and Pestieau (1996), Cremer *et al.* (1996).

²To justify the absence of a source-based capital tax one might argue that once profits are fully taxed, a source-based capital tax can be ignored on efficiency grounds in both a closed and an open economy. However this argument is not correct in an open economy setting where wages result from a bargaining process rather than competitive market clearing. See, e.g., Huber and Fuest (1999), Richter and Schneider (2001), Koskela and Schöb (2000). Furthermore, once distributive considerations enter the picture, the capital income tax plays an important role in the closed economy setting since it can be used to redistribute from capital owners to workers. If the median voter has a low capital endowment, his preferred tax rate on capital will be high.

approach different from the one that we have adopted here.

In a paper related to ours, Lejour and Verbon (1996) develop a two-country model where wages also result from a union-firm bargaining process and where capital is imperfectly mobile across countries. In their model a payroll tax is levied to finance an unemployment benefit. The government is concerned to choose the payroll tax (and therefore the unemployment benefit) so as to maximize a weighted sum of the utility of workers and capital owners. In their setting that assumes, among other, the wage elasticity of labour demand to be larger than unity, Lejour and Verbon show that opening borders to capital reduces the payroll tax and that, with mobile capital, a coordinated rise in the countries' payroll tax would increase the countries' weighted sum of individual utilities. In a more recent paper, Huber and Fuest (1999) also assume that wages are subject to union-firm bargaining. However, contrary to Lejour and Verbon (1996) and our paper, individuals' labour supply is elastic. Accordingly the wage bargaining process results in all individuals being employed but rationed in their labour supply (underemployment). In each country a wage tax and a source-based capital tax are used along with a 100% profit tax to finance the provision of a public good rather than an unemployment benefit. Taking into account the mobility of capital across countries, each country's government chooses its fiscal instruments so as to maximize the utility of its representative citizen. If governments do not account for the effects of their policy on the wage bargaining process, Huber and Fuest show that a coordinated increase in either the wage tax or the capital tax (the other tax being kept constant) results in a reduction of welfare. However, if they account for the effect of their policy, the result is shown to depend upon the wage elasticity of labour demand: the above coordinated moves lead to a fall in welfare if this elasticity is smaller than one and to a rise otherwise.

Lozachmeur (2001) develops a model in the vein of Harris and Todaro in which there is unemployment and potential migrants equate their expected utility across countries. Mobility and fiscal competition lead to underprovision of unemployment benefits. Using a common framework of analysis, Richter and Schneider (2001) and Koskela and Schöb (2000) show that the optimal tax on mobile capital need not be zero if there are distortions in the labour market. This conclusion holds under both unemployment and underemployment. In particular they show that, if wages are the result of bargaining between unions and firms, the tax on capital depends not only on the properties of the production function but also on the restrictions on other fiscal instruments, such as profit and wage taxes. The issue of fiscal competition with distorted labour markets has also been investigated by Gabszewicz and van Ypersele (1996). They develop a political economics model where some minimal wage is chosen by majority voting and results in unemployment. They show that opening borders to capital flows has a depressing effect on the minimal wage.

The rest of the paper is organized as follows. Section ?? presents the basic model. In section ??, we consider the case where wages are exogenously given and assess the effects of allowing for capital mobility on the chosen policies. In section ?? wages are set by bargaining between the unions and the firms and we compute the optimal policy regarding the unemployment compensation and employment subsidy. We compare the open and the closed economy value for the parameters and explain for the differences with the fixed wage setting. Finally, the last section concludes.

2 The Model

There is a large number of small and identical countries, in each of which there are N inhabitants indexed by h . Individual h ($= 1, \dots, N$) is endowed with one unit of labour and κ_h units of capital, both being inelastically supplied. The national capital endowment is denoted by $N\bar{\kappa}$ with $\bar{\kappa}$ being the average κ_h . Capital, labour and a fixed factor are used in the production of a composite commodity. Production takes place in a large number (S) of sectors, each taking prices as given, and these are assigned exogenously equal numbers of workers ($N/S = n$), with the same distribution of the workers' capital endowment κ_h across sectors.³

The aggregate production function of firms in sector $s = 1, \dots, S$ can be written as

$$y^s = F(k^s, \ell^s), \quad (1)$$

with ℓ^s and k^s denoting the aggregate labour and capital in sector s . It is identical across sectors and countries. The two inputs are assumed to be complementary in the sense that increasing the use of one of them increases the marginal product of the other ($F_{k\ell} > 0$). This production function exhibits decreasing returns to scale in capital and labour. The firms of sector s in each country maximize aggregate profits

$$\pi^s = F(k^s, \ell^s) - w\ell^s - rk^s$$

with respect to ℓ^s and k^s , with the producer factor prices given by $w = \omega - \theta$ and r , where ω is the wage paid to workers and θ is an employment subsidy given to firms. Note that a negative value of θ would be a payroll tax. Profits are fully taxed and the revenue is used to finance that employment subsidy to firms and unemployment benefits.

The first order conditions for maximum profit with respect to ℓ^s and k^s are

$$F_\ell(k^s, \ell^s) = \omega - \theta \quad (2)$$

$$F_k(k^s, \ell^s) = r. \quad (3)$$

Solving (2) and (3) yields the factor demand functions:

$$\ell^s = \ell(\omega - \theta, r) \quad (4)$$

$$k^s = k(\omega - \theta, r) \quad (5)$$

and since the two factors are complements in production, the own and cross-price derivatives of these factor demands are negative. For the sake of simplicity, hereafter we will omit the superscript s . This is justified by the assumptions made earlier that the sectors comprising an economy are identical. The factor demands at the national level, denoted by L and K , are obtained by aggregating these sector demands:

$$L(\omega - \theta, r) = S\ell(\omega - \theta, r)$$

$$K(\omega - \theta, r) = Sk(\omega - \theta, r).$$

³Note that it is possible to interpret these sectors as (geographic) regions. All regions are then characterized by having an equal number of workers and by the same distribution of the individuals' capital endowments. With this interpretation, the (exogenous) assignment of workers to regions would simply mean that labour is immobile across regions.

Collective decisions about the employment subsidy and the unemployment benefit are assumed to be taken by majority voting at the national level and these decisions take place before each individual's employment status is determined. Assuming that the probability of getting a job is equal for all voters (and given by the ratio of available job offers to the number of workers), the expected utility of an individual endowed with κ_h units of capital can be written as:

$$E[U_h] = N^{-1} \left[Lv(\omega + r\kappa_h) + (N - L)u(b + r\kappa_h) \right], \quad (6)$$

where b stands for the unemployment benefit.⁴ $v(\cdot)$ and $u(\cdot)$ represent the worker's utility of income if he is employed and unemployed respectively. We have respectively $v(y) = u(y) - \delta$, where δ is the utility of foregone leisure when working. We assume $u'(0) = \infty$.

Recalling that profits are fully taxed, the government budget constraint of each country can be simplified as $S\pi = \theta S\ell + b(N - S\ell)$ or, using the definition of profits,

$$SF(k, \ell) - \omega L - rK - b(N - L) = 0. \quad (7)$$

In the open economy setting, capital is assumed to be perfectly mobile across countries and the countries' governments are assumed to choose their policies non-cooperatively. The equilibrium policies are the outcome of a Nash game between the countries' median voters, each aiming to maximize his expected utility by means of the same policy instruments as under autarky: an employment subsidy and an unemployment benefit. Since savers invest their capital where the net-of-tax return is the highest, net rates of return equate across countries. Since there is a large number of competitive and small countries, the median voter of each of these takes the international interest rate as given, considering that its value is not affected by his own policy decisions.

Two different modelling assumptions will be used regarding the causes of unemployment. In the next section we will consider the simpler case where unemployment is due to an exogenously fixed wage. The more interesting case of unemployment arising from endogenous wage setting by labour unions will be examined in section ??.

3 Fixed Wage Model

In this section unemployment results from a fixed wage rate being exogenously set. Let $\bar{w}$ be the fixed wage paid to employed workers. Under these circumstances the only decision variables are θ and b , whose levels are determined by majority voting in a national ballot. As our aim is to evaluate the effects on these policy instruments of capital mobility, we will first characterize the autarkic equilibrium, used later as a benchmark.

3.1 Closed economy (autarky)

The winning proposal on the unemployment benefit b and the employment subsidy θ will maximize the expected utility of the individual having the median capital endowment, hereafter called the median voter and denoted by subscript m . For the sake of realism, the median voter's capital endowment κ_m is assumed to satisfy $0 \leq \kappa_m < \bar{\kappa}$.

⁴We assume that the wage rate is always larger than the unemployment compensation so that the utility an individual gets from being employed is larger than the one he gets if unemployed.

The employment subsidy to be chosen in each country is obtained by maximizing its median voter's expected utility:

$$E[U_m] = N^{-1} \left[L(\bar{\omega} - \theta, r) v(\bar{\omega} + r\kappa_m) + (N - L(\cdot)) u(b + r\kappa_m) \right] \quad (8)$$

taking into account that his choice of θ influences the values taken by b and r through the government's budget constraint and the market-clearing condition for capital in the domestic economy:

$$SF(n\bar{\kappa}, \ell(\bar{\omega} - \theta, r)) - \bar{\omega}L(\cdot) - rN\bar{\kappa} - b(N - L(\cdot)) = 0 \quad (9)$$

$$K(\bar{\omega} - \theta, r) = N\bar{\kappa}. \quad (10)$$

These two equations determine the unemployment benefit b and the interest rate r as functions of θ : $b(\theta)$ and $r(\theta)$. Differentiating these equations yields:

$$\frac{db}{d\theta} = (N - L)^{-1} \left[(b - \theta) \frac{dL}{d\theta} - N\bar{\kappa} \frac{dr}{d\theta} \right] \quad (11)$$

$$\frac{dr}{d\theta} = \frac{k_w}{k_r} > 0, \quad (12)$$

with

$$\frac{dL}{d\theta} = S \left(-\ell_w + \ell_r \frac{dr}{d\theta} \right) > 0, \quad (13)$$

the sign of which comes from the concavity of the production function.⁵

The general equilibrium effects on L and r of a change in the employment subsidy have the expected sign: since the two factors are complements in production (implying that $k_w < 0$), an increase in θ raises the equilibrium levels of employment and interest rate, the rise in r being caused by an increase in capital demand. However, increasing θ has an ambiguous effect on b except if $\theta > b$. In this case, b falls. The first term of the expression in brackets on the right-hand side of (??) accounts for the change in the net public expenses following the rise in employment (one additional worker employed saves b but costs θ) while the second term accounts for the fall in taxed profits (through the increase of r).

In the following the fixed wage $\bar{\omega}$ is assumed to be large enough for unemployment to prevail at the policy preferred by the median voter. We can now use the above results to obtain the first order condition for a maximum of the expected utility of the median voter:

$$\frac{dE[U_m]}{d\theta} = N^{-1} \left[(v_m - u_m) + u'_m(b - \theta) \right] \frac{dL}{d\theta} + \left[E[U'_m] \kappa_m - u'_m \bar{\kappa} \right] \frac{dr}{d\theta} = 0, \quad (14)$$

with $v_m = v(\bar{\omega} + r\kappa_m)$ and $u_m = u(b + r\kappa_m)$. In this expression $E[U'_m] = N^{-1}(Lv'_m + (N - L)u'_m)$ denotes the median voter's expected marginal utility of income.

The interpretation of this first-order condition is straightforward. The first term takes into consideration the effect of increasing θ on $E[U_m]$ through the increase in employment: the direct utility gain from a marginal increase in employment and the change in utility resulting

⁵By differentiating (??) and (??) we obtain $k_r = \Delta^{-1}F_{\ell\ell}$, $k_w = -\Delta^{-1}F_{k\ell}$, $\ell_r = -\Delta^{-1}F_{k\ell}$ and $\ell_w = \Delta^{-1}F_{kk}$, where $\Delta = F_{kk}F_{\ell\ell} - (F_{k\ell})^2$. Therefore we have: $-\ell_w + \ell_r(k_w/k_r) = -(F_{\ell\ell})^{-1} > 0$.

from the budget-balancing change in unemployment benefit. The second term accounts for the endogenous change in the rate of return on capital; its effect on the median voter's expected utility is twofold. On the one hand an increase in r raises the median voter's capital income in proportion of κ_m , independently of his employment status, and on the other hand it causes a reduction of the taxed profits by $N\bar{\kappa}$, which affects negatively the unemployment benefit.

3.2 Open economy

Since our purpose is to investigate whether opening the borders to capital flows will cause the median voter's optimal choice of θ to rise or fall,⁶ we will now characterize the open economy equilibrium. The median voter's objective is to maximize his expected utility given by (??), taking into account the government's budget constraint

$$SF(k(\bar{\omega} - \theta, r), \ell(\cdot)) - \bar{\omega}L(\cdot) - rK(\cdot) - b(N - L(\cdot)) = 0, \quad (9')$$

the interest rate now being taken as a constant (given the assumption that each country is small relative to the rest of the world, in the sense that it takes prices as given).

Differentiating (??) yields:

$$\frac{db}{d\theta} = (N - L)^{-1}(b - \theta)\frac{dL}{d\theta} \quad (11')$$

with

$$\frac{dL}{d\theta} = -S\ell_w > 0. \quad (13')$$

These effects are identical to those in the closed economy except that the terms involving $dr/d\theta$ have disappeared. Accordingly, the sign of $db/d\theta$ is here identical to that of $(b - \theta)$. The effect of an increase of θ on the median voter's expected utility now simplifies to

$$\frac{dE[U_m]}{d\theta} = N^{-1} \left[(v_m - u_m) + u'_m(b - \theta) \right] \frac{dL}{d\theta} \quad (14')$$

and the interpretation of this expression is similar to the one given for (??): it accounts for the effects of the induced change in employment on both the employment status and the unemployment benefit. Therefore the median voter's optimal choice of θ must satisfy (assuming an interior solution):

$$v_m - u_m = u'_m(\theta - b). \quad (15)$$

This optimal tax formula simply states that the marginal (expected) benefit from increasing θ should equal its marginal cost. As $v_m > u_m$ (otherwise no worker would want to work), $\theta > b$, which implies, from (??), that $db/d\theta < 0$ at the optimum. Reasonably one expects $b > 0$. This will be the case if $\kappa_m = 0$, given our assumptions on $u(\cdot)$.

⁶Even though there is majority voting on the fiscal parameters, we don't consider voting on the opening of the economy. We assume, as it is usual, that globalization is exogenously given.

3.3 Effect on θ of opening the borders

As stated above, our main interest is however to see how the median voter's optimal choice of θ is modified when capital is allowed to flow across countries. To this end, let us start from the closed economy situation where condition (??) is satisfied in each of the identical countries, and suppose that borders are overnight open to capital flows. The question we ask is whether, in this starting position, median voters will find it desirable to increase or decrease θ . In other words, is the derivative of the median voter's expected utility, as given by (??), positive or negative in the starting position? To answer this question, we substitute $[(v_m - u_m) + u'_m(b - \theta)]$ from (??) into (??) and use (??), (??) and (??). We obtain the following expression for the derivative with respect to θ at the closed economy equilibrium:

$$\frac{dE[U_m]}{d\theta} = -[E[U'_m]\kappa_m - u'_m\bar{\kappa}] \left(\frac{k_r}{k_w} - \frac{\ell_r}{\ell_w} \right)^{-1} > 0, \quad (16)$$

where the sign comes from the following inequalities: we have (i) $\frac{k_r}{k_w} - \frac{\ell_r}{\ell_w} > 0$ by the concavity of the production function, (ii) $v'_m < E[U'_m] < u'_m$, and (iii) $\kappa_m < \bar{\kappa}$ by assumption.

Therefore, opening borders to capital flows makes the median voter's employment subsidy rise. The intuition for this result can be understood along the following lines. First, according to (??) increasing the employment subsidy θ in a closed economy makes the interest rate rise. Second, the median voter in the closed economy is concerned by this rise in r through both its negative effect on the government's budget balance (and so the unemployment benefit) and its positive effect on his capital income (if $\kappa_m > 0$). However, our assumption that $\kappa_m < \bar{\kappa}$ is sufficient for the negative effect to dominate the positive one. Therefore, the rise in r depresses the unemployment subsidy that the median voter chooses in the closed economy. By contrast, in the open economy the interest rate stays constant, which makes the employment subsidy higher than in the closed economy.

4 Monopoly-Union Model

In this section wages are no longer exogenously given. Instead they are the outcome of a bargaining process between firms and labour unions. As already mentioned, we assume this bargaining to take place at the sector level and in an uncoordinated way. We will first extend the model of the previous section to include wage bargaining and then compare the equilibrium in a small open economy with capital mobility across countries with the one resulting in a closed economy setting.

The wage bargaining process is assumed to be of the monopoly-union type, i.e., we take the unions to have full bargaining power. They maximize their objective incorporating the firms' optimal behaviour, given by (??) and (??). In each sector the wage rate is chosen by a majority vote within the labour union. As workers are, at the time of voting, uncertain about their employment status, the individual preferred wage rate is the maximizer of his expected utility. Since the distribution of κ_h among the workers of any sector is assumed to be identical to the one at the national level, the median voter at the sector level is the same as the median voter at the national level.⁷ As the production function is identical across sectors, the national unemployment rate is equal to that in each sector, and so the probability of getting a job will

⁷More specifically, we only need to assume that the capital endowment of the median voter κ_m is the same across sectors.

be equal in all sectors. Thus each sector is a small replica of the national economy not only in terms of production, but also regarding the individual characteristics of its workers.

Given the atomicity of the productive sectors in the domestic economy, the union members consider that the outcome of the wage bargaining process in their sector is not going to affect the policy parameters that are decided at the national level, θ and b . In other words, when choosing his preferred wage level, the median union member in each sector takes θ and b as given. The same holds true for the interest rate, even in the closed economy. This may seem odd at first sight as the same individuals, when voting at the national level on the policy (θ, b) , take full account of the impact of their choice on the capital market equilibrium. This duality comes from the issue at stake in that national ballot, i.e., the choice of the combination (θ, b) that concerns the whole domestic economy rather than a specific sector.

The timing of the decision process is the following. In a first step, the policy (θ, b) is decided in a ballot at the national level, the median voter anticipating the effect that his choice will have on the outcome of the wage bargaining process in the productive sectors. In a second step, a ballot is organized by the trade unions among the workers of each sector to decide upon the sector's wage level. The median voter in each sector takes the policy (θ, b) as given. This two-step decision process gives rise to a subgame perfect equilibrium that we solve by backward induction, first looking at the second step.

The expected utility of the labour union's median voter in each of the S identical sectors can be written as

$$E[U_m] = n^{-1} [\ell v(\omega + r\kappa_m) + (n - \ell)u(b + r\kappa_m)], \quad (17)$$

in which he takes ℓ as depending upon $w = \omega - \theta$ and the policy (θ, b) as given. The median voter's preferred wage rate ω maximizes that expected utility. It thus satisfies:

$$\ell_w(v_m - u_m) + \ell v'_m = 0, \quad (18)$$

where all utility terms are related to the median voter (i.e., to the individual with κ_m). This condition holds only if some unemployment prevails at the wage level chosen by the median voter (otherwise, $w = \omega - \theta$ is set at the competitive level). This crucially depends upon the level of the unemployment benefit b , that of the disutility of work δ , and the magnitude and shape of the demand function for labour at the sector level. For a while we shall take for granted that there is some unemployment at the subgame perfect equilibrium, and we shall return to this issue when we examine the policy (θ, b) decided at the national level. It follows from (??) that the median voter's utility when employed is larger than when unemployed and thus he will always choose a wage rate higher than the unemployment benefit. This first order condition gives the wage rate as a function of the two policy instruments and of the rate of return on capital: $\omega = \omega(\theta, b, r)$. The second order condition for a maximum requires:

$$\Sigma \equiv \ell_{ww}(v_m - u_m) + 2\ell_w v'_m + \ell v''_m < 0.$$

Differentiating (??) we obtain the following expressions for the partial derivatives of $\omega(\theta, b, r)$:

$$\omega_b = \frac{\ell_w u'_m}{\Sigma} > 0 \quad (19)$$

$$\omega_\theta = \frac{\ell_{ww}(v_m - u_m) + \ell_w v'_m}{\Sigma} \quad (20)$$

$$\omega_r = -\frac{\ell_{wr}(v_m - u_m) + \ell_r v'_m + \ell_w(v'_m - u'_m)\kappa_m + \ell v''_m \kappa_m}{\Sigma}. \quad (21)$$

As expected, an increase in b causes the median voter's optimal wage to rise. The direction of the response of ω to changes in θ and r is indeterminate, although with a Cobb-Douglas production function we have $\omega_\theta < 0$.⁸ However the producer wage ($\omega - \theta$) always falls as the employment subsidy rises:

$$\omega_\theta - 1 = -\frac{\ell_w v'_m + \ell v''_m}{\Sigma} < 0. \quad (22)$$

This ends the analysis of the second stage of the subgame perfect equilibrium. We now turn to the first stage.

4.1 Closed economy (autarky)

As in the previous section we first consider the autarkic case where the countries' capital markets are not integrated. Given the wage setting function $\omega(\theta, b, r)$, the employment subsidy θ is chosen by the "same" median voter as in the trade unions' ballot, now acting at the national level, who maximizes:

$$E[U_m] = N^{-1} \left[L(\omega(\theta, b, r) - \theta, r) v(\omega(\cdot) + r\kappa_m) + (N - L(\cdot)) u(b + r\kappa_m) \right], \quad (23)$$

where b and r are linked to θ through the governments' budget constraint and the market-clearing condition for domestic capital:

$$SF(n\bar{\kappa}, \ell(\cdot)) - \omega(\cdot)L(\cdot) - rN\bar{\kappa} - b(N - L(\cdot)) = 0 \quad (24)$$

$$K(\omega(\cdot) - \theta, r) = N\bar{\kappa}. \quad (25)$$

These equations implicitly define b and r as functions of θ . Differentiating them enables us to determine the following general equilibrium effects of a change in θ :

$$\begin{aligned} \frac{db}{d\theta} = & -B^{-1}A^{-1}(N - L)^{-1} \left[L \left(\omega_\theta + \omega_r \frac{k_w}{k_r} \right) \right. \\ & \left. + \left((\theta - b)S \left(\ell_w - \ell_r \frac{k_w}{k_r} \right) - N\bar{\kappa} \frac{k_w}{k_r} \right) (\omega_\theta - 1) \right] \end{aligned} \quad (26)$$

$$\frac{dr}{d\theta} = -A^{-1} \frac{k_w}{k_r} \left[(\omega_\theta - 1) + \omega_b \frac{db}{d\theta} \right] > 0,^9 \quad (27)$$

with

$$A = 1 + \omega_r \frac{k_w}{k_r} > 0$$

$$B = 1 + A^{-1}(N - L)^{-1} \left[L + (\theta - b)S \left(\ell_w - \ell_r \frac{k_w}{k_r} \right) - N\bar{\kappa} \frac{k_w}{k_r} \right] \omega_b > 0.$$

These derivatives are much more complex than the ones given in (??)–(??), that hold in the fixed-wage model (although the former simplify to the latter when ω_θ , ω_b and ω_r are equal to 0).

⁸Note that, using the union's first order condition (??), ω_θ can be written as $\omega_\theta = \Sigma^{-1} v'_m [-\ell \ell_{ww} / \ell_w + \ell_w]$, where the term in brackets is negative with a Cobb-Douglas production function.

⁹Substituting (??) into (??) and simplifying we obtain: $dr/d\theta = -B^{-1}A^{-1}(N - L)^{-1}(k_w/k_r)[(N - L)(\omega_\theta - 1) - L\omega_b] > 0$.

In the above expressions, A^{-1} and B^{-1} can be interpreted as multipliers, that are required to be positive for guaranteeing a stable equilibrium. Even though the sign of $db/d\theta$ is ambiguous, that of $dr/d\theta$ is not: an increase in θ raises the market-clearing interest rate.

Relations (??) and (??) can be used to obtain the total derivatives of ω and ℓ with respect to θ by means of:

$$\frac{d\omega}{d\theta} = \omega_\theta + \omega_b \frac{db}{d\theta} + \omega_r \frac{dr}{d\theta} \quad (28)$$

$$\frac{dL}{d\theta} = S\ell_w \left(\frac{d\omega}{d\theta} - 1 \right) + S\ell_r \frac{dr}{d\theta} > 0.^{10} \quad (29)$$

Although the sign of $d\omega/d\theta$ is ambiguous, an increase in the employment subsidy lowers the producer wage ($d\omega/d\theta - 1 < 0$) when the general equilibrium effects are accounted for (this is like in (??)). It also raises employment. These general equilibrium effects of θ , given by (??)–(??), are important to determine the median voter’s optimal choice of θ , which is given by the solution to:

$$\frac{dE[U_m]}{d\theta} = N^{-1} \left[(v_m - u_m) \frac{dL}{d\theta} + Lv'_m \frac{d\omega}{d\theta} + (N - L)u'_m \frac{db}{d\theta} + NE[U'_m] \kappa_m \frac{dr}{d\theta} \right] = 0. \quad (30)$$

According to this expression, a change in the employment subsidy affects the expected utility of the median voter through four channels. The direct effect, which is represented by the first term in the expression in brackets of (??), measures the change in expected utility due to the change in the employment rate and is proportional to the gain in utility from getting a job. The remaining terms capture the induced changes in non-capital and capital income: as θ changes, this affects the wage rate set by the union, the unemployment subsidy (given the government’s budget constraint) and the market-clearing interest rate.

As in the fixed-wage model, in writing (??) we are assuming that there is some unemployment at the policy chosen by the median voter. However, allowing wages to be set according to a monopoly-union model introduces a new feature that needs to be accounted for: the national median voter, by choosing a relatively low level for the unemployment benefit and so pushing the union to lower its wage rate to the competitive level, may eliminate unemployment. Even though this situation could be relevant in some cases, there are circumstances under which the unemployed’s income is at a level such that the union always chooses a wage level higher than the one compatible with full employment. Such circumstances would prevail if e.g. the marginal reservation wage were high relative to the marginal productivity of labour at full employment. Since we are interested in the trade-off between reducing the unemployment rate, via the employment subsidy, and increasing the welfare of the unemployed, with the unemployment benefit, we will assume hereafter that unemployment still characterizes the equilibrium when those two policy instruments are chosen by the national median voter.

4.2 Open economy

To examine how the national voter’s preferred policy changes when borders are open to capital flows, let us now as earlier consider the small open economy case, where r is taken as given by each country’s median voter. In this case b is linked to θ by the government’s budget constraint:

$$SF(k(\omega(\theta, b, r) - \theta, r), \ell(\cdot)) - \omega(\cdot)L(\cdot) - rK(\cdot) - b(N - L(\cdot)) = 0. \quad (24')$$

¹⁰Differentiating $Sk(\omega - \theta, r) = N\bar{\kappa}$ with respect to θ we obtain $d\omega/d\theta - 1 = -(k_r/k_w)dr/d\theta$. Substituting in (??) we have $dL/d\theta = S(-\ell_w(k_r/k_w) + \ell_r)dr/d\theta > 0$.

Differentiating (??) yields:

$$\frac{db}{d\theta} = -C^{-1}(N - L)^{-1} \left[L\omega_\theta + (\theta - b)S\ell_w(\omega_\theta - 1) \right], \quad (26')$$

where C is defined by¹¹

$$C = 1 + (N - L)^{-1} \left[L + (\theta - b)S\ell_w \right] \omega_b > 0.$$

This is a much simpler expression than its counterpart in the closed economy case. The derivative in (??) can be inferred from the derivative in (??) by deleting all the terms that involve the interest rate in the latter derivative.

The general equilibrium effects on ω and ℓ of a change in θ can be written as:

$$\frac{d\omega}{d\theta} = \omega_\theta + \omega_b \frac{db}{d\theta} \quad (28')$$

$$\frac{dL}{d\theta} = S\ell_w \left(\frac{d\omega}{d\theta} - 1 \right) > 0. \quad (29')$$

The interpretation of these general equilibrium effects is similar to that of the autarkic ones (although simpler). Note that, since the interest rate is considered constant by the median voter in this open economy setting, there is only the multiplier effect associated with the union's wage response to b , here denoted by C^{-1} . As in the closed economy case, L increases with θ , but the signs of the general equilibrium effects on b and ω are ambiguous.

The effect of a marginal change in θ on the median voter's expected utility, taking account of all general equilibrium effects in the open economy setting and using the first-order condition from the optimization at the union level, can be simplified as¹²

$$\frac{dE[U_m]}{d\theta} = -N^{-1} \left[(v_m - u_m)S\ell_w + u'_m \frac{(\theta - b)(\omega_\theta - 1)S\ell_w + L\omega_\theta}{C} \right]. \quad (30')$$

In this expression the term in brackets captures two effects: on the one hand, the utility gain resulting from getting a job and, on the other hand, the effect on expected utility that results from the change in the unemployment benefit. It is worth noting that no term relative to the change in the utility of employed workers appears, even though their income varies with the wage rate. This is the result of the wage setting process by the unions since they adjust the wage rate to the changes in employment in such a way that the marginal (expected) gain from increasing ω is equal to the marginal loss due to the induced decrease in L .¹³

Equating to zero the derivative of $E[U_m]$ in (??) and using the above general equilibrium effects, we obtain the first-order condition that the median voter's optimal choice must satisfy:

$$(v_m - u_m)(-S\ell_w) = u'_m(b - \theta)(-S\ell_w) \left(\frac{d\omega}{d\theta} - 1 \right) + u'_m L \frac{d\omega}{d\theta}. \quad (31)$$

The differences between this optimal rule with wage bargaining and the one with fixed wages (??) arise from the endogenous formation of wages: in particular θ does not only affect the employment status of the marginal worker and the level of the unemployment subsidy, but also causes the consumer wages to change.

¹¹As in the closed economy setting, the positive sign of the multiplier is implied by stability.

¹²Note that setting $\omega_\theta = \omega_b = 0$ in (??) we are back to the fixed wage case (??).

¹³See the union's wage setting rule (??).

4.3 Effect on θ of opening borders

However our main concern is to evaluate the effect on θ of allowing capital mobility across countries. Thus, as earlier, we analyse whether the median voter's optimal choice of θ tends to increase or decrease, following the opening of borders to capital flows. We will therefore determine the sign of the derivative of $E[U_m]$ with respect to θ , given in the open economy case by (??), when evaluated at the autarkic optimal value of θ , which is given by the solution to (??). After some tedious manipulations¹⁴ it is possible to write that derivative as:¹⁵

$$\begin{aligned} \frac{dE[U_m]}{d\theta} = & -C^{-1}\Sigma^{-1} \left[\frac{L}{N}(u'_m - v'_m)(v_m - u_m) \left(\ell_{wr} - \ell_{ww} \frac{\ell_r}{\ell_w} \right) \right. \\ & \left. + (\kappa_m - \bar{\kappa}) \left(\frac{N}{N-L} v'_m u'_m \ell_w + u'_m v''_m \ell \right) \right] \left(\frac{k_r}{k_w} - \frac{\ell_r}{\ell_w} \right)^{-1}. \end{aligned} \quad (32)$$

To evaluate the sign of this derivative, it is worth recognizing that except for $\ell_{wr} - \ell_{ww} \frac{\ell_r}{\ell_w}$, all terms on the right-hand side of (??) can be signed. The derivative in (??) turns out to have the same sign as the expression in brackets on the right-hand side. This expression is composed of two terms. With our assumption that $\kappa_m < \bar{\kappa}$, the second of these terms is positive; the first one has the same sign as $(\ell_{wr} - \ell_{ww} \frac{\ell_r}{\ell_w})$. Therefore, from (??) we draw the following conclusions:

- (i) If $\ell_{wr} \geq \ell_{ww} \frac{\ell_r}{\ell_w}$, then $\frac{dE[U_m]}{d\theta} > 0$ i.e. opening borders to capital flows makes the median voter choose a higher employment subsidy. This result is identical to the one obtained when the wage rate is exogenously fixed.
- (ii) If $\ell_{wr} < \ell_{ww} \frac{\ell_r}{\ell_w}$, the sign of $\frac{dE[U_m]}{d\theta}$ is ambiguous.¹⁶ If the first term in the expression in brackets dominates the second one, this sign is negative i.e. opening borders to capital flow triggers the median voter to reduce the employment subsidy, a conclusion that is opposite to the one reached with exogenously fixed wage.

It is worth noticing that if the production function is quadratic, $\ell_{wr} = \ell_{ww} = 0$ and we are in case (i), whereas if it is of the Cobb-Douglas type with decreasing returns to scale, we have $\ell_{wr} < \ell_{ww} \frac{\ell_r}{\ell_w}$, so we are in case (ii). Therefore both outcomes are possible with wage bargaining.

In assessing the impact of economic integration on the median voter's choice of θ , two important factors play a key role. On the one hand, the distribution of capital endowment across the population, in particular the difference between the average and median endowments, determines the sign of the second term in the bracketed expression of (??): under our assumption that the median capital endowment is lower than the average, this term pushes up the employment subsidy when allowing for international capital mobility. This agrees with intuition since the lower is the capital endowment of the median voter, the less he values increases in the interest rate induced by larger employment subsidies in the closed economy.

On the other hand, the responsiveness of labour demand to the factor prices and in particular the way the response to the wage rate is affected by the interest rate determine the sign of the first term in the bracketed expression of (??). As far as this term is concerned, the employment

¹⁴We substitute (??)-(??) into (??) and solve it for the RHS of (??), using the union's first order condition (??). Inserting it into (??) and re-arranging yields (??).

¹⁵Note that the correspondent expression under the fixed wage model (??) could have been easily derived from (??) setting $\omega_b = \omega_r = \omega_\theta = 0$, i.e., making the wage insensitive to any changes.

¹⁶In the unlikely case of $\kappa_m \geq \bar{\kappa}$, there would no ambiguity: the open economy employment subsidy would be lower than the autarkic one.

subsidy is pushed down in the open economy setting when $\ell_{wr} - \ell_{ww} \frac{\ell_r}{\ell_w}$ is negative. The intuition behind this effect is related to the myopic behaviour of unions in autarky: when workers choose their preferred wage rate at the sector level, they take the interest rate as constant, so neglecting its effect on the equilibrium labour demand. To fix idea, suppose that $\ell_{wr} < \ell_{ww} \frac{\ell_r}{\ell_w}$. This means that, in the closed economy, union members overestimate the (absolute value of the) wage elasticity of labour demand by neglecting the fact that a rise in w depresses r and therefore reduces this elasticity. This overestimation gives the government (here the median voter) more room for increasing θ . However, this overestimation of the wage elasticity of demand is not present in the open economy setting since its cause (i.e., the negative impact of w on r) has disappeared. This means that when $\ell_{wr} < \ell_{ww} \frac{\ell_r}{\ell_w}$ the government has less incentives to increase θ in the open economy than in the closed one.

To sum up, to get the result that tax competition depresses the wage subsidy we need a very strong impact of the interest rate on ℓ_w , the labour demand derivative with respect to wage.

5 Conclusions

Most of the work devoted to fiscal competition and its depressive effects on either public expenditure or redistribution assumes full employment. This is a bit surprising as one of the sharpest types of tax competition one witnesses in the real world concerns the attempt by national or regional governments to attract employment-enhancing investments and so to fight growing structural unemployment. This paper has tried to deal with this issue in a setting of wage bargaining, where each country had to decide on employment-enhancing policies and redistributive policies regarding the unemployed. Contrary to the case where wages are exogenously given, the chosen level of employment subsidy may be lower with capital mobility. This result, which seems counter-intuitive, is explained by the fact that unions do not fully account for all the effects of their wage choice on the expected utility of their members. In particular, the change in the interest rate induced by the choice of the union's wage affects the elasticity of labour demand. The choice of the country's employment subsidy in a closed economy setting will then account for this myopic behaviour of unions. Opening the borders to capital flows may then lower the employment subsidy.

Even though this paper focused on the rate of employment subsidy and not on the issue of redistribution, one gets however some information as to the *ex post* disposable incomes of both employed and unemployed individuals. In the fixed wage model, opening borders to capital flows leads to an increase in the employment subsidy which in turn leads to a decrease in the unemployment compensation. In other words, economic integration implies a widening gap between the incomes of employed and unemployed even though, at the same time, employment increases. In the wage bargaining model the result is even more ambiguous. One observes that both the wage level and the unemployment compensation move in the same direction. It would be interesting to investigate these aspects further but this would go quite beyond the scope of this paper.

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