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ABSTRACT

Welfare Policies, Labour Taxation and International Integration*

How will international integration affect welfare policies? This paper considers the possibilities of financing public sector activities (public consumption and social security expenses) by general (wage) taxation in an economy which becomes more integrated in international product markets. Even if labour is internationally immobile, the increased mobility of products and hence jobs implies a change in the distortions arising from taxes and social security contributions levied on labour income. Since financing of social security via general taxation involves a negative externality the effects of international integration depend critically on the institutional structure of the labour market. This paper shows that increased international integration inducing more product market competition implies that it becomes more costly to maintain welfare systems financed by general taxation.

JEL Classification: F10, J30, H20, H30

Keywords: Product market integration, tax distortions, social security, and public consumption.

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1 Introduction

The process of international integration is getting widespread attention and it is widely expected to change economic structures fundamentally. One of the concerns - especially among Northern European countries - is that it may erode the possibilities for maintaining an extended welfare state. A particular concern is whether it will become more difficult to maintain a large public sector and an extended social security system which is financed by general taxation or social security contributions. Moreover, some observers are pointing to the fact that international integration may lead to more volatility and needs for restructuring which may increase the demand for the parts of public sector activities which provide (explicit or implicit) social insurance (see eg Rodrik (1997, 1998)). The need for social insurance arrangements may thus increase at the same time as it becomes more difficult to finance the system. This paper addresses the second part of this problem, namely the problem of maintaining welfare activities and social security systems financed by general taxation in the face of tighter international integration[1].

The fact that international integration enhances the mobility of certain tax bases has been widely stressed as a major threat to the welfare state (see eg Tanzi (2000)). International integration makes it easier to move the tax base to minimize tax payments, which implies that tax revenues are eroding and it will accordingly be more difficult to finance the welfare state as international integration proceeds further. However, while mobility of some tax bases including in particular financial capital has increased significantly it remains the case that labour is fairly immobile - at least in Europe - see OECD (1999). Does this imply that the tax pressure on the welfare state is relieved? After all, capital income taxation contributes a fairly small proportion of total tax revenue in most European countries[2], and the bulk of social expenditures are financed by various forms of taxes levied on wage income. This seems to suggest that the mobility problem is not a major threat to the possibility of financing welfare arrangements and social security by taxes or contributions levied on labour[3].

However, this argument overlooks that increased mobility of goods and firms [4] also imply that jobs become increasingly mobile, hence even if workers are not very mobile, jobs are. This can in various ways affect labour market performance (see eg Andersen, Haldrup and Sørensen (2000)) and therefore in turn the consequences for welfare state activities. This paper considers this issue and focuses on the scope for maintaining strong universal or collective elements in welfare state activities. The universal principle prevails if all citizens have a right to the welfare arrangements (eventually dependent on labour market status), and

[1] The issue of integration and risk is addressed in Andersen (2000a).

[2] In EU-countries the revenues raised from taxation of corporations is less than 3% of GDP in 1997, and taxation of capital income of various forms yields even less revenue, see EU (2000).

[3] Obviously, taxes levied on some form of consumption may be threathened. However, if labour is immobile this can be counteracted by changing from consumption to income taxation.

[4] Important examples include the pressure on indirect taxes due to border trading and e-commerce.

they all contribute to the financing via general taxation (see Esping-Andersen (1990) on various welfare models). The present analysis considers public provision of goods and services as well as social security in the form of unemployment benefits to unemployed members of the labour force and transfers unrelated to labour market status (eg pensioners or other groups outside the labour force). Since most European countries have a strong universal element in the welfare arrangements, the issue of how it is affected by international integration is of direct policy relevance.[5]

To analyse this issue two fundamental aspects have to be considered. First, we need to clarify how welfare programmes (unemployment benefits) and taxation affect wage formation and employment. Second, we have to address how these effects depend on the extent to which the economy is integrated in international product markets.

For the first part the paper builds on an extensive literature on how unemployment benefits and taxes affect wage formation. Since the paper takes a macro or general equilibrium perspective on the problem, the institutional structure of the labour market becomes crucial in respect to the perceived connection between receipt of unemployment benefits or other welfare arrangements and payment in the form of taxes or social security contributions (see eg Atkinson (1999)). The problem is that the public budget becomes a common resource which in turn may create a negative externality. An example of this is that the costs of unemployment in the form of larger expenses on unemployment benefits with a universal social security model are born by all participating groups. This crucial link was pointed out by Summers, Gruber and Vergara(1993) and has since been addressed in work on the importance of the institutional structure in labour markets.[6]

The second part of the paper builds on a growing literature addressing how tighter product market competition and increased mobility of production may affect labour markets even if labour is immobile (see eg Andersen, Haldrup and Sørensen (2000)). While the effects of international integration can appear in many forms this paper presents a model formulation which makes it possible to capture the main qualitative effects in a manageable way which can be combined with the interrelationship between taxation, social security systems and the institutional structure of the labour market.

The paper is organized as follows: Section 2 develops a model for an open economy which to different degrees can be integrated in international product markets, section 3 outlines some basic mechanisms concerning the interaction

[5] A distinction is often made beween Scandinavian countries which are taken to be more universal in their welfare arrantements as opposed to the continental model which is taken to rely more on private insurance arrangements. However, the difference between the two systems is more nominel than real since the insurance model relies on mandatory insurance arrangements with a colletive element in financing, ie contributions are ususally a flat rate defined on some income measure. This does not preclude that there are substantial differences across countries in terms of eg replacements ratio and the distributional profile of the arrangements.

[6] See eg Holden and Raaum (1991), Holmlund (1993) Jackman (1990). For surveys on the role of centralization see Calmfors (1983) and Moene, Wallerstein and Hoel (1993).

between taxation and social security and labour market performance. Section 4 considers how increased international integration changes the effects taxes and social security systems have on labour market performance, and section 5 addresses the welfare effects. Section 6 provides some concluding remarks, and all technical details have been placed in appendices.

2 A two-sector model

Consider an economy with a continuum of sectors j $\in [0,1]$, which in turn is made up of subsectors $i \in [0,1]$. Each subsector produces a differentiated commodity of the sector-specific type of goods and there is one representative firm in each subsector. Some firms $i \in T \equiv [0,\eta]$ produce traded goods with prices determined in international product markets, ie $p_{ji} = p^*_{ji} \forall\, i \in T$, and the remaining firms i$\in N \equiv]\eta, 1]$ produce non-tradeables with prices p_{ji} determined by the conditions in the domestic product market (cf below). An increase in η is taken as a proxy for increased international integration since it captures that the competitive pressure in product markets becomes more intensified.[7]

2.1 Households

Households supply labour from which they receive wage income if employed and unemployment benefits if unemployed. Each household supplies a specific type of labour matching the labour requirements of one particular sector. Moreover households own firms and are entitled to profits. Ex-ante there is uncertainty with respect to the labour market status of the household (employed or unemployed). The utility of a representative household $h \in [0,1]$ is given as

$$U_h = c_h - dl_h + V(g)$$

This formulation captures the utility from consumption of the private consumption bundle c_h (see below), the disutility of work and the utility achieved by access to the goods and services (g) provided by the public sector (V'>0,V"<0). Note that d capturing the disutility of work has the interpretation of a reservation wage, ie for any consumption real wage above d the household supplies inelastically its working time (normalized to unity). The budget constraint of the household reads

$$pc_h = I_h + \pi_h + TR_h$$

[7] Allowing for explicit trade friction makes it possible to endogeneously determine which goods become tradeables and which become non-tradeables, and also to address explicitly the consequences of reduced trade frictions as the cause of tighter international integration, see eg Andersen (2000b). However, the qualitative implications are the same as those captured by the more simple way of modelling international integration used here. See Hau (1998) for a similar approach to the modelling of intergration of product markets.

where TR_h are lump-sum transfers from the government, π_h profits and $I_h$labour income given as

$$\begin{aligned} I_h &= (1-\tau)w \qquad if\ employed \\ &= b \qquad\quad if\ unemployed \end{aligned}$$

where τ is the tax rate, and b the unemployment benefit (net of taxes).

The consumption bundle c_h is defined over commodities from the j sectors as

$$c_h = [\int_0^1 c_{hj}^{\frac{\theta-1}{\theta}} dj]^{\frac{\theta}{\theta-1}}$$

and the associated price index is given as

$$p \equiv [\int_0^1 p_j^{1-\theta} dj]^{\frac{1}{1-\theta}}$$

The demand by household h of commodities from sector j is given as

$$c_{hj} = [\frac{p_j}{p}]^{-\theta} c_h$$

The consumption bundle of goods from sector j is similarly defined over the sector specific goods as

$$c_{hj} = [\int_0^1 c_{hji}^{\frac{\theta-1}{\theta}} di]^{\frac{\theta}{\theta-1}}$$

with the associated price index

$$p_j \equiv [\int_0^1 p_{ji}^{1-\theta} di]^{\frac{1}{1-\theta}}$$

and the demand by household h of commodity i in sector j is given as

$$c_{hji} = [\frac{p_{ji}}{p_j}]^{-\theta} c_{hj}$$

2.2 Government

The government provides public services/goods and social security in the form of transfers related to production/employment (unemployment benefits) and transfers unrelated to the activity level lumpsum transfers to eg pensioners or others outside the labour force).

The public services g are produced by use of commodities from all sectors according to

$$g = [\int_0^1 g_j^{\frac{\theta-1}{\theta}} dj]^{\frac{\theta}{\theta-1}}$$

and the associated price index is defined by p defined above, implying that public demand for product variety j can be written

$$g_j = [\frac{p_j}{p}]^{-\theta} g$$

Similar to the structure of private households, the composite good from sector j is made up of the specific goods as

$$g_j = [\int_0^1 g_{ji}^{\frac{\theta-1}{\theta}} di]^{\frac{\theta}{\theta-1}}$$

and the associated price index is defined by p_j given above, implying that public demand for product variety i from sector j can be written

$$g_{ji} = [\frac{p_{ji}}{p_j}]^{-\theta} g_j$$

Note that this way of specifying public consumption rules out relative demand shifts between public and private consumption as a source of relative price changes[8]. Since we are considering the incentive effects of welfare arrangements this assumption helps isolating the pure effects of these activities absent any relative price effects that may arise if the distribution of income affects aggregate demand.

The public sector budget constraint reads

$$pg + pTR + pB = \tau I$$

where TR is total transfers

$$TR = \int_h TR_h dh$$

B is the aggregate expenses on unemployment benefits, ie

$$B = b(1 - \int_0^1 \int_0^1 l_{ji} didj)$$

and I is the aggregate labour income,ie

$$I = \int_0^1 \int_0^1 w_{ji} l_{ji} didj$$

The tax is levied only on wage income partially to simplify the model and partially to capture the empirical fact that general wage income taxation accounts for most of public sector revenue. Moreover this formulation allows us to interpret taxes as social security contributions.

In the following analysis of wage formation it is assumed that the real level of unemployment benefits (b), transfers (TR) and public consumption (g) are exogenous - unless otherwise stated. Consequently, the wage tax rate (τ) is endogenous adjusting so as to balance the budget.

[8] See Andersen (2000) for an analysis of the effects of relative demand shifts arising when public and private consumption are differently distributed over tradeables and non-tradeables.

2.3 Firms

All firms are price and wage takers, and they produce subject to a technology linking output to the employed amount of labour given by

$$y_{ji} = \frac{1}{\alpha}(l_{ji})^{\alpha}, \qquad where\ 0 < \alpha < 1$$

which under the assumption of wage taking behaviour implies that labour demand reads

$$l_{ji} = (\frac{w_{ji}}{p_{ji}})^{\gamma} \quad where \quad \gamma \equiv (\alpha - 1)^{-1} < 0$$

and output supply can be written

$$y_{ji} = \frac{1}{\alpha}(\frac{w_{ji}}{p_{ji}})^{\alpha\gamma}$$

The total demand faced by firm i in sector j can now be written

$$d_{ji} = [\frac{p_{ji}}{p_j}]^{-\theta}[\frac{p_j}{p}]^{-\theta}(c+g)$$

Hence, the labour demand elasticity differs between tradeable and non tradeable firms since

$$\beta_i = \gamma\ for\ i = T$$

$$\beta_i = \gamma(1 - \varepsilon_{pw}) = \gamma\ \left(\frac{-\theta}{\alpha\gamma - \theta}\right) > \gamma \quad for\ i = N$$

That is, labour demand is less elastic in non-tradeable firms as compared to tradeables firms since in the former sectors wage increases are partly passed into prices while this is not possible in the latter sector.

2.4 Wage formation

The labour market is assumed to be imperfectly competitive. While there is no consensus on how to model imperfectly competitive labour markets it is commonly accepted that the monopoly union model in a simple way captures the qualitative implications of different labour market models at least in respect to generate unemployment, and in the wage response to general income taxation and the degree of centralization (see eg Blanchard and Fischer (1989)). Hence, this model is used here in the right to manage version to capture some essential mechanisms in relation to wage formation, public policy and international integration of product markets.

All workers are organized in unions, and workers in a given sector belong to the same union. A union sets wages for a fraction ϕ $(0 < \phi \leq 1)$ of the

sectors implying that there are $1/\phi$ unions. Labour is mobile across firms in a given subsector, while not among different sectors and nations. Since sectors are symmetric there is no incentive for workers to move across sectors in equilibrium, and disregarding international mobility matches the current European situation quite well (cf the introduction). The union is able to discriminate its wage policy between firms producing tradeables and firms producing non-tradeables[9]. Since nominal issues are not crucial to the problems considered here, it is assumed that wage setters can determine real wages[10], and the aggregate price level is normalized to one ($p \equiv 1$).

The union is assumed utilitarian and maximizes the expected utility of its members. Note that there is individual uncertainty wrt to labour market status - employed or unemployed - but there is no aggregate uncertainty. The former implies that an unemployment insurance system has potential welfare benefits, and the latter implies that it is possible to diversify the unemployment risk. The interesting question is how this affects incentives when the unemployment insurance system is universal, that is, collectively financed.

Since a union represents workers in both tradeables and non-tradeables firms, it has to take the interaction between the two into account, and it is shown in Appendix A that the wages set for tradeable and non-tradeable firms in all sectors (hence the sector index j can be dropped), respectively can be written[11]

$$w_i = \frac{\beta_i(b+d)}{(\beta_i+1)(1-\tau) - \varepsilon_{\tau w_i}} \ for \ i = T, N$$

where the labour demand elasticity $\beta_i (< -1)$ is given above, and $\varepsilon_{\tau w}$ is the effect which unions perceive that a change in wage policy has on taxes.

2.5 Equilibrium conditions

The price of all non-tradeables are determined by the market clearing condition

$$y_{ji} = c_{ji} + g_{ji} \quad for \quad all \ j, i \in N$$

[9] While this may seem restrictive, bargaining usually leaves some room for wage differences across firms. The assumption serves the technical purpose here of avoiding that sectoral differences disappear in equilibrium. With equal wages, output prices would be the same, and thus employment independent of the sectoral composition of the economy.

[10] In the case of nominal contracting this would amount to assuming that the nominal wage is fully indexed. This assumption rules out the price-externality effect which has been stressed as one mechanism through which the degree of centralization in labour market may make a difference, see eg Calmfors and Driffill (1988) and Alesina and Perotti (1997)

[11] Note that in the case where the effects of changed wages on the public budget are accomodated either by changes in public consumption or changes in transfers we have $\epsilon_{\tau w} = 0$ and we get the standard monopoly wage formula appearing in the literature, ie

$$w_j = \frac{\beta_i}{1+\beta_i} \frac{(b+d)}{(1-\tau)}$$

in which case the wage is increasing in both b and τ.

and for tradeables the net export x is given as

$$x_{ji} = y_{ji} - (c_{ji} + g_{ji}) \quad for \quad all \ j, i \in T$$

Since the model is static, trade has to balance, ie

$$\int_j \int_{i \in T} p_{ji} x_{ji} dj di = 0$$

Given the wages set by unions, employment is determined by labour demand. We solve for the symmetric[12] equilibrium where $p_{ji} = p_N$ for i $\in N$, and $p_{ji} = p_T$ for i $\in T$, and $w_{ji} = w_N$ for i $\in N$, and $w_{ji} = w_T$ for i $\in T$. For later reference define aggregate wages as

$$\begin{aligned} w &= \int_0^\eta w_i di + \int_\eta^1 w_i di \\ &= \eta w_T + (1 - \eta) w_N \end{aligned}$$

In the following we first lay out some basic mechanisms concerning the interaction between wage formation, social security and taxation, and next we turn to an explicit analysis of the effects of tighter international integration.

3 Taxation and wage formation

A crucial aspect of collectively financed welfare arrangements is that they are universal (eventually conditioned on active participation in the labour market). While this may have the politically attractive feature of offering equal opportunities or the economic of allowing better diversification of risks, it also implies that there is a potential externality in wage setting. For the tax payer there is no direct link between the taxes paid and the benefits received, or in the present setting of non-atomistic wage setters between total taxes paid by employed members and what is received in the form of eg unemployment benefits for unemployed members. To put this differently, by its wage decision a given union affects the employment situation for its members which in turn affects the expenses of the social security system and therefore the tax rate levied on all wage earners to finance the system. This reflects an externality present in any collectively financed system (the problem of common resources). Consider first how this affects wage formation.

In symmetric equilibrium (see appendix) the wages in tradeable and non-tradeable firms can be written as

$$w_T = m_T \frac{d + (1 - \phi) b}{1 - \tau(1 - \phi)} \ where \ m_T \equiv \frac{\beta_T}{\beta_T + 1}$$

[12] As is well-known due to the symmetry across sectors there will be no trade in equilibrium ie $nx_{ji} = 0$ for all i $\in$T. However, clearly incentives are affected by the possibility for trade.

and

$$w_N = m_N \frac{d + (1-\phi)b}{1 - \tau(1-\phi)} \; where \; m_N \equiv \frac{\beta_N}{\beta_N + 1}$$

Observe that these expressions are not closed form solutions since the tax rate τ is endogenous. However, it can be concluded that wages in non-tradeable firms are higher than in tradeables firms,

$$w_N > w_T$$

reflecting that the competitive pressure is higher in tradeable firms and therefore the wage is lower.

Considering how the wages respond to changes in welfare activities we find that for unemployment benefits there is both a direct effect in terms of raising the reservation wage of workers and an indirect effect in terms of raising taxes (see appendix). Both effects tend to increase wage demands and we have

$$\frac{\partial w_i}{\partial b} \geq 0 \; for \; i = T, N$$

For public consumption and transfers unrelated to production/employment, wage formation is only affected via the implied increase in the tax rate, that is,

$$\frac{\partial w_i}{\partial z} > 0 \quad for \; i = T, N; z = TR, g$$

This captures that standard result that an increase in public sector activities may lead to a wage increase (see eg Alesina and Perotti (1997))

Turning to the importance of the institutional structure we find that

$$\frac{\partial w_i}{\partial \phi} < 0 \; for \; i = T, N$$

The more comprehensive the union, the more the tax externality is internalized and the lower the wage demands. The reason is simple - the higher ϕ - the more the union takes into account that higher wage demands will lead to higher unemployment and therefore higher public expenses to transfer payments which in turn will have to be financed by taxes which lowers the disposable income of employed workers.

Welfare policies like eg unemployment benefits will thus affect wage formation less the more centralized the labour market, since unions realize that the unemployment benefits are going to its members, ie

$$\frac{\partial}{\partial \phi} \frac{\partial w_i}{\partial b} < 0$$

The same holds for the effects of transfers an public consumption. With fully centralized wage setting ($\phi = 1$) the negative externality in the social security

system is fully internalized and the wage rate becomes independent of both unemployment benefits and the tax rate, ie

$$\frac{\partial w_i}{\partial b} = 0 \; for \; i = T, N, and \quad \phi = 1$$

The reason is that the system is actuarially fair at the aggregate level and therefore essentially works as a way to redistribute income from employed to unemployed, since unions are assumed utilitarian, this will have no effects on the incentives underlying wage formation when wage setting is fully centralized. This suggests why countries with a strong element of universal welfare policies also tend to be economies with highly centralized labour markets (see Summers et. al. 1993, and Moene and Wallerstein (1995)). The general point here is that the effects of social security systems and taxation cannot be judged independently from the institutional structure of the labour market.

It is interesting to observe that the "tax" externality does not induce a hump-shaped wage curve a la Calmfors and Driffill (1988). The reason is straightforward, the externality is monotonously increasing in the degree of decentralization in the labour market[13].

Using that aggregate employment can be written

$$l = \eta l_T + (1 - \eta) l_N$$

It follows straightforwardly that aggregate employment is decreasing in the level of unemployment benefits, transfers and public consumption, and increasing in the degree of centralization of labour market. These effects arise directly from the wage responses outlined above.

4 International product market integration

Consider now a process of international integration which via a reduction in various barriers to trade as well as implicit and explicit trade costs imply that a larger share of the sectors will be exposed to international competition, that is, η increases. The immediate effect is a reduction of aggregate wages,i.e.

$$\frac{\partial w}{\partial \eta} < 0$$

This reflect that a larger fraction of economic activity takes place in firms/sector in which the market power of unions is smaller because the goods produced can be traded internationally. As a consequence of this reduction in market power it also follows that increases in unemployment benefits and taxes to a lesser extent spilover into wage increases, ie

$$\frac{\partial(\frac{\partial w}{\partial b})}{\partial \eta} < 0$$

[13] Alesina and Perotti (1997) conjecture a hump-shaped relation, but this is not supported by the present analysis. See also Daveri and Tabellini (2000).

and

$$\frac{\partial(\frac{\partial w}{\partial z})}{\partial \eta} < 0 \qquad z = TR, g$$

The reason is straightforward. With tighter international integration the unions face a more elastic labour demand relation. Accordingly, they are less aggressive in their wage demands and increases in taxes and unemployment benefits are to a lesser extent shifted into wages. This points out that international integration may imply an "implicit" structural reform of labour markets through the effects it has on union market power. However, even though international integration in this way may reduce the distortionary effects of unemployment benefits and taxation on wage formation it does not necessarily follow that the distortionary effects on employment are reduced. Despite the wage moderation the employment consequences may become larger because tighter international integration increases the sensitivity of aggregate employment to wage costs.

To address this issue first note that international integration implies an increase in aggregate employment due to the reduced market power of unions, ie

$$\frac{\partial l}{\partial \eta} > 0$$

Turning to the employment consequences of welfare policies we find that they are numerically larger the more integrated the economy is, since

$$\frac{\partial}{\partial \eta}\left(\frac{\partial l}{\partial z}\right) < 0 \; for \; z = b, g, TR$$

That is, even though the international integration works to lower the shifting of taxes and unemployment benefits into wages, the net effect is that the employment consequences are (numerically) larger, ie a given increase in tax rates or unemployment benefits have a larger distortionary effect on aggregate employment, the more integrated the economy is. It is interesting to note that the distortionary employment effects are larger, the less centralized the wage formation process (ϕ low), that is, the more decentralized wage formation is, the more international integration increases the distortions on employment of welfare policies.

5 Welfare implications

The welfare implications of taxation, public consumption and social security in the form of unemployment benefits and lump sum transfers can now easily be considered. Although the market power of unions implies that employment is inefficiently low, ie

$$\frac{\partial \Psi}{\partial l_i} > 0 \qquad for \quad i = T, N$$

the welfare consequences cannot directly be measured by the employment consequences since aggregate welfare under a utilitarian welfare criterion is given as (see appendix D)

$$\Psi = \eta p_T y_T + (1-n)\, p_N y_N - d(\eta l_T + (1-\eta) l_N) + V(g)$$

Since tighter international integration affects not only employment, the general welfare effects cannot be inferred simply from observing that employment increases. It is, however, possible to show that the standard argument for aggregate welfare gains from international integration applies, since international integration unambiguously improve welfare, ie

$$\frac{\partial \Psi}{\partial \eta} > 0$$

The reason is straightforward that international integration reduces the market power of unions and therefore the distortion due to imperfectly competitive labour markets.

The interesting question is, however, how international integration affects welfare policies. To this end let us consider the three main categories in turn.

Consider first public consumption. Since the benefits of public consumption are not directly affected by international integration it follows that the change in the distortions arising from financing public consumption is the channel through which international integration affects the optimal level of public consumption, and we have

$$\frac{\partial g^{opt}}{\partial \eta} < 0$$

The optimal level of public consumption is reduced when product markets are integrated, because the costs of financing public consumption goes up (the tax distortions increase).

An increase in public lump sum transfers financed by income taxation reduces welfare and the consequences are larger the more open the economy, ie

$$\frac{\partial \Psi}{\partial T} < 0 \quad and \quad \frac{\partial}{\partial \eta}(\frac{\partial \Psi}{\partial T}) < 0$$

Similarly, unemployment benefits have a welfare cost which is larger the more integrated the economy,

$$\frac{\partial \Psi}{\partial b} < 0 \quad and \quad \frac{\partial}{\partial \eta}(\frac{\partial \Psi}{\partial b}) < 0$$

Note that these results only capture the cost side of unemployment benefits since the formulation adopted here does not address the welfare gains (reduction of inequality, better insurance) of unemployment benefits and other transfers. The reason being that the distribution of income does not have any aggregate consequences under the specification adopted, and hence under the utilitarian

welfare criteria it comes to play no role for aggregate welfare. This is obviously a special case, but the finding of increasing costs of providing transfers either to unemployed or unrelated to production/employment would increase will also be relevant even if there are benefits from such transfers.

6 Concluding remarks

This paper has highlighted some important channels through which international product market integration affects a universal welfare model. Specifically, we have considered provision of public consumption, transfers unrelated to labour market status and unemployment benefits. In all cases it was found that tighter international integration puts the public sector under pressure, not because the tax base as such is very mobile, it is not since labour is assumed immobile across nations, but because the distortionary consequences of taxation increase when product markets become more integrated.

An important point of the present study was that the institutional structure underlying wage formation is critical for the effects of taxes and unemployment benefits on labour market performance. This is due to the negative externality implied by welfare arrangements financed by general taxation. Hence, the more centralized the labour market the more the externality is internalized. Or to put it differently, it is less costly to maintain universal welfare arrangements if labour markets are highly centralized. Empirical support for the importance of this mechanism has recently been provided by Summers, Gruber and Vergara (1993), Alesina and Perotti (1997) and Daveri and Tabellini (2000).

The importance of the institutional structure may be of interest in its own right, since international integration may be expected to lead to more decentralized labour market structures (see eg $\prod$ and Hunt (1993)). Hence there may be a "double pressure" on the public sector from international integration - directly by increasing the distortionary effects of public sector activities financed by wage taxation and indirectly by changing institutional structures in the direction of more decentralized labour market structures which will tend to reinforce the direct effect. Even if it is questioned whether international integration in itself leads to more decentralization in wage formation, in remains a fact that in many countries there has been a trend towards more decentralized wage setting arrangements in recent years (see Flanagan (1999)). The present analysis suggests that this may contribute to increase the costs of maintaining universal welfare policies.

Privatization of social security is often proposed as a solution to the problems faced by publicly financed systems. While decentralization of social security surely reduces the tax externality and therefore the distortionary effects, it is also the case that in terms of risk diversification it can offer less than a universal system which pools the risks of all agents in the economy. It is an interesting topic for future research to clarify how international integration affects the tradeoff between risk sharing and the distortionary effects of taxation.

Appendix A : Wage setting

Consider the union which represents sectors j$\in J$ where the set J constitutes a fraction ϕ of all sectors. The expected utility of members which are employed in both tradeable and non-tradeable firms can be written

$$\int_J \left[\int_0^{\eta} (l_{ji}((1-\tau)w_T - d) + (1-l_{ji})b)di + \int_{\eta}^{1} (l_{ji}((1-\tau)w_N - d) + (1-l_{ji})b)di \right] dj$$

Note that labour supply (exogenous time constraint) is one in all sectors. The union sets the wage for tradeable and non-tradeable firms taking into account the labour demand relation and the effects its decisions have on the public budget. Since the problem is symmetric for all sector the sector index is dropped on the wage. The first order condition for the wage decision problem can be written

$$\beta_i((1-\tau)w_i - d - b) + (1-\tau)w_i - \frac{w_i}{l_i} I_J \frac{\partial \tau}{\partial w_i} = 0 \qquad \text{for i=T.N}$$

Denoting

$$\varepsilon_{i\tau} \equiv \frac{w_i}{l_i} I_J \frac{\partial \tau}{\partial w_i}$$

yields the wage setting rule given in section 2.4. In this expression I_J denotes total labour income generated by the union. i.e.

$$I_J = \int_J \left[\int_0^{\eta} (l_{ji} w_T di + \int_{\eta}^{1} l_{ji} w_N di \right] dj$$

>From the public sector budget constraint we find by using that $\phi I = I_J$

$$I_J \frac{\partial \tau}{\partial w_i} = \phi l_i \left(-b\beta_i w_i^{-1} - \tau(1+\beta_i) \right)$$

Inserting we find that the wage relation can be written

$$w_i = \frac{\beta_i}{\beta_i + 1} \frac{d + (1-\phi)b}{(1 - \tau(1-\phi))} \qquad \text{for i=T,N}$$

or

$$w_i = m_i w^* \quad \text{for i=T,N}$$

where

$$m_j = \frac{\beta_j}{\beta_j + 1} \quad \text{for j=T,N}$$

and

$$w^* = \frac{d + (1-\phi)b}{(1 - \tau(1-\phi))}$$

The interpretation being that the mark-up which differs across tradeable and non-tradable firms determines how much the wage is increased beyond the base level w*.

Appendix B: Wage effects

It follows straightforwardly that

$$\frac{\partial w_i}{\partial b} = \frac{\beta_i}{\beta_i + 1}\left[\frac{(1-\phi)}{(1-\tau(1-\phi))} + \frac{(d+(1-\phi)b)(1-\phi)}{(1-\tau(1-\phi))^2}\frac{\partial \tau}{\partial b}\right] \text{ for i=T,N}$$

and

$$\frac{\partial w_i}{\partial z} = w_i \frac{(1-\phi)}{(1-\tau(1-\phi))}\frac{\partial \tau}{\partial z} \quad \text{for i=T,N and z= g, TR}$$

It follows that

$$\frac{\partial \tau}{\partial z} > 0 \text{ for z=b, g,TR}$$

Since

$$\frac{\partial w}{\partial z} = \eta \frac{\partial w_T}{\partial z} + (1-\eta)\frac{\partial w_N}{\partial z} \text{ for z=b,g,TR}$$

we have

$$\frac{\partial}{\partial \eta}\frac{\partial w}{\partial z} = \frac{\partial w_T}{\partial z} - \frac{\partial w_N}{\partial z}$$

The results in the text follows now directly by observing

$$\frac{\partial w_T}{\partial z} < \frac{\partial w_N}{\partial z} \quad \text{for z= b,g,TR}$$

Finally note that

$$\frac{\partial w}{\partial \phi} < 0$$

and

$$\frac{\partial}{\partial \phi}\frac{\partial w}{\partial z} < 0 \quad \text{for z=b,g,TR}$$

Appendix C: Aggregate prices

First note that by aggregating the private and public sector budget constraints we get

$$p(c+g) = \eta p_T y_T + (1-\eta) p_N y_N$$

The demand for any non-tradeable can be written

$$d_N = \left(\frac{p_N}{p}\right)^{-\theta} p^{-1}(\eta p_T y_T + (1-\eta) p_N y_N)$$

using that supply of non-tradeables equals demands, and that p=1 we get

$$\left(1-(1-\eta)\, p_N^{1-\theta}\right) p_N y_N = \eta p_N^{1-\theta} p_T y_T$$

Using that the supply of non-tradeables can be written

$$y_N = \frac{1}{\alpha}(\frac{w_N}{p_N})^{\alpha\gamma}$$

and that the supply of tradeables can be written

$$y_T = \frac{1}{\alpha}(\frac{w_T}{p_T})^{\alpha\gamma}$$

from which we get

$$\frac{\left(1-(1-\eta)\, p_N^{1-\theta}\right)}{\eta p_N^{1-\theta}} \frac{m_N}{m_T} = \left(\frac{m_T}{m_N}\frac{p_N}{p_T}\right)^{\alpha\gamma-1}$$

Since P_T is exogenous, it follows that P_N is independent of b and τ, and therefore g and TR.

Note that the LHS of ( ) is in increasing in p_N while the RHS is decreasing in p_N. For $p_N = p_T = 1$ (the latter equality follows from p=1) it follows that the LHS is less than the RHS from which it follows that $p_N > p_T$. It is easily verified that

$$\frac{\partial p_N}{\partial \eta} > 0$$

Next to prove that

$$\frac{m_N}{p_N} > \frac{m_T}{p_T}$$

implying that the product real wage is higher in non-tradeable firms than in tradeable firms, ie

$$\frac{w_N}{p_N} > \frac{w_T}{p_T}$$

This can be proved by contradiction. Assume $m_N/p_N \leq m_T/p_T$ in which case it follows that the RHS is less than or equal to one, but the LHS is larger than one. Hence a contradiction at it follows that $m_N/p_N > m_T/p_T$.

Finally, note that this implies that

$$l_T > l_N$$

Appendix D: Employment effects

>From ( ) we find that

$$\frac{\partial l}{\partial z} = \eta \frac{\partial l_T}{\partial z} + (1-\eta)\frac{\partial l_N}{\partial z} < 0 \quad \text{for z= b,g,TR}$$

$$\frac{\partial l}{\partial \phi} = \eta \frac{\partial l_T}{\partial \phi} + (1-\eta)\frac{\partial l_N}{\partial \phi} > 0$$

$$\frac{\partial l}{\partial \eta} = (l_T - l_N) + (1-\eta)\frac{\partial l_N}{\partial p_N}\frac{\partial p_N}{\partial \eta} > 0$$

$$\frac{\partial}{\partial \eta}\left(\frac{\partial l}{\partial z}\right) = \frac{\partial l_T}{\partial z} - \frac{\partial l_N}{\partial z} + (1-\eta)\frac{\partial}{\partial \eta}\left(\frac{\partial l_N}{\partial z}\right) < 0 \text{ for z=b,g,TR}$$

Appendix E : Welfare implications

We have

$$\psi = c - dl + v(g)$$

where

$$c = (1-\tau) I + \pi + TR + b(1-l)$$

$$\tau I = g + b(1-l) + TR$$

Hence,

$$c = I + \pi - g = \eta p_T y_t + (1-\eta) p_n y_n - g$$

Using that $\alpha_T y_T l_T^{-1} = \frac{w_T}{p_T}$ and $\alpha_N y_N l_N^{-1} = \frac{w_N}{p_N}$, we have

$$\psi = \eta \Gamma(w_T, p_T) + (1-\eta)\Gamma(w_N, p_N) + v(g)$$

where

$$\Gamma(w_i, p_i) = \left(\frac{1}{\alpha} w_i - d\right) l\left(\frac{w_i}{p_i}\right)$$

and

$$\Gamma_w = \frac{l\left(\frac{w_i}{p_i}\right)}{w_i}\left(\frac{1}{\alpha} w_i (1+\varepsilon) - d\varepsilon\right) < 0$$

$$\Gamma_{ww} = 2\frac{1}{\alpha} l'\left(\frac{w_i}{p_i}\right) + \left(\frac{1}{\alpha} w_i - d\right) l''_w\left(\frac{w_i}{p_i}\right) < 0$$

$$\Gamma_p = \left(\frac{1}{\alpha} w_i - d\right) l'_w(\frac{w_i}{p_i}) \left(-\frac{w_i}{p_i^2}\right) > 0$$

It follows straightforwardly that

$$\frac{\partial \psi}{\partial \eta} = \Gamma(w_T, p_T) - \Gamma(w_N, p_N) + (1-\eta)\Gamma_p \frac{\partial p_N}{\partial \eta} > 0$$

and

$$\frac{\partial}{\partial \eta}\left(\frac{\partial \psi}{\partial z}\right) = \Gamma_w(w_{T,} p_T)\frac{\partial w_T}{\partial z} - \Gamma_w(w_N, p_N)\frac{\partial w_N}{\partial z} - \Gamma_{wp_N}(w_N, p_N)\frac{\partial p_N}{\partial z}$$

Since,

$$\Gamma_w(w_T, p_T)\frac{\partial w_T}{\partial z} - \Gamma_w(w_N, p_N)\frac{\partial w_N}{\partial z} = \frac{\partial w*}{\partial z}\frac{1}{w*}\left[w_T\Gamma_w(w_T) - w_N\Gamma_w(w_N)\right] < 0$$

Since,

$$\frac{\partial w\Gamma_w(w,p)}{\partial w} = \frac{1}{\alpha}(1+\varepsilon)^2 l - l'_w d\varepsilon > 0 \quad for$$

It follows that

$$\frac{\partial}{\partial \eta}\left(\frac{\partial w}{\partial z}\right) < 0 \qquad for\ z = b, g, TR$$

Optimal public consumption (tax-financed) is determined by the modified Samuelson rule according to

$$MC(g) \equiv 1 + \left(\eta\Gamma(w_T, p_T)\frac{\partial w_T}{\partial \tau} + (1-\eta)\Gamma(w_N, p_N)\frac{\partial w_N}{\partial \tau}\right)\frac{\partial \tau}{\partial g} = v'(g)$$

The LHS gives the costs of public consumption as the sum of the direct resource cost plus the distortion.

We have that

$$\begin{aligned}\frac{\partial MC(g)}{\partial \eta} &= \left(\Gamma(w_T, p_T)\frac{\partial w_T}{\partial \tau} - \Gamma(w_N, p_N)\frac{\partial w_N}{\partial \tau}\right)\frac{\partial \tau}{\partial g} \\ &+ (1-\eta)\Gamma_p \frac{\partial p_N}{\partial \eta}\frac{\partial \tau}{\partial g} \\ &+ \left(\eta\Gamma(w_T, p_T)\frac{\partial w_T}{\partial \tau} + (1-\eta)\Gamma(w_N, p_N)\frac{\partial w_N}{\partial \tau}\right)\frac{\partial}{\partial \eta}\left(\frac{\partial \tau}{\partial g}\right)\end{aligned}$$

>From the public budget constraint we have

$$\frac{\partial \tau}{\partial g} = \frac{\tau}{g}\left[1 - \tau(1+\varepsilon)(\eta l_T + (1-\eta) l_N)\right]$$

Hence,

$$\frac{\partial}{\partial \eta}\left(\frac{\partial \tau}{\partial g}\right) = -\frac{\tau^2}{g}(1+\varepsilon)(l_T - l_N) - \frac{\tau^2}{g}(1+c)(1-\eta)\frac{\partial l_N}{\partial p_N}\frac{\partial p_N}{\partial \tau} > 0$$

Accordingly,

$$\frac{\partial MC(g)}{\partial \eta} > 0$$

from which it follows that the optimal g is decreasing in η.

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