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EUROPEAN INTEGRATION – A DOWNWARD BIAS IN EMPLOYMENT POLICIES?

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Abstract

Even when labour mobility is low, international integration affects labour markets by making jobs more mobile. This runs via product market integration, which is an essential element of European integration. Increasing job mobility aects the possibilities single countries perceive in pursuing employment policies. In a setting where trade is driven by comparative advantages, and thus wage competitiveness plays an important role for employment, it is shown that there is a tendency that a bias arises in employment policies. Policies expanding private employment tend to be used too little, while policies harming private employment tend to be used too much. These effects are stronger the more integrated product markets are.

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1 Introduction

It is an increasing policy concern that international integration may be harmful for employment objectives, and that it will make it increasingly difficult to implement employment oriented policies. There is a vivid public debate on these issues, and public reactions at international summits have in a very visible way reflected the concern for employment and social objectives in the international integration process. Since this is shaping views on the pros and cons of further integration it is worth considering these issues in more detail, both to evaluate the strength of the argument, and to consider possible remedies to the extent that these views have some support.

The importance at the policy level are already visible. There has been a growing presure for the EU to take a more clear responsibility with respect to employment, and this has resulted in an explicit employment objective. Article 2 of the Amsterdam treaty (June 1997) reads

"Member States ... shall regard promoting employment as a matter of common concern and shall co-ordinate their action".

In an interpretation of the treaty the EU commission writes[1]:

"Embedded throughout the approach set out in the Treaty is a recognition of the interdependence of employment policies pursued in Member States, and the need for coordination to ensure that measures to support employment in one Member state do not negatively affect progress in others. The notition of employment as a matter of common concern stresses that member states, in pursuing their own employment policies, should be contributing to a 'positive sum game' across the union."

These statements recognize that there are interdependencies in employment across European countries, that they are growing growing, and that non-cooperative policy making may lead to policies which are not beneficial for the overall employment level. Surprisingly, these issues have not been much researched in the academic literature. The present paper takes a first step in trying to address whether the concern raised above is justified, and in particular the extent to which there is a bias in non-cooperative policy making which has potential harmful effects for the overall employment level within the EU.

The present paper takes its outset in certain stylized facts concerning integration in Europe (see e.g. Coppel and Durand (1999), Andersen et. al. (2000), and Middelfart-Knarvik et. al. (2000)). There is a strong increase in trade, but it is as concentrated in other European countries as it has been in the past, intra-industrial trade is growing rapidly, there is a tendency towards increasing specialization among European countries, but labour remains fairly immobile across European countries. In short the primary driving force in European integration is product market integration.

Sometimes substantial labour market effects of European integration are dismissed on account of the fact that labour mobility among European countries

[1] See http://www.europa.eu.int/comm/employment_social/empl&esf/amst_en.htm

currently is very modest[2]. This conclusion may, however, be premature. A basic lesson of trade theory is that mobility of goods may be a substitute for mobility of factors of production. European integration of in particular product markets may therefore have important effects for labour markets. To put it simple, integration of product markets effectively implies that jobs become more mobile, since the more competitive areas will tend to have job creation at the cost of less competitive areas (via changes in market shares, FDI's or firm relocation across countries). Hence, even though labour mobility is small and not likely to increase much in the near future, it is a fact that job mobility is increasing as a consequence of European integration. In policy debates there is an increasing focus on this mobility of jobs, which recently has been exemplified by some large cooperations shifting the location of their production from one EU country to another (see e.g. Andersen, Haldrup and Sørensen, 2000). The increased mobility of jobs may have important effects on labour markets and therefore in turn employment oriented policies. Single countries may perceive that ambitious employment oriented policies may lead to loss of competitivenes and a net export of jobs, and therefore employment oriented policies may be downward biased.

The present paper considers the implications of product market integration for a very stylized form of employment policy, namely, public employment. This is motivated both by the empirical observation that this is one of the most often proposed instruments in active employment policy, and the fact that it can be modelled in a straightforward way. It is conjectured that the basic qualitative lessons can be generalized to other forms of instruments in employment policy.

The issue of interdependencies in employment and social policies has a long history in economic theory. According to simple Keynesian reasoning there would be a tendency that countries choose insufficiently expansionary fiscal policies since the demand leakage reduces the expansionary domestic effects of fiscal policies (see Cooper (1985)). This line of reasoning has often motivated proposals for coordinated fiscal expansions intended to overcome free rider problems in policies oriented towards output and employment. This view has been contested on two accounts, namely, the usual problems associated with the theoretical foundation of Keynesian models and the fact that policy evaluations are not based on an explicit welfare analysis but instead rely on arbitrary policy objective function.

A number of authors have considered international interdependencies in fiscal policy in explicitly formulated general equilibrium models, and have addressed the issue of cooperative vs non-cooperative policy making from an explicit welfare approach. The standard set-up has featured specialized production, that is, countries specialize in production of specific commodities which they trade with each other. One surprising finding in these models is that fiscal policies tend to be too expansionary when comparing the non-coopertive to the cooperative policy outcome (see e.g. Chari and Kehoe (1990), Devereux (1991), Turnovsky (1988) and van der Ploeg (1987,1988). The reason is a term-of-trade

[2] This may, of course, change in the future because international integration reduces both the direct and the indirect (cultural, language etc.) costs of mobility.

or "beggar thy neighboor" effect. Fiscal policy in the form of demand for domestically produced goods tends to shift demand from foreign to domestic products, which in turn improve the terms of trade and thus the real income of the home country. No such terms of trade effect arises in the cooperative case, and therefore non-cooperative policies tend to be too expansionary[3]. The presence of inefficiently low employment levels does not overturn this result (Andersen and Sørensen (1995), Andersen, Rasmussen and Sørensen (1996)). Likewise the terms-of-trade effect implies that the optimal setting of tax rates should aim at twisting demand towards domestically produced goods (See Holmlund and Kolm (1999), Lockwood (2000)).

The terms of trade effect is debatable since it essentially implies that the fiscal authorities exploit the market power the domestic economy has relative to its trading partners by being the sole producer of a particular set of commodities. It is an open question whether this structure matches the current European situation adequately. Basically the specialized production model relies on exogenously given characteristics which explains the structure of specialized commodities. However, the European situation seems to match this assumption to a decreasing degree. An increasing share of trade and thus production is in commodities which in principle can be produced anywhere in Europe (intra-industrial trade) - the domestic production can thus for an increasing share of commodities be replaced by foreign production (see e.g. Coppel and Durand (1999)). These may not be perfect substitutes but there is a high degree of flexibility - up to "protection" caused by trade frictions and differences in costs etc.- and these have important implications for the interdependencies in policies across countries.

The present paper presents a model capturing some of these aspects. The location of production is flexible up to differences caused by comparative advantages and trade frictions. Trade frictions influence whether commodities are tradeables or non-tradeables in equilibrium, while comparative advantages determine whether tradeables are exportables or importables. Domestic policies influence both margins, and a concern is the extent to which domestic policies directed towards employment objectives have harmful effects on competitiveness and therefore in turn employment and income creation in the private sector. If so, it may imply that policy makers adopt a "downward" bias in employment oriented policies.

The paper runs as follows: Section 2 sets up the details of the two-country model, and section 3 considers the mechanisms determining employment. Next section 4 considers employment policies and the differences between non-cooperative and cooperative employment oriented policies, and how these are affected by further international integration. Section 5 draws some implications of the analysis for employment policies in the EU.

[3] Irrespective of whether the policy in abolsute terms is expansionary or contractionary.

2 The Model[4]

Consider two countries which are fairly similar. The produce and trade in commodities of which there is a continuum indexed by $\mathsf{i} \in [0,1]$. Each good can in principle be produced either at home or abroad, and can be imported or exported across countries. Denote the price charged for commodity i by domestic producers in the domestic market by P_i and the price charge by foreign producers in the foreign market P_i^* (the exchange rate is assumed constant, and normalized to one without loss of generality). Trade involves various frictions in the form of explicit and implicit trade costs. Trading one unit of a commodity internationally absorbs κ units of the good in frictions (Samuelson's iceberg costs), that is, if a foreign commodity is imported it costs $(1+\kappa) P_i^*$ in the domestic market, similarly, if a domestic firm exports a commodity it obtains a net-price $(1+\kappa)^{-1} P_i^*$. Trade frictions are symmetric with respect to the direction of trade. International integration can now easily be captured by a reduction in κ.

Production

Assume that domestic production of a given good takes place in a representative firm possessing a production technique

$$Y_i = A_i L_i$$

where A_i denotes an exogenous productivity parameter, and L_i is the labour input in the production function.

Firms are competitive (with free entry) and the output price of domestically produced goods of type i is accordingly linked to the wage (W) as[5]

$$P_i = A_i^{-1} W$$

As a consequence firm relocation between countries becomes a non-issue, and the analysis therefore focuses on the employment implications of trade flows.

It follows straightforwardly that the commodity i will be imported if foreign producers can supply at a price which is competitive in the domestic market ($i \in I$), i.e.

$$P_i > (1+\kappa) P_i^*$$

[4] The model structure builds on Dornbusch, Fischer and Samuelson (1977). See also Obstfeld and Rogoff (1996) for a textbook version of the model. The same framework is used in Andersen (2001) to analyse how product market integration may cause increased heterogeneity in the labour market.

[5] Allowing for imperfectly competitive product markets will not change the analysis qualitatively, provided that product market power is symmetric across the two countries.

and exported if domestic firms are competitive in the foreign market ($i \in E$), i.e.

$$P_i < (1+\kappa)^{-1} P_i^*$$

The trade frictions imply that commodities may be non-tradeables ($i \in NT$) provided

$$(1+\kappa)^{-1} P_i^* \leq P_i \leq (1+\kappa) P_i^*$$

Although there may be price differences between the domestic and the foreign market there is no trade, since the trade friction is too large to make it worthwhile.

Households

There is a continuum of households indexed by $h \in [0,1]$. Households derive utility from consumption of commodities and leisure as well as public services/goods. The utility function is assumed to be separable and reads

$$U(c_h) - D(l_h) + V(g) \quad , \quad U' > 0, U'' < 0, D' > 0, D'' > 0, V' > 0, V'' > 0,$$

where the first term gives the uility derived from private consumption (c_h), the second term the disutility from work (l_h) and the final term is the utility derived from publicly provided goods and services (g). The private consumption bundle is defined over the available commodities as

$$c_h = \left(\int_0^1 c_{hi}^{\frac{\theta-1}{\theta}} di \right)^{\frac{\theta}{\theta-1}} \quad , \theta > 1,$$

where c_{hi} is the consumption of commodity i by household h, and the d function gives the disutility of labour.

It follows straightforward that the demand for commodity i by household h can be written

$$c_{hi} = \left(\frac{P_i}{P} \right)^{-\theta} (1-\tau) r_h$$

where $(1-\tau)r_h$ denotes the real disposable income of the household and where the consumer price index P is defined as

$$P = \left[\int_0^1 P_i^{1-\theta} di \right]^{\frac{1}{1-\theta}}$$

For later reference note that aggregate demand for commodity i is

$$c_i = \int c_{hi} dh = \left(\frac{P_i}{P} \right)^{-\theta} (1-\tau) r$$

where r is aggregate real income given by

$$r = \int r_h dh = \int \frac{W}{P} l_h dh = \frac{W}{P} l$$

with W denoting the nominal wage and l total employment (= sum of private (e) and public (g) employment, see below).

The private consumption bundle for household[6] h can be written

$$\begin{aligned} c_h &= (1-\tau) r_h - d(l_h) \\ &= (1-\tau) \frac{W}{P} l_h - d(l_h) \end{aligned}$$

Finally, using that all agents are identical it follows that adopting a utilitarian welfare criterion implies a welfare function

$$U((1-\tau)\frac{W}{P} l) - D(l) + V(g)$$

Government

The government demands labour to produce public goods/services. This captures that for most countries employment constitutes the major part of public consumption[7]. Denote public demand for labour by g, and assume for simplicity a linear technlogy linking inputs and outputs in the public sector. The utility of the goods/services produced is denoted $V(g)$, cf the household utility function. The budget balance of the public sector reads

$$\frac{W}{P} g = \tau r \tag{1}$$

Note that it is assumed that the wage rate for public employees corresponds to that of private employees.

[6] Notice that there is no profit income due to the assumption of constant returns to labour and free entry of firms.

[7] For most countries wages and salaries are the dominant expenditure item, see e.g. IMF (2001).

Using the public sector budget constraint (1) it follows that private disposable income can be written

$$\begin{aligned}(1-\tau)\,r &= (1-\tau)\,\frac{W}{P}\,(e+g)\\ &= \frac{W}{P}e\end{aligned}$$

Public employment therefore does not have any income effects, which in turn implies that variations in public activity or employment do not have any Keynesian aggregate demand effects[8]. The model is classical in structure, and any effects of variations in public employment arises from the way in which it affects relative prices (real wages) (see below).

[8] Note that this also holds even if the wages paid in the public sector are only a fraction of the wages paid in the public sector.

Wage Setting

The wage setting relation is specified in a general way encompassing various wage setting institutions to show that the results do not depend on a particular wage setting institution. There are two channels through which wage setting in general will be affected, namely, the aggregate employment level ($l = e+g$), and the tax rate (τ). Since the latter depends on the level of public employment (g) it follows that the real wage target can be written as

$$\frac{W}{P} = \lambda(e, g) \quad , \quad \lambda_e > 0, \lambda_g \lessgtr 0$$

An increase in private employment may lead to an increase in the real wage rate, because the labour market becomes more tight. An increase in public employment may either increase or decrease wages depending on incentives in wage formation. Appendix A develops in detail the wage setting relation in the standard case of a monopoly union operating under a right to manage structure.

If the labour market is characterized by imperfections inducing an inefficiently low level of employment we have that

$$U_c \frac{W}{P} > D_l$$

that is, the marginal utility value of real wage exceeds the marginal disutility of work reflecting that the market is not achieving the efficient level of employment. The source of this inefficiency is both the taxation and the market power of wage setters (see Appendix A). For the latter it is well-known that the source of this inefficiency may arise either on the demand side (firms) or on the supply side (employees, unions) with the same qualitative implications for the aggregate employment level. With the set-up adopted here the inefficiency originates on the supply side of the labour market.

Equilibrium conditions

The equilibrium condition for non-tradeables reads

$$C_i = Y_i \qquad \text{if} \quad i \in NT$$

and for exportables the condition is

$$C_i + (1+\kappa)C_i^* = Y_i \quad \text{if} \quad i \in E$$

Similar conditions hold for the foreign country, and since an importable for the domestic country is an exportable for the foreign country this fully characterizes the equilibrium for product markets (similar expressions apply for the foreign country). Notice that employment is demand determined in equilibrium given as the sum of private (e) and public (g) employment, i.e. $l = e + g$, and that trade is always balanced (static model).

3 Equilibrium employment

Consider first the determination of the equilibrium level of employment, and therefore the general equilibrium to the two-country model. It is assumed that two countries are completely symmetric (for productivity this applies to the distribution of productivity, cf below) and that they both have the structure outlined above. All foreign variables are denoted by a *.

Define the relative productivity of domestic firms relative to foreign firms in producing commodity i as,

$$a_i \equiv \frac{A_i}{A_i^*}$$

Productivity is distributed identically in the two countries, and the sectors are indexed in such a way that a_i is increasing in i, that is, for low values of i the foreign country has a comparative advantage, and for high values of i the home country has a comparative advantage[9]. The comparative advantage variable a_i is symmetrically distributed over the interval $[\lambda^{-1}, \lambda], \lambda < 1$.[10] This implies that $a_i = 1$ for $i = 1/2$, that is, for half the sectors the domestic economy has a comparative advantage relative to the foreign country and vice versa. This assumption on productivity ensures that there is trade in equilibrium, and the productivity differences can be interpreted as capturing many of the effects associated with the new trade theory (see e.g. Krugman (1995)). Note that it is an implication that the average skill levels are the same in the two countries, and similar trade frictions in all sectors rule out that some low productivity sectors can be protected by high trade frictions so as to maintain a status as non-tradeables.

Similarly, define relative wages or wage competitiveness as

$$\omega \equiv \frac{W}{W^*}$$

Since labour is assumed to be the only (variable) input, it follows that relative wages solely determine international competitiveness.

Trade and domestic activity

A key question is which commodities are traded in equilibrium, and which factors determine the direction of trade for each type of commodity. It follows

[9] The index is thus not necessarily in any way related to the characteristics of the commodities, that is, two commodities which have fairly similar characteristics (say French and German cars) can be located quite differently on the unit interval, since one country has a comparative advantage in the production of the one type, and the other country has a comparative advantage in the production of the other type.

[10] Assume that A_i is uniformly distributed over the inverval $[1 - x, 1 + x]$ and similarly for A_i^*. Hence $\frac{A_i}{A_i^*}$ is distributed over the interval $\left[\frac{1-x}{1+x}, \frac{1+x}{1-x}\right]$, with a density function with the property that $f(\frac{1}{z}) = f(z)$.

straightforward that a commodity i is a non-tradeable ($i \in NT$) at home if

$$(1+\kappa)^{-1} A_i^{*-1} W^* < A_i^{-1} W < (1+\kappa) A_i^{*-1} W$$

or

$$(1+\kappa)^{-1} < \frac{\omega}{a_i} < (1+\kappa)$$

The commodity is an exportable ($i \in E$) for the home country if

$$(1+\kappa)^{-1} < \frac{\omega}{a_i}$$

and an importable ($i \in I$) for the home country if

$$\frac{\omega}{a_i} < (1+\kappa)$$

Define the critical import level for comparative advantage as

$$a_I \equiv \omega(1+\kappa)^{-1}$$

and the critical export level for comparative advantage as

$$a_E \equiv \omega(1+\kappa)$$

It follows that exportable sectors are given by

$$E \equiv \{a_i \mid a_i > a_E\}$$

the non-tradeable sectors by

$$NT \equiv \{a_i \mid a_I \leq a_i \leq a_E\}$$

and the importable sectors by

$$I \equiv \{a_i \mid a_i < a_I\}$$

Exports take place for activities for which the domestic economy holds a sufficiently strong comparative advantage, while oppositely imports take place where the comparative advantage of the foreign country is sufficiently strong. The non-tradeable sectors are made up of activities with intermediary levels of comparative advantages (seen relative to trade frictions).

Obviously, if a commodity i is an importable in the home country it is an exportable in the foreign country ($i \in I \Rightarrow i \in E^*$), and vice versa. It is important to note that the sectoral structure is determined endogenously in the model.

We have that an increase in the relative wage affects the trade position of various sectors since

$$\frac{\partial a_I}{\partial \omega} > 0 \quad , \quad \frac{\partial a_E}{\partial \omega} > 0$$

The higher the relative wage, the higher the comparative advantage needs to be both protected from imports, and to be able to export. An increase in the relative wage will thus increase the importable sector and decrease the exportable sector. The net effect is tantamount to a net export of jobs.

The important thing to note here is that relative wages - or wage competitiveness - play a crucial role, the higher the domestic wage relative to the foreign (the worse the wage competitiveness) the more jobs effectively relocate to foreign companies - other things being equal.

The non-tradeable sector arises because differences in comparative advantage for some commodities are too small for trade to be worthwhile given the trade frictions. The lower the trade frictions, the smaller the non-tradeable sector other things being equal since

$$\frac{\partial a_I}{\partial \kappa} < 0 \quad , \quad \frac{\partial a_E}{\partial \kappa} > 0$$

Employment relation

Private employment (e) can be written as a function of foreign employment (e^*), the level of public employment at home (g) and the level of foreign public employment (g^*), i.e.

$$e = \pi(e^*, g, g^*) \quad , \quad 0 < \ \pi_{e^*} < 1, \pi_g \gtrless 0, \pi_{g^*} \gtrless 0 \tag{2}$$

a similar expression holds for foreign employment.

An increase in foreign employment has always a positive effect on domestic employment. The reason is both that higher foreign employment increases foreign income and thus export demand, and that the induced increase in foreign wages cause a change in competitiveness leading to an expansion of the number of goods which can be exported and a reduction in the number of goods which are imported. This mechanism captures an international employment multiplier.

The sensitivity of private employment to public employment depends on the wage response, and we have (see Appendix B)

$$sign\ \pi_g = -sign\ \lambda_g$$

and

$$sign\ \pi_g = -sign\ \pi_{g^*}$$

That is, the impact effect on private employment of an increase in public employment is postive if wages decrease ($\lambda_g < 0$) since this makes private production more profitable (a vice versa if wages increase $\lambda_g > 0$). The domestic and foreign impact responses are always opposite in sign, if the policy change benefits domestic employment it harms foreign employment on impact, and vice versa.

Taking into account how domestic and foreign employment are interdependent we have that the effect of a change in public employment on private employment can be written

$$\frac{\partial e}{\partial g} = \frac{1}{1-(\pi_{e^*})^2}[\pi_g + \pi_{e^*}\pi_{g^*}] \tag{3}$$

while the effect on foreign employment is given as

$$\frac{\partial e}{\partial g^*} = \frac{1}{1-(\pi_{e^*})^2}[\pi_{g^*} + \pi_{e^*}\pi_g] \tag{4}$$

It turns out (see appendix)

$$sign\frac{\partial e}{\partial g} = sign\frac{\partial e^*}{\partial g} = -sign\lambda_g$$

The first part of the equality says that if a change in public employment has an expansionary effect on domestic employment it also has an expansionary effect on foreign employment, and vice versa. This captures the important spill-over effect arising from trade. While the impact effects are opposite in sign, the total effect is equal in sign due to the fact that the employment multiplier is always strong enough to overcome differences in impact effects[11].

The second part of the expression gives the condition under which a change in public employment expands or contracts private employment. An expansionary effect arises if an increase in public employment moderates wage demands ($\lambda_g < 0$), while a contractionary effect arises in the opposite case ($\lambda_g > 0$). This reflects the classical properties of the model, and is thus a property shared with closed economy models. It is well-known that the simplest way to ensure that public activities are expansionary is to adopt the so-called "Classical" approach in the sense of assuming that income effects dominate substitution effects in labour supply (see Dixon and Rankin, Baxter and King 1992). Appendix A elaborates on the details.

Gains from lower trade frictions

As a prelude to the subsequent discussion of employment policies it is useful to point out that there are welfare gains from international integration. Lower frictions (κ)imply that less resources are absorbed by trade frictions and an increase in the gain from further division of labour or exploitation of the scope for specialization given by differences in comparative advantages. A reduction of trade friction will thus increase employment (see appendix B)

$$\frac{\partial e}{\partial \kappa} < 0$$

[11] The reason is that a change in employment always has both a direct effect (income changes for given wages) and an indirect effect (the wage change), while the change in public employment only on impact released the indirect effect.

it follows that lower trade frictions increase real income

$$\frac{\partial r}{\partial \kappa} < 0$$

Aggregate welfare is improved both due to the consumption gain arising from lower trade frictions and the fact that employment is increasing (employment is inefficiently low due to labour market distortions)[12], i.e.

$$\frac{\partial c}{\partial \kappa} < 0$$

Finally, note that lower trade frictions lead to more trade, that is, the non-tradeable sector shrinks and both the importable and the exportable sector increases. The metric for international integration used in the present analysis is thus consistent with the trend increase in international trade which has been observed over the recent decades.

Lower trade frictions also change the spill-over effects between the two countries, and we have

$$\frac{\partial \pi_{e^*}}{\partial \kappa} < 0; \frac{\partial \mid \pi_g \mid}{\partial \kappa} > 0 \quad , \quad \frac{\partial \mid \pi_{g^*} \mid}{\partial \kappa} < 0$$

that is, the lower the trade friction the higher the "international employment multiplier" and the less does a change in domestic public employment affect domestic private employment numerically, and the more it affects foreign employment numerically. The lower the trade friction the stronger the "employment" leakage. It follows (see Appendix B) that

$$\mid \frac{\partial}{\partial \kappa} \frac{\partial e}{\partial g} \mid > 0$$

$$\mid \frac{\partial}{\partial \kappa} \frac{\partial e^*}{\partial g} \mid < 0$$

The smaller the trade friction the less variations in domestic public employment affect domestic private employment, and the more they affect foreign private employment. To put it differently, lower trade frictions imply that expansionary employment policies boost domestic employment less, and foreign employment more, the less the trade friction (and vice versa). The spill-over effects thus become stronger the smaller the trade frictions. This can also be interpreted as capturing the fact that with further integration the control of the domestic policy maker over the domestic economy becomes smaller, and the influence of foreign policies becomes larger.

[12] It follows that $\frac{\partial (r - d(l))}{\partial \kappa} > 0 \;\; if \;\; \frac{\partial r}{\partial \kappa} > d_l \frac{\partial l}{\partial \kappa}$ which is the case since wages exceed the competitive wage.

4 Employment policies

Consider next the determination of public employment. The policy decision is assumed to rely on a utilitarian criterian maximizing the utility of the representative household. Both the case of non-cooperative and cooperative policy making are considered to assess the importance of the interdependencies in policies between the two countries, and how they are affected by further international integration.

The optimal policy (g) thus maximizes

$$U(\lambda(e,g)e) - D(e+g) + V(g)$$

subject to employment being determined by (2). The non-cooperative solution is found by taking foreign public employment (g^*) for given, and the cooperative solution is found by assuming $g = g^*$.

The optimal level of public employment is determined by the condition

$$(D_l - U_c\lambda_g e) + [U_c(\lambda_e e + \lambda) - D_l)](-\frac{\partial e}{\partial g}) = V_g \tag{5}$$

The first term on the LHS captures the direct resource consequences (expanding public employment means more work, thus a loss of leisure) of an increase in public employment[13], and the second term is the indirect effect arising from the effect a change in public employment has on private employment (the distortion). Notice that $U_c(\lambda_e e + \lambda) - D_l > 0$ due to imperfect competition in the labour market, and thus implies that employment is inefficiently low. If an increase in public employment increases private employment it implies that the marginal costs of public activities are lowered, and vice versa. A difference between the non-cooperative and the cooperative case may arise because these costs are perceived differently in the two cases.

4.1 Interdependencies in employment policies

For both the non-cooperative and cooperative case the optimal level of public employment is determined by (5), but the difference between the two arises because the perceived effect of a change in public employment on private employment ($\frac{\partial e}{\partial g}$) differs between the two cases. In the cooperative case eventual interdependencies or externalities in employment policies between the two countries are taken into account. To compare the two cases note first that a change in public employment in the non-cooperative case is perceived to affect private employment less than in the cooperative case, ie. (see appendix)

$$|\frac{\partial e}{\partial g}|_{coop}| > |\frac{\partial e}{\partial g}|_{non-coop}|$$

[13] Note that $D_l - U_c\lambda_g e > 0$ is assumed, that is, the utility loss from more work is assumed never to be dominated by the indirect wage effect, see appendix A.

This difference can be interpreted in terms of a demand and a cost spill-over effect. Single countries do not take into account that a change in domestic public employment will change domestic income and thus the demand for foreign product (demand spill-over), whereas they perceive that wage competitiveness will be affected (cost spillover). In the cooperative case the demand spill-over effect is taken into account while there is no cost spill-over effect to take into account (wage competitiveness is always unity).

Accordingly, if an increase in public employment has an expansionary effect on domestic employment we have that (see appendix B),

$$g\mid_{coop} > g\mid_{non-coop} \qquad if \qquad \frac{\partial e}{\partial g} > 0 \tag{6}$$

Non-cooperative policy making implies that policies which can boost employment are at an inefficiently low level. Non-cooperative policy making does not take into account that the policy benefits employment for the trade partners, but fears that competitiveness is detoriated. More could be done to improve employment if countries coordinated their policies.

In the opposite case we have

$$g\mid_{coop} < g\mid_{non-coop} \qquad if \qquad \frac{\partial e}{\partial g} < 0 \tag{7}$$

If public employment has a contractionary effect on employment they are at an inefficiently high level. Non-cooperative policy making does not take into account that the policy is harming employment for its trade partners, and they perceive that competitiveness can be improved by use of this policy instrument.

In sum, non-cooperative policy making implies that policies which can improve employment are used too little while policies which are harmful for private employment are used too much. It is an implication that in comparing the employment level in the non-cooperative and the cooperative case we have unambiguously that

$$e\mid_{coop} > e\mid_{non-coop} \tag{8}$$

There are two mechanisms generating this result. Non-cooperative policy making disregards the demand spill-over and over-estimates the cost spill-over. Making a comparison in terms of total employment is more difficult. If the policy is expansionary we have unambiguously that

$$l\mid_{coop} > l\mid_{non-coop} \qquad if \quad \frac{\partial e}{\partial g} > 0$$

which follows directly from (6) and (8). Whereas for the contractionary case we have

$$l\mid_{coop} \gtrless l\mid_{non-coop} \qquad if \quad \frac{\partial e}{\partial g} < 0$$

This is important since it brings out that non-cooperative policy making unambiguously causes private employment to be too low (8), but the implications for the aggregate employment level may be ambiguous.

It is important to point out that the terms of trade effect which has been in focus in much of the literature on fiscal interdependencies, cf introduction, is ruled out here by the pricing assumption made, that is, the mark-up pricing rules out that the relative price of domestically produced commodities can increase as a result of an expansionary policy - there is no terms of trade effect, but a demand and a wage/profitability effect.

4.2 International integration

Would further international integration affect the interdependencies in policies, and if so in what direction? Is there reason to be more or less concerned about these externalities in the face of further integration than in the past with less integration? Further integration is in the present context confined to product market integration in the form of reduced trade friction (a decrease in κ).

To see the effects involved it is convenient first to solve for the symmetric cooperative equilibrium since it is the simplest. The optimal level of public employment is determined by the condition (5) where the LHS gives the marginal costs as the sum of the direct utility cost of more work and the cost of reducing private employment (the crowding out effect). International integration may affect the optimal level of public employment by affecting the marginal costs.

The effects of international integration on the optimal level of public employment turns out to be ambiguous (see appendix).

$$\frac{\partial g^{coop}}{\partial \kappa} \gtreqless 0$$

Two effects are at stake. First, a reduction in the trade friction implies - other things being equal - an increase in the private consumption bundle. This implies a reduction in the marginal utility of the private consumption bundle, and therefore the marginal costs of expanding public employment goes down. Obtaining an increase in the private consumption bundle implies that part of this is used to expand public services/goods and therefore employment. Second lower trade frictions imply an increase in private employment, therefore the inefficiency in the overall employment level is reduced, and this reduces the employment motive as a reason for expanding public employment.

Although the level effect is ambiguous it is the case that the difference between the cooperative and non-cooperative level of public employment is increasing when the trade friction is reduced. In appendix C it is shown that

$$\frac{\partial \mid g \mid_{coop} - g \mid_{non-coop} \mid}{\partial \kappa} < 0$$

The intuition for this result is that

$$\frac{\partial}{\partial \kappa} \mid \frac{\partial e}{\partial g} \mid_{coop} - \frac{\partial}{\partial \kappa} \mid \frac{\partial e}{\partial g} \mid_{non-coop} < 0$$

The lower the trade friction, the larger are the spill-over effects and therefore the larger (numerically) the difference between the effect on employment of changes in public employment perceived in the non-cooperative case compared to the cooperative case. Intuitively, the larger the spill-over effects, the larger the difference between the cooperative and non-cooperative case, since this difference is driven by the spill-over effects.

5 European integration and employment policies

This paper has considered these issues in a setting with further integration between fairly similar countries between whom trade is not driven by differences in factor endowments but by differences in comparative advantages. It was shown that due to a concern for competitiveness and a neglect of demand spill-overs there is a tendency that employment policies have a downward bias seen relative to private employment. These findings capture concerns often underlying policy debates but running oppositely to the traditional findings in the theoretical literature. Moreover, this interdependency is stronger the more integrated the markets are, pointing to the increasing importance of this issue as European economies are getting increasingly integrated.

The European integration process has led to a debate on the role of employment and social policies within the EU, and there is a growing political pressure for these issues to be given a more explicit role in EU policies. Explicit employment objectives have been introduced in the Amsterdam treaty, cf the introduction. The process concerning labour markets is known as the Luxembourg process (initiated prior to the Amsterdam treaty). Annual reports on the employment situation in all EU countries are issued each year, and they include recommendations on policy initiatives to be taken. Social issues are the topic of the Social Pagt from 1999. Certain issues like working conditions, notification rules, European work councils and equal treatment rules can be decided by majority within the EU, whereas unanimity is needed on issues related to social security and firing rules.

Are these steps justified on economic terms or do they only reflect a political concern attempting to give the EU a social profile? Surprisingly, an issue which has not been much debated in the academic literature.[14] Most of the debate has focused on a race to the bottom induced by mobility of workers - the empirical

[14] There is a larger literature addressing whether trade liberalizations should be accompanied with requirements concerning labour standards, an issue particularly relevant for the "Globalization"-debate on the consequences of further integration between developing and industrialized countries. See Lee (1997) for a survey of this issue and references to the literature.

importance of which is often contested. The present paper has shown that even without such mobility there are interdependencies in economic policies and fiscal policies in particular, and that a concern for competitiveness and a neglect of the demand spill-over effect does produce a downward bias in employment policies.

Are employment targets an appropriate response to this challenge? First, there is an issue on how to define operational targets for employment (number of unemployed, the unemployment rate (if so defined how?)) etc. Second, whether such targets are conducive depends on the labour market structure. If employment is low due to structural problems in the labour market, an employment target may be harmful by redirecting policies from coping with structural policies, to indirect measures like public employment programmes. Thirdly, even if structural problems cannot be remidied, employment targets are still problematic since they very imprecisely target the inefficiencies in non-cooperative policy making. A problem which is reinforced when taking into account structural differences across countries as well as shocks and dynamics.

It must thus be concluded that current policies do not adequately address the interdependencies in employment policies among EU countries. An interesting topic for future research would be to make a quantitative assessment of the importance of the mechanisms addressed in this paper.

Appendix A: Wage setting

The objective of a utilitarian union is to choose a wage rate so as to maximize

$$U((1-\tau)\frac{W}{P}e) - D(e+g)$$

Maximizing this with respect to the real wage taking into account that private employment depends on the wage rate and given the tax rate (public employment), we get that the first order condition can be written

$$F \equiv \left[U_c((1-\tau)\frac{W}{P}e)[(1-\tau)\frac{W}{P}(1+\varepsilon)] - \varepsilon D_l(e+g)\right] = 0$$

where $\varepsilon < -1$ denotes the elasticity of labour demand wrt to the real wage rate. Note that it is an implication that

$$U_c\frac{W}{P} > D_l$$

i.e. employment is inefficiently low both due to the taxation (τ) and the market power ($\frac{\varepsilon}{1+\varepsilon} > 1$).

The second order condition is that

$$F_{\frac{W}{P}} < 0$$

Using that the public sector budget constraint can be written

$$\tau e = g \quad , \qquad e > g$$

we get

$$F \equiv e(\frac{W}{P})^{-1}\left[U_c((1-\frac{g}{e})\frac{W}{P}e)[(1-\frac{g}{e})\frac{W}{P}](1+\varepsilon)-\varepsilon D_l(e+g)\right]=0$$

hence

$$F_e = e(\frac{W}{P})^{-1}\left[((1-\frac{g}{e})\frac{W}{P}U_{cc}\frac{W}{P}+U_c\frac{g}{e^2}\frac{W}{P})(1+\varepsilon)-\varepsilon D_{ll}\right]$$

$$F_g = e(\frac{W}{P})^{-1}\left[(-(1-\frac{g}{e})\frac{W}{P}U_{cc}\frac{W}{P}-U_c\frac{1}{e}\frac{W}{P})(1+\varepsilon)-\varepsilon D_{ll}\right]$$

Note that

$$F_e > 0$$

unless the budget effect is very strong (higher employment lowers the tax rate so much that this dominates over the direct effect). This is ruled out and hence $\frac{\partial \frac{W}{P}}{\partial e} > 0$. Due to the opposite effect of the income and subsitution effect we have that

$$F_g \gtrless 0$$

and hence $\frac{\partial \frac{W}{P}}{\partial g} \gtrless 0$. Note that

$$F_g + F_e = e(\frac{W}{P})^{-1}\left[-U_c\frac{1}{e}\frac{W}{P}(1-\frac{g}{e})(1+\varepsilon)-2\varepsilon D_{ll}\right] > 0$$

The wage relation can now be summarized as

$$\frac{W}{P} = \lambda(e,g) \quad , \quad \lambda_e > 0, \lambda_g \gtrless 0$$

Appendix B: Employment

Define $\omega \equiv \frac{W}{W^*} = \frac{\lambda(e,g)}{\lambda(e^*,g^*)}$ and $a_i \equiv \frac{A_i}{A_i^*}$. It follows that sector i produces an exportable if $a_i > a_E \equiv \omega(1+\kappa)$, while there is no production in the sector and the commodities are imported if $a_i < a_I \equiv \omega(1+\kappa)^{-1}$.

Equilibrium private employment can now be written as the sum of employment in the production of non-tradeables, the employment needed to serve the domestic market for the exportable, and the employment needed to serve the foreign demand for the exportable, i.e.

$$\begin{aligned} e &= \int_{a_I}^{a_E} A_i^{-1}\left(\frac{A_i^{-1}W}{P}\right)^{-\theta}\lambda(e,g)eh(a_i)da_i \\ &+ \int_{a_E}^{\overline{a}} A_i^{-1}\left(\frac{A_i^{-1}W}{P}\right)^{-\theta}\lambda(e,g)eh(a_i)da_i \\ &+ \int_{a_E}^{\overline{a}} (1+\kappa)A_i^{-1}\left(\frac{A_i^{-1}W(1+\kappa)}{P*}\right)^{-\theta}\lambda(e^*,g^*)e^*h(a_i)da_i \end{aligned}$$

using the wage equation we get

$$\begin{aligned} e &= \int_{a_I}^{a_E} A_i^{-1}\left(A_i^{-1}\lambda(e,g)\right)^{-\theta}\lambda(e,g)eh(a_i)da_i \\ &+ \int_{a_E}^{\overline{a}} A_i^{-1}\left(A_i^{-1}\lambda(e,g)\right)^{-\theta}\lambda(e,g)eh(a_i)da_i \\ &+ \int_{a_E}^{\overline{a}} (1+\kappa)A_i^{-1}\left(A_i^{-1}\lambda(e,g)\rho(\omega)(1+\kappa)\right)^{-\theta}\lambda(e^*,g^*)e^*h(a_i)da_i \end{aligned}$$

where it has also been used that

$$\begin{aligned} P &= \left[\int_0^1 P_i^{1-\theta}di\right]^{\frac{1}{1-\theta}} = \left[\int_{\underline{a}}^{a_I}((1+\kappa)W^*A_i^{*-1})^{1-\theta}h(a)da + \int_{a_I}^{\overline{a}}(WA_i^{-1})^{1-\theta}h(a)da\right]^{\frac{1}{1-\theta}} \\ &= \left[v^*W^{*1-\theta} + vW^{1-\theta}\right]^{\frac{1}{1-\theta}} \end{aligned}$$

where

$$v^* = (1+\kappa)^{1-\theta}\int_{\underline{a}}^{a_I}(A_i^{*-1})^{1-\theta}h(a)da$$

$$v = \int_{a_I}^{\overline{a}}(A_i^{-1})^{1-\theta}h(a)da$$

Hence

$$\begin{aligned} \frac{P}{P^*} &= \frac{\left[v^*W^{*1-\theta} + vW^{1-\theta}\right]^{\frac{1}{1-\theta}}}{\left[v^*W^{1-\theta} + vW^{*1-\theta}\right]^{\frac{1}{1-\theta}}} \\ &= \frac{\left[v^* + v\omega^{1-\theta}\right]^{\frac{1}{1-\theta}}}{\left[v^*\omega^{1-\theta} + v\right]^{\frac{1}{1-\theta}}} \equiv \rho(\omega) \qquad , \rho'(\omega) > 0 \end{aligned}$$

In symmetric equilibrium $\omega = 1$, and $\rho(1) = 1$. Finally, it has been used that

$$\frac{W}{P^*} = \frac{W}{P}\frac{P}{P^*} = \lambda(e,g)\rho(\omega)$$

The employment relation can now be written

$$\begin{aligned} 1 &= \lambda(e,g)^{1-\theta}[\int_{a_I}^{a_E} A_i^{\theta-1}h(a_i)da_i \\ &+ \int_{a_E}^{\overline{a}} A_i^{\theta-1}h(a_i)da_i \\ &+ \int_{a_E}^{\overline{a}} (1+\kappa)^{1-\theta}A_i^{\theta-1}\rho(\omega)^{-\theta}\frac{\lambda(e^*,g^*)e^*}{\lambda(e,g)e}h(a_i)da_i] \end{aligned} \tag{9}$$

In more compact form (9) can be written

$$1 = \lambda(e,g)^{1-\theta}\left[\Gamma_1 + \Psi\Gamma_2\right]$$

where

$$\Gamma_1 \equiv \int_{a_I}^{a_E} A_i^{\theta-1}h(a_i)da_i + \int_{a_E}^{\overline{a}} A_i^{\theta-1}h(a_i)da_i$$

$$\Gamma_2 \equiv (1+\kappa)^{1-\theta}\int_{a_E}^{\overline{a}} A_i^{\theta-1}h(a_i)da_i$$

$$\Psi \equiv \rho(\omega)^{-\theta}\frac{\lambda(e^*,g^*)e^*}{\lambda(e,g)e}$$

For later reference note that

$$\Gamma_{1e} = -A_I^{\theta-1}h(a_I)\frac{\partial a_I}{\partial e} < 0, \Gamma_{1g} = -A_I^{\theta-1}h(a_I)\frac{\partial a_I}{\partial g} < 0$$

$$\Gamma_{1e^*} = -A_I^{\theta-1}h(a_I)\frac{\partial a_I}{\partial e^*} > 0, \Gamma_{1g^*} = -A_I^{\theta-1}h(a_I)\frac{\partial a_I}{\partial g^*} > 0$$

$$\Gamma_{2e} = -(1+\kappa)^{1-\theta}A_E^{\theta-1}h(a_E)\frac{\partial a_E}{\partial e} < 0, \Gamma_{2g} = -(1+\kappa)^{1-\theta}A_E^{\theta-1}h(a_E)\frac{\partial a_E}{\partial g} < 0$$

$$\Gamma_{2e^*} = -(1+\kappa)^{1-\theta}A_E^{\theta-1}h(a_E)\frac{\partial a_E}{\partial e^*} > 0, \Gamma_{2g^*} = -(1+\kappa)^{1-\theta}A_E^{\theta-1}h(a_E)\frac{\partial a_E}{\partial g^*} > 0$$

$$\Psi_e = -\theta\rho(\omega)^{-\theta-1}\rho_\omega\frac{\lambda(e^*,g^*)e^*}{\lambda(e,g)e}\frac{\lambda_e}{\lambda(e^*,g^*)} - \rho(\omega)^{-\theta}\frac{\lambda(e^*,g^*)e^*}{(\lambda(e,g)e)^2}(\lambda_e e + \lambda) < 0$$

$$\Psi_g = -\theta\rho(\omega)^{-\theta-1}\rho_\omega\frac{\lambda(e^*,g^*)e^*}{\lambda(e,g)e}\frac{\lambda_g}{\lambda(e^*,g^*)} - \rho(\omega)^{-\theta}\frac{\lambda(e^*,g^*)e^*}{(\lambda(e,g)e)^2}(\lambda_g e) \gtrless 0$$

$$\Psi_{e^*} = \theta\rho(\omega)^{-\theta-1}\rho_\omega\frac{\lambda(e^*,g^*)e^*}{\lambda(e,g)e}\frac{\lambda\lambda_{e^*}}{(\lambda(e^*,g^*))^2} + \rho(\omega)^{-\theta}\frac{(\lambda_{e^*}e^* + \lambda^*)}{\lambda(e,g)e}$$

$$\Psi_{g^*} = \theta\rho(\omega)^{-\theta-1}\rho_\omega\frac{\lambda(e^*,g^*)e^*}{\lambda(e,g)e}\frac{\lambda\lambda_{g^*}}{(\lambda(e^*,g^*))^2} + \rho(\omega)^{-\theta}\frac{\lambda_{g^*}e^*}{\lambda(e,g)e}$$

Note that in symmetric equilibrium we have

$$\Psi_{e^*} = -\Psi_e \quad ; \quad \Psi_{g^*} = -\Psi_g.$$

$$\Gamma_{ie} = -\Gamma_{ie^*} \quad ; \quad \Gamma_{ig} = -\Gamma_{ig^*} \qquad i = 1, 2$$

Employment can be summarized by the implicit functions

$$e = \pi(e^*, g, g^*, \kappa)$$

$$e^* = \pi\left(e, g^*, g, \kappa\right)$$

Note that evaluated in a symmetric equilibrium we have

$$\frac{\partial e}{\partial e^*} = \pi_{e^*} = -\frac{\lambda^{1-\theta}[\Gamma_2\Psi_{e^*} + \Gamma_{1e^*} + \Psi\Gamma_{2e^*}]}{(1-\theta)\lambda^{-\theta}\lambda_e\left[\Gamma_1 + \Psi\Gamma_2\right] + \lambda^{1-\theta}[\Gamma_2\Psi_e + \Gamma_{1e} + \Psi\Gamma_{2e}]} > 0$$

$$\frac{\partial e}{\partial g} \equiv \pi_g = -\frac{(1-\theta)\lambda^{-\theta}\lambda_g\left[\Gamma_1 + \Psi\Gamma_2\right] + \lambda^{1-\theta}[\Gamma_2\Psi_g + \Gamma_{1g} + \Psi\Gamma_{2g}]}{(1-\theta)\lambda^{-\theta}\lambda_e\left[\Gamma_1 + \Psi\Gamma_2\right] + \lambda^{1-\theta}[\Gamma_2\Psi_e + \Gamma_{1e} + \Psi\Gamma_{2e}]} \gtrless 0$$

$$\frac{\partial e}{\partial g^*} \equiv \pi_{g^*} = -\frac{\lambda^{1-\theta}[\Gamma_2\Psi_{g^*} + \Gamma_{1g^*} + \Psi\Gamma_{2g^*}]}{(1-\theta)\lambda^{-\theta}\lambda_e\left[\Gamma_1 + \Psi\Gamma_2\right] + \lambda^{1-\theta}[\Gamma_2\Psi_e + \Gamma_{1e} + \Psi\Gamma_{2e}]} \gtrless 0$$

It is easily seen that sign (π_g) = -sign λ_g and sign (π_{g^*}) = sign λ_g, and hence sign (π_g)=-sign(π_{g^*}), and that $\mid \pi_e \mid < 1$.Note also that (the employment effect always dominates in the country interdependency)

$$\Vert\, \pi_e\pi_g \,\Vert > \Vert\, \pi_{g^*} \,\Vert$$

The proof of which follows by observing that

$$\frac{\partial e}{\partial g} = \frac{1}{1-(\pi_{e^*})^2}[\pi_g + \pi_{e^*}\pi_{g^*}]$$

and

$$\frac{\partial e}{\partial g^*} = \frac{1}{1-(\pi_{e^*})^2}[\pi_{g^*} + \pi_{e^*}\pi_g]$$

and hence

$$\begin{aligned} sign\frac{\partial e}{\partial g^*} &= sign(\pi_{g^*} + \pi_{e^*}\pi_g) \\ &= sign\pi_g \end{aligned}$$

which is seen by noting that

$$\begin{aligned}
& (\pi_{g^*} + \pi_e \pi_g) \left[(1-\theta)\lambda^{-\theta}\lambda_e \left[\Gamma_1 + \Psi\Gamma_2\right] + \lambda^{1-\theta}[\Gamma_2\Psi_e + \Gamma_{1e} + \Psi\Gamma_{2e}] \right]^2 \\
= \quad & -\lambda^{1-\theta}[\Gamma_2\Psi_{g^*} + \Gamma_{1g^*} + \Psi\Gamma_{2g^*}] \left[(1-\theta)\lambda^{-\theta}\lambda_e \left[\Gamma_1 + \Psi\Gamma_2\right] + \lambda^{1-\theta}[\Gamma_2\Psi_e + \Gamma_{1e} + \Psi\Gamma_{2e}] \right] \\
& + \left[\lambda^{1-\theta}[\Gamma_2\Psi_{e^*} + \Gamma_{1e^*} + \Psi\Gamma_{2e^*}] \right] \left[(1-\theta)\lambda^{-\theta}\lambda_g \left[\Gamma_1 + \Psi\Gamma_2\right] + \lambda^{1-\theta}[\Gamma_2\Psi_g + \Gamma_{1g} + \Psi\Gamma_{2g}] \right] \\
= \quad & -\lambda^{1-\theta} \left[\Gamma_1 + \Psi\Gamma_2\right] (1-\theta)\lambda^{-\theta} \left[\lambda_e[\Gamma_2\Psi_{g^*} + \Gamma_{1g^*} + \Psi\Gamma_{2g^*}] - \lambda_g[\Gamma_2\Psi_{e^*} + \Gamma_{1e^*} + \Psi\Gamma_{2e^*}]\right]
\end{aligned}$$

Since

$$\begin{aligned}
& \lambda_e[\Gamma_2\Psi_{g^*} + \Gamma_{1g^*} + \Psi\Gamma_{2g^*}] - \lambda_g[\Gamma_2\Psi_{e^*} + \Gamma_{1e^*} + \Psi\Gamma_{2e^*}] \\
= \quad & \Gamma_2\lambda_g\rho\left(\omega\right)^{-\theta} e
\end{aligned}$$

Comparison of $\frac{\partial e}{\partial g} \mid_{non-coop} < \frac{\partial e}{\partial g} \mid_{coop}$

In the non-cooperative case we have

$$\frac{\partial e}{\partial g} \mid_{non-coop} = \frac{1}{1-(\pi_{e^*})^2}[\pi_g + \pi_{e^*}\pi_{g^*}]$$

and in the cooperative case it follows straightforward from (9) that

$$\frac{\partial e}{\partial g} \mid_{coop} = -\frac{\lambda_g}{\lambda_e}$$

From which it follows directly that

$$\frac{\partial e}{\partial g} \mid_{non-coop} \lessgtr \frac{\partial e}{\partial g} \mid_{coop} for \lambda_g \gtrless 0$$

if

$$\frac{1}{1-(\pi_{e^*})^2}[\pi_g + \pi_{e^*}\pi_{g^*}] \lessgtr -\frac{\lambda_g}{\lambda_e}$$

Define

$$A = (1-\theta)\lambda^{-\theta}\lambda_e \left[\Gamma_1 + \Psi\Gamma_2\right] < 0$$

$$B = \lambda^{1-\theta}[\Gamma_2\Psi_e + \Gamma_{1e} + \Psi\Gamma_{2e}] < 0$$

$$C = \lambda^{1-\theta}[\Gamma_2\Psi_g + \Gamma_{1g} + \Psi\Gamma_{2g}] \gtrless 0$$

It follows that

$$\pi_{e^*} = \frac{B}{A+B}$$

$$\pi_g = -\frac{\frac{\lambda_g}{\lambda_e}A + C}{A+B}$$

$$\pi_{g^*} = \frac{C}{A+B}$$

Note for later reference that

$$\frac{\partial e}{\partial g} + \frac{\partial e}{\partial g^*} = \frac{\pi_g + \pi_{g^*}}{1-\pi_{e^*}} = -\frac{\lambda_g}{\lambda_e}$$

By substution is can be verified that

$$\frac{1}{1-(\pi_{e^*})^2}[\pi_g + \pi_{e^*}\pi_{g^*}] = -\frac{A(\frac{\lambda_g}{\lambda_e}A + C) + \frac{\lambda_g}{\lambda_e}AB}{A^2 + 2AB} \lessgtr -\frac{\lambda_g}{\lambda_e} \qquad (10)$$

(I) Proof that $\frac{1}{1-(\pi_{e^*})^2}[\pi_g + \pi_{e^*}\pi_{g^*}] < -\frac{\lambda_g}{\lambda_e}$ for $\lambda_g < 0$ (implying C>0)

$$\begin{aligned} -A(\frac{\lambda_g}{\lambda_e}A + C) - \frac{\lambda_g}{\lambda_e}AB &< -\frac{\lambda_g}{\lambda_e}\left(A^2 + 2AB\right) \\ -AC &< -\frac{\lambda_g}{\lambda_e}AB \\ 1 &< \frac{\lambda_g}{\lambda_e}\frac{B}{C} \end{aligned}$$

which is fulfilled since B/C>$\frac{\lambda_g}{\lambda_e}$

(I) Proof that $\frac{1}{1-(\pi_{e^*})^2}[\pi_g + \pi_{e^*}\pi_{g^*}] > -\frac{\lambda_g}{\lambda_e}$ for $\lambda_g > 0$ (implying C<0)
From (10) we have that this inequality can be written

$$\begin{aligned} -A(\frac{\lambda_g}{\lambda_e}A + C) - \frac{\lambda_g}{\lambda_e}AB &> -\frac{\lambda_g}{\lambda_e}\left(A^2 + 2AB\right) \\ -AC &> -\frac{\lambda_g}{\lambda_e}AB \\ 1 &< \frac{\lambda_g}{\lambda_e}\frac{B}{C} \end{aligned}$$

which is fulfilled since B/C>$\frac{\lambda_g}{\lambda_e}$

We have that

$$\begin{aligned}\frac{1}{1-(\pi_{e^*})^2}[\pi_g+\pi_{e^*}\pi_{g^*}] &= -\frac{A(\frac{\lambda_g}{\lambda_e}A+C)+\frac{\lambda_g}{\lambda_e}AB}{A^2+2AB}\\ &= -\frac{\lambda_g}{\lambda_e}\frac{A(A+\widehat{C})+AB}{A^2+2AB}\\ &= -\frac{\lambda_g}{\lambda_e}\left[1+\frac{\widehat{C}-B}{A+2B}\right]\end{aligned}$$

where

$$\widehat{C}\equiv C\frac{\lambda_e}{\lambda_g}$$

and $\widehat{C}>B$. From the definition of C and B we have that

$$\begin{aligned}\widehat{C}-B &= \lambda^{1-\theta}\Gamma_2\rho\left(\omega\right)^{-\theta}\frac{e}{\lambda}\\ &= \lambda^{-\theta}\rho\left(\omega\right)^{-\theta}e(1+\kappa)^{1-\theta}\int_{a_E}^{\overline{a}}A_i^{\theta-1}h(a_i)da_i\end{aligned}$$

Hence

$$\frac{\widehat{C}-B}{A+2B}=\frac{\lambda^{-\theta}\rho\left(\omega\right)^{-\theta}e(1+\kappa)^{1-\theta}\int_{a_E}^{\overline{a}}A_i^{\theta-1}h(a_i)da_i}{(1+\kappa)^{\theta-1}\left(A+2B\right)}$$

It follows from the definition of A and B that

$$\frac{\partial\left(\frac{\widehat{C}-B}{A+2B}\right)}{\partial\kappa}>0$$

and therefore

$$sign\frac{\partial}{\partial\kappa}\left(\frac{\partial e}{\partial g}\right)=sign\frac{\partial e}{\partial g}$$

It follows that

$$sign\frac{\partial}{\partial\kappa}\left(\frac{\partial e^*}{\partial g}\right)=-sign\frac{\partial e}{\partial g}$$

Integration

It follows directly that

$$\frac{\partial e}{\partial\kappa}<0$$

and therefore

$$\frac{\partial r}{\partial \kappa} < 0$$

Note that

$$\frac{\partial}{\partial \kappa}\frac{\partial e}{\partial g} > 0$$

Cooperative policy

The symmetric equilibrium employment is determined by the condition

$$1 = \lambda(e,g)^{1-\theta}[\int_{a_I}^{a_E} A_i^{\theta-1}h(a_i)da_i + \int_{a_E}^{\overline{a}} A_i^{\theta-1}h(a_i)da_i + \int_{a_E}^{\overline{a}} (1+\kappa)^{1-\theta}A_i^{\theta-1}h(a_i)da_i]$$

Implying that

$$\frac{\partial e}{\partial g} = -\frac{\lambda_g}{\lambda_e} < 0$$

$$\frac{\partial e}{\partial \kappa} < 0$$

The condition determining optimal public employment reads

$$\Gamma_g = V_g + [U_c(\lambda_e e + \lambda) - D_l]\,(\frac{\partial e}{\partial g}) - (D_l - U_c\lambda_g e) = 0$$

The second order conditions is

$$\Gamma_{gg} < 0$$

It follows that

$$\frac{\partial g}{\partial \kappa} = -\frac{\Gamma_{g\kappa}}{\Gamma_{gg}}$$

Hence $sign\left(\frac{\partial g}{\partial \kappa}\right) = sign\Gamma_{g\kappa}$

Using that $\frac{\partial e}{\partial g} = -\frac{\lambda_g}{\lambda_e}$ implies that

$$\frac{\partial}{\partial \kappa}\frac{\partial e}{\partial g} = 0$$

hence

$$\begin{aligned}\Gamma_g &= V_g - [U_c(\lambda_e e + \lambda) - D_l]\,\frac{\lambda_g}{\lambda_e} - (D_l - U_c\lambda_g e)\\ &= V_g - (U_c\lambda - D_l)\frac{\lambda_g}{\lambda_e} - D_l\end{aligned}$$

Therefore

$$\Gamma_{g\kappa} = -U_{cc}\lambda\frac{\lambda_g}{\lambda_e}\frac{\partial c}{\partial \kappa} + \left[\frac{\lambda_g}{\lambda_e}(U_{cc}(\lambda_e e + \lambda)\lambda + U_c\lambda_e - D_{ll}) + (U_c\lambda - D_l)\frac{\lambda_g}{\lambda_e^2}\lambda_{ee} - D_{ll}\right]\frac{\partial e}{\partial \kappa} \gtrless 0$$

where the first term capturing the "gains from trade"- effect is negative, and the second term capturing the "distortion"-effect is positive. Hence

$$\frac{\partial g^{coop}}{\partial \kappa} \gtrless 0$$

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