*DO CAPITAL MARKET AND TRADE LIBERALIZATION TRIGGER LABOR MARKET DEREGULATION?**

Hervé Boulhol

IXIS-CIB and Centre d'Economie de la Sorbonne (University Paris I Panthéon-Sorbonne and CNRS)
hboulhol@ixis-cib.com

March 2006

Abstract

Cross-country analyses showed that product market deregulation often precedes labor market (LM) reforms. This paper introduces LM imperfections within an economic geography framework, the level of optimal LM regulation being based on each country's social preferences. Due to capital mobility, opening the economy to a country with a deregulated LM puts pressure on LM institutions. As the fall in trade costs increases the intensity of the agglomeration force, LM regulation loses in efficiency. The threat of relocation drives changes in LM policy, which suggests that the effect of liberalization might be found primarily in the weakening of employment protection, resulting in minimal actual relocations.

Keywords: Deregulation, Wage Bargaining, Employment Protection, Agglomeration, Relocations

JEL Classification: F12, F16, F20, J41, J42

** I am grateful to Pierre Cahuc, Matthieu Crozet, Lionel Fontagné, David Galvin, Philippe Martin and Glenn Rayp for their very helpful comments.*

1. Introduction

To date, the question of product-labor market interactions has mostly been viewed through the impact of competition on employment and wages. Blanchard (2005) summarizes that the empirical evidence about the role of institutions is mixed and sees the exploration of other interactions as a promising avenue for research. Recently, from an empirical investigation which addresses multi-collinearity issues that might be responsible for the lack of robustness in previous results, Nicoletti and Scarpetta (2005) conclude that employment gains from product market deregulation are likely to be higher in countries that have rigid labor markets.

Concurrently, recent works at the OECD highlight that product market (PM) and labor market (LM) deregulations are correlated across countries and that the former seems to precede the latter. This correlation is illustrated by Figure 1 taken from Brandt, Burniaux and Duval (2005): changes in PM regulation over 1993-1998 are significantly correlated with the intensity of LM reforms recorded over 2000-2004. Said differently, “countries which have undertaken most labour market reforms recently are also those that had most deregulated their product markets beforehand” (Brandt et al., p.8). Even if an all encompassing liberal economic policy might seek to deregulate in both dimensions, which could explain this positive relationship, the sequence of events tells us more. The main purpose of this paper is to shed light on mechanisms which could account for *this* interaction, from increased competition in the PM to deregulation in the LM.

Empirical literature has well established that foreign competition can have a negative impact on wages by reducing rents in concentrated sectors (e.g. Borjas and Ramey, 1995). However, lower rents does not mean that the rent-sharing scheme between capital and labor has changed. Rodrik (1997) was probably the first to formalize the idea that import competition might weaken workers’ bargaining power. More recently, using a matched employer-employee database for France, Kramarz (2003) shows that outsourcing weakens the bargaining position of high-school graduate workers by limiting the availability of alternative jobs.

Within the last two years, especially in Germany and France, competition from emerging countries seems to goad workers to accept less favourable conditions. For example, in the car industry, Volkswagen's and Opel's management invoke that the new worldwide competitive environment requires drastic cuts in labor costs and succeed in enforcing wage moderation. In France, the threat of relocations to Eastern Europe has been driving employees at Bosch and Fenwick to accept longer working hours at the same monthly wage, a development with few precedents in recent economic history. Although most empirical analyses do point out that actual relocations affect a small number of workers, a recent poll in France indicates that thirty five percent of people surveyed consider that they, or someone closely related to them, face high risks of seeing her/his job delocalized. There is no doubt that high media coverage explains the extent of such fears, but this perception is factual and it is therefore easy to foresee how it could weaken the workers' bargaining position.

Blanchard and Giavazzi (2003), hereafter BG, is the most influential paper in the literature dealing with product-labor market interactions. In an elegant setting combining monopolistic competition and wage bargaining, BG study the dynamic impacts of PM and LM deregulations separately. A short sub-section analyzes the regulation interactions *per se* and it is probably fair to say that this part is less convincing. Indeed, it relies heavily on a very *ad hoc* function representing the "lobbying cost" of bargaining. The intuition that PM deregulation leads to LM deregulation in their model is the following: because rents are reduced, unions no longer fight as hard. However, this line of thought should apply to shareholders as well. Based on a similar model, Spector (2004) suggests that PM and LM deregulations tend to reinforce each other. Going one step further, Ebell and Haefke (2004), endogenizing the bargaining regime, suggest that the strong decline in coverage and unionization in the US and the UK might have been a direct consequence of PM reforms of the early 'eighties.

The model proposed here brings four new contributions. It is a first attempt to introduce LM imperfections within an economic geography framework. We do this in the easiest and most tractable geography model, the footloose capital model (FCM) developed by Martin and Rogers (1995) and further analyzed in Baldwin et al. (2003). Secondly, we can then take into account one aspect of globalization that does not appear in the papers discussed above, capital mobility, and therefore study the interactions between capital mobility, tradability and LM regulation. Thirdly, the level of LM regulation is endogenized, depending on the country's social preferences. Finally, new mechanisms through which opening the economy could put pressure on LM institutions are highlighted.

The intuition of the model is as follows. As detailed in OECD (2004, Chapter 2), employment protection has as a main objective to improve working conditions and the well-being of workers. It is generally believed however that this comes at a cost for employers and generates insiders/outsiders conflicts of interest. Employment protection therefore most likely raises labor costs and unemployment. Modelling LM regulation using a bargaining model inspired from McDonald and Solow (1985) enables us to include these general features. Rent-sharing is mainly about distributing rents and, as a high level of workers' bargaining power favors employed workers over capital owners, a government might choose to regulate the LM based on its social preferences. This link between social preferences and LM institutions fits well within Freeman's (2000) analysis.

As workers capture some share of the rents, capital return is negatively affected. With capital mobility, opening the economy to a country that has a fully deregulated LM (because of its own preferences) entails capital outflows, because firms find better returns abroad. As domestic rents are transferred abroad, the positive effect of LM regulation on average real wages is reduced or even reversed, all the more so that trade costs are high and importing the "delocalized" good is costly. When trade costs fall, the agglomeration force gains in intensity. When they are very low, even the slightest regulation deters firms from producing domestically. LM institutions being endogenized, it is the *threat* of relocations which drives LM deregulation, neutralizing in turn the actual outflows of capital and relocations.

Therefore, whatever the level of trade costs, capital mobility induces the government to deregulate. Falling trade costs puts additional pressure on LM institutions and, with full trade liberalization, even the most pro-equality government will optimally choose a fully deregulated LM. In terms of welfare, opening the economy is found to be, most generally, beneficial. However, unless trade costs reach a low enough level, it has here a detrimental effect for a government with a high degree of aversion to inequality.

This way of formalizing LM regulation bears some resemblance to the tax competition literature. The main difference lies in the link between regulation and social preferences, which highlights that the questions at stake are probably more profound that mere tax issues. They refer to social relationships and collective choice. Another difference is that this "social competition" arises between countries identical in terms of size and factor endowments. The remainder of the paper is organized as follows. Section 2 integrates LM imperfections into the FCM and describes the role of social preferences in optimal LM regulation. Section 3 focuses on the open economy and Section 4 shows how capital mobility and trade liberalization induce changes in LM regulation. Finally, Section 5 concludes.

2. Model

2.1. Footloose capital model with labor market regulation

The setting of the model is the FCM. The two factors are labor and capital, denoted *L* and *K*. The utility function of each individual is a Cobb-Douglas CES nest of the consumption of two goods:

$$V = \alpha^{-\alpha} .(1-\alpha)^{-(1-\alpha)} .C_R^{\alpha} .C_A^{1-\alpha} \tag{1}$$

One sector produces a homogenous good using only labor under constant returns and perfect competition and is commonly called sector *A*. The rent sector *R* produces the Dixit-Stiglitz good composed of a mass *n* of differentiated products under monopolistic competition.

$$C_R = \left[\int_0^n c(i)^{(\sigma-1)/\sigma} .di \right]^{\sigma/(\sigma-1)} \quad , \quad \sigma > 1 \tag{2}$$

One unit of capital is required to produce one variety *i* of the differentiated good. For each variety, labor is the only variable input and the unit labor cost is β times the wage. In this setting, entry is constrained by the capital endowments and the number of varieties *n* equals *K* in autarky. Good *A* is the numeraire and its unit choice is such that one unit of labor produces one unit of the good:

$$X_R = L_R / \beta \quad ; \quad X_A = L_A \quad ; \quad p_A = 1 \tag{3}$$

The only difference with the standard FCM lies in the choice of the government to regulate the labor market (LM) based on its social preferences. To reflect the idea that regulating the LM is essentially related to rent sharing, the level of employment protection is characterized by the bargaining power of workers, γ, as in BG. Although within this framework, the benefits of regulation are limited to pecuniary advantages, we mean it to encompass the conditions which make workers happier in their job more generally. For the firm producing the variety *i*, workers and shareholders bargain over wages and employment simultaneously. The Nash bargaining leads to the maximization of the product of the parties' surplus weighted by their bargaining strength, i.e. omitting the subscript *i* for variety:

$$[(w-z).l]^{\gamma} [p(x).x - w.l]^{1-\gamma} \tag{4}$$

where z is the reservation wage. First order conditions on wages and employment lead to:

$$p = \mu.\beta.z \qquad \textit{(5a)}$$

$$w = \left[1+\gamma.(\mu-1)\right].z \equiv \nu.z \quad ; \quad \gamma \in [0\,,1] \quad \Leftrightarrow \quad \nu \in [1\,,\mu] \qquad \textit{(5b)}$$

where $\mu = \sigma/(\sigma-1)$. Classically under efficient bargaining with a homothetic utility function, equation (5a) states that the marginal revenue of labor is the reservation wage. Equation (5b) just clarifies that sector-*R* workers receive a share γ of the total rent $(\mu-1)$.

The overall LM operates along the lines of McDonald and Solow (1985). Workers not employed in the rent sector could always occupy a lower paid job in the perfectly competitive sector and therefore, the reservation wage z equals the wage in sector *A* which is unity. The alternative is to be unemployed, total unemployment being denoted *U*. Indeed, being unemployed is supposed to give more time to search for a sector-*R* job and therefore a better chance to obtain one. This creates a positive relationship between the "sectoral unemployment rate" u_R and the potential reward of obtaining a well paid job, i.e. the surplus enjoyed by manufacturing workers, $\gamma.(\mu-1) \equiv \nu-1$. The reason is that, within this framework, a higher bargaining power raises the expected return from being unemployed relative to the return from working in sector *A*. The equilibrium unemployment rate is obtained when the expected utility of an unemployed person matches that of a sector *A* employed worker.

$$u_R \equiv U/(U+L_R) \quad , \quad u_R = f(\nu) \quad , \quad f\,' > 0 \quad , \quad f\,(1) = 0 \quad , \quad z = w_A = 1 \qquad \textit{(6)}$$

In order to understand this mechanism through a simple example, consider the Harris-Todaro case where a sector-*A* worker gives up any opportunity to find a better paid job in the next period, whereas an unemployed person gets a probability q, negatively related to the "sectoral unemployment rate" u_R, to get a sector-*R* job: $q = q\,(u_R) \quad , \quad q\,' < 0$. If *d* denotes the exogenous unemployment benefits, h the exogenous probability to lose a high-paid job and *r* the discount rate, the steady state unemployment is given by Bellman's equations which lead to the arbitrage condition: $q.w + (h+r).d = (q+h+r).z \Leftrightarrow \nu - 1 = \dfrac{(h+r).(1-d)}{q\,(u_R)}$, hence the positive relationship f.

As in BG, unemployment arises from the bargaining scheme. Moreover, following McDonald and Solow, the transitional unemployment differs from the standard notion of search unemployment. Indeed, at each moment, the unemployed do not decide between accepting and rejecting offers; they take the first manufacturing job available to them. Because some sectors are perfectly competitive and others not, regulation *de facto* generates segmented labor markets. Therefore, focusing on the function f is a short cut capturing the essential component of the LM regulation trade-off, at least as it is generally perceived. Indeed as Saint-Paul (2004) summarizes, “a rough consensus emerged that high unemployment in Europe was due to labor market rigidities” which “increase the equilibrium rate of unemployment by boosting the incumbent employee’s bargaining power in wage setting”. The more regulated the LM, i.e. the higher the bargaining power γ, the better off the rent-sector workers, the higher the unemployment rate.[1] Also, looking at the source of unemployment, i.e. the surplus $\gamma.(\mu-1)$, highlights the complementary role of PM and LM regulation. Despite the focus here not being on domestic PM deregulation, it is clear that within this setting, the more the PM is regulated (high μ, low σ), the greater the impact of LM deregulation on the unemployment rate, and vice versa.

2.2. Autarky

We postpone the question of choosing the optimal level of LM regulation up to the following subsection. In this first stage, the bargaining power is a given parameter. In addition to the trade-off discussed above, the regulation has a negative impact on the return to capital, π, because part of the rents are transferred to workers. Indeed, for each sector-*R* firm:

$$\pi = p.x - w.l = (\mu - \nu).l = (\mu - 1).(1-\gamma).l \quad \Rightarrow \quad \pi.K = n.\pi = (\mu-1).(1-\gamma).L_R \qquad (7)$$

Total GDP is given by $I = p.X_R + X_A = \mu.L_R + L_A$ and maximization of utility leads to:

$$L_A = (1-\alpha).I \quad \Rightarrow \quad \alpha.L_A = \mu.(1-\alpha).L_R \qquad (8)$$

Because the relative price of the goods are not impacted by the regulation, relative employment is not either, when capital is immobile. However in the open economy, efficient bargaining does not have a

[1]Even though this is the general perception, the empirical support of the link between various measures of the strictness of Employment Protection Legislation and the unemployment rate had so far seriously lacked robustness (see Baker and al., 2005). However, Nicoletti and Scarpetta (2005) bring new evidence in support of this relationship.

distributive effect only; it also has an allocative impact due to specialization. Denoting the country unemployment rate *u*, equation (8) and LM clearing give the sectoral employment levels:

$$L_R = \frac{\alpha.(\sigma-1)}{\sigma-\alpha}.L.(1-u) \quad , \quad L_A = \frac{\sigma.(1-\alpha)}{\sigma-\alpha}.L.(1-u) \tag{9}$$

Denoting the capital labor ratio $\kappa \equiv K/L$, return on capital is obtained using equation (7):

$$\pi = \frac{b}{\kappa.(1-b)}.(1-\gamma).(1-u) \tag{10}$$

where $b \equiv \alpha/\sigma$ is positively related to the share of the differentiated good sector in the economy and to the market power; b is a measure of the size of the rents in the economy. Note that, as it will be the case throughout the paper, the FCM is obtained in the special case of the totally deregulated LM, i.e. with $\gamma = 0$ and therefore $u = 0$. LM regulation reduces capital return both directly, by transferring part of the rents to workers and indirectly, through the unemployment rate, by reducing the effective labor available to the economy. Finally, to close the model, we need to derive the unemployment rate:

$$u = \frac{U}{L} = \left(1-\frac{L_A}{L}\right).u_R = \left(1-\frac{L_A}{L}\right).f(\nu) \tag{11}$$

This expression highlights that the country unemployment rate is the product of the "sectoral" unemployment rate and of the complement of the employment in sector *A.* This remains true with market opening and therefore, liberalization might wipe out unemployment as a result of specialization in sector *A*, should capital move abroad. However in autarky, using (9) in (11) leads to:

$$u = \frac{\alpha.(\sigma-1).f(\nu)}{\sigma-\alpha-\sigma.(1-\alpha).f(\nu)} \tag{12}$$

which is positively related to the level of LM regulation unambiguously. Obviously, the lower the share of the rent sector in the economy, α, the lower the impact of regulation overall and the lower the country unemployment rate.

2.3. Social utility

In our model, the regulation of the LM clearly has a negative impact on real GDP. Indeed, the price index in autarky, $G = p^{\alpha} / K^{\alpha/(\sigma-1)} = (\mu.\beta.K^{1/(1-\sigma)})^{\alpha}$, does not change with the level of regulation and given equation (9), real GDP is:

$$I/G = (\mu.\beta.K^{1/(1-\sigma)})^{-\alpha}.(\mu.L_R + L_A) = \frac{K^{\alpha/(\sigma-1)}}{\mu^{\alpha}.\beta^{\alpha}}.\frac{L.(1-u)}{1-b} \tag{13}$$

The higher the unemployment rate, the lower the GDP. Consequently, a utilitarian government will choose to totally deregulate the LM. However, we consider the case where the government has some degree of aversion against inequality, represented by parameter λ. To simplify, it puts less weight on capital income, the greater the parameter λ. Specifically,

$$W_\lambda = \frac{w_A.L_A + w_R.L_R + (1-\lambda).\pi.K}{G} \quad , \quad \lambda \in [0\,,1] \qquad (14)$$

When $\lambda = 0$, the government is indifferent to inequality and the welfare function boils down to the real GDP. In the other extreme when $\lambda = 1$, government only cares about labor income.[2] Appendix 1 shows that:

$$W_\lambda = cte.(1-u).[1-\lambda.b.(1-\gamma)] \qquad (15)$$

Equation (15) makes it clear that regulation has two effects on welfare: a negative one through unemployment which reduces GDP and a positive redistributive effect, the term between brackets. This term is all the greater for a given bargaining power, when the size of the rents is higher (b) and when the government is more adverse to inequality (λ). Differentiating (15) leads to:

$$\frac{dW_\lambda}{d\gamma} \geq 0 \quad \Leftrightarrow \quad \gamma \leq 1 - \frac{1}{b.\lambda} + \frac{1-u}{du\,/\,d\gamma} \qquad (16)$$

When the expression on the RHS is positive, welfare increases until the bargaining power hits the value of the RHS term, from which it then decreases: this value is therefore the optimal regulation level. Two points are worth noting. When the degree of aversion against inequality λ is small enough, the RHS of the inequality is negative and the government opts for deregulation. Secondly, the higher the sensitivity of the unemployment rate to the regulation, $du\,/\,d\gamma$, the lower the RHS, and therefore the lower the optimal level of the bargaining power.

In order to move further, we have to specify a functional form f respecting (6). In order to remain as general as possible, we choose f depending on a parameter δ which measures how sensitive the unemployment rate is to the regulation level. Appendix 1 gives the full derivation, the exact function being chosen to facilitate the calculations:

[2] This implies that unemployment benefits are financed by taxes on labor income only. This is fine here since we want to keep away from issues related to capital taxation *per se*. Moreover, to keep things simple and restrict social preferences to one parameter only, occupied workers and the unemployed bear the same weighting in social preferences implicitly.

$$u_R = f(\gamma) \approx \delta.(\nu-1) = \delta/(\sigma-1).\gamma \qquad (17a)$$

This is important to stress that the main results of this study, presented in Section 3, are general, i.e. they do not depend on this specific function. The advantage of specifying f is firstly, to show how optimal regulation based on social preferences could arise and secondly, to illustrate the results through simulations. Moreover, this function fits the Harris-Todaro case sketched out in sub-section 2.1 almost perfectly with $\delta = \frac{h}{h+r}.\frac{1}{1-d}$.[3] As one might expect in that case, δ is an increasing function of the probability to loose a job, h, and of the unemployment benefits, d. Given this functional form, the autarky unemployment rate is:

$$u = 1 - \exp\left(-\frac{b}{1-b}.\delta.\gamma\right) \approx \frac{b}{1-b}.\delta.\gamma \qquad (17b)$$

increasing with b, δ and γ unambiguously. Proposition 1 indicates the optimal regulation level.

Proposition 1. Optimal labor market regulation in autarky

The optimal level of regulation $\hat{\gamma}(\lambda)$ is an increasing function of the social preferences parameter λ such that:

(i) *If δ is greater than 1 , then any government will choose a totally deregulated market:*

$$\delta \geq 1 \quad \Rightarrow \quad \hat{\gamma}(\lambda) = 0 \quad \forall \lambda$$

(ii) *If δ is lower than 1, then any government with a degree of aversion to inequality lower than $\lambda_{\min}$ (given below) chooses to deregulate totally, whereas a government with a greater degree of aversion decides to regulate according to $\hat{\gamma}(\lambda) > 0$. In particular, if δ is lower than $(1-b)$, any government such that $\lambda \geq \lambda_{\max}$ (given below) chooses to transfer all the rents to workers. Formally,*

$$\delta \leq 1 \quad \Rightarrow \quad a) \quad \lambda \leq \lambda_{\min} = \delta/(1-b+\delta.b) \qquad \Rightarrow \quad \hat{\gamma}(\lambda) = 0$$

$$b) \quad \lambda \geq \lambda_{\max} = \min\left(\delta/(1-b)\,,1\right) \quad \Rightarrow \quad \hat{\gamma}(\lambda) = 1$$

$$c) \quad \lambda_{\min} \leq \lambda \leq \lambda_{\max} \qquad \Rightarrow \quad \hat{\gamma}(\lambda) = \frac{1-b}{b}.\left(\frac{1}{\delta}-1\right) - \frac{1}{b}.\left(\frac{1}{\lambda}-1\right)$$

(Proof is directly derived from equation (16) and is given in Appendix 1)

[3] Details are available upon requests.

This proposition is illustrated in Figure 2, showing that the optimal LM regulation level is positively related to the aversion against inequality, λ, and negatively related to the sensitivity of unemployment, δ. The first part of the proposition states that if the unemployment is too responsive to regulation ($\delta \geq 1$), then even the government the most inclined to protect workers chooses to fully deregulate.[4]

However, if this is not the case, the redistributive effect dominates for low enough levels of the bargaining power and when the government is such that $\lambda \geq \lambda_{\min}$. The government then decides to regulate all the more, the greater the social preferences parameter. To give an intuition of a relevant order of magnitude for δ, consider the maximum "sectoral" unemployment rate achieved when all rents go to workers, $u_R^{\max} = u_R(\gamma = 1) \approx \delta/(\sigma - 1)$. Note that the case $\delta \geq 1$ looks fairly extreme for reasonable values of σ since it means that $u_R^{\max} \geq 1/(\sigma - 1)$.[5] Let us now turn to the open economy.

3. Open economy

There are two countries, an asterisk referring to the foreign country. International trade in good *A* is costless, whereas trade costs, τ, for good *R* are iceberg. Labor is immobile and capital perfectly mobile between countries. Moreover, capital owners are assumed to consume in their home country only. Therefore in the FCM, capital is better thought of as physical capital. Appendix 2 provides the calculation details in the general case where the two countries may differ both in their factor endowments and in their social preferences, but most of the interesting results are obtained when they differ only in their social preferences, which we assume for the remainder of the paper. The foreign country has preferences so that the LM is totally deregulated, whereas the domestic country has a higher degree of aversion against inequality and chooses optimally to regulate in autarky.[6]

---

[4] Obviously, when taking the cost of capital into account, the maximum tolerable bargaining power is not unity but the level which equalizes the rents kept by the firm with the fixed costs. This is ignored here as it just changes this maximum level without altering the reasoning.

[5] The range for the empirical estimates of σ is quite large. Based on price-cost margins analyzes, they should not be far from a [5 , 8] range. However, these analyses almost always assume perfect LM. Because what is measured is in fact the share of the rents kept by firms, taking into account workers' bargaining power leads to a lower range. For instance with $\gamma = 0.3$, the range above becomes [3.8 , 5.9] - for example, 3.8 = 1 + (1-0.3).(5-1) - (see Boulhol, 2005, for a discussion).

[6] If we choose the specific function of Proposition 1, this means that $\delta < 1$ and $\lambda^* < \lambda_{\min} < \lambda$.

As in the previous section, the domestic regulation level, γ, is considered as given in the first stage, and the impact of liberalization on the optimal level of the LM regulation is studied in a second stage. As shareholders have to forsake part of the rents in the domestic country, the return on capital is lower in autarky than in the foreign country. With capital mobility, this obviously triggers an outflow of capital abroad and the share of firms located in the domestic country, s_n, decreases to equalize capital returns. This equilibrium results from the combination of the market access effect (agglomeration force) and the market crowding effect (dispersion force). In the FCM, the demand linkages are absent because income from capital is repatriated and therefore, agglomeration is not self-reinforcing.

Two variables are essential for the characterization of the equilibrium: the location of firms represented by s_n and the unemployment rate u in the domestic country. Appendix 2 gives all the details. Equilibrium in good R leads to the expression of the capital return:

$$\pi = \frac{b}{\kappa.(1-b)} \frac{(1-\gamma).(1-u/2)}{1-\gamma+\gamma.s_n} \tag{18}$$

As in autarky, LM regulation in the domestic country reduces the world capital return through the two channels identified before. Note though that the direct impact of regulation on capital return is attenuated when firms move abroad, as expressed by the denominator. Also in the global capital market, the world labor force is twice as large, hence the $u/2$ term. As shown below, when the activity is fully agglomerated in the foreign country, equation (18) remains valid. In this situation, the source of unemployment, i.e. the presence of a rent sector, disappears from the home country and the capital return equals $1/\kappa.b/(1-b)$ which is both the FCM return and the foreign return in autarky.

We assume that the non-full-specialization condition (see Baldwin et al.), that is the condition which ensures that good *A* is produced in both countries, is respected. Here, this condition is $b < 1/(2.\sigma-1)$. Denoting the free-ness of trade, i.e. the so-called phi-ness, $\phi \equiv \tau^{1-\sigma}$ and taking equilibrium in sector *A* (or alternatively the balanced current account condition) into account lead to the first relationship between the share of firms and the unemployment rate in the home country:

$$s_n(\gamma,\phi)=\frac{(1-\phi)^2-\gamma.(1+\phi^2)-u.\left[(1-\phi-\gamma)-b/2.(1-\phi^2).(1-\gamma)\right]}{2.(1-\phi)^2-\gamma.\left((1-\phi)^2+b.(1-\phi^2)\right)-u.(1-\phi-\gamma).(1-\phi)} \qquad (19)$$

Note that with $\gamma=0$ (and $u=0$), the share of firm is one half as in the FCM, whatever the level of trade costs. Finally, LM equilibrium in the domestic country gives the second relationship:

$$\frac{u}{2-u}=\frac{b}{1-b}.(\sigma-1).\frac{f(\nu)}{1-f(\nu)}.\frac{s_n}{1-\gamma+\gamma.s_n} \qquad \left(=\frac{u^{autarky}(\gamma)}{1-u^{autarky}(\gamma)}.\frac{s_n}{1-\gamma+\gamma.s_n}\right) \qquad (20)$$

Equation (20) is easily interpreted. In the open economy, unemployment is driven by two channels. The first is the "sectoral unemployment" which directly leads to the autarky unemployment rate and the first term on the RHS. The second channel is the number of sector-*R* firms producing domestically, which leads to the second term. Therefore, full employment is reached either because the LM is deregulated ($\gamma=0 \Leftrightarrow \nu=1$) which eliminates the primary cause or because the *R*-economy is aggregated in the foreign country ($s_n=0$). We can therefore expect the open economy unemployment rate to be hump shaped, as a function of the workers' bargaining power. This is a result of the conflicting effects of the increase in the "sectoral" unemployment rate and of the outflow of capital, which triggers the decrease in the share of sector *R* in domestic production.

Given the levels of the trade costs and of the bargaining power, equations (19) and (20) define the location of firms and the equilibrium unemployment rate, leading to Proposition 2A.

Proposition 2A. Location of firms and unemployment rate in the open economy

(i) *Given the level of the bargaining power, if trade costs are low enough, then all R-firms are agglomerated in the foreign country. Formally, the "break point" ϕ_B is given by:*

ϕ_B *is such that* $\gamma=g(\phi_B)\equiv\dfrac{(1-\phi_B)^2}{1+\phi_B^2} \quad \Leftrightarrow \quad \phi_B=g^{-1}(\gamma) \quad , \quad g'<0$

$$\phi\geq\phi_B \quad \Rightarrow \quad s_n=0$$

(ii) *The share of firms located in the domestic country is a decreasing function of both the workers' bargaining power and the phi-ness of trade:*

$$\frac{\partial s_n}{\partial\gamma}<0 \quad , \quad \frac{\partial s_n}{\partial\phi}<0$$

(iii) *The domestic unemployment rate is hump-shaped in γ and decreasing with ϕ. In particular, at the agglomerated equilibrium, the domestic country is by definition fully specialized in good A and the unemployment rate is zero:*

$$\phi \geq \phi_B \quad \Rightarrow \quad u = 0$$

(Proof is given in Appendix 2)

To understand what happens, if there is a level of trade costs where the firms are agglomerated, then from (20) we infer that at this level, the unemployment rate is zero. Based on the numerator of (19), it follows necessarily that this level is defined by $\gamma = g(\phi)$. Importantly, this main result is valid with a general functional form f. Appendix 2 shows that the unemployment rate is given by:

$$\phi \leq \phi_B \;\Leftrightarrow\; \gamma \leq \psi \quad \Rightarrow \quad u \approx \frac{(\psi - \gamma)}{\psi.(1-\gamma)}.u^{autarky}(\gamma) \quad , \quad \psi \equiv g(\phi) = \frac{(1-\phi)^2}{1+\phi^2} \in [0\,,1] \quad , \quad g' < 0 \qquad (21)$$

Moreover, the unemployment rate is exactly zero when the LM is fully deregulated or when the phi-ness of trade exceeds the break point. Figure 3a illustrates this pattern for different levels of trade costs (for simulations, the specific function f from § 2.3 is used). When trade costs fall, as more firms locate abroad, the domestic country specializes in good *A*, and the unemployment rate decreases.

Similarly for the share of domestic firms:

$$\phi \leq \phi_B \quad \Leftrightarrow \quad \gamma \leq \psi \quad \Rightarrow \quad s_n \approx \frac{\psi - \gamma}{2.\psi} \qquad (22)$$

Figures 3b and 3c illustrate how the domestic share of firms and the world capital return react to the workers' bargaining power for various levels of trade costs. The difference in capital returns between the two countries drives the location of firms and the equilibrium location is the one which equalizes these returns. When this is not possible (domestic bargaining power too high, i.e. $\gamma \geq \psi$), the agglomeration in the foreign country is the only equilibrium. Moreover, in autarky the greater the bargaining power, the lower the domestic return on capital. It therefore requires more firms to move to make the returns converge. In addition, as trade costs fall it is easier to serve the market abroad and therefore, the intensity of the agglomeration force increases, which renders the location in the foreign country even more appealing.

As it is clear from Figure 3c, with market opening, capital return increases in the domestic country. Keep in mind that the choice of the numeraire implies that capital return is, in fact, the return relative to sector-*A* wages. Thus, at constant bargaining power, as inter-sector relative wages are constant, market opening benefits capital owners relative to wage earners. We are now in a position to study the impact of market liberalization on LM regulation.

4. Pressure to deregulate the labor market

Proposition 2A should now be interpreted from the point of view of the government that should choose the optimal level of LM regulation, as follows.

Proposition 2B. Maximum level of labor market regulation

(i) *Given the level of trade costs, there exists a maximum level of the workers' bargaining power beyond which all firms move abroad:*

$$\exists\ \gamma_{\max} = \psi = g\,(\phi) \equiv \frac{(1-\phi)^2}{1+\phi^2} \leq 1 \quad \textit{such that} \quad \gamma \geq \gamma_{\max} \quad \Rightarrow \quad s_n = 0$$

(ii) *This maximum level of the bargaining power is a decreasing function of the phi-ness:*

$$\gamma_{\max}(\phi = 0) = 1 \quad , \quad \gamma_{\max}(\phi = 1) = 0 \quad , \quad d\gamma_{\max} / d\phi \leq 0$$

Result *(i)* states that if the regulation in the domestic country is too favourable to workers, all firms move abroad. Result *(ii)* gives some details. When trade costs are prohibitive, there will always remain some firms in the domestic country (except in the limit case where all rents go to workers). However, when trade costs fall, this bargaining power ceiling diminishes towards zero. With free trade, all firms move to the foreign country, except if the domestic LM is completely deregulated, in which case the symmetric equilibrium is reached. In addition, regulating the LM beyond $\gamma_{\max}$ has no additional effect on the economy as the rent sector has disappeared.

However, is it that bad if all firms move to the foreign country? After all, within this framework, capital owners spend domestically and, as it has been established, nominal returns increase with market opening. Moreover, when the domestic country specializes in sector *A*, unemployment disappears. The answer depends on what the reference point is. If the comparison is with autarky, the answer is: it depends on how costly importing good R is. If the question is that of optimal LM policy in the open economy, then relocation hurts unambiguously. We address these issues in turn, starting by the latter.

4.1. Optimal regulation in the open economy

To start with, let us compute the general price index. Since LM regulation does not affect relative prices, the price index is standard and negatively related to the share of domestic firms:

$$G^{open} = (\mu.\beta.K^{1/(1-\sigma)})^{\alpha}.\left[2.(s_n + \phi.(1-s_n))\right]^{\alpha/(1-\sigma)} = G^{autatky}.\left[2.(s_n + \phi.(1-s_n))\right]^{\alpha/(1-\sigma)} \quad \text{(23)}$$

In other words, except if trade is costless, an increase in LM regulation entails *ceteris paribus* an increase in the price index due to firm relocations abroad (because $\partial s_n / \partial \gamma < 0$). Very importantly, when comparing the symmetric equilibrium corresponding to the fully deregulated LM ($\gamma = 0$, FCM) with the agglomerated outcome ($\gamma \geq \gamma_{\max}$), one notices that wages are identical, equal to *1*, unemployment is zero in both cases and nominal capital returns are equal (see equation 18). However, because the price index is lower in the first case, welfare is greater. What is remarkable about this result is that it holds whatever the social preferences:

$$\forall \phi \neq 1, \quad W_{\lambda}(\gamma = 0) > W_{\lambda}(\gamma \geq \gamma_{\max}) \quad \forall \lambda$$

[more precisely, see Appendix 3, $W_{\lambda}(\gamma \geq \gamma_{\max}) = \left(2\phi/(1+\phi)\right)^{\alpha/(\sigma-1)}.W_{\lambda}(\gamma = 0)$]. This implies directly that the optimal level of regulation is strictly lower than $\gamma_{\max} = g(\phi)$. As this maximum bargaining power tends to zero when trades becomes costless, the optimal choice is to fully deregulate in that case, whatever the social preferences. This is the main result of this paper.

Proposition 3. Optimal level of labor market regulation in the open economy

(i) *Whatever the social preferences parameter, the optimal level of regulation is lower than the level leading to the aggregated equilibrium:*

$$\hat{\gamma}(\lambda) \leq \gamma_{\max}(\phi) \quad \forall \lambda$$

(ii) *As trade becomes costless, the optimal choice is to fully deregulate the labor market:*

$$\lim_{\substack{\phi \to 1 \\ \phi \neq 1}} \hat{\gamma}(\lambda) = 0$$

In autarky, the advantage of protection is to increase average wages. With market opening, as local firms are deterred to produce domestically, the redistributive component of LM protection is ineffectual above a threshold. Compared to the symmetric deregulated LM situation, it just makes imported goods more expensive. This threshold, in a way the maximum tolerated level, diminishes with trade liberalization. Stated differently, even the slightest protection is non optimal when trade becomes very cheap. Indeed, firstly capital mobility puts pressure on LM institutions because of the threat of outflow and secondly, trade liberalization reinforces the strength of the agglomeration force, so that any positive effect of regulation on welfare is wiped out when trade is costless. However, as the LM is deregulated, firms are no longer inclined to relocate their activities. The *threat* of relocation drives the changes in LM institutions. In this stylized framework, the effect of liberalization is to be found in the weakening of employment protection, with minimal *actual* outflows and relocations.

4.2. Comparison between the autarky equilibrium and the fully deregulated trade equilibrium

Given the pressure to deregulate with market opening, it is natural to compare these two situations. Domestic capital owners unambiguously win in nominal terms with each step of the following sequence (recall Figure 3c): capital mobility, falling trade costs, full LM deregulation. In real terms, this effect is reinforced because, as seen from (23) with perfect labor markets, the symmetric equilibrium leads to a fall in prices with trade: this is one of the sources of the usual gains from trade.

$$G^{open}(\gamma=0) = G^{autarky}.(1+\phi)^{\alpha/(1-\sigma)} \quad \Rightarrow \quad (\pi/G)^{open}_{\gamma=0} > (\pi/G)^{autarky}_{\gamma=0} > (\pi/G)^{autarky}_{\gamma>0}$$

This price effect also means that, in the open economy, sector-*A* workers are better off with LM deregulation in terms of real current income. Next, autarky unemployed workers find jobs and see their real income increase too. Finally, for sector-*R* wage earners however, the outcome is not clear-cut:

$$\begin{aligned} \left(\frac{w_R}{G}\right)^{open}_{\gamma=0} \geq \left(\frac{w_R}{G}\right)^{autarky}_{\hat{\gamma}^A} &\Leftrightarrow \frac{1}{G^{open}(\gamma=0)} \geq \frac{1+\hat{\gamma}^{autarky}/(\sigma-1)}{G^{autarky}} \\ &\Leftrightarrow \hat{\gamma}^{autarky} \leq (\sigma-1).\left[(1+\phi)^{\alpha/(\sigma-1)}-1\right] \approx \alpha.Log(1+\phi) \leq \alpha.Log\,2 \end{aligned} \tag{24}$$

Real wages improve with market opening and deregulation, only if the initial protection, and therefore the underlying level of aversion for inequality, is below a certain level. This implies that a government with a high level of aversion against inequality, choosing optimally to deregulate, might generate conflicts of interests and uncover levels of resistance among workers in the rent sector: based on (24), when trade costs are high, deregulating is detrimental to them.

In certain instances, this negative contribution to overall welfare is not benign. Indeed, Appendix 3 which focuses on welfare shows that when trade costs and the aversion against inequality are high enough then the gains from trade are too low to compensate for the loss of the redistributive tool. Welfare then decreases with LM deregulation.

4.3. Welfare impact of market opening

Deregulation is not only a question of optimal policy. The pressure is strong because keeping the autarky level could be very damaging. The main negative effect arises with the combination of capital mobility and high trade costs. With capital outflows, imports are expensive in this situation. From equation (23), it is straightforward to establish that:

$$G^{open}(\gamma) > G^{autarky} \quad \Leftrightarrow \quad s_n + \phi.(1-s_n) < 1/2 \quad \Leftrightarrow \quad s_n < (1/2-\phi)/(1-\phi) \qquad \textit{(25)}$$

When the phi-ness of trade is greater than $1/2$ then the price level is always lower in the open economy. However, when the phi-ness is lower than $1/2$, if the employment protection is high enough, the share of domestic firms is lower than the term on the RHS and opening the economy induces a negative price impact.

Appendix 3 demonstrates that when trade costs are high, keeping the regulation at the optimal autarky level induces a decrease in welfare. Formally,

$\phi < 1/2.(1-u^{autarky})^{(\sigma-1)/\alpha}$ and λ such that $\hat{\gamma}^{autarky}(\lambda) > \psi \quad \Rightarrow \quad W^{open}(\hat{\gamma}^{autarky}) < W^{autarky}(\hat{\gamma}^{autarky})$

This result is illustrated in Figure 4 which compares, based on the social preferences, the change in welfare induced by market opening, for different levels of trade costs and by keeping the LM regulation at the optimal autarky level. To the right of the chart, when the social preferences parameter is such that keeping the regulation at the autarky level leads to agglomeration, welfare is lower than in autarky if trade costs are sufficiently high.

The need to deregulate is therefore not a question of fine-tuning, especially when the LM is highly regulated to start with. Does the opening of the economy improve welfare when the government chooses the optimal LM regulation? What follows is illustrated through simulations only and might therefore depend on the function f. Figure 5a plots, for each government represented by λ, the maximized welfare level, with $\delta = 0.25$. The general pattern is that opening the economy is beneficial when the government adapts the regulation level optimally. However, when the government has a high degree of aversion to inequality and therefore highly regulates the LM in autarky, market opening is detrimental unless trade costs are low enough. In this case, if $\lambda = 0.5$ then welfare is lower with market opening as soon as $\tau \geq 3$. Figure 5b does the same with $\delta = 0.7$. In this case, the negative occurrences are not as frequent. This is because, in our framework, the high sensitivity of unemployment to the regulation level has a stronger negative impact in autarky. With market opening, either specialization, if the LM remains regulated, or deregulation strongly mitigates this effect.

To sum up, these results highlight how the different liberalizations interact. With capital liberalization, barriers to trade could be harmful, especially if the LM is highly regulated, and therefore, capital mobility renders trade liberalization critical. In turn, falling trade costs reinforces agglomeration and triggers LM deregulation as employment protection becomes ineffective.

4.4. Impact for the foreign country

In contrast to the domestic country, the foreign price index decreases, and therefore real wages increase, with the employment protection in the domestic country. This stems from the location of firms in the foreign country as capital moves abroad:

$$G^{*,\,open} = G^{*\,,\,autatky}.\left[2.(1-s_n+\phi.s_n)\right]^{\alpha/(1-\sigma)} \quad \Rightarrow \quad \frac{\partial G^{*,\,open}}{\partial s_n} > 0$$

The simulation in Figure 6 indicates that in all situations, foreign real GNP increases with the degree of regulation in the domestic country (the initial decrease in nominal capital return never outweighs the beneficial impacts of trade and agglomeration which channel through prices and therefore real wages).

5. Conclusion

This paper is a first attempt at introducing labor market (LM) imperfections in an economic geography setting. The most obvious limitations refer to the specificities of the model integrating wage bargaining in the footloose capital model. Although we have kept away from capital taxation issues *per* se, as bargaining is directly associated with rent-sharing, this framework presents some similarities with capital taxation used as a redistributive purpose. It is, however, consistent with segmented LMs, which arise because the size of the rents differs across sectors. Therefore, it is not surprising that, as in most of the tax competition literature, it entails a race to the bottom in terms here of LM institutions.

However, this framework captures some interesting features, even when the analysis is limited to the case of two countries, differing only in their social preferences, opening to each other. The levels of LM regulation are chosen based on their idiosyncratic degree of aversion against inequality. In autarky, LM protection has the advantage of shifting part of the rents to workers and therefore, of increasing real wages. This comes though at the cost of unemployment and lower capital return. Weighing-up these components, the government chooses the optimal level of protection.

In the context of perfect capital mobility with a country that has a totally deregulated LM (because of its own preferences), the pro-real wage effect of regulation is at best attenuated. Indeed, as firms seeking for higher capital return move abroad, total rents diminish and the share kept by workers as well. Within this setting, if the domestic country has a regulated LM initially, market opening will unambiguously benefit capital owners relative to wage earners. In addition, shipping the “delocalised” good has an adverse effect on the purchasing power of domestic consumers. Consequently, the benefits of LM regulation are significantly reduced, or even reversed, by the mobility of capital which leads the government to deregulate.

When trade costs fall, the intensity of the agglomeration force increases further. The level of protection beyond which all firms move abroad decreases as trade in goods becomes cheaper. When trade liberalization extends, even the slightest LM protection deters any single firm to produce domestically. The only outcome of LM regulation is then to make imported good more expensive compared to the symmetric fully deregulated LM equilibrium. As trade tends to become costless, the optimal choice is to totally deregulate the LM. This result is also striking because it holds even if the government has an extreme degree of aversion for inequality. The threat of relocation drives the changes in LM institutions. Consequently, the effect of liberalization might be found primarily in the weakening of employment protection, with minimal actual outflows and relocations.

However, this does not mean that deregulation does not generate conflicts of interests. Capital mobility without trade makes the wage earners, who enjoyed some share of the rents in autarky, worse off. It is only if the gains from trade, typical of the monopolistic competition, are large enough, i.e. trade costs low enough, that the negative impact of deregulation on real wages is offset. The current model underlines the complexity of analyzing the effects of globalization taken as a single phenomenon, even if focusing on only two aspects, capital and trade liberalization.

Moreover, within this framework, the welfare impact of market opening depends on social preferences. In most cases, market opening is beneficial. However, if trade costs are not sufficiently low, opening the economy has a negative effect overall for a government with a high degree of aversion for inequality (and therefore a highly regulated LM in autarky). This is in contrast to the positive outcome for a utilitarian country, which benefits from openness in all situations.

Generally, in terms of economic policy, support for market opening is drawn from models assuming a perfect LM. Taking into account LM regulation, this study highlights how capital and trade liberalization can put pressure on LM institutions. Therefore, liberalization measures should be thought of as tied to the LM deregulation they trigger. This combination might be well accepted by countries with low protection initially. However, countries that attached importance to LM protection may face a difficult situation once engaged in the liberalization process, especially if trade barriers are not so benign.

Appendix 1: Proof of Proposition 1

Using equation (9) leads to the expression of nominal GDP, I :

$$I = p.X_R + X_A = \mu.\beta.X_R + X_A = \mu.L_R + L_A = \left(\frac{\sigma.\alpha}{\sigma-\alpha} + \frac{\sigma.(1-\alpha)}{\sigma-\alpha}\right).L.(1-u) = \frac{L.(1-u)}{1-b}$$

Therefore, welfare defined in (14) becomes:

$$W_\lambda = \frac{GDP - \lambda.\pi.K}{G} = \frac{1-\lambda.b.(1-\gamma)}{G.(1-b)}.L.(1-u) \tag{A1}$$

hence (15). Differentiating this expression with respect to the bargaining power leads to:

$$\frac{d\ LogW_\lambda}{d\gamma} \geq 0 \quad \Leftrightarrow \quad \frac{-du/d\gamma}{1-u} + \frac{\lambda.b}{1-\lambda.b.(1-\gamma)} \geq 0 \quad \Leftrightarrow \frac{1}{b.\lambda} - (1-\gamma) \leq \frac{1-u}{du/d\gamma} \quad \Leftrightarrow \quad \gamma \leq 1 - \frac{1}{b.\lambda} + \frac{1-u}{du/d\gamma} \tag{A2}$$

δ being a constant representing the sensitivity of the unemployment rate to the regulation level, we choose the following functional form $u_R = f(\nu)$:

$$u_R = f(\nu) = \frac{1-e^{-b/(1-b).\delta.\gamma}}{1-\frac{1-b.\sigma}{1-b}.e^{-b/(1-b).\delta.\gamma}} \approx \frac{1}{\sigma-1}\delta.\gamma = \delta.(\nu-1)$$

Indeed this entails from (12):

$$u = 1-e^{-b/(1-b).\delta.\gamma}$$

and therefore, $du/d\gamma = b/(1-b).\delta.(1-u)$. *(A2)* then becomes:

$$\frac{d\ LogW_\lambda}{d\gamma} \geq 0 \quad \Leftrightarrow \quad \gamma \leq 1-\frac{1}{b.\lambda}+\frac{1-b}{b.\delta} \equiv \varphi(\lambda,\delta) \quad , \quad \varphi(1,1)=0 \quad \varphi_\lambda \equiv \frac{\partial\varphi}{\partial\lambda}>0 \quad \varphi_\delta \equiv \frac{\partial\varphi}{\partial\delta}<0$$

Therefore, whatever the level of parameter $\lambda(\leq 1)$, if δ is greater than 1, $\varphi(\lambda,\delta) \leq \varphi(1,\delta) < \varphi(1,1) = 0$. This means that, in this case, welfare is strictly decreasing with the bargaining power and therefore, the government chooses to fully deregulate, which proves *(i)* of Proposition 1.

When δ is lower than 1, it is easy to verify that $0 \leq \frac{\delta}{1-b+b.\delta} \leq 1$ and $\varphi\left(\frac{\delta}{1-b+b.\delta},\delta\right)=0$. Therefore, if $\lambda \leq \lambda_{\min} \equiv \delta/(1-b+b.\delta)$ then $\varphi(\lambda,\delta)<0$ and $\hat{\gamma}(\lambda)=0$, hence *(ii) a)*. Moreover, as $\varphi(\delta/(1-b),\delta)=1$, if the government is such that $\lambda \geq \lambda_{\max} \equiv \delta/(1-b)$ then all rents are transferred to workers and $\hat{\gamma}(\lambda)=1$. In the intermediate case where $\lambda_{\min} \leq \lambda \leq \lambda_{\max}$,

$$\hat{\gamma}(\lambda) = \frac{1-b}{b}.\left(\frac{1}{\delta}-1\right)-\frac{1}{b}.\left(\frac{1}{\lambda}-1\right)$$

Appendix 2: The Open Economy

A domestic firm produces $X = x+\tau.y$, where x and y are sold in the domestic and foreign country respectively. Similarly, for a foreign firm, $X^* = x^*+\tau.y^*$. As in autarky, capital returns are:

$$\pi = (\mu-1).(1-\gamma).\beta.X \quad , \quad \pi^* = (\mu-1).\beta.X^* \tag{A3}$$

Therefore, the assumption of perfect capital mobility leads to the equalization of returns, as long as both countries produce good *R*:

$$X^* = (1-\gamma).X \tag{A4}$$

Equation (A4) highlights that because some rents are transferred to workers in the domestic country, domestic firms should be bigger than their foreign competitors in order to cover fixed costs and be able to pay the same return to shareholders. I denoting nominal GNP, worldwide equilibrium in good *R* is written:

$$\alpha.(I+I^*)=\mu.\beta.(n.X+n^*.X^*) \quad , \quad n+n^*=K+K^* \tag{A5}$$

$$I=\pi.K+\nu.L_R+L_A \quad , \quad I^*=\pi^*.K^*+L^* \tag{A6}$$

Given the equalized returns condition (A4), equation (A5) becomes,

$$\mu.\beta.[n+n^*.(1-\gamma)].X=\alpha.[\pi.(K+K^*)+\nu.L_R+L_A+L^*] \tag{A7}$$

The production function of good *R* links sectoral output and employment:

$$L_R=n.X.\beta \tag{A8}$$

Using equation (A3), (A8) and $L_R+L_A=L.(1-u)$, equation (A7) becomes:

$$\mu.\beta.[n+n^*.(1-\gamma)].X=\alpha.[(\mu-1).(1-\gamma).(K+K^*).\beta.X+(\nu-1).n.\beta.X+L.(1-u)+L^*]$$

Denoting the share of domestic firms $s_n\equiv n/(n+n^*)$, the expression above leads to:

$$X=\frac{\alpha}{\beta}.\frac{L.(1-u)+L^*}{\mu.[n+n^*.(1-\gamma)]-\alpha.(\mu-1).[n+(1-\gamma).n^*]}=\frac{\alpha}{\beta}.\frac{L.(1-u)+L^*}{K+K^*}.\frac{\sigma-1}{(\sigma-\alpha).(1-\gamma+\gamma.s_n)} \tag{A9}$$

From (A3), the equilibrium capital return is then easily obtained:

$$\pi=\alpha.\frac{L.(1-u)+L^*}{K+K^*}.\frac{1-\gamma}{(\sigma-\alpha).(1-\gamma+\gamma.s_n)}=\frac{b}{1-b}.\frac{L.(1-u)+L^*}{K+K^*}.\frac{1-\gamma}{1-\gamma+\gamma.s_n} \tag{A10}$$

Classically with iceberg trade costs,

$$p_y=\tau.p_x=\tau.p=\tau.\mu.\beta \quad \text{and} \quad p_y^*=\tau.p_x^*=\tau.p^*=\tau.\mu.\beta$$

Therefore, with Dixit-Stiglitz preferences,

$$y^*=x.\tau^{-\sigma} \quad \text{and} \quad y=x^*.\tau^{-\sigma}$$

Moreover, the equilibrium for good *R* in the domestic country is:

$$\alpha.I=n.p.x+n^*.p_y^*.y^*=\mu.\beta.x.(n+\phi.n^*) \quad \Rightarrow \quad x=\frac{1}{\mu.\beta}.\frac{\alpha.I}{n+\phi.n^*} \tag{A11a}$$

Similarly,

$$x^*=\frac{1}{\mu.\beta}.\frac{\alpha.I}{n+\phi.n^*} \quad \Rightarrow \quad y=\frac{\tau^{-\sigma}}{\mu.\beta}.\frac{\alpha.I^*}{\phi.n+n^*} \tag{A11b}$$

Combining equations (A11a) and (A11b) to get $X = x + \tau.y$ gives:

$$\frac{I}{n+\phi.n^*} + \frac{\phi.I^*}{\phi.n+n^*} = \frac{\mu.\beta}{\alpha}.X \tag{A12a}$$

and reciprocally, using (A4):

$$\frac{\phi.I}{n+\phi.n^*} + \frac{I^*}{\phi.n+n^*} = \frac{\mu.\beta}{\alpha}.X^* = \frac{\mu.\beta}{\alpha}.(1-\gamma).X \tag{A12b}$$

It is already clear that, when ϕ tends to 1, the system (A12a)-(A12b) holds, i.e. capital returns are equalized, only if the bargaining power is zero. Eliminating I from the system (A12a)- (A12b) leads to:

$$\phi.n + n^* = \frac{\alpha}{\mu.\beta}.\frac{(1-\phi^2).I^*}{X.[1-\gamma-\phi]} = \frac{\alpha}{\mu.\beta}.\frac{(1-\phi^2).(\pi.K^*+L^*)}{X.(1-\gamma-\phi)}$$

Substituting successively the expressions of the capital return and of a domestic firm's output given by (A3) and (A9) leads to the first relationship linking the location of firms to the unemployment rate:

$$\phi.n + n^* = \frac{\alpha}{\mu.\beta}.\frac{(1-\phi^2).[(\mu-1).(1-\gamma).\beta.X.K^*+L^*]}{X.(1-\gamma-\phi)} = \alpha.\frac{1-\phi^2}{1-\gamma-\phi}.\left[\frac{1-\gamma}{\sigma}.K^* + \frac{L^*.(K+K^*)}{L.(1-u)+L^*}.\frac{(\sigma-\alpha).(1-\gamma+\gamma.s_n)}{\alpha.\sigma}\right]$$

$$\Rightarrow \quad 1-(1-\phi).s_n = \frac{1-\phi^2}{1-\gamma-\phi}.\left[b.(1-\gamma).s_K^* + (1-b)\frac{s_L^*.(1-\gamma+\gamma.s_n)}{1-u.s_L}\right] \tag{A13}$$

It is convenient to denote $s = b.s_K + (1-b).s_L$, the average of the domestic country shares in world factor endowments, weighted based on the scope of the rents, b. In the standard FCM (see Baldwin et al, Chapter 3), s is the domestic income share and plays a decisive role for the location of firms. The weighting of factor shares in s highlights that when the share of spending in good *R* and/or the degree of market power is high, i.e. b is large, then the spatial distribution of capital owners matters the most. Conversely, when b is small, labor distribution across countries is crucial. After some manipulations, equation (A13) leads to:

$$s_n = \frac{(1-\phi).[s.(1+\phi)-\phi] - \gamma.[\phi^2 + s.(1-\phi^2)] - u.s_L.[(1-\phi-\gamma) - b.s_K^*.(1-\gamma).(1-\phi^2)]}{(1-\phi)^2 - \gamma.(1-\phi).[1-s_L^*.(1+\phi).(1-b)] - u.s_L.(1-\phi).(1-\phi-\gamma)} \tag{A14}$$

In the special case where the two countries have the same factor endowments ($s_L = s_K = s = 1/2$), (A14) becomes equation (19) in the main text. In order to reach the second relationship, i.e. equation (20), we need to calculate the sectoral employment. This is achieved easily by combining (A8) and (A9):

$$L_R = \frac{b}{1-b}.(\sigma-1).[L.(1-u)+L^*].\frac{s_n}{1-\gamma+\gamma.s_n}$$

We then compute the unemployment rate as in autarky, using equation (11):

$$u = \left(1 - \frac{L_A}{L}\right).u_R = \left(1 - \frac{L.(1-u) - L_R}{L}\right).f(\nu) = \left[u + \frac{b}{1-b}.(\sigma-1).\left(1 - u + \frac{1-s_L}{s_L}\right).\frac{s_n}{1-\gamma+\gamma.s_n}\right].f(\nu)$$

$$\Rightarrow \quad u.(1-f(\nu)) = \left[\frac{b}{1-b}.(\sigma-1).(1/s_L - u).\frac{s_n}{1-\gamma+\gamma.s_n}\right].f(\nu)$$

$$\Rightarrow \quad \frac{u}{1/s_L - u} = \frac{b}{1-b}.(\sigma-1).\frac{f(\nu)}{1-f(\nu)}.\frac{s_n}{1-\gamma+\gamma.s_n} \qquad \textit{(A15)}$$

which directly leads to equation (20) in the special case $s_L = 1/2$.

When the activity is agglomerated in the foreign country, $s_n = 0$ and given (A15) the unemployment rate is zero due to specialization in sector *A*.[7] Based on the numerator of (A14), this is achieved when: $\left[s.(1-\phi^2) - \phi.(1-\phi)\right] \leq \gamma.\left[\phi^2 + s.(1-\phi^2)\right]$ which defines the break-point, ϕ_B, such that:

$$\gamma = 1 - \frac{\phi_B}{\phi_B{}^2 + s.(1-\phi_B{}^2)}$$

The break-point is represented in Figure A1, for various levels of "the relative size" , s, of the domestic country. For obvious reasons, given the level of domestic bargaining power, the break-point decreases as a function of s. Even when the domestic country is very large ($s \to 1$), the break-point tends to $1-\gamma$: when trade costs are low, the slightest LM protection leads to agglomeration in the foreign country. Therefore, the main results in Propositions 2 and 3 prove very general: they do not depend on any functional form f and extend to the case when countries differ in factor endowments, as long as the non-full-specialization condition is respected.[8]

We now limit ourselves to the symmetric endowment case, $s_L = s_K = s = 1/2$. It follows that, in this case, the break-point is defined as (see Figure A1, $s = 1/2$, for a representation):

$$\gamma = g(\phi_B) \equiv \frac{(1-\phi_B)^2}{1+\phi_B^2} \quad \Leftrightarrow \quad \phi_B = g^{-1}(\gamma) \quad , \quad g' < 0$$

---

[7] It is straightforward to check that capital return in the agglomerated equilibrium is still given by (A10) with $s_n = 0$ and $u = 0$.

[8] When the domestic country is very large and the domestic regulation not too strict, agglomeration is possible in the domestic country. For instance in the standard FCM, when $\gamma = 0$, we infer from (A14) that when $s > 1/(1+\phi)$ then the activity is agglomerated in the domestic country.

When the phi-ness is lower than the break-point, equations (19) and (20) define the two unknowns, s_n and u. More precisely, using the expression of s_n given by (19) in (20) leads to the unemployment rate as the solution of a second-order equation. Neglecting second order unemployment rate terms leads to the following approximation, with $\psi \equiv g(\phi)$:

$$\phi \le \phi_B \quad \Leftrightarrow \quad \gamma \le \psi \quad \Rightarrow \quad u = \frac{u^A(\gamma).(\psi-\gamma)}{\psi\left[1-\gamma-\frac{\gamma}{\psi}.\left(\gamma.\frac{\phi}{1+\phi^2}+b.(1-\gamma)\frac{1-\phi^2}{1+\phi^2}\right)\right]} \approx \frac{(\psi-\gamma)}{\psi.(1-\gamma)}.u^{autarky}(\gamma)$$

which is equation (21). Furthermore this approximation is exact in the two following cases: the unemployment rate is zero either when the LM is totally deregulated ($\gamma = 0$) or when the agglomerated equilibrium is reached ($\phi \ge \phi_B$ and therefore $s_n = 0$). From equation (20),

$$\phi \le \phi_B \quad \Leftrightarrow \quad \gamma \le \psi \quad \Rightarrow \quad s_n = \frac{(1-\gamma).u.(1-u^A)}{u^A.(2-u)-\gamma.u.(1-u^A)} \approx \frac{(1-\gamma).u}{2.u^A-\gamma.u} \approx \frac{\psi-\gamma}{2.\psi-\gamma.\frac{\psi-\gamma}{1-\gamma}} \approx \frac{\psi-\gamma}{2.\psi}$$

which is (22). The share of domestic firms is therefore decreasing with the levels of the bargaining power and of the phi-ness of trade. Also, the unemployment rate decreases as trade costs fall ($\tau \downarrow \Rightarrow \phi \uparrow \Rightarrow \psi \downarrow$). Finally,

$$\frac{\partial u}{\partial \gamma} = \frac{1}{\psi.(1-\gamma)}.\left[(\psi-\gamma)\frac{du^A}{d\gamma} - \frac{1-\psi}{1-\gamma}.u^A\right]$$

When the bargaining power is small, u^A is small, the first term between brackets dominates and the unemployment rate is an increasing function. Conversely, when the bargaining power is close to the break-point, the second term dominates and the unemployment rate decreases.

Appendix 3: Welfare

We proved in Proposition 1 that the autarky optimal level of LM protection was an increasing function of the degree of aversion against inequality:

$$\hat{\gamma}^A = \Gamma(\lambda) \quad , \quad \Gamma' \ge 0$$

Based on (15) or (A1), welfare in autarky is:

$$W_\lambda^A(\hat{\gamma}^A) = \left[G^A.(1-b)\right]^{-1}.(1-u^A).\left[1-\lambda.b.(1-\hat{\gamma}^A)\right]L \qquad \textit{(A16)}$$

Let us assume that the autarky bargaining power is greater than the threshold $\gamma_{\max} = \psi$, i.e. that the government as a parameter λ greater than $\Gamma^{-1}(\psi)$, then according to Proposition 2B, with bargaining power maintained at the autarky level, trade leads to the agglomerated equilibrium in the foreign country. In this case, all workers earn the wage $w = 1$, there is no unemployment and capital earns $\pi = b/(1-b)/\kappa$ abroad. Using (23), welfare is then:

$$W^T_{\lambda \geq \Gamma^{-1}(\psi)}(\hat{\gamma}^A) = W^T_\lambda(\hat{\gamma}^A \geq \psi) = \left[G^T\right]^{-1}.\left[1+(1-\lambda).b/(1-b)\right].L = \left[G^A.(1-b)\right]^{-1}.(2.\phi)^{\alpha/(\sigma-1)}.\left[1-\lambda.b\right].L \qquad \textit{(A17)}$$

Comparing (A16) and (A17), it is clear that the following sufficient condition holds:

$$(2.\phi)^{\alpha/(\sigma-1)} < 1-u^A \quad \Rightarrow \quad W^T_{\lambda \geq \Gamma^{-1}(\psi)}(\gamma = \hat{\gamma}^A) < W^A_\lambda(\gamma = \hat{\gamma}^A)$$

That is, if transport costs are high enough, such that the inequality on the left is respected, maintaining LM protection at its autarky level entails a loss in welfare, for a government that has a high degree of aversion to inequality.

What happens if the government fully deregulates the LM? Factor prices are the same as above, but the price index is more favourable, so that welfare is:

$$W^T_\lambda(\gamma = 0) = \left[G^A.(1-b)\right]^{-1}.(1+\phi)^{\alpha/(\sigma-1)}.\left[1-\lambda.b.\right].L = \left(\frac{1+\phi}{2.\phi}\right)^{\alpha/(\sigma-1)}.W^T_\lambda(\gamma \geq \psi) \quad , \quad \forall \lambda \qquad \textit{(A18)}$$

(which proves Proposition 3 more explicitly). Combining (A16) and (A18),

$$W^T_\lambda(\gamma = 0) < W^A_\lambda(\gamma = \hat{\gamma}^A) \quad \Leftrightarrow \quad (1+\phi)^{\alpha/(\sigma-1)}.(1-\lambda.b) < (1-u^A).(1-\lambda.b.(1-\hat{\gamma}^A))$$

To go further, we use the specific form f detailed in Appendix 1. Based on Proposition 1, if $\delta \leq 1-b$ and $\lambda \geq \lambda_{\max} = \delta/(1-b)$ then the optimal bargaining power equals 1 in autarky. Therefore, based on the autarky unemployment rate given by (17b):

$$\lambda \geq \lambda_{\max} \quad \Rightarrow \quad \left(W^T_\lambda(\gamma = 0) < W^A_\lambda(\gamma = \hat{\gamma}^A) \quad \Leftrightarrow \quad (1+\phi)^{\alpha/(\sigma-1)}.(1-\lambda.b) < 1-u^A = \exp(-b.\delta/(1-b)\right)$$

Moreover, in that case,

$$\exp(-b.\delta/(1-b)) \geq \exp(-b) > 1-b \quad \Rightarrow \quad \exists\, \tilde{\lambda} \in \left]0,1\right[\quad \textit{such that} \quad \exp(-b.\delta/(1-b)) = 1-\tilde{\lambda}.b$$

which entails: $\lambda \geq \lambda_{\max} \quad \Rightarrow \quad \left(W^T_\lambda(\gamma = 0) < W^A_\lambda(\gamma = \hat{\gamma}^A) \quad \Leftrightarrow \quad (1+\phi)^{\alpha/(\sigma-1)} < (1-\tilde{\lambda}.b)/(1-\lambda.b)\right)$

If the government is such that $\lambda > \max(\lambda_{\max}, \tilde{\lambda})$ then the last term on the RHS is greater than 1 and, for low enough phi-ness, total deregulation is detrimental in terms of welfare compared to autarky.

References

Baker, D., A.Glyn, D.R. Howell, J.Schmitt, 2005. Labor Market Institutions and Unemployment: A Critical Assessment of the Cross-Country Evidence, in Fighting Unemployment: The Limits of Free Market Orthodoxy, D.R. Howell, ed., Oxford University Press.

Baldwin, R., R.Forslid, P.Martin, G.Ottaviano, F.Robert-Nicoud, 2003. Economic Geography and Public Policy. Princeton University Press.

Blanchard, O., 2005. European unemployment: the evolution of facts and ideas. NBER WP 11750.

Blanchard, O., Giavazzi F., 2003. Macroeconomic Effects of Regulation and Deregulation in Goods and Labor Markets. Quarterly Journal of Economics CXVIII (3), 879-908.

Borjas, G.J., Ramey V.A., 1995. Foreign Competition, Market Power and Wage Inequality. Quarterly Journal of Economics, November, 1075-1110.

Boulhol, H., 2005. The Convergence of Markups. Cahiers de la MSE, Série blanche TEAM, 05-19.

Brandt, N., J.-M. Burniaux, R.Duval, 2005. Assessing the OECD jobs strategy : past development and reforms. OECD Working Paper 429.

Ebell, M., C.Haefke, 2004. The Missing Link: Product Market Regulation, Collective Bargaining and the European Unemployment Puzzle. Society for Economic Dynamics, Meeting Papers 579.

Freeman, R., 2000. Single Peaked versus Diversified Capitalism: the Relation Between Economic Institutions and Outcome. NBER WP 7556.

Kramarz, F., 2003. Wages and International Trade. CEPR Discussion Paper 3936.

Martin, P., C.A.Rogers, 1995. Industrial location and public infrastructure. Journal of International Economics, 39 (3/4), 335-352.

McDonald, I.M., R.M. Solow, 1985. Wages and Employment in a Segmented Labor Market. Quarterly Journal of Economics 100 (4), 1115-1141.

Nicoletti, G., S.Scarpetta, 2005. Product market reforms and employment in OECD countries. OECD Working Paper 472.

OECD, 2004. Employment Outlook.

Rodrik, D., 1997. Has Globalization gone too far? Institute for International Economics.

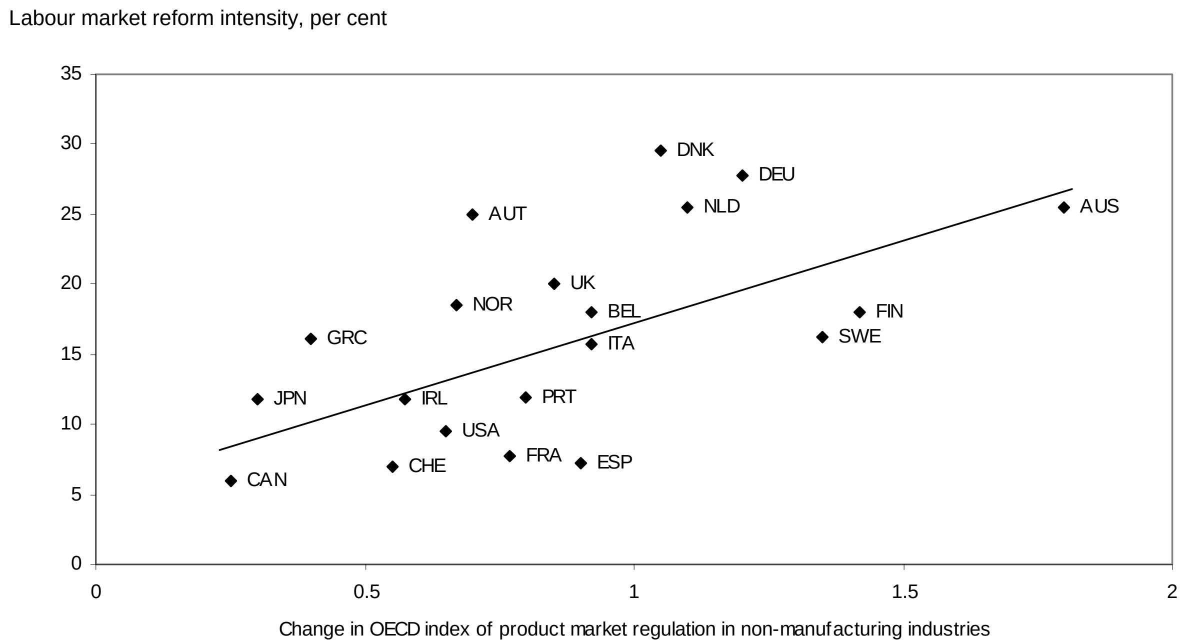
Saint-Paul, G., 2004. Why are European Countries Diverging in their Unemployment Experience? Journal of Economic Perspectives 18(4), 49-68.

Spector, D., 2004. Competition and the capital-labor conflict. European Economic Review 48, 25-38.

Figure 1

Changes in product market regulation over 1993-1998

and intensity of labour market reforms over 2000-2004



Correlation coefficient: 0.51
t-statistics 2.58**

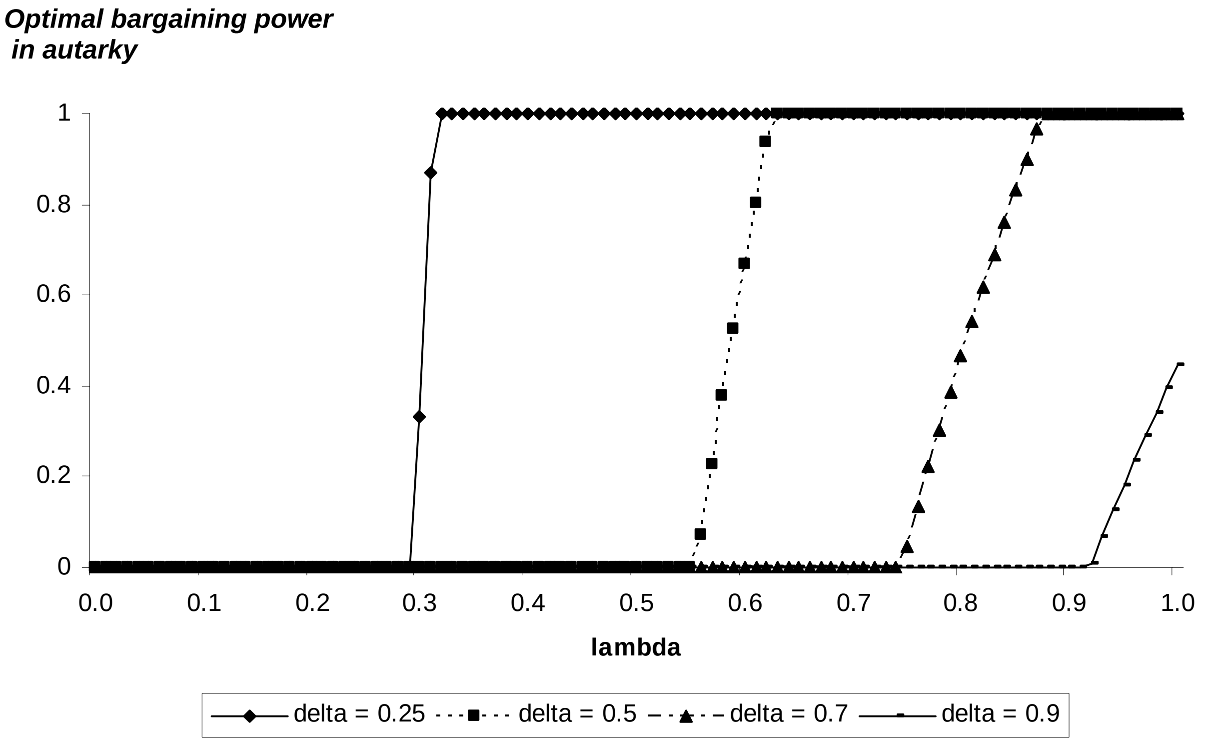
Source: Figure 34 in Brandt et al. (2005)

Figure 2

Autarky: Sensitivity of the Optimal Level

of Labor Market Regulation to Social Preferences

$$\lambda \rightarrow \hat{\gamma}\,(\lambda)$$



$b = 0.2$

λ represents the social preferences of the government. A higher λ means that the government puts less weight on capital income; the welfare function is $W_\lambda = \dfrac{w_A.L_A + w_R.L_R + (1-\lambda).\pi.K}{G}$, $\lambda \in [0\,,1]$.

$\hat{\gamma}\,(\lambda)$ is the optimal level of workers' bargaining power chosen by the government.

Based on Proposition 1, when $\delta < 1 - b = 0.8$, any government with $\lambda \geq \lambda_{\max} = \delta/(1-b)$ chooses to transfer all rents to workers. Reciprocally, any government having a parameter λ, such that $\lambda \leq \lambda_{\min} = \delta/(1 - b + \delta.b)$, deregulates totally.

Figure 3a

Unemployment Rate in the Domestic Country for Various Levels of Trade Costs

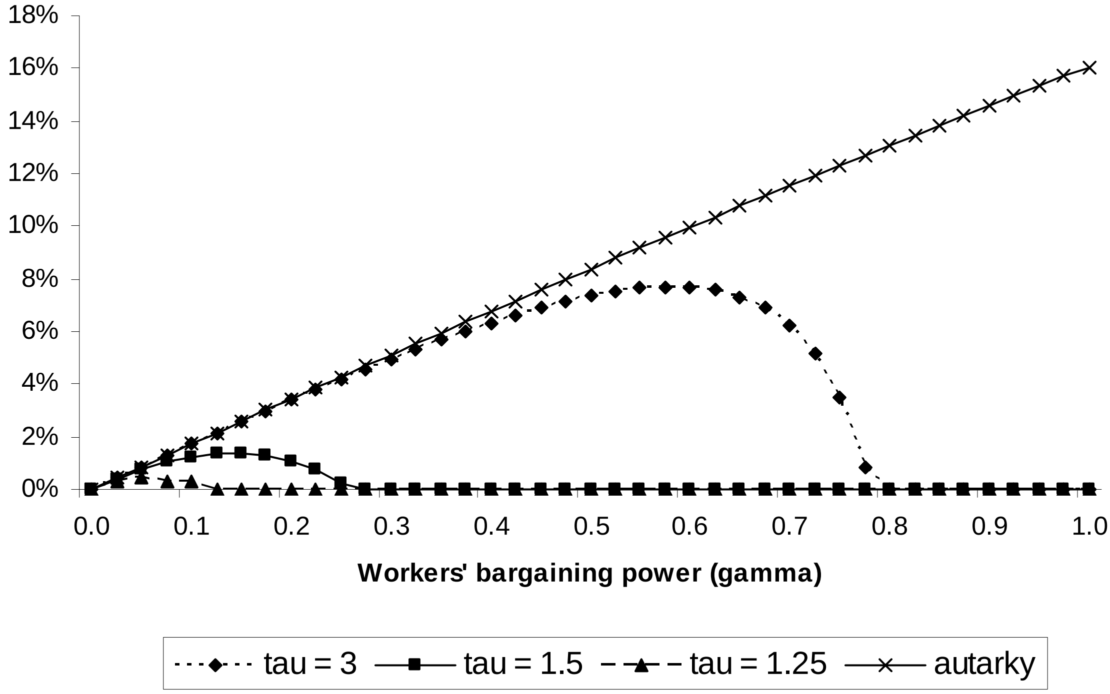


Figure 3b

Share of Domestic Firms in Sector *R* for Various Levels of Trade Costs

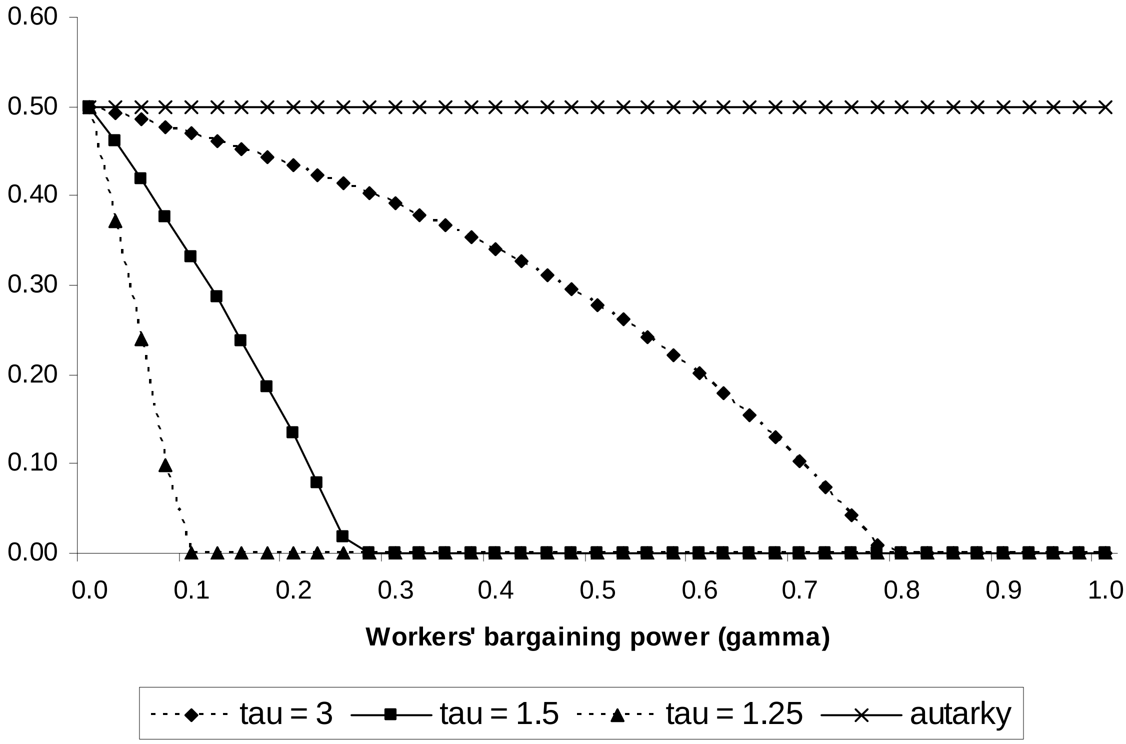


Figure 3c

Capital Return

for Various Levels of Trade Costs

(foreign autarky return = 1)

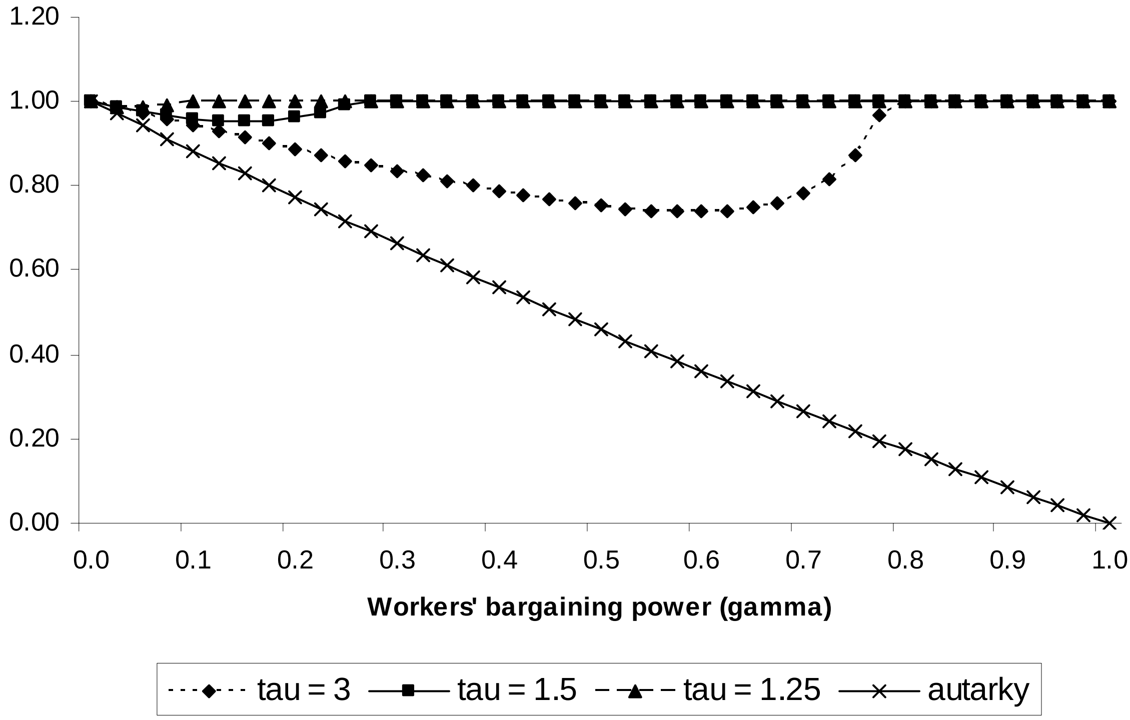


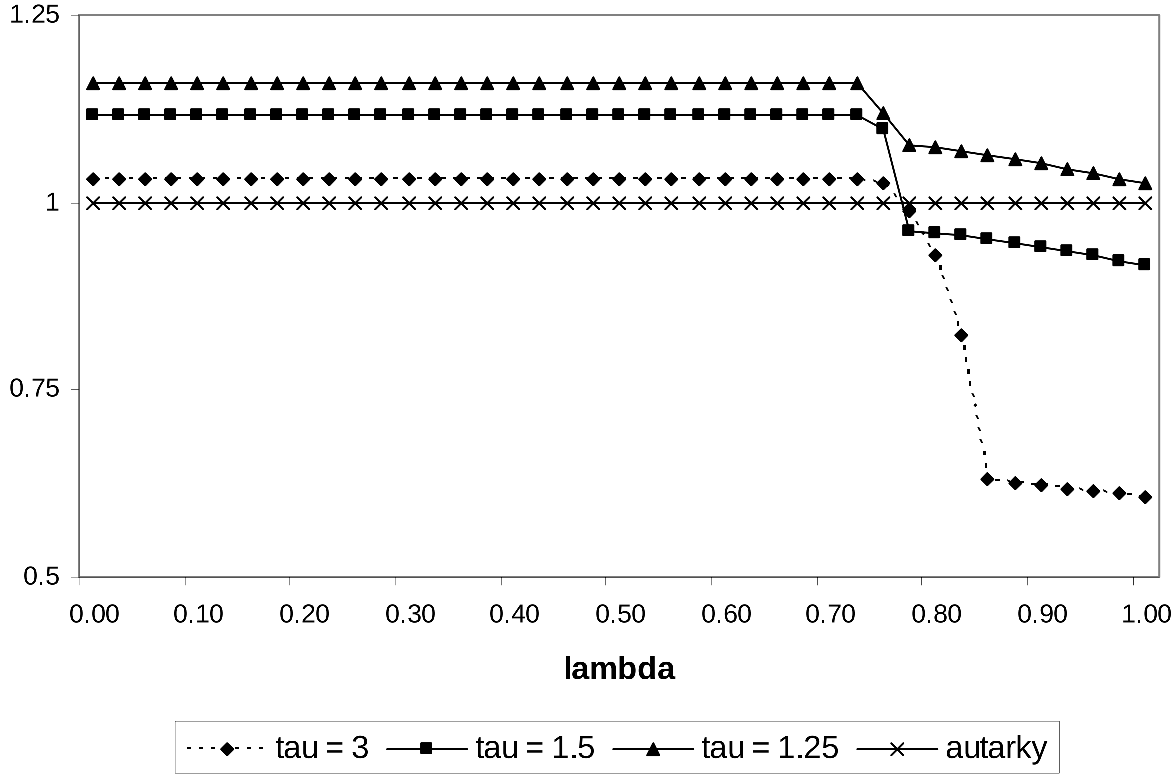
Figure 4

Welfare when the Level of Labor Market Regulation

remains at the Optimal Autarky Level

$$\lambda \to W_\lambda(\hat{\gamma}^{autarky}(\lambda))$$

Normalization is $W_\lambda(\hat{\gamma}^{autarky}(\lambda)) = 1 \quad \forall \lambda$



$b = 0.2 \quad , \quad \delta = 0.7$

λ *represents the social preferences of the government. A higher* λ *means that the government puts less weight on capital income; the welfare function is* $W_\lambda = \dfrac{w_A.L_A + w_R.L_R + (1-\lambda).\pi.K}{G} \quad , \quad \lambda \in [0\,,1]$.

Figure 5a

Welfare at the Optimal Labor Market Regulation Level

$\lambda \rightarrow W_\lambda(\hat{\gamma}(\lambda))$ **(**$W_\lambda(\hat{\gamma}^{autarky}(\lambda)) = 1 \ \forall \lambda$ **) -** $b = 0.2$, $\delta = 0.25$

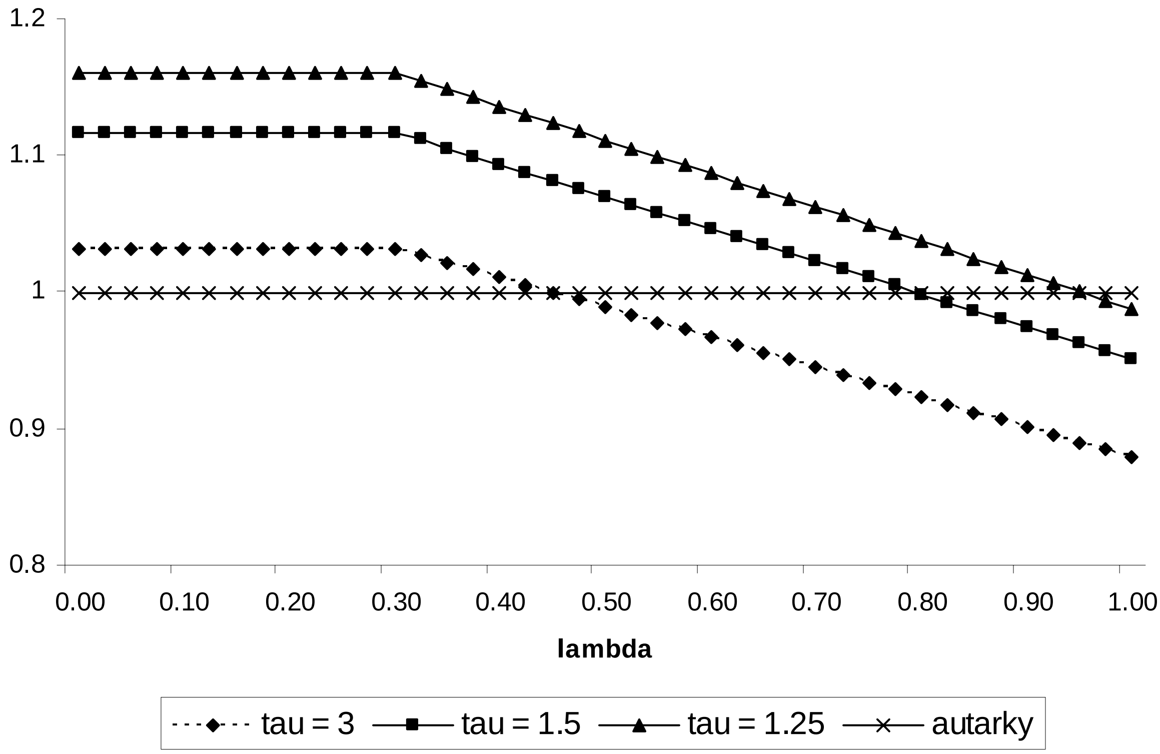


Figure 5b

Welfare at the Optimal Labor Market Regulation Level

$\lambda \rightarrow W_\lambda(\hat{\gamma}(\lambda))$ **(**$W_\lambda(\hat{\gamma}^{autarky}(\lambda)) = 1 \ \forall \lambda$ **) -** $b = 0.2$, $\delta = 0.7$

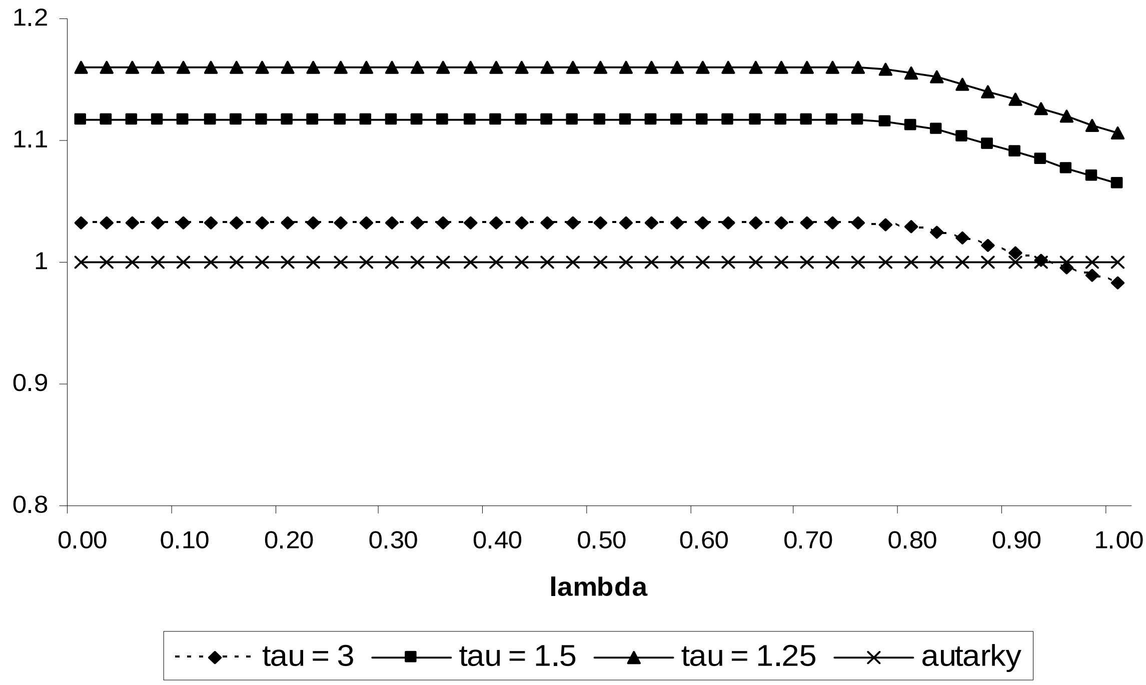


Figure 6

Impact of Domestic Labor Market Regulation

on Foreign Real GNP (Welfare)

$$\gamma^{domestic} \rightarrow W^{*}_{\lambda^{*}=0}$$

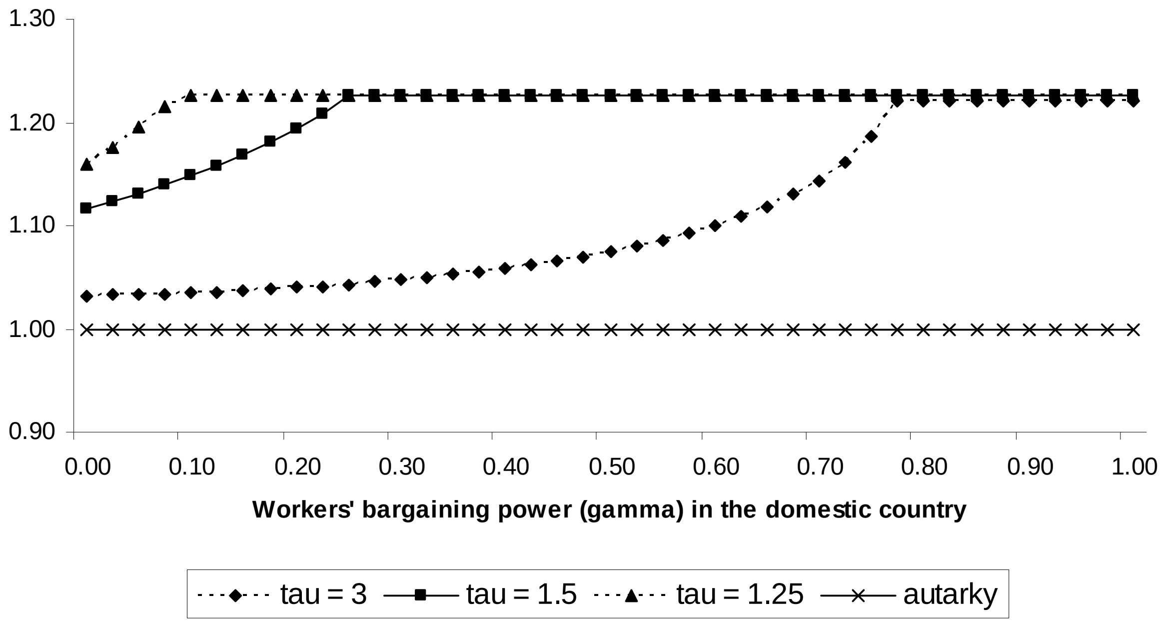
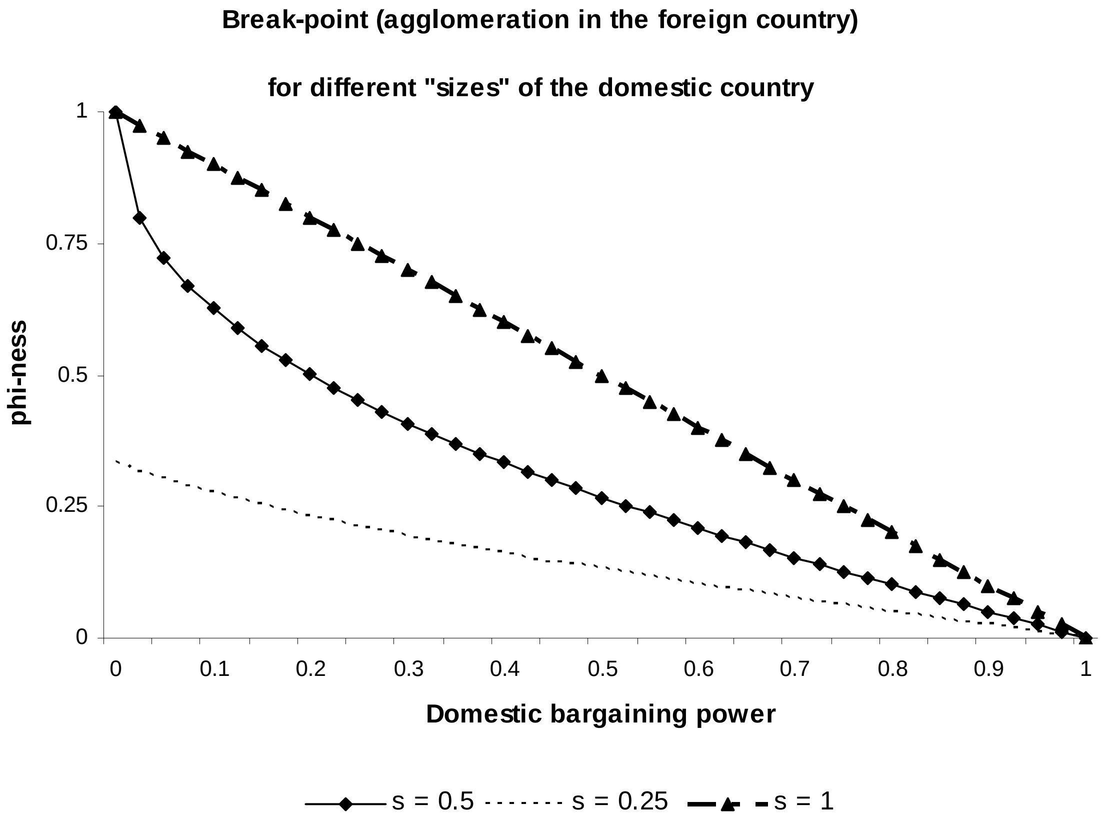


Figure A1



$s = b.s_K + (1-b).s_L$

$s = 1/2$ in the symmetric endowment case