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Employment protection and country's attractiveness: a more ambiguous relationship than is usually assumed

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Abstract

This paper argues that being constrained by a strict employment protection legislation (EPL) is not as terrible for domestic firms as is usually assumed. Indeed, the markets concerned with international trade are oligopolistic. In such markets, a firm located in a country with a strict EPL suffers from a lack of production flexibility. However, because of this, that same firm may become a Stackelberg leader, which may turn out to be beneficial. Strategic interactions, therefore, cause the profitability of firms to become disconnected from their ability to adjust to demand fluctuations. Moreover, although they are unable to adjust their total output, firms located in the country with a strict EPL can allocate their sales across the different markets. This allocation flexibility, therefore, causes the adaptation of firms to demand fluctuations to be disconnected from their level of production flexibility. Unfortunately, allocation flexibility weakens the strategic advantage related to quantity commitment. The analysis of the impact of EPL on the attractiveness of the country then becomes more complex than generally alleged. However, this paper shows that, for a wide range of values of model parameters, a strict EPL does not deter investments.

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1- Introduction

This paper investigates the role played by employment protection legislation in attracting productive investments. The standard point of view is that firms need flexibility in order to better face demand uncertainty. Since employment protection legislation, hereafter EPL, impacts the cost of volume adjustments faced by firms, it restricts the production flexibility they can achieve; weakening the EPL might therefore be thought of as a desirable policy, in particular when multinational firms decide where to locate their production. Only two papers, to our knowledge (Dewit *et al* 2013, Lecostey 2013), discuss this assertion through theoretical models by arguing that multinational firms are oligopolistic and therefore adopt a strategic behaviour. In such a context, flexibility is no longer seen as an advantage if firms compete in quantities. Indeed, it is well known that when quantities are strategic substitutes, quantity commitment gives the firm a strategic advantage (Bulow *et al* 1985, Tirole 1989). This implies that, when choosing where to locate their plant, firms face a trade-off between the production flexibility allowed by setting up in the country with a weak EPL, and the strategic advantage derived from quantity commitment imposed by locating in a country with a strict EPL. Therefore, when two countries differ in EPL intensity, there can occur either a strategic agglomeration in the country with the strictest EPL, or a strategic geographical dispersion, the latter also requiring an anchorage factor (Dewit *et al* 2013) or a dispersion force (Lecostey 2013).[1]

The present paper uses the theoretical framework of Lecostey (2013) but allows firms located in the country with a strict EPL to allocate their production across the different markets once the demands are known. On the one hand, this enables these firms to acquire an informational benefit, but, on the other hand, this weakens the strategic advantage related to production inflexibility. The result in terms of attractiveness of the different countries is *a priori* ambiguous. We show, however, that allocation flexibility favours a strategic location in the country with the strictest EPL.

2- The model

The market is that of a homogeneous good. The option of storage is excluded.
There are two countries (S and W), whose markets are internationally separated, meaning that consumers cannot arbitrate between markets.
In market k, the demand function is $q=a+\varepsilon_k-p$; where q denotes the quantity, p the price, a a strictly positive constant and ε_k a random variable[2] with mean 0 and variance σ_k^2. The correlation coefficient between demands is $\rho \in [-1,1]$.
There are two firms, A and B, which have to choose their location.
Firms operate in their domestic market at a zero marginal cost of production and incur a per unit trade cost t in exporting to their foreign market. As usual, the cost (hereafter neglected) incurred by a firm when setting up a plant is assumed to be large enough to exclude multiplant firms and small enough to ensure the profitability of both firms.

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[1]When analysing the trade-off between commitment and flexibility, Spencer and Brander (1992) pointed out that heterogeneous technological choices needed some degree of exogenous asymmetry.
[2]The demand level is thought of as random in each period, but without exhibiting any intertemporal dependence. Postponing the location decision does not provide any additional information since firms face the same uncertainty irrespective of the date of entry. Due to this assumption of "permanent" uncertainty, we are not here concerned with the desirability of possible relocation upon learning the demand level, nor with determining the optimal date of entering.

Firms compete in quantities. *a, t and* ε_k are assumed to be such that the shutdown of any firm is ruled out.

The countries differ with respect to their employment protection legislation regime. In country *S* - the one with a strict EPL - firms cannot adjust their employment level in response to uncertainty, whereas in country *W* - with a weak EPL - the employment level can be adjusted without any cost. This corresponds to the two extreme cases of technological flexibility *à la* Turnovsky (1973). It is as though a firm located in country *W* produced *ex post – i.e.,* after learning the value of the demand intercept on each market- (**perfect production flexibility**), whereas a firm located in country *S* would produce *ex ante – i.e.,* before learning the value of the demand intercept on each market- (**complete lack of production flexibility**). However, firms located in country *S* are assumed to be able to choose *ex post* the allocation of their production between the two markets (**allocation flexibility**), although unable to adjust their global output volume. Firms are assumed to be risk neutral.

The timing of the game is as follows.
In the first stage, firms choose their location simultaneously.
The second stage is the quantity stage, and involves two sub-stages. In the first sub-stage, firms located in country *S*, if there are any, choose their quantities *ex ante*. At the beginning of the second sub-stage, demands are known, and then firms located in country *W* - if there are any - choose their quantities, whereas firms located in country *S* - if there are any - choose the allocation of their output between the two markets. In each sub-stage, decisions are taken simultaneously.
Firms then receive their profits.
The outcome of the subgame-perfect Nash equilibrium is found by backward induction.

3- Equilibria

Given the links between EPL and technology (*i.e.*, with or without production flexibility), the competitive structure of the quantity stage depends on the locations chosen in the first stage. If the firms are both located in the same country, the outcome is a Cournot equilibrium. However, if the firms are geographically dispersed, the one located in country *S* chooses its total output *ex ante*. In contrast, its rival produces *ex post*. Thus, the former firm becomes a Stackelberg leader and its competitor a Stackelberg follower.

3-1- Second stage equilibria

3-1-1-quantity equilibrium following agglomeration in country *W*

Firms are perfectly flexible. Therefore, they simultaneously choose their quantities *ex post* (*i.e.*, after knowing ε_k) for each market.
The profit of any firm i ($j \neq i$) is:

$$\pi_i = (a + \varepsilon_S - t - q_{Si} - q_{Sj})q_{Si} + (a + \varepsilon_W - q_{Wi} - q_{Wj})q_{Wi}$$

with q_{ki} denoting the sales of firm i in market k, $k=W,S$.
Equilibrium quantities for each firm i are $q_{Wi} = (a + \varepsilon_W)/3$ and $q_{Si} = (a + \varepsilon_S - t)/3$.
The equilibrium expected profit of each firm is

$$C^F = a^2/9 + \sigma_W^2/9 + (a - t)^2/9 + \sigma_S^2/9$$

C^F stands for "Cournot with perfect Flexibility".

3-1-2- quantity equilibrium following agglomeration in country *S*

In the subgame in which both firms are located in country *S*, firm *i (*resp. *j)* chooses *ex ante* a total quantity q_i (resp. q_j) to produce (first sub-stage), and *ex post* the allocation of this production between the two markets (second sub-stage).

3-1-2-1- second sub-stage decisions: ex post decisions

Profit functions of firm *i* and *j* can be written as:

$$\pi_i = (a + \varepsilon_S - q_{Si} - q_{Sj})q_{Si} + \left(a + \varepsilon_W - t - (q_i - q_{Si}) - (q_j - q_{Sj})\right)(q_i - q_{Si})$$

$$\pi_j = (a + \varepsilon_S - q_{Si} - q_{Sj})q_{Sj} + \left(a + \varepsilon_W - t - (q_i - q_{Si}) - (q_j - q_{Sj})\right)(q_j - q_{Sj})$$

with q_{Si} (resp. q_{Sj}) denoting the sales of firm *i* (resp. *j*) in market *S*.
Firms simultaneously decide how much to sell in each market.
The first order conditions (hereafter FOC) for maximising *ex post* profits (given q_i and q_j) are therefore:

$$(a + \varepsilon_S - 2q_{Si} - q_{Sj}) - \left(a + \varepsilon_W - t - 2(q_i - q_{Si}) - (q_j - q_{Sj})\right) = 0 \quad \text{and}$$

$$(a + \varepsilon_S - q_{Si} - 2q_{Sj}) - \left(a + \varepsilon_W - t - (q_i - q_{Si}) - 2(q_j - q_{Sj})\right) = 0$$

This yields the following *ex post* quantities in market *S*:
$q_{Si} = (\varepsilon_S - \varepsilon_W + t + 3q_i)/6$, $\quad q_{Sj} = (\varepsilon_S - \varepsilon_W + t + 3q_j)/6$.
(*Ex post* quantities in market *W* are $q_i - q_{Si}$ and $q_j - q_{Sj}$).

3-1-2-2- first sub-stage decisions: ex ante decisions

Firms anticipate the above quantities and simultaneously choose the quantities, q_i and q_j, that maximise their expected profits.
These optimal quantities are: $q_i = q_j = (2a - t)/3 = 2(a - t/2)/3$, and the equilibrium expected profit of each firm is

$$C^{AF} = (2a^2 - 2at + t^2)/9 + (\sigma_S^2 + \sigma_W^2 - 2\rho\sigma_S\sigma_W)/18$$

C^{AF} stands for "Cournot with Allocation Flexibility".

3-1-3- quantity equilibrium following geographical dispersion

In the case of geographical dispersion, the firm located in country *S* (let us say, firm *A*) chooses *ex ante* a total quantity q_A, and chooses *ex post* to sell a quantity q_{SA} in market *S* and q_{wA} in market *W* (with $q_{SA} + q_{WA} = q_A$), whereas the firm located in market *W* (let us say, firm *B*) chooses *ex post* q_{SB} for market *S* and q_{WB} for market *W*. Therefore, firm *A* becomes a *Stackelberg leader* (it cannot adjust *ex post* its output level), whereas firm *B* becomes a *Stackelberg follower* (it is perfectly flexible).

3-1-3-1- second sub-stage decisions: ex post decisions

Profit functions are the following:

$$\pi_A = (a + \varepsilon_S - q_{SA} - q_{SB})q_{SA} + (a + \varepsilon_W - t - (q_A - q_{SA}) - q_{WB})(q_A - q_{SA})$$

$$\pi_B = (a + \varepsilon_S - t - q_{SA} - q_{SB})q_{SB} + (a + \varepsilon_W - (q_A - q_{SA}) - q_{WB})q_{WB}$$

Firms simultaneously decide how much to sell in each market.
FOC for maximising profits given q_A are:

$$(a + \varepsilon_S - 2q_{SA} - q_{SB}) - (a + \varepsilon_W - t - 2(q_A - q_{SA}) - q_{WB}) = 0$$

$$(a + \varepsilon_S - t - q_{SA} - 2q_{SB}) = 0$$
$$(a + \varepsilon_W - (q_A - q_{SA}) - 2q_{WB}) = 0$$

This yields the following *ex post* quantities: $q_{SA} = (\varepsilon_S - \varepsilon_W + 3t + 3q_A)/6$, $(q_{WA} = q_A - q_{SA})$, $q_{SB} = (6a + 5\varepsilon_S + \varepsilon_W - 9t - 3q_A)/12$ and $q_{WB} = (6a + \varepsilon_S + 5\varepsilon_W + 3t - 3q_A)/12$

3-1-3-2- first sub-stage decisions: ex ante decisions

When choosing *ex ante* q_A, firm *A* anticipates the above quantities.
The quantity that maximises its expected profit is $q_A = (2a - t)/2 = a - t/2$.
This yields the following expected profits in the subgame equilibrium.

- For firm *A* (Stackelberg leader):
$$L^{AF} = (4a^2 - 4at + 9t^2)/16 + (\sigma_S^2 + \sigma_W^2 - 2\rho\sigma_S\sigma_W)/18$$
- For firm *B* (Stackelberg follower):
$$F^{AF} = (4a^2 - 4at + 17t^2)/32 + (13\sigma_S^2 + 13\sigma_W^2 + 10\rho\sigma_S\sigma_W)/72$$

L^{AF} (respectively, F^{AF}) stands for "*Leader* (respectively, *Follower*) with *Allocation Flexibility"*.

3-2- First stage equilibria (location equilibria)

In the first stage, firms choose their location simultaneously. The following matrix gives the expected profits depending on the location (either in country *S* or *W*).

		Firm *B*	
		country *S*	country *W*
Firm *A*	country *S*	C^{AF}, C^{AF}	L^{AF}, F^{AF}
	country *W*	F^{AF}, L^{AF}	C^F, C^F

Denoting $\alpha(t/a) = [28 - 28\,t/a - 121(t/a)^2]/36$ and $\beta(t/a) = [4 - 4t/a + 65(t/a)^2]/8$, we obtain that

1- a dispersion equilibrium (a Stackelberg equilibrium) emerges if and only if $L^{AF} > C^F$ and $F^{AF} > C^{AF}$ *i.e.* if $\alpha(t/a) < (\sigma_S^2 + \sigma_W^2 + 2\rho\sigma_S\sigma_W)/a^2 < \beta(t/a)$,
2- firms agglomerate in country *W*, with the weakest EPL, if and only if $L^{AF} < C^F$ *i.e.* if $(\sigma_S^2 + \sigma_W^2 + 2\rho\sigma_S\sigma_W)/a^2 > \beta(t/a)$,[3]
3- firms agglomerate in country *S*, with the strictest EPL, in other cases.

Figure 1 summarises these results.(Curve *h* is the upper frontier of values of model parameters that yield positive volumes of sales[4].)

[3] If $L^{AF} < C^F$ and $F^{AF} < C^{AF}$, there are two location equilibria, (*S,S*) and (*W,W*), but the latter pareto-dominates the former. It is then assumed that, in this case, both firms locate their plant in country *W*. Note that if firms had chosen their location sequentially, (*W,W*) would be the unique equilibrium in this case.
[4] Model parameters are expected to ensure that sales volumes are positive on each market. The strongest constraints hold for the sales of the Stackelberg follower. They are $q_{SB} = (6a + 10\varepsilon_S + 2\varepsilon_W - 15t)/24 \geq 0$ and $q_{WB} = (6a + 2\varepsilon_S + 10\varepsilon_W + 9t)/24 \geq 0$. The lower bounds of ε_S and ε_W are such that q_{SB} =0 and q_{WB} =0

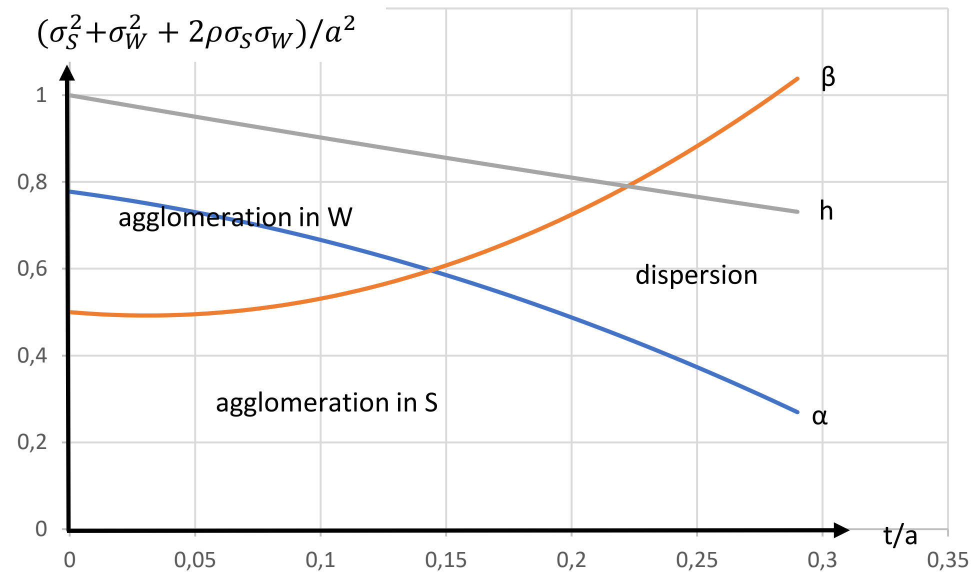

Figure 1. location equilibria

4- Discussion

The standard point of view predicts that firms should agglomerate in country *W* (with the weakest EPL) under demand uncertainty. Thus, the other location equilibria obtained in this paper necessarily result from the strategic behaviour of firms. The question we now explore is: what is the role played by allocation flexibility? We compare this model with Lecostey (2013), in which allocation flexibility is not allowed. In Lecostey (2013), agglomeration in country *S* yielded expected profit $C^{NF} = [a^2 + (a-t)^2]/9$ for each firm, and geographical dispersion resulted in expected profit $L = [(a+t)^2 + (a-2t)^2]/8$ for the firm in country *S* and expected profit $F = [(a+2t)^2 + (a-3t)^2]/16 + (\sigma_S^2 + \sigma_W^2)/4$ for the firm in country *W*. It is clear that the incentive of the Stackelberg follower to deviate and to locate in country *S* is unambiguously greater in the model that allows for allocation flexibility (C^{AF}-F^{AF}>C^{NF}-F). This indicates that an agglomeration in country *S* is more likely to emerge when flexibility allocation is allowed. The incentive of the Stackelberg leader to deviate and to locate in country *W* is smaller in the current model than it is in Lecostey (2013) if $(C^F\text{-}L^{AF})\text{-}(C^F\text{-}L)<0$ *i.e.* if $L - L^{AF} = t^2/16 - (\sigma_S^2 + \sigma_W^2 - 2\rho\sigma_S\ \sigma_W)/18 < 0$. The first term $t^2/16$ corresponds to the weakening of the strategic advantage of output commitment that is due to adjustment possibilities offered by allocation flexibility. The term in brackets, which is the informational benefit related to allocation flexibility, is non negative: its smallest value $(\sigma_W - \sigma_S)^2$ is obtained for $\rho=1$. All this implies that the smaller t and/or ρ, the smaller the likelihood of an agglomeration emerging in country *W*.

simultaneously equal zero. Thus, $\varepsilon_S \geq -(a-3{,}5t)/2$ and $\varepsilon_W \geq -(a+2{,}5t)/2$. We therefore assume that $t<a/3{,}5$. Moreover, assuming a symmetric distribution of random demand intercepts yields $\sigma_S^2 \leq (a-3{,}5t)^2/4$ and $\sigma_W^2 \leq (a+2{,}5t)^2/4$. As $\rho \leq 1$, this implies that $\sigma_S^2 + \sigma_W^2 + 2\rho\sigma_S\sigma_W \leq (a-t/2)^2$.

5- Conclusion

The usual recommendations for relaxing the employment protection policy are based on the idea that a strict EPL reduces the production flexibility of firms, which is detrimental to them. Therefore, a strict EPL would deter companies from setting up in a given country.
This paper introduces two elements which should enrich the thinking.
First of all, firms can decide how to allocate their production between markets according to the demand levels. This causes the adaptation of firms to demand uncertainty to be disconnected from their level of production flexibility.
Secondly, the markets concerned with international trade are oligopolistic. In such markets, a firm located in a country with a weak EPL may become a Stackelberg follower, which may be disadvantageous. Strategic interactions therefore cause the profitability of firms to be disconnected from their production flexibility.
Unfortunately, allocation flexibility weakens the strategic advantage of the Stackelberg leader (the firm in the country with a strict EPL).
Figure 2 depicts how strategic interactions and allocation flexibility affect the chain of causal relationships between EPL and firms' profitability.

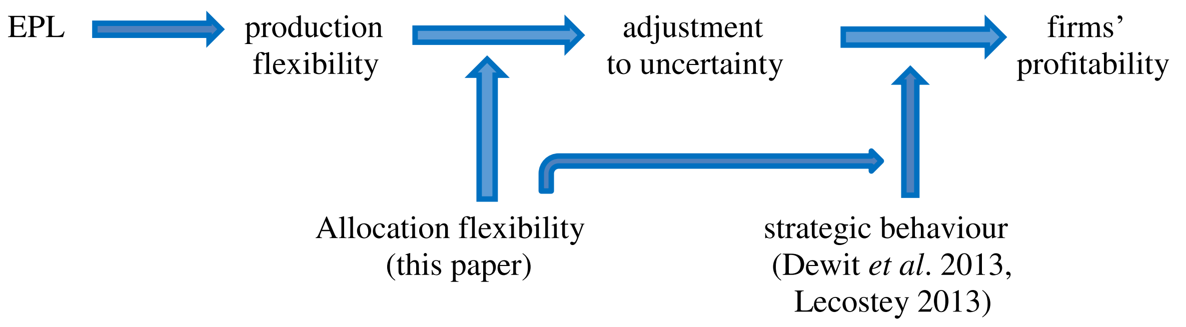

Figure 2. chain of causal relationships between EPL and firms' profitability

The simultaneous consideration of allocation flexibility and oligopolistic behaviour thus complicates the analysis of the effect of EPL on the attractiveness of the country.
However, this paper shows that firms are not deterred from locating in countries with the strictest EPL, contrary to what is usually expected.
These conclusions help to explain the contradictory results obtained by evidence pertaining to the links between EPL and FDI, as mentioned for example by Dewit *et al* (2009) and Polat (2017).
These preliminary results also suggest that relaxing EPL in the country where it is the strictest could have unexpected, even paradoxical, effects on firms' relocation decisions.
This will be investigated in further research.

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