# Composition of Firms versus Composition of Jobs: The Impact of Labor Market and Product Market Deregulations

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**Abstract**

The aim of this paper is to explore the qualitative aspects of the interaction between product and market regulations. For this purpose, we present a labor market matching model with two industries and two types of jobs, temporary and permanent, in which either composition of firms and composition of jobs is endogenously determined. Our main result is that the effects of labor market deregulations will depend on the type of equilibrium that arises in the economy. Therefore, the same labor market policy can yield opposite outcomes when applied to different countries.

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# 1 Introduction

European countries are characterized by high regulated labor and product markets despite several deregulations that have taken place over the recent years. Initially, research studied the impact of labor and product market regulations on macroeconomic aggregates such as turnover and employment separately. In this sense, evidence on the impact of labor market regulations is not clear. Bertola and Rogerson (1997) and Boeri (1999) found similar job creation and job destruction rates across countries with different regulations. In the same way, there are no clear effects on unemployment, whereas some works as Boeri et al (2000), Nickell (1997) and Heckman and Pagès (2000) find a negative effect of labor market regulations on the employment rate, others such as OECD (1999) argue that this effect differ across different categories of workers.

On the other hand, there are some studies that have studied whether product market deregulations may have positive effects on employment. Boeri et al (2000) and Nicoletti et al (2001) find that various measures of product market regulation are negatively related to employment for some OECD countries. Messina (2005) finds a negative correlation between a measure of entry costs and the employment rate. Pissarides (2001) finds a negative effect of start-up costs on employment rates across a subset of OECD countries.

However, recent literature has turned their attention to interactions between labor and product market regulations to explain the evolution of macroeconomic aggregates. This literature looks for interactions among policies in labor and product markets. Krueger and Pischke (1997) and Kugler and Pica (2003) argue that more regulated product markets reduce the effectiveness of labor market reforms in generating new jobs.

The aim of this paper is to explore the qualitative aspects of the interaction between product and market regulations. More particularly, we want to answer two simple questions. First, whether deregulations of product markets affect the nature of jobs offered to workers. Secondly, whether deregulations of labor markets affect the nature of firms created in the economy.

For this purpose, we present a labor market matching model with two industries and two types of jobs (temporary and permanent). Each industry presents a different degree of regulation and faces its own demand. Furthermore, the number of firms in each industry is endogenously determined. On the other hand, firms hire workers in temporary jobs and, then, they have to decide whether they keep them in a permanent job or they fire them. Therefore, we present a model in which either composition of firms and composition of jobs is endogenously determined.

We obtain a full range of conversion rates into permanent jobs. More specifically, there are three possible equilibria which imply different conversion rates. The first one is the *no conversion equilibrium* in which neither industry converts temporary jobs into permanent. The second one is the *full conversion equilibrium* in which both industries convert temporary jobs into permanent. Finally, the *mixed conversion equilibrium* in which only one industry converts temporary jobs into permanent.

First, we examine the impact of deregulating the labor market by reducing firing costs and unemployment benefits on either industry and job composition. We find that the effects on industry composition rely on the type of equilibrium (no conversion, mixed conversion, full conversion) that arises in the economy. As a consequence, the same labor market policy can yield opposite outcomes when applied to different countries. On the other hand, it increases the conversion of temporary jobs into permanent and, therefore, it incentives the use of permanent jobs, as it should be expected.

Secondly, we study the impact of deregulating the products market by reducing the entry costs of an industry on either industry and job composition. We find that reducing entry costs in an industry increases the size of this industry and reduces the size of the other. On the other hand, the impact on the composition of jobs is ambiguous.

The paper is organized as follows. In Section 2 we introduce the basic model. In section 3 we present the different equilibria. In Section 4, some comparative statics are presented. Finally, Section 5 concludes.

# 2 The model

Assume an economy with a continuum of workers of size one. We assume that there are two industries $A$ and $B$. The number of firms in each industry is endogenously determined. Each firm faces a cost of entry equal to $c_i$, where $i \in \{A, B\}$ and $c_A > c_B$.

We assume that when a new firm is created, a temporary job is offered with productivity $y = 1$, regardless of the type of firm. With instantaneous probability $\lambda$ the firm has to decide to lay off the worker (and, hence, hire a new worker in a temporary job) or keep him in a permanent job. This assumption captures the idea that at a given time a proportion $\lambda$ of firms face the decision of converting the temporary job into permanent or to fire the worker and to hire a new one in a temporary job[1]. In the latter case, the permanent job can be destroyed with exogenous probability $\phi$. In which case there exist firing costs, $f$, which are pure waste.

$B$ and $A$ firms sell their final goods in competitive markets, and their prices are given by the following inverse linear demands:

$$P_A = 1 - b_A X_A \quad (1)$$
$$P_B = 1 - b_B X_B \quad (2)$$

where $0 < b_A < 1$ and $0 < b_B < 1$. The output of $A$-industry and $B$-industry is, respectively, $X_A$ and $X_B$.

Unemployed workers and vacancies are assumed to meet each other randomly according to a conventional function $m(u, v)$ with constant returns to scale, where $v$ and $u$ denote, respectively, the masses of job vacancies and of unemployed workers. We denote the arrival rate for workers as $h(\theta)$, where $\theta = \frac{v}{u}$, $h'(\theta) > 0$ and $\lim_{\theta \to 0} h(\theta) = 0$. Let $\varphi$ be the proportion of $A$-vacancies. We suppose that $A$-firms and $B$-firms meet workers at the same rate. Therefore, the arrival rate for workers of $A$-vacancies is $\varphi h(\theta)$ and the arrival rate of $B$-vacancies is $(1 - \varphi) h(\theta)$. Similarly, vacancies meet unemployed workers at the rate $l(\theta)$, where $l'(\theta) < 0$ and $\lim_{\theta \to 0} h(\theta) = \infty$.

When a matched is formed, the firm and worker divide the surplus of the match according to the asymmetric Nash bargaining solution. The worker's share of the surplus is exogenous and denoted by $\beta \in (0, 1)$.

In deriving the asset value equations we use the following notation. Let $U$ be the value of an unemployed worker and $V_i$ the value of a vacancy of type $i \in \{A, B\}$. $J_{ij}$ the value of a type of contract $j \in \{T, P\}$ in a firm of type $i$. Similarly, let $W_{ij}$ denote the value of employment for a worker in a contract of type $j$ in a firm of type $i$. The surplus of a match between a worker and a firm of type $i$ with contract of type $j$, is given by:

$$S_{iT} = W_{iT} + J_{iT} - U - V_i \quad (3)$$
$$S_{iP} = W_{iP} + J_{iP} - U - V_i + f \quad (4)$$

[1] It's an stylised fact of many european labor markets that upon expiry of a given legal limit a temporary employee must be promoted to a permanent job or dismissed.

Hence, the wage $w_{ij}$ is given by the Nash Bargaining solution of

$$\beta\left(J_{iT}-V_i\right) = (1-\beta)\left(W_{iT}-U\right) \quad (5)$$

$$\beta\left(J_{iP}-V_i+f\right) = (1-\beta)\left(W_{iP}-U\right) \quad (6)$$

Finally, we assume that the common discount rate of workers and firms is $r$. Moreover, the unemployed workers earn a flow income $z < y$. We now develop expressions for the asset value equations.

First, the value to a firm of type $i$ of employment of a worker on a temporary contract is given by:

$$rJ_{iT} = P_i - w_{iT} + \lambda\left[\max\left\{V_i, J_{iP}\right\} - J_{iT}\right] \quad (7)$$

and for a permanent contract:

$$rJ_{iP} = P_i - w_{iP} + \phi\left(V_i - J_{iP} - f\right) \quad (8)$$

Next, the value to a worker of employment on a firm of type $i$ in a temporary contract is:

$$rW_{iT} = w_{iT} + \lambda\left[\max\left(U, W_{iP}\right) - W_{iT}\right] \quad (9)$$

and for a permanent contract:

$$rW_{iP} = w_{iP} + \phi\left(U - W_{iP}\right) \quad (10)$$

The value of unemployment for a worker is:

$$rU = z + \varphi h(\theta)\left(W_{GT} - U\right) + (1-\varphi)\, h(\theta)\left(W_{BT} - U\right) \quad (11)$$

The value of a vacancy in a firm of type $i$ is given by:

$$rV_i = -k + l(\theta)\left(J_{iT} - V\right) \quad (12)$$

# 3 Equilibrium

A steady-state equilibrium in this model is a collection of three variables $\{\theta, u, \varphi\}$ that satisfy the following conditions:

(i) Creation of $A$-type firm vacancies and $B$-type firm vacancies satisfy free entry condition.

(ii) The flow of workers into and out of unemployment is equal.

We will focus on two important points. The first one is the composition of firms in equilibrium, that is, which is the proportion of $A$-type and $B$-type firms arising in this economy. The second one is which type of jobs are used (temporary versus permanent). Finally, we study the relationship between the composition of firms and jobs.

## 3.1 Preliminary Analysis

In steady state, both types of vacancies meet workers at the same rate, and in equilibrium workers accept both types of jobs. This implies that:

$$X_A = (1-u)\,\varphi \tag{13}$$
$$X_B = (1-u)\,(1-\varphi) \tag{14}$$

Then,

$$P_A = 1 - b_A\,(1-u)\,\varphi \tag{15}$$
$$P_B = 1 - b_B\,(1-u)\,(1-\varphi) \tag{16}$$

As a previous step, we obtain the surplus of the different job-worker matchings. From (3), (4), (7), (8), (9), (10), (11) and (12), the surplus of a job in a permanent and temporary contract in a firm of type $i \in \{A, B\}$ is given, respectively, by:

$$S_{AP} = \frac{P_A - z + r(f - c_A) - \beta h(\theta)[\varphi S_{AT} + (1-\varphi) S_{BT}]}{r + \phi} \quad (17)$$

$$S_{BP} = \frac{P_B - z + r(f - c_B) - \beta h(\theta)[\varphi S_{AT} + (1-\varphi) S_{BT}]}{r + \phi} \quad (18)$$

$$S_{AT} = \frac{P_A - z - rc_A + \lambda[\max\{f, S_{AP}\}] - \beta h(\theta)(1-\varphi) S_{BT}}{r + \lambda + \varphi \beta h(\theta)} \quad (19)$$

$$S_{BT} = \frac{P_B - z - rc_B + \lambda[\max\{f, S_{BP}\}] - \beta h(\theta) \varphi S_{AT}}{r + \lambda + (1-\varphi) \beta h(\theta)} \quad (20)$$

The surplus of a permanent job (17) in a $A$-firm is equal to the discounted flows obtained in the matching net of the worker's discounted value of continued search. This latter value is the surplus of a temporary job in each type of firm weighted by the number of $A$-firms and $B$-firms, respectively. In the same way, the surplus of a permanent job (18) in a $B$-firm is equal to the discounted flows obtained in the matching net of the worker's discounted value of continued search. This latter value is the surplus of a temporary job in each type of firm weighted by the number of $A$-firms and $B$-firms, respectively. Therefore, the surplus of a permanent job decreases with the value of a temporary job in each type of firm.

On the other hand, the surplus of a temporary job (19) in a $A$-firm is equal to the discounted flows obtained in the matching. These flows have two components. The first one are the flows obtained inside the temporary relationship. The second one is the maximum value between the firing costs and the surplus of a permanent job in a $A$-firm. The latter component can be interpreted as a consequence of the decision of the firm whether to convert the temporary job into permanent or not. The same applies to the surplus of a temporary job (20) in a $B$-firm.

From (19) and (20), it follows a crucial condition which determines the conversion of temporary jobs into permanent. It is stated in the following Corollary.

**Corollary 1** *A match between a firm of type $i \in \{B, A\}$ and a worker is only profitable under a permanent contract when:*

$$S_{iP} > f$$

Corollary 1 states an $i$-firm decides to keep a worker in a permanent job only if the surplus generated under a permanent job is greater or equal to the firing costs. The intuition behind this result is simple: conversion of a temporary job into permanent cannot be profitable if the firing costs the employer has to pay once the worker has been hired under a permanent contract exceeds the value of this conversion, $S_{iP}$. Otherwise, the firm is better off laying off the worker.

The condition of conversion stated in Corollary 1 can be rearranged to express it in the following way

**Lemma 1** *A temporary job in an $i$-type firm will be converted into permanent if:*

$$P_i - rc_i > z + \phi f \left(1 + \frac{\beta h(\theta)}{r+\lambda}\right) \tag{21}$$

*where $i \in \{A, B\}$.*

**Proof.** It follows from using Corollary 1 and solving simultaneously (17), (18), (19) and (20). ■

The next step is to investigate the composition of firms in this economy. Our first result is that it is not possible an equilibrium in which only $A$-type firms are created, that is, $\varphi < 1$. The intuition is quite simple, $A$-type firms buy more expensive equipment and they need to recover these costs with higher profits. As $\varphi$ tends to 1, the price they receive from selling their goods, $P_A$, is so low that $P_A - rc_A < P_B - rc_B$.

**Lemma 2** *In any equilibrium, the proportion of $A$-type firms is never greater than:*

$$\varphi < \frac{b_B}{b_B + b_A} - \frac{rc_A - rc_B}{(1-u)(b_B + b_A)} < 1 \tag{22}$$

**Proof.** Using (1), (2), (13) and (14), $(P_A - rc_A)$ and $(P_B - rc_B)$ are decreasing and increasing in $\varphi$, respectively. It is easy to check that when $\varphi$ is greater than (22), $P_A - rc_A < P_B - rc_B$ and, thus, the creation of $A$-type firms is no longer profitable. Moreover, we can check that (22) is always lower than 1. ■

From Lemma 2, net flow profits for $A$ and $B$-type firms are bounded in the following way:

$$\frac{b_B(1-rc_A)+b_A(1-rc_B)-b_Bb_A(1-u)}{b_B+b_A} < P_A - rc_A < 1 - rc_A \tag{23}$$

$$1 - b_B\left(1-u\right) - rc_B < P_B - rc_B < \frac{b_B(1-rc_A)+b_A(1-rc_B)-b_Bb_A(1-u)}{b_B+b_A} \tag{24}$$

A coordination externality arises in this framework. The greater the proportion of $B$-type firms, the greater the hand side part of expression (21) for $A$-type firms. This means that $A$-type firms have more incentives to transform the temporary job into permanent. The same argument applies to $B$-type firms when the proportion of $A$-type firms increases.

From (23) and (24), in any equilibrium $P_A - rc_A \geq P_B - rc_B$. Using Lemma 1, this implies that regarding the type of jobs created in this economy, three cases may arise. The first one is the *no conversion equilibrium* in which it is not worthwhile for both types of firms to convert temporary jobs into permanent. In this case, permanent jobs do not arise in equilibrium. The second one is the *full conversion equilibrium* in which it is beneficial for both types of firms to convert temporary jobs into permanent. In this case, temporary contracts are a way to access to permanent contracts for workers no matter the type of firm they are matched to. Finally, the *mixed conversion equilibrium* in which only $A$-type firms convert temporary jobs into permanent. Notice that a mixed conversion equilibrium in which only $B$-type firms convert temporary jobs into permanent cannot exist since it is never the case that $P_B - rc_B > P_A - rc_A$.

Before we analyse the different equilibria, a preliminary result is the following: when firms have the same entry costs ($c_A = c_B$) the composition of firms in the economy will only depend on the demand functions.

$$\varphi^* = \frac{b_B}{b_B + b_A}$$

## 3.2 No conversion equilibrium

In this equilibrium, both type of firms do not convert temporary jobs into permanent, that is, they are better off replacing workers in temporary jobs. From Lemma 1, this requires that:

$$P_A - rc_A < z + \phi f \left(1 + \frac{\beta h(\theta)}{r + \lambda}\right) \quad (25)$$

$$P_B - rc_B < z + \phi f \left(1 + \frac{\beta h(\theta)}{r + \lambda}\right) \quad (26)$$

Our first step is to find the steady state conditions to solve for the endogenous variables $\{\theta, u, \varphi\}$. The first steady state condition is that the flow of workers out of unemployment equals the flow of workers into unemployment.

$$h(\theta)\, u = (1 - u)\, \lambda \quad (27)$$

The corresponding measure of flow into unemployment is $\lambda$ times the measure of employed workers since in a no conversion equilibrium firms do not convert a temporary job into permanent.

Equation (27) can be used to solve for $u$ as a function of $\theta$:

$$u = \frac{\lambda}{\lambda + h(\theta)} \quad (28)$$

Equilibrium also requires a zero-profit condition for $A$-firms and $B$-firms, implying that it is not possible to create either an additional $A$-firm or $B$-firm and make expected net profits. This implies that $V_A = c_A$ and $V_B = c_B$. Using equations (7), (12) and the assumption that it is not worthwhile for firms to convert temporary jobs into permanent, we obtain:

$$-(k + rc_A)(r + \lambda) + l(\theta)(1 - \beta)[P_A - rc_A - rU] = 0 \quad (29)$$

$$-(k + rc_B)(r + \lambda) + l(\theta)(1 - \beta)[P_B - rc_B - rU] = 0 \quad (30)$$

Firms of each type will be created until the net flow profits are equal to the sum of the equipment costs ($c_i$) and the costs of keeping the job vacant ($k$).

Finally, using (9) and (11), the value of unemployment is given by:

$$rU = D(\theta, \varphi) = \frac{(r+\lambda)z+\beta h(\theta)[\varphi(P_A - rc_A)+(1-\varphi)(P_B - rc_B)]}{r+\lambda+\beta h(\theta)} \tag{31}$$

Equation (31) shows that the flow value of unemployment equal weighted averages of the flow value of leisure and their respective flow values of employment. Note that $rU$ is increasing in $\theta$. Taking the composition of firms constant, workers are better off as the ratio of vacancies to unemployment increases. On the other hand, the effects of a change in the composition of firms on the value of unemployment depend on the flow net profits of each type of firm. If $(P_A - rc_A)$ is sufficiently greater than $(P_B - rc_B)$ an increase in the proportion of $A$-firms, $\varphi$, improves the position of workers. Otherwise, they are worse off.

We can use the zero-profit conditions to find the equilibrium. It is more convenient to work with the equivalent condition in which (29) is equal to (30), which holds when:

$$P_A - P_B = (rc_A - rc_B)\left(\frac{r+\lambda+l(\theta)(1-\beta)}{l(\theta)(1-\beta)}\right) \tag{32}$$

Using (15), (16) and (28) gives:

$$\varphi^* = \frac{b_B}{b_A+b_B} - \left(\frac{rc_A - rc_B}{b_A+b_B}\right)\left(\frac{[r+\lambda+l(\theta)(1-\beta)](\lambda+h(\theta))}{l(\theta)(1-\beta)h(\theta)}\right) \tag{33}$$

which has a unique solution for $\varphi$. If we insert (33) in either (29) or (30) we find a solution for $\theta$. It can be shown that this solution is unique in the sense that only one of the roots is admissible.

We need to take into account the possibility of a corner solution[2] in which only $B$-vacancies are offered, that is, $\varphi = 0$. In this case, the value of opening a $A$-vacancy is negative and (30) is the relevant condition. The condition on the parameters that ensures this is:

$$b_B < (rc_A - rc_B)\left(\frac{[r+\lambda+l(\theta^*)(1-\beta)](\lambda+h(\theta^*))}{l(\theta^*)(1-\beta)h(\theta^*)}\right)$$

where $\theta^*$is the value of $\theta$ that solves conditions (28) and (30).

[2] A corner solution in which only $A$-vacancies are offered is not possible, by Lemma 2.

Finally, we have to address two issues. First, we have to check that workers accept a job with either an $A$-firm and $B$-firm, which occurs when $P_A - rc_A > rU$ and $P_B - rc_B > rU$. Secondly, the non conversion equilibrium we have derived is conditional on the parameters of the model being such that it is not worthwhile for $A$-firms and $B$-firms to convert temporary jobs into permanent. That is, we need to check that (25) and (26) hold.

### 3.3 Full Conversion Equilibrium

In this equilibrium, both type of firms convert temporary jobs into permanent. From Lemma 1, this requires that:

$$P_A - rc_A > z + \phi f \left(1 + \frac{\beta h(\theta)}{r + \lambda}\right) \tag{34}$$

$$P_B - rc_B > z + \phi f \left(1 + \frac{\beta h(\theta)}{r + \lambda}\right) \tag{35}$$

To solve for the equilibrium, our first step is to use the steady-state conditions to derive the relationships between the endogenous variables. The first steady-state condition is now:

$$h(\theta)\, u = (1 - u)\, \lambda\phi \tag{36}$$

Notice that the corresponding measure of flow into unemployment is $\lambda$ and $\phi$ times the measure of employed workers, reflecting the fact that in a full conversion equilibrium both types of firms convert a temporary job into permanent.

Equation (36) can be used to solve for $u$ as a function of $\theta$:

$$u = \frac{\lambda\phi}{\lambda\phi + h(\theta)} \tag{37}$$

The zero-profit equations in this case become:

$$-(k + rc_A)(r + \lambda) + l(\theta)(1 - \beta)\left[\left(1 + \tfrac{\lambda}{r+\phi}\right)(P_A - rc_A - rU) - \tfrac{\lambda}{r+\phi}\phi f\right] = 0$$

$$(38)$$

$$-\left(k+rc_B\right)\left(r+\lambda\right)+l\left(\theta\right)\left(1-\beta\right)\left[\left(1+\tfrac{\lambda}{r+\phi}\right)\left(P_B-rc_B-rU\right)-\tfrac{\lambda}{r+\phi}\phi f\right]=0 \quad (39)$$

Using (9) and (11), the value of unemployment becomes:

$$rU=D\left(\theta,\varphi\right)=\frac{(r+\lambda)z+\beta h(\theta)\left[\left(1+\frac{\lambda}{r+\phi}\right)(\varphi(P_A-rc_A)+(1-\varphi)(P_B-rc_B))-\frac{\lambda}{r+\phi}\phi f\right]}{r+\lambda+\beta h(\theta)\left(1+\frac{\lambda}{r+\phi}\right)}$$

To find the equilibrium, we work with the equivalent condition in which (38) is equal to (39), which holds when:

$$P_A-P_B=\left(rc_A-rc_B\right)\left(\frac{r+\lambda+l(\theta)(1-\beta)\left(1+\frac{\lambda}{r+\phi}\right)}{l(\theta)(1-\beta)\left(1+\frac{\lambda}{r+\phi}\right)}\right) \quad (40)$$

Using (15), (16) and (28) gives:

$$\varphi^*=\frac{b_B}{b_A+b_B}-\left(\frac{rc_A-rc_B}{b_A+b_B}\right)\left(\frac{\left[r+\lambda+l(\theta)(1-\beta)\left(1+\frac{\lambda}{r+\phi}\right)\right](\lambda\phi+h(\theta))}{l(\theta)(1-\beta)\left(1+\frac{\lambda}{r+\phi}\right)h(\theta)}\right) \quad (41)$$

Equation (41) has a unique solution for $\varphi$. If we insert (41) in either (38) or (39) we find a solution for $\theta$, which is unique since only one of the roots is admissible.

A corner solution in which only $B$-vacancies are offered is also possible. In this case, the value of opening a $A$-vacancy is negative and (39) becomes the relevant condition. The condition on the parameters that ensures this is:

$$b_B<\left(rc_A-rc_B\right)\left(\frac{\left[r+\lambda+l(\theta^*)(1-\beta)\left(1+\frac{\lambda}{r+\phi}\right)\right](\lambda\phi+h(\theta^*))}{l(\theta^*)(1-\beta)\left(1+\frac{\lambda}{r+\phi}\right)h(\theta^*)}\right)$$

where $\theta^*$ is the value of $\theta$ that solves conditions (36) and (39).

here $\theta^*$is the value of $\theta$ that solves conditions (28) and (30).

We also have to check that workers accept a job with either an $A$-firm and $B$-firm, which occurs when $P_A - rc_A > rU$ and $P_B - rc_B > rU$.

Furthermore, the non conversion equilibrium we have derived is conditional on the parameters of the model being such that it is worthwhile for $A$-firms and $B$-firms to convert temporary jobs into permanent. That is, we need to check that (34) and (35) hold.

### 3.4 Mixed Conversion Equilibrium

In this equilibrium[3], $A$-type firms convert a temporary job into permanent. From Lemma 1 this occurs when:

$$P_A - rc_A > z + \phi f \left(1 + \frac{\beta h(\theta)}{r + \lambda}\right) \tag{42}$$

$$P_B - rc_B < z + \phi f \left(1 + \frac{\beta h(\theta)}{r + \lambda}\right) \tag{43}$$

The first steady-state condition becomes now:

$$h(\theta)\, u = (1 - u)\, \lambda \left[1 - (1 - \phi)\, \varphi\right] \tag{44}$$

The measure of flow into unemployment is $\lambda$ times the measure of workers in $B$-type firms and $\lambda\phi$ times the measure of workers in $A$-type firms.

Equation (44) can be rearranged to solve for $u$ as a function of $\theta$:

$$u = \frac{\lambda \left[1 - (1 - \phi)\, \varphi\right]}{\lambda \left[1 - (1 - \phi)\, \varphi\right] + h(\theta)} \tag{45}$$

The zero-profit equations in this case are:

$$-(k + rc_A)(r + \lambda) + l(\theta)(1 - \beta)\left[\left(1 + \tfrac{\lambda}{r+\phi}\right)(P_A - rc_A - rU) - \tfrac{\lambda}{r+\phi}\phi f\right] = 0 \tag{46}$$

[3]In a previous subsection, we ruled out the possibility of a mixed conversion equilibrium in which only $B$-type firms convert a temporary job into permanent.

$$-\left(k+rc_B\right)\left(r+\lambda\right)+l\left(\theta\right)\left(1-\beta\right)\left[P_B-rc_B-rU\right]=0 \tag{47}$$

Using (9) and (11), the value of unemployment is:

$$rU=D\left(\theta,\varphi\right)=\frac{(r+\lambda)z+\beta h(\theta)\left[(\varphi(P_A-rc_A)+(1-\varphi)(P_B-rc_B))+\frac{\lambda}{r+\phi}\varphi(P_A-rc_A-\phi f)\right]}{r+\lambda+\beta h(\theta)\left(1+\varphi\frac{\lambda}{r+\phi}\right)}$$

To find the equilibrium, we work with the equivalent condition in which (46) is equal to (47). To obtain this condition, we solve for $rU$ in equation (47). Substituting the resulting value in equation (47) and rearranging, this condition becomes:

$$P_A-P_B=\left(rc_A-rc_B\right)\left(\frac{r+\lambda+l(\theta)(1-\beta)\left(1+\frac{\lambda}{r+\phi}\right)}{l(\theta)(1-\beta)\left(1+\frac{\lambda}{r+\phi}\right)}\right)+\frac{\lambda}{r+\phi+\lambda}\left(\frac{k(r+\lambda)}{l(\theta)(1-\beta)}+\phi f\right) \tag{48}$$

Using (15), (16) and (48) gives:

$$\varphi^*=\frac{b_B-\eta\left(\frac{\lambda+h(\theta)}{h(\theta)}\right)}{b_A+b_B-\eta\left(\frac{\lambda(1-\phi)}{h(\theta)}\right)} \tag{49}$$

where $\eta=\left(rc_A-rc_B\right)\left(\frac{r+\lambda+l(\theta)(1-\beta)\left(1+\frac{\lambda}{r+\phi}\right)}{l(\theta)(1-\beta)\left(1+\frac{\lambda}{r+\phi}\right)}\right)+\frac{\lambda}{r+\phi+\lambda}\left(\frac{k(r+\lambda)}{l(\theta)(1-\beta)}+\phi f\right)$.

Equation (49) has a unique solution for $\varphi$. If we insert (49) in either (46) or (47), we find a solution for $\theta$. We can show that this solution is unique in the sense that only one of the roots is admissible.

A corner solution is possible in which only $B$-vacancies are offered ($\varphi^*=0$). In this case, the value of opening a $A$-vacancy is negative and (47) becomes the relevant condition. The condition on the parameters that ensures this is:

$$b_B<\left[\left(rc_A-rc_B\right)\left(\frac{r+\lambda+l(\theta^*)(1-\beta)\left(1+\frac{\lambda}{r+\phi}\right)}{l(\theta^*)(1-\beta)\left(1+\frac{\lambda}{r+\phi}\right)}\right)+\frac{\lambda}{r+\phi+\lambda}\left(\frac{k(r+\lambda)}{l(\theta^*)(1-\beta)}+\phi f\right)\right]\left(\frac{\lambda+h(\theta^*)}{h(\theta^*)}\right)$$

where $\theta^*$ is the value of $\theta$ that solves conditions (37) and (47).

As in the former cases we have to check that workers accept a job with either an $A$-firm and a $B$-firm. Secondly, we need to check that (42) and (43) hold since the mixed conversion equilibrium we have derived is conditional on the parameters of the model being such that it is not worthwhile for $A$-firms and $B$-firms to convert temporary jobs into permanent.

### 3.5 Multiple Equilibria.

From Lemma 1, the different equilibria (no conversion, full conversion, mixed conversion) arise depending on whether the net flow of profits of each type of firms exceed a critical value. Both sides of condition (21) depend on the endogenous variables of the model. Therefore, we cannot rule out the possibility that for some parameter values more than one equilibrium is possible. However, it is important to note that this do not occur for all possible set of parameter configurations. For small values of $(z, f, \phi)$ there is a unique full conversion equilibrium. For large values of $(z, f, \phi)$ there is a unique no conversion equilibrium. For an intermediate range of parameter values of $(z, f, \phi)$, it is possible the coexistence of more than one type of equilibrium.

## 4 Comparative Statics.

The aim of this section is to show the effects of deregulations in the labor market and in the product market either on the composition of firms ($A$-firms versus $B$-firms) and the composition of jobs (temporary versus permanent).

To see this, we first characterize diagrammatically the equilibrium (see Figure 5). This can be illustrated by the intersection of the zero-profits equations for $A$-firms and $B$-firms. Either in a no conversion, full conversion, and mixed conversion equilibrium it can be checked that the zero-profit condition is upward sloping[4] for $A$-firms and downward sloping[5] for $B$-firms. To see this, we can differentiate $\frac{d\theta}{d\varphi}|_{i=A,B}$ zero-profits equations for $A$-firms and $B$-firms. The sign of this derivative is positive when $\frac{\partial P_i}{\partial \varphi} < \frac{\partial D(\theta,\varphi)}{\partial \varphi}$ and negative when $\frac{\partial P_i}{\partial \varphi} > \frac{\partial D(\theta,\varphi)}{\partial \varphi}$.

[4] It is possible that for values of $\varphi$ sufficiently close to 1, this condition can be downward sloping.

[5] It is possible that for values of $\varphi$ sufficiently close to 0, this condition can be upward sloping.

## 4.1 Labor market deregulations

We first consider the effects of deregulating the labor market through two instruments, namely, reductions in firing costs $(f)$ and reductions in unemployment benefits $(z)$.

### 4.1.1 The impact of lower firing costs.

We examine first the impact on the composition of jobs. To begin, suppose that our starting point is a high regulated labor market where the parameter configuration is such that there is only a no conversion equilibrium. Now, a reduction in firing costs do not affect $(\theta^*, \varphi^*)$ as long as there is no shift to a mixed conversion equilibrium. Then, left-hand side of (25) and (26) do not change and the right hand side diminishes.

Successive reductions in firing costs would shift the economy from a no conversion equilibrium to one with mixed conversion. At this point, reductions in firing costs have a second order impact on the left hand side of expressions (42) and (43) since there is a change in $(\theta^*, \varphi^*)$, which do not compensate for the reductions in the right hand side due to the lower firing costs.

Finally, more reductions in firing costs would shift the economy from a mixed conversion equilibrium to a full conversion one. In this case, there is a second order change in the left hand side of (34) and (35) which do not compensate for the reductions in the right hand side due to lower firing costs.

Therefore, as it should be expected deregulating the labor market through reducing firing costs increases the use of permanent jobs. The economy would shift from a no conversion equilibrium to a mixed conversion and a full conversion equilibrium, successively.

Another question we want to examine is whether reductions in firing costs change composition of firms. Again, assume that the starting point is a no conversion equilibrium. In this case, a reduction in firing costs do not affect $(\theta^*, \varphi^*)$ as long as there is no shift to a mixed conversion equilibrium.

If the starting point is a mixed conversion equilibrium, as long as there is no shift to a full conversion equilibrium, a decrease in firing costs shift down (47) and shift up (46)[6]. Therefore, $\varphi$ is unambiguously increased. Intuitively, with $\varphi$ unchanged, a reduction in firing costs affects negatively

[6] Although in the last case it could shift down slightly (46) for values of $\varphi$ close to zero.

$B$-firms through an increase in the value of unemployment, whereas for $A$-firms this negative effect is compensated by the positive effect of the reduction in the firing costs.

Finally, if the starting point is a full conversion equilibrium, a decrease in firing costs shift up (38) and (39). Hence, $\theta$ will definitively increase. We verify that (39) will shift by more; therefore, $\varphi$ is unambiguously reduced. To see that, differentiate both terms of (40) by $\theta$.

Right hand side derivative of (40) becomes:

$$\frac{-(r+\lambda)\, l'(\theta)}{l^2(\theta)(1-\beta)\left(1+\frac{\lambda}{r+\phi}\right)}(rc_A - rc_B) > 0$$

which is nonnegative since $l'(\theta) < 0$.

Left hand side derivative of (40) becomes:

$$\frac{\partial P_A}{\partial \theta} - \frac{\partial P_B}{\partial \theta} = \frac{\lambda h'(\theta)}{(\lambda + h(\theta))^2}\left[(b_A + b_B)\varphi - b_B\right] < 0$$

which is negative by Lemma 2.

Therefore, to hold (40) again after a reduction in firing costs $\varphi$ must be reduced since $P_A - P_B$ decreases with $\varphi$.

Table 1: The effects of lower firing costs.

| | No conversion | Mixed Conversion | Full Conversion |
|---|---|---|---|
| $\varphi$ | Unaffected | Increase | Decrease |
| $\theta$ | Unaffected | Increase | Increase |

#### 4.1.2 The impact of lower unemployment benefits.

The impact on the composition of jobs would be the following. Assuming that the starting point is a high regulated labor market where the parameter configuration is such that there is only a no conversion equilibrium. A reduction of unemployment benefits do not affect $(\theta^*, \varphi^*)$ as long as there is no shift to a mixed conversion equilibrium.

Successive reductions of unemployment benefits would shift the economy from a no conversion equilibrium to one with mixed conversion. At this point, reductions of unemployment benefits have a second order impact on the left hand side of expressions (42) and (43) since there is a change in $(\theta^*, \varphi^*)$, which do not compensate for the reductions in the right hand side due to unemployment benefits.

Finally, more reductions of unemployment benefits would shift the economy from a mixed conversion equilibrium to a full conversion one. In this case, there is a second order change in the left hand side of (34) and (35) which do not compensate for the reductions in the right hand side due to lower unemployment benefits.

Therefore, deregulating the labor market through reductions of unemployment benefits is equivalent to reductions of firing costs in terms of the composition of jobs, that is, it increases the use of permanent jobs. The economy would shift from a no conversion equilibrium to a mixed conversion and a full conversion equilibrium, successively.

The effects on the composition of firms would be the following. Again, assume that the starting point is a no conversion equilibrium. In this case, a reduction of unemployment benefits as long as there is no shift to a mixed conversion equilibrium shift up (29) and (30). Hence, $\theta$ will definitively increase. We verify that (30) will shift by more; therefore, $\varphi$ is unambiguously reduced. To see that, differentiate both terms of (32) by $\theta$.

Right hand side derivative of (32) becomes:

$$\frac{-(r+\lambda)\, l'(\theta)}{l^2(\theta)(1-\beta)}(rc_A - rc_B) > 0$$

which is nonnegative since $l'(\theta) < 0$.

Left hand side derivative of (32) becomes:

$$\frac{\partial P_A}{\partial \theta} - \frac{\partial P_B}{\partial \theta} = \frac{\lambda h'(\theta)}{(\lambda + h(\theta))^2}\left[(b_A + b_B)\varphi - b_B\right] < 0$$

which is negative by Lemma 2.

Therefore, to hold (32) again after a reduction in unemployment benefits $\varphi$ must be reduced since $P_A - P_B$ decreases with $\varphi$.

In the same way, it can be verified that in a full conversion equilibrium, $\theta$ increases and $\varphi$ is reduced differentiating both terms of (41).

On the other hand, in a mixed conversion equilibrium a reduction of unemployment benefits shift up (46) and (47) and in this case (46) will shift by more since the value of unemployment is multiplied by the factor $\left(1+\frac{\lambda}{r+\phi}\right)$; therefore, $\varphi$ is unambiguously increased.

Table 2: The effects of lower unemployment benefits.

| | No conversion | Mixed Conversion | Full Conversion |
|---|---|---|---|
| $\varphi$ | Decrease | Increase | Decrease |
| $\theta$ | Increase | Increase | Increase |

## 4.2 Product Market Deregulations.

We now consider the effects of deregulating the product market of $A$-firms and $B$-firms through reductions of entry costs. Assume that there is a decrease in entry costs for $A$-firms ($c_A$).

We examine first the effects on the composition of firms. A reduction of entry costs for $A$-firms shift up free entry condition for $A$-firms and shift down free entry condition for $B$-firms either in a no conversion, mixed conversion and full conversion equilibrium. Hence, $\varphi$ definitively increases. It can be easily verified that free entry condition for $A$-firms shift more and, hence, $\theta$ is unambiguously increased.

The effects on the composition of jobs is ambiguous. It increases either the right hand side and the left hand side of (21). To see that, the increase in $\theta$ would increase the right hand side of (21) and regarding the left hand side, it is increased for $B$-firms since the increase of $\theta$ and $\varphi$ increase $P_B$. For $A$-firms, the effect on $P_A$ is not clear since the increase of $\theta$ and $\varphi$ interact in opposite ways but the reduction of $c_A$ increases the left hand side.

Therefore, it is not clear whether a reduction in entry cost for $A$-firms increase the use of permanent jobs.

Next, we examine the effects of a reduction in entry costs for $B$-firms. Regarding the composition of firms, it would shift up free entry condition for $B$-firms and shift down free entry condition for $A$-firms in any type of equilibrium. Hence, $\varphi$ decreases. It can be easily verified that free entry condition for $B$-firms shift more and, hence, $\theta$ is unambiguously increased. In the same way, the effects on the composition of jobs are ambiguous.

Table 3: The effects of lower entry costs for A-firms.

| | No conversion | Mixed Conversion | Full Conversion |
|---|---|---|---|
| $\varphi$ | Increase | Increase | Increase |
| $\theta$ | Increase | Increase | Increase |

Table 4: The effects of lower entry costs for B-firms.

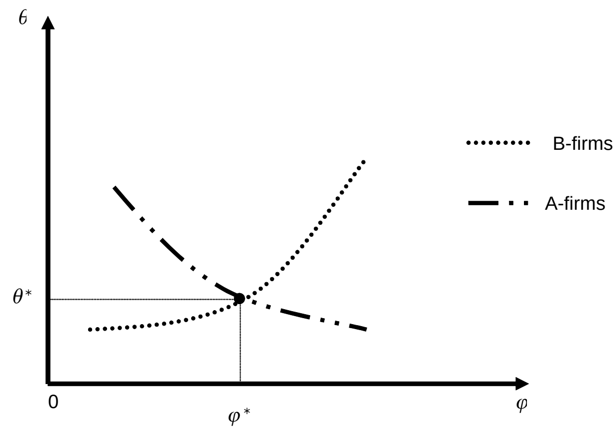
| | No conversion | Mixed Conversion | Full Conversion |
|---|---|---|---|
| $\varphi$ | Decrease | Decrease | Decrease |
| $\theta$ | Increase | Increase | Increase |

# 5 Conclusions.

In this paper we to explore the qualitative aspects of the interaction between product and market regulations. More particularly, we want to answer two simple questions. First, whether deregulations of product markets affect the nature of jobs offered to workers. Secondly, whether deregulations of labor markets affect the nature of firms created in the economy.

For this purpose, we present a matching model with two industries and two types of jobs; temporary and permanent. Each industry presents a different degree of regulation and faces its own demand. Furthermore, the number of firms in each industry is endogenously determined. On the other hand, firms hire workers in temporary jobs and, then, they have to decide whether they keep them in a permanent job or they fire them. Therefore, we present a model in which either composition of firms and composition of jobs is endogenously determined.

APPENDIX: GRAPHICS.



# References


[1] Acemoglu, D. (2001) "Good Jobs versus Bad Jobs" *Journal of Labor Economics* **19** (1), 1-21.

[2] Albrecht, J. and S. Vroman (2002) "A Matching Model with Endogenous Skill Requirements" *International Economic Review* **43** (1), 283-305.

[3] Bertola, G. and R. Rogerson (1997) "Institutions and Labor Reallocation" *European Economic Review* **41** (6), 1141-1171.

[4] Boeri, T. (1999) "Enforcement of Employment Security Regulations, On-the-job Search and Unemployment Duration" *European Economic Review* **43**, 65-89.

[5] Boeri, T., G. Nicoletti and S. Scarpetta "Regulation and Labour Market Performance", CEPR Discussion Paper Series, n$^o$.2420.

[6] Bulow, J. and L. Summers (1986) "A Theory of Dual Labor Markets with Applications to Industrial Policy, Discrimination and Keynesian Unemployment" *Journal of Labor Economics* **4**, 376-414.

[7] Burdett, K. and M. Dale (1998) "Wage Differentials, Employer Size and Unemployment" *International Economic Review* ***39***, 257-273.

[8] Davidson, C., M. Lawrence and S. Matusz (1987) "Search, Unemployment, and the Production of Jobs" *Economic Journal* **97**, 857-876.

[9] Gautier, P. (2002) "Search Externalities in a Model with Heterogenous Workers and Firms" *Economica* **273** (1), 21-40.

[10] Heckman, J.J. and C. Pagès (2000) "The Cost of Job Security Regulation: Evidence From Latin American Labor Markets", NBER Working Papers, n$^o$ 7773.

[11] Hosios, A. "On the Efficiency of Matching and Related Models of Search and Unemployment" *Review of Economic Studies* **57** (2), 279-298.

[12] Krueger, A. and J.-S. Pischke (1997), "Observations and Conjectures on the U.S. Employment Miracle", NBER Working Paper, n$^o$ 6146.

[13] Kugler, A., and G. Pica (2003) "Effects of Employment Protection and Product Market Regulations on the Italian Labor Market." Institute for the Study of Labor, Discussion Paper 948. Bonn, Germany.

[14] Lang, K. (1987) "Pareto Improving Minimum Wage Laws" *Economic Inquiry* **25**, 145-158.

[15] Messina, J. (2005), "Institutions and Service Employment: A Panel Study for OECD Countries", Labour CEIS, Fondazione Giacomo Brodolini and Blackwell Publishing Ltd, vol.19(2), pp.343-372.

[16] Nickell, S. (1997) "Unemployment and Labor Market Rigidities: Europe versus North America" *Journal of Economic Perspectives* **11** (3), 55-74.

[17] Nicoletti, G., R.C.G. Haffner, S. Nickell, S. Scarpetta and G. Zoega (2001), "European Integration, Liberalization and Labor Market Performance", in G. Bertola, T. Boeri and G. Nicoletti (eds.) (2001) "Welfare and Employment in United Europe", the MIT Press, Cambridge Mass.

[18] OECD (1999) "Employment Outlook", Paris.

[19] Pissarides, C.A. (2001), "Company Start-Up Costs and Employment", Center for Economic Performance Discussion Paper, No. 520, London School of Economics.