

Taxation and Unemployment Benefits with Imperfect Goods and Labor Markets

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Abstract

We consider a model in which the labor market is characterized by search frictions and there is monopolistic competition in the goods market. We introduce proportional income taxation and unemployment benefits with Government balanced budget constraint. Then, we evaluate the effects of both more competition in the goods market and higher unemployment benefits on labor market equilibrium and equilibrium tax rate. We show that more competition has a positive effect on equilibrium unemployment and the Government budget. Higher unemployment benefits can be financed either by higher tax rate or increasing goods market competition. Liberalization policies could permit: a) to avoid an increase in unemployment if we allow some rise in the tax rate; b) to decrease unemployment if they are incisive enough to keep the tax rate unchanged.

JEL classifications: H20, J64, J65

Keywords: Matching Models, Monopolistic Competition, Fiscal Policy, Unemployment Insurance

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1 Introduction

The Nineties were characterized by a number of labor market reforms in the major European countries. The introduction of "non-standard" labor contracts allowed for easier access to the labor market for some categories of workers (mainly young people looking for first jobs), but it also determined an increase in the flows in and out of unemployment.

With respect to Italy, in particular, this process was not accompanied by the introduction of social dampers able to give support to the unemployed workers in the transition period from one job to another. This is also due to the difficulty of drawing upon resources to finance these kinds of programs given the public budget constraints imposed by the *EMU*. At the same time, the last few years have seen the emergence of a new political determination to introduce measures to increase the degree of competition in some strategic sectors, such as the services and public utilities.

Such is the context of the subject matter of this paper which aims to study the interactions between income taxation and unemployment benefits in a theoretical framework where the labor market is characterized by search frictions and there is monopolistic competition in the goods market.

By the term competition policy we mean the set of measures that aim to widen the area of the market economy, with interventions in different areas: *a)* liberalization and simplification, in order to remove the public constraints on the free behavior of economic agents; *b)* privatization, to eliminate the constraints of implicit control over entrepreneurship by the Government; *c)* regulation to introduce new rules, mainly market-oriented; *d)* specific guarantee interventions, within application of antitrust legislation.

There are many empirical studies that show the positive effects of a higher level of competition. First of all, it is reasonable to suppose that greater competition determines a positive effect on per capita income, which can be considered a convenient measure of welfare. Nicoletti and Scarpetta (2003) have pointed out the positive effect on productivity, through an improvement in the allocation of resources and as an incentive for managers to increase productive efficiency. Positive effects of competition on innovation and on the diffusion of technology have been underlined by Aghion, Harris, Howitt, and Vickers (2001) and Gust and Marquez (2002). Alesina, Ardagna, Nicoletti, Schiantarelli, and Nicoletti (2003) have empirically shown how greater competition can have a positive effect on the level of fixed investments, at least for certain types of industries.

Moreover, there are many contributions that show how a higher level of competition (especially with the removal of entry barriers) can have positive effects on employment, from both the theoretical (Pissarides (2001); Saint-Paul (2002); Blanchard and Giavazzi (2003); Ebell and Haefke (2003)) and the empirical point of view (Boeri, Nicoletti, and Scarpetta (2000); Nicoletti, Haffner, Nickell, Scarpetta, and Zoega (2001); Kugler and Pica (2004);

Nicoletti and Scarpetta (2004)). In fact, greater competition reduces the firms' rents in the goods market, determining an increase of the production activity and therefore of employment. Moreover, the more competitive the product market is, the more negative will a rigid labor market prove for the growth rate of the economy; however, when the product market is not perfectly competitive, a greater labor market rigidity may possibly enhance growth driven by, among others things, higher productivity.

The empirical evidence suggests a positive relationship between reforms in the goods market and reforms in the labor market in the *OECD* countries, underlining how the latter is generally preceded by the former (Brandt, Burniaux, and Duval (2005)). Blanchard and Giavazzi (2003) show that reforms in the goods market, reducing the firms' rent, are also able to reduce the workers' incentive to appropriate such rents (by maintaining or increasing their bargaining power), thus reducing in resistance to labor market reforms. Koeniger and Vindigni (2003) argue that resistance to labor market reforms (in particular with regard to employment protection) can be reduced with liberalization policies if they are able to determine an increase in job opportunities.

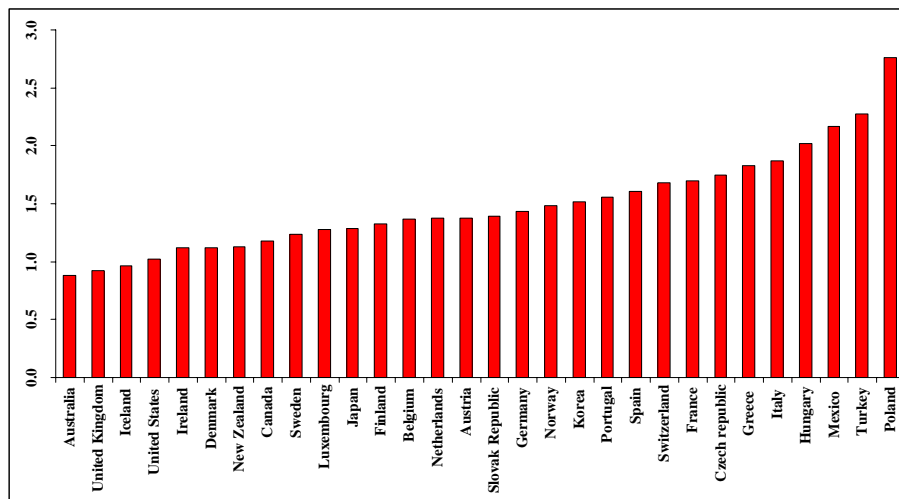
OECD (2004) notes that in the last five years employment protection has not suffered remarkable changes and, where such changes have occurred, they have mainly concerned temporary jobs. This represents an important feature with regard to the goals of this paper, where labor market reforms are considered in a different perspective, in which a more flexible labor market has to be accompanied with some forms of intervention in support of the unemployed workers. One of the main results of the paper is that these kinds of policies can be financed with the resources produced by a liberalization policy.

Our model is an extension of the basic framework proposed by Blanchard and Giavazzi (2003), Ebell and Haefke (2003) and Ziesemer (2005). In an economy where a labor market with frictions *à la* Pissarides (2000) and an imperfectly competitive goods market *à la* Dixit and Stiglitz (1977) coexist, we show that more competition in the goods market has a positive effect on the Government budget and on equilibrium unemployment. The public budget surplus can finance either higher unemployment benefits or tax expenditure. In the former case, the cost is represented by a lower increase in aggregate employment than in the latter case.

The paper is organized as follows. The next section illustrates some preliminary evidence on product market competition. Section 3 describes the model, while section 4 focus on equilibrium, comparative statics and some policy considerations. Section 5 concludes.

FIGURE 1

OECD Overall Product Market Regulation Index - 2003



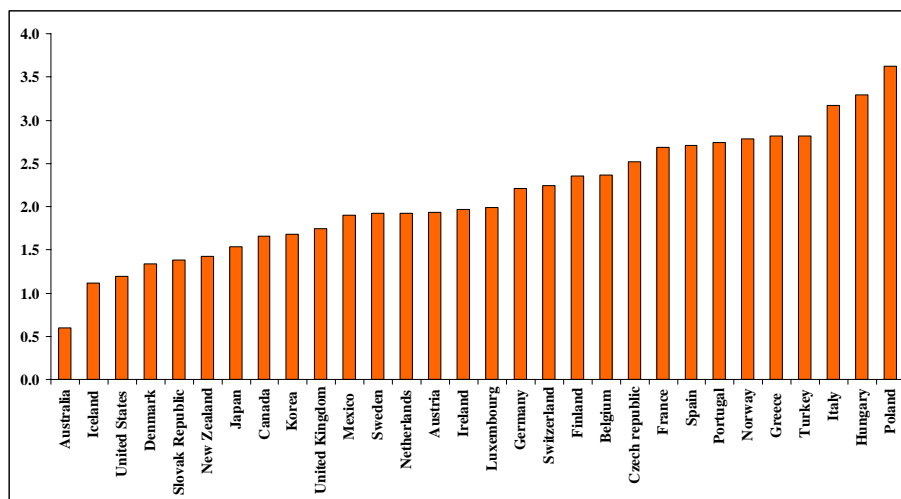
2 Preliminary evidence

The indicators of the degree of competition in the goods market are calculated through the *OECD International Regulation Database*, which contains all the information for calculation of the Product Market Regulation (*PMR*) Index. This index was first introduced by the *OECD* in 1998 and subsequently updated in 2003. It is built considering a set of norms and regulations that are potentially able to reduce the degree of competition in particular sectors of the goods market, where the technology and the market conditions can determine relevant benefits for the whole economy.

In general, besides an overall index, other more specific indexes are considered with a lower level of aggregation. In this context, we will consider those related to State control, barriers to entrepreneurship and barriers to trade and investment.

Looking at the overall index (figure 1), countries such as the United States, the United Kingdom, Australia, New Zealand, Iceland and Ireland show the lowest level of regulation. On the other hand, Poland, Turkey, Mexico and Hungary, followed by Italy, Greece, the Czech Republic and Spain, show a lower level of competition. Turning to more specific indicators (figures 2, 3 and 4), we see that the United Kingdom, even though it reveals few barriers to entrepreneurship and trade and investment, is in the middle of the classification as regards State control. The United States, on the other hand, shows a relatively smaller degree of competition with regard to barriers to trade and investments. As for countries with smaller degrees of competition, Italy shows marked State control and barriers to trade and

FIGURE 2
 OECD State control - 2003



investments, while the barriers to entrepreneurship seem to place it in an intermediary position among the other countries, unlike the case of France and Greece, where the level of competition results more homogeneous in the specification considered.

As noted by Conway, Janod, and Nicoletti (2005), from 1998 to 2003 there was a convergence of the *PMR* index among the *OECD* countries, in the sense that countries particularly backward in 1998 implemented remarkable measures towards a greater degree of competition in the last few years, reducing the gap with respect to the countries with a lower *PMR* index. Nevertheless, there is still room for further interventions, especially for the countries of the European Union.

The purpose of this paper is to study the consequential effects from greater competition on the goods market, not only with respect to the unemployment rate, but also on the public budget constraints, which represent a crucial variable within the countries of the European Union. Looking at figure 5 a clear positive correlation can be noted between unemployment rate and product market regulation: countries with higher unemployment show a high *PMR* index level.

But two more aspects also assume a remarkable role: the level of taxation and the possible interactions between competition policy and labor market reforms. In fact, it will be seen in figure 6 that the level of the fiscal wedge shows a positive correlation with the *PMR* index. This paper aims to consider the effects that a liberalization policy in the goods market can produce on the level of taxation, in order to respect the balanced public budget constraint that the policy makers have to take into account. The

FIGURE 3
OECD Barriers to entrepreneurship - 2003

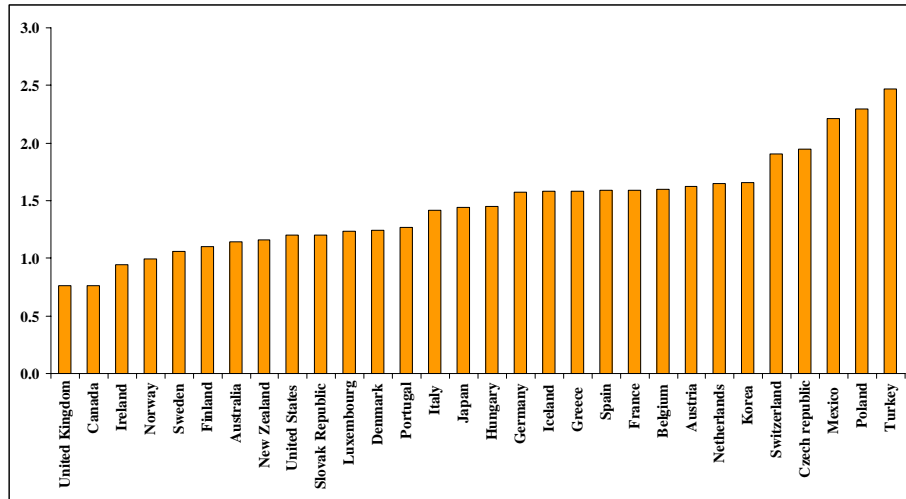


FIGURE 4
OECD Barrier to trade & investment - 2003

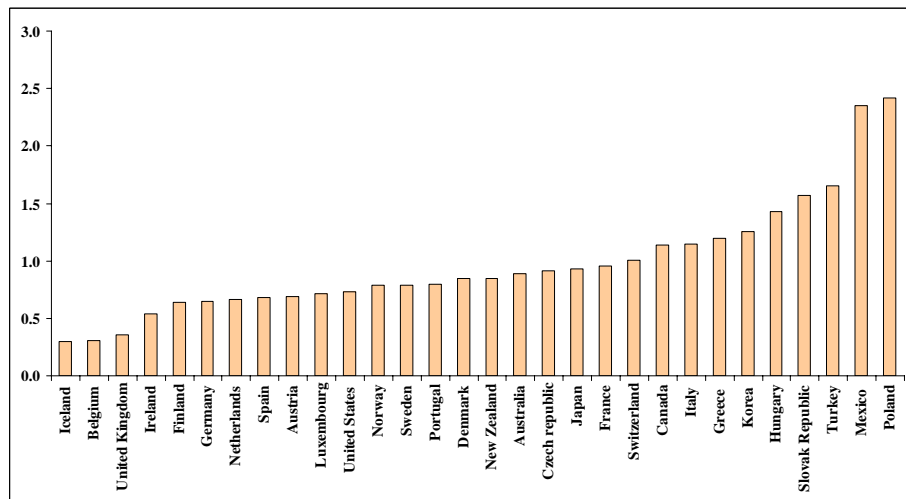
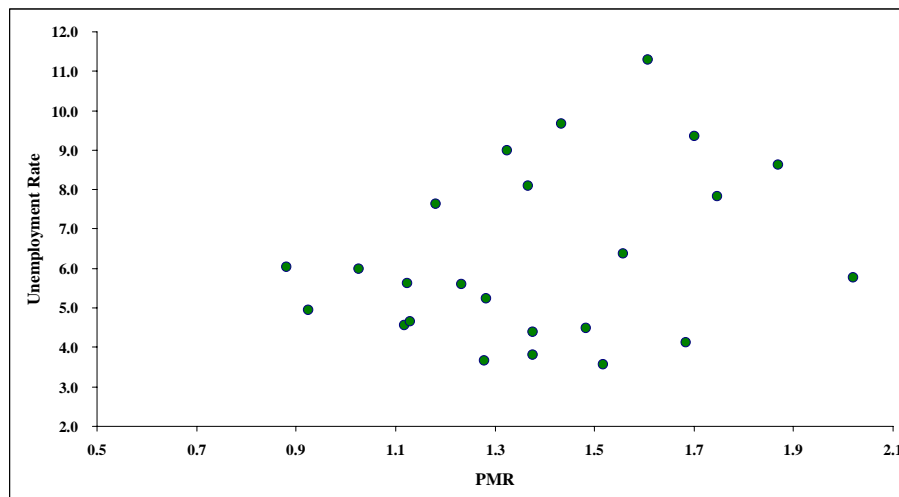


FIGURE 5

Correlation between unemployment rate and PMR in OECD countries - 2003



issue is important because greater competition can produce resources which may serve to reduce taxation or channell the public surplus generated by liberalization towards some forms of social expenditure or, as in the case discussed in this paper, to finance labor market reforms. In particular, we will show that liberalization policies in the goods market can allow for the introduction of unemployment benefits without resorting to any increase in the level of taxation for its financing.

3 The model

3.1 Frictions in the labor market

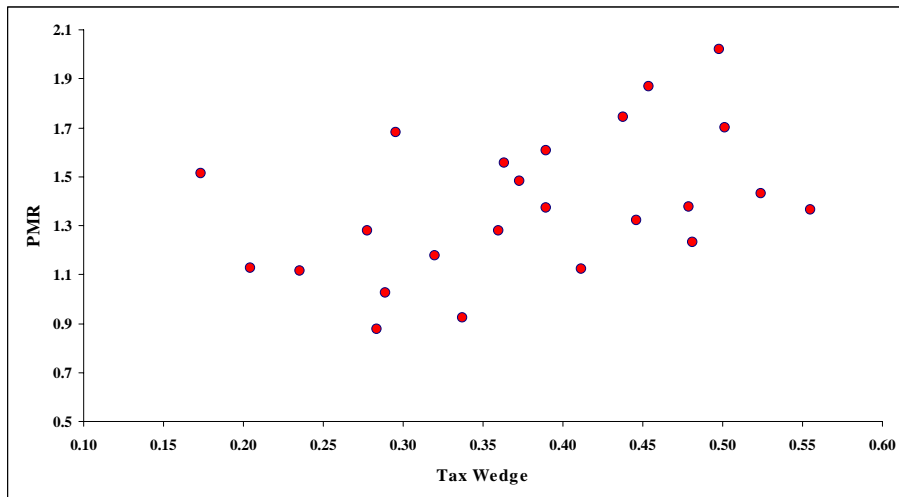
Consider an economy with risk-neutral workers and firms which discount future at constant rate r . The labor force is given and normalized to one. Job-worker pairs are destroyed at the exogenous Poisson rate s . Unemployed workers and vacancies randomly match according to a Poisson process. If the unemployed workers are the only job seekers and they search with fixed intensity of one unit each, and firms also search with fixed intensity of one unit for each job vacancy, the matching function gives $h = h(u, v)$ where h denotes the flow of new matches, u is the unemployment rate and v is the vacancy rate.

The matching function is assumed to be increasing in each argument and to have constant return to scale overall.¹ Furthermore, it is assumed to

¹On the ground of empirical plausibility, see Petrolongo and Pissarides (2001) for a

FIGURE 6

Correlation between tax wedge and PMR in OECD countries - 2003



be continuous and differentiable, with positive first partial derivatives and negative second derivatives.

By means of the properties of the matching function, we can define the average rate at which vacancies meet potential partners by the following “intensive” representation of the matching function:

$$\frac{h(v, v)}{v} = m(\theta) \quad (1)$$

with $m'(\theta) < 0$ and elasticity $-\varepsilon(\theta) \in (-1, 0)$. θ is the ratio between vacancies and unemployed workers $\frac{v}{u}$ and can be interpreted as a convenient measure of labor market tightness.

Similarly, $\frac{h(u, v)}{u}$ is the probability for an unemployed worker to find a job. Simple algebra shows that:

$$\frac{h(u, v)}{u} = \frac{h(u, v)}{v} \frac{v}{u} = \theta m(\theta) \quad (2)$$

The linear homogeneity of the matching function implies that $\theta m(\theta)$ is increasing with θ . The average durations of unemployment and vacancies are respectively $\frac{1}{\theta m(\theta)}$ and $\frac{1}{m(\theta)}$. This implies that the duration of unemployment decreases with labor market tightness while the duration of a vacant job increases with θ . The dependence of the two transition probabilities, $m(\theta)$ and $\theta m(\theta)$, on the relative number of traders implies the existence of a trading externality (Diamond (1982)). Increasing vacancies cause congestion

survey.

for other firms, as increasing unemployed job searchers cause congestion for other workers.

The measure of workers who enter unemployment is $s(1-u)$, while the measure of workers who leave unemployment is $\theta m(\theta)u$. The dynamics of unemployment is given by the difference between inflows and outflows: $\dot{u} = s(1-u) - \theta m(\theta)u$. This differential equation defines dynamics converging to the unique steady state:

$$u = \frac{s}{s + \theta m(\theta)} \quad (3)$$

showing that θ uniquely determines the unemployment rate. The properties of the matching function ensure that the equation (3) is decreasing and convex.

Since $\theta u = \frac{uv}{v} = v$, we can derive the following equation for the vacancy rate:

$$v = \frac{s}{\frac{s}{\theta} + m(\theta)} \quad (4)$$

with $\frac{\partial v}{\partial \theta} > 0$.

Taking into account that there is proportional income taxation, consider now the “value” E of being an employed worker. This is defined by the following equation:

$$rE = w(1-t) + s(U - E) \quad (5)$$

An employed worker earns net wage $w(1-t)$, but loses his job with flow probability s . In the latter case, his utility plunges to that of an unemployed worker. The value U of being an unemployed worker is given by:

$$rU = b + \rho w(1-t) + \theta m(\theta)(E - U) \quad (6)$$

The unemployed worker earns flow utility b , representing the value of leisure, plus the unemployment benefit as a fixed proportion ρ (replacement ratio) of the net wage $w(1-t)$. Then, with probability $\theta m(\theta)$, she finds employment.

3.2 Monopolistic competition in the goods market

We assume that households have love-of-variety preferences that can be expressed by the following constant elasticity of substitution type:

$$y_j = \left[n^{-\frac{1}{\sigma}} \int_0^n y_{ij}^{\frac{\sigma-1}{\sigma}} di \right]^{\frac{\sigma}{\sigma-1}} \quad (7)$$

where y_i is household j 's consumption of good i and $\sigma > 1$ is the elasticity of substitution among differentiated goods.

In continuous time, the problem of representative household j is to choose the value of consumption y_{ij} that maximizes:

$$\int_0^\infty e^{-\delta t} \left[n^{-\frac{1}{\sigma}} \int_0^n y_{ij}^{\frac{\sigma-1}{\sigma}} di \right]^{\frac{\sigma}{\sigma-1}} dt \quad (8)$$

subject to the following budget constraint:

$$\dot{A}_j = rA_j + I - \int_0^n p_i y_{ij} di \quad (9)$$

and $A_j(0) = \bar{A} \geq 0$. μ is the subjective discount rate, A_j is the current wealth, r is the interest rate, p_i is the price of good i . I can be defined as a mean of the workers income when employed or unemployed, weighted with her probability to be in the two states: $I = (1 - u)w(1 - t) + u[b + \rho w(1 - t)]$.

The Hamiltonian current value of the intertemporal optimization problem is given by:

$$H = \left[n^{-\frac{1}{\sigma}} \int_0^n y_{ij}^{\frac{\sigma-1}{\sigma}} di \right]^{\frac{\sigma}{\sigma-1}} + \lambda \left[rA_j + (1 - u)w(1 - t) + u[b + \rho w(1 - t)] - \int_0^n p_i y_{ij} di \right] \quad (10)$$

The *FOCs* are:

$$\left[n^{-\frac{1}{\sigma}} \int_0^n y_{ij}^{\frac{\sigma-1}{\sigma}} di \right]^{\frac{1}{\sigma-1}} n^{-\frac{1}{\sigma}} y_{ij}^{-\frac{1}{\sigma}} = \lambda p_i \quad (11)$$

$$\dot{\lambda} - \delta\lambda = r\lambda \quad (12)$$

From equation (11) we can derive the following relationship for every couple of goods i and j :

$$\frac{y_{ij}}{y_{kj}} = \left(\frac{p_i}{p_k} \right)^{-\sigma} \quad (13)$$

Equation (13) shows that the relative demand for goods is independent of the income earned by employed or unemployed.

In steady state, condition (12) gives $r = \delta$. Solving 11 for y_{ij} yields:

$$y_{ij} = (\lambda p_i)^{-\sigma} \frac{y_j}{n} \quad (14)$$

Substituting into (7) we obtain:

$$\lambda = \left(n^{\frac{\sigma-1}{\sigma}} \int_0^n p_i^{1-\sigma} di \right)^{\frac{1}{\sigma-1}} = \frac{1}{p}$$

That is, λ is the inverse of the price index. Substituting the latter equation into (14) we obtain the aggregate demand for good i :

$$y_i = \left(\frac{p_i}{p} \right)^{-\sigma} \frac{Y}{n} \quad (15)$$

where Y is the aggregate level of consumption and σ is the constant elasticity of the demand function.

3.3 Profit maximization

There are a large number of multiple-worker firms and no single firm is able to affect labor market tightness θ . Monopolistic competition in the goods market implies that each firm produces one of the goods that appear in the utility function.

Technology exhibits increasing return to scale and is defined by the following production function:

$$y_i = l_i - f \quad (16)$$

where the marginal labour productivity is assumed to be equal to 1. Furthermore, the production function (16) exhibits internal economies of scale because of the fixed cost component f . As all goods are assumed identical in the utility function and in the production function, their price and quantity will be the same.

The firm instantaneous profit in real term is given by:

$$\frac{\pi_i}{p} = \frac{p_i(y_i)}{p} y_i - w_i y_i - c v_i \quad (17)$$

where $p_i(y_i)$ is the inverse demand function facing by the firm producing good i , w_i is the real wage, and c is the cost of keeping the vacancy open.

The firm maximizes the present discount value of expected profits:

$$\int_0^{\infty} e^{-rt} \left[\frac{p_i(y_i)}{p} y_i - w_i y_i - c v_i \right] dt \quad (18)$$

subject to the law of motion of quantity:

$$\dot{y}_i = m(\theta) v_i - s y_i \quad (19)$$

Solving the maximization problem, the firm chooses the number of vacancies, given the demand for goods, the output dynamic and the other parameters that describe the economy.

The Hamiltonian current value is:

$$H = \frac{p_i(y_i)}{p} y_i - w_i y_i - c v_i + \lambda [m(\theta) v_i - s y_i] \quad (20)$$

The first order conditions are:

$$\frac{\partial H}{\partial v_i} = 0 \Rightarrow \lambda = \frac{c}{m(\theta)} \quad (21)$$

$$-\frac{\partial H}{\partial y_i} = \dot{\lambda} - r\lambda \Rightarrow \dot{\lambda} - r\lambda = - \left[\frac{p'_i(y_i)}{p} y_i + \frac{p'_i(y_i)}{p} - w_i - \lambda s \right] \quad (22)$$

Substituting equation (21) into (22), considering steady state ($\dot{\lambda} = 0$) and remembering that $\frac{1}{\sigma} = p'_i(y_i) \frac{y_i}{p_i(y_i)}$, we get the following condition in price terms:

$$\frac{p_i(y_i)}{p} = (1 + \mu) \left(w_i + \frac{(r + s)c}{m(\theta)} \right) \quad (23)$$

which represents the standard price setting rule under imperfect competition: the firm sets the price of good i with mark-up $\mu = \frac{1}{\sigma-1}$ on the marginal costs, given by the state of technology and the expected recruiting costs.

Finally, solving equation (23) for w_i , and considering symmetric equilibrium ($\frac{p_i(y_i)}{p} = 1$) we get the job creation condition as a relationship between real wage and labor market tightness:

$$w = \frac{1}{1 + \mu} - \frac{(r + s)c}{m(\theta)} \quad (24)$$

Equation (24) can be considered as a pseudo-labor demand and represents the level of wage that firms are willing to pay. The worker receives a wage lower than productivity because of both the finite value of the demand elasticity of product ($\frac{1}{1+\mu} = \frac{\sigma-1}{\sigma} < 1$), and the search externality $\frac{(r+s)c}{m(\theta)}$.

3.4 Wage setting

Since firms are multiple-workers, their outside option is to produce with one worker less. Consider a firm with an open vacancy and $l_i - 1$ workers and define its value by $V(l_i - 1)$. Thus the stock price of this firm, $V(l_i - 1)$ must satisfy:

$$rV(l_i - 1) = -c + m(\theta) [J(l_i) - V(l_i - 1)] \quad (25)$$

With a flow probability $m(\theta)$ the firm fills the vacancy and its value jumps from $V(l_i - 1)$ to $J(l_i)$. Free entry implies that the value of a firm with an open vacancy cannot exceed the value of an inactive firm, i.e. zero.

Thus, as long as some vacancies are held open at t , $V(l_i - 1) = 0$. Hence, equation (25) plus free-entry implies that:

$$J(l_i) = \frac{c}{m(\theta)} \quad (26)$$

Equation (26) states that the value of a filled job must be equal to the maintenance cost by the expected duration of a vacancy. Since a filled job can be destroyed with probability s , the current value of the expected value of a filled job is $(r + s) J(l_i) = \frac{(r+s)c}{m(\theta)}$. The labor cost per worker then equals $w + \frac{(r+s)c}{m(\theta)}$.

When a searching firm and a searching worker meet, there is a potential gain from trade. The wage contract is the instrument to split this surplus. Firms and workers are assumed to bargain over the wage and conditions under which separation occurs. Each party can force renegotiation whenever it wishes, and in particular when new information arrives (or, equivalently, the parties bargain continuously as long as they remain matched).

We assume that the sharing rule stems from the following Nash bargaining problem:

$$w = \arg \max [E - U]^\beta [J(l_i) - V(l_i - 1)]^{1-\beta} \quad (27)$$

The solution of this maximization programme yields the following sharing rule:

$$E - U = \frac{\beta(1-t)}{1-\beta} [J(l_i) - V(l_i - 1)] \quad (28)$$

which states that the worker obtains a fraction β of the total surplus produced by the economic activity.

Making use of the free entry condition and of equations (5), (6) and noting that $J(l_i) = \frac{c}{m(\theta)} = \frac{\frac{1+\mu}{r+s} - w}{r+s}$, we get:

$$w = \frac{(1-\beta)b}{(1-t)[1-(1-\beta)\rho]} + \frac{\beta}{1-(1-\beta)\rho} \left[\frac{1}{1+\mu} + c\theta \right] \quad (29)$$

This condition is known as the wage equation, and it is a positively sloped relationship between the wage and the labor market tightness. Note that, since cv is the total recruiting cost in the economy, $c\theta$ is the recruiting cost per unemployed worker. When θ is high (tight labor market) the expected recruiting cost faced by firms is high, while, conversely, the cost for workers to wait for the next job offer is low. This implies that workers can bargain for better wages. Monopoly power in the goods market reduces the level of bargained wage. Moreover, the wage bargained by the workers increases in the value of their outside option, b , in the worker's bargaining power β , in the level of productivity and in the cost of recruiting unemployed workers c .

3.5 Government budget constraint

No public deficits are allowed, hence the Government faces the following budget constraint:

$$t[(1-u)w + u\rho w] = u\rho w \quad (30)$$

Looking at equation (30), on the left side we put the public revenue, on the right public expenditure. Public revenues come from taxation t on gross wage bulk $(1-u)w$ and on unemployment benefit $u\rho w$, while public expenditure is the unemployment benefit ρw paid to unemployed workers u .

Making use of the Beveridge curve (3) and taking into account that $1-u = \frac{\theta m(\theta)}{s+\theta m(\theta)}$, we can express the budget constraint as:

$$t = \frac{s\rho}{s\rho + \theta m(\theta)} \quad (31)$$

As $\theta m(\theta)$ is an increasing function of θ , equation (31) states a decreasing relationship between tax rate t and labor market tightness, since rising θ brings the unemployment rate down; as a consequence we have a reduction of expenditure for unemployment benefits and, given t , an increase of the public revenue. Hence, the public budget balance requires a lower level of t .

4 Results

In this Section, we characterize the macroeconomic equilibrium and analyze the effects and interactions of product market regulation and labor market intervention. In particular, we begin by considering a reduction in mark-up μ as the final result of deregulation policies.² We will then assess the effect of an increase in the replacement ratio ρ . Finally, in the Discussion we will propose more general policy considerations in the light of previous comparative statics exercises.

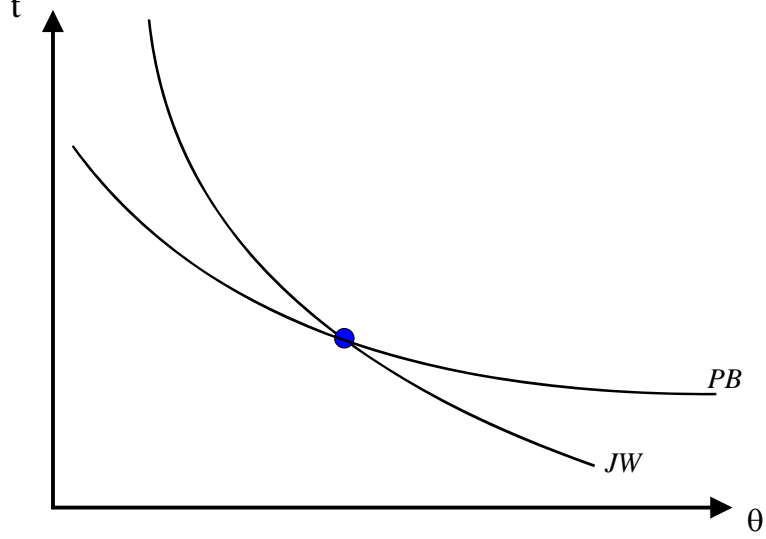
4.1 Equilibrium

The steady state equilibrium is defined as a vector (w, θ, u, t) that solves the system of equations (24), (29), (3) and (31).

Equating equation (24) with equation (29) we obtain the following relationship:

²Since in our model, the mark-up depends only on demand elasticity σ (i.e. a preference parameter), this procedure could be questionable. However, our results could also be obtained introducing entry costs, assuming demand elasticity as an increasing function of the number of firms (i.e. in a Hotelling fashion) and making comparative statics directly on entry costs. In the latter case, the variation of the mark-up is obtained indirectly from the variation of the entry costs, which affect the equilibrium number of firms and, as a further step, the demand elasticity. This is the way followed by Blanchard and Giavazzi (2003).

FIGURE 7



$$\frac{1}{1+\mu} - \frac{(r+s)c}{m(\theta)} = \frac{(1-\beta)b}{(1-t)[1-(1-\beta)\rho]} + \frac{\beta}{1-(1-\beta)\rho} \left[\frac{1}{1+\mu} + c\theta \right] \quad (32)$$

which gives the pairs (t, θ) such that the labor market is in equilibrium. Equation (32) states a decreasing relationship between tax rate t and labor market tightness θ . To see this, let us start from an initial situation where the labor market is in equilibrium for a given value of the tax rate t . Higher t increases the worker's option value (by reduction of the net wage) leading firms to reduce the number of vacancies and, in this way, diminishing the equilibrium value of θ .

Equation (31) and (32) are a self contained block that gives the pairs (t, θ) such that the labor market is in equilibrium and the Government budget is in balance (see figure 7).³ Because equation (3) depends only on labor market tightness we have the equilibrium value of the unemployment rate u . Finally, substituting the equilibrium value of θ either into the job creation condition (24) or into the wage equation (29), we get the equilibrium value of the gross wage.

In order to determine the equilibrium size of the firm we have to impose the zero profit condition. Given equation (17) in symmetric equilibrium, equating it to zero and using the production function (16) we get:

³In principle, the PB curve could be steeper or flatter than the JW curve. We focus on the latter situation since it guarantees a stable equilibrium.

$$y - w(f + y) - cv = 0 \quad (33)$$

Let us consider the law of motion of the firm's output given by $\dot{y} = m(\theta)v - s(f + y)$; solving for v in steady state equilibrium ($\dot{y} = 0$) we have:

$$v = \frac{s(f + y)}{m(\theta)} \quad (34)$$

Substituting the latter equation into zero profit condition (33) and solving by y we obtain the equilibrium firm size:

$$y = \frac{f[m(\theta)w^* + sc]}{(1 - w^*)m(\theta) - sc} \quad (35)$$

where w^* is the equilibrium wage.

We can now determine the equilibrium number of active firms in symmetric equilibrium. Total labor requirement is nl , where n is the number of firms. Equating this to the employment $1 - u$ and solving for n we get:

$$n = \frac{1 - u}{l} \quad (36)$$

Making use of the Beveridge curve (3), the production function (16) and the equation (35), we obtain that the firms' equilibrium number n must satisfy the following condition:

$$n = \frac{\theta[(1 - w^*)m(\theta) - sc]}{f(2 - w^*)[s + \theta m(\theta)]} \quad (37)$$

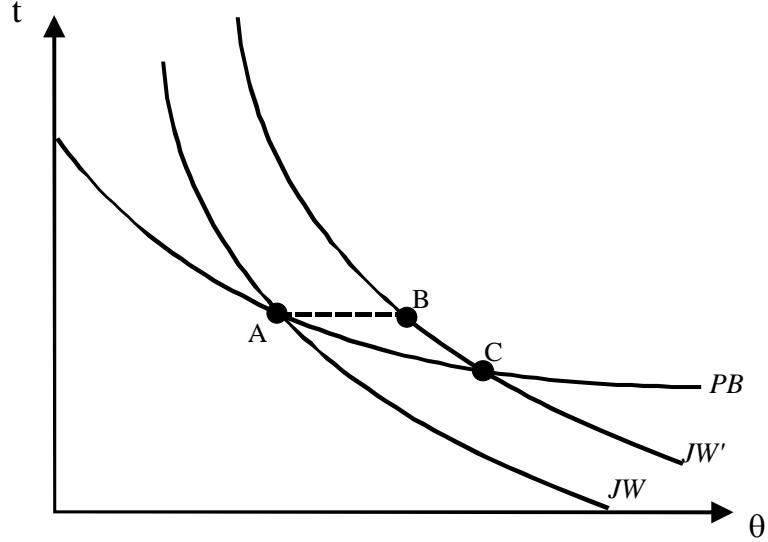
4.2 Comparative statics

In this Section we performe some comparative statics analysis, in order to assess the effects of changes in mark-up μ and replacement ratio ρ .

Let consider the effect of a decrease in the mark-up μ .⁴ Looking at figure 8, we see that the JW curve moves up to the right. Given t , we have that both the wage that firms are willing to pay (*via* the job creation condition) and the wage required by the workers (*via* the wage equation) increase; however, the latter increase is proportionally lower than the former: hence, given t , the "demand side" wage is higher than the "supply side" one. As a consequence, firms will open a higher number of vacancies, which in turn implies a higher level of θ : higher θ implies a lower equilibrium unemployment rate u (*via* the Beveridge curve). In terms of figure 8, this implies a shift from equilibrium A to point B , where the labor market is in

⁴We follow Blanchard and Giavazzi (2003) in assuming that "To interpret an increase in σ as the result of deregulation, one should think of our specification of utility as a reduced form reflecting higher substitutability among products for whatever reason' (p. 885).

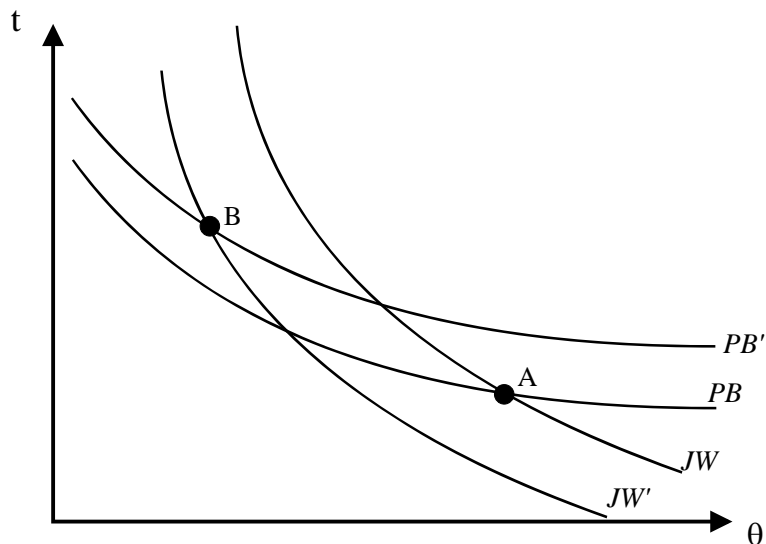
FIGURE 8



equilibrium (point B is on the JW curve) but the public budget is in surplus (because of the lower level of unemployment). Given ρ , lower tax rate t is required in order to balance the Government budget. The tax rate reduction produces feedback on the bargained wage because the workers will perceive a higher net wage and will claim a lower gross wage, with a further positive effect on θ (given the wage offered by the firm). The final result of this process will be a higher equilibrium value of θ and a lower equilibrium value of t (point C in figure 8). We can also derive the effects on the equilibrium firm size and number of firms: from equations (35) and (37), the firm size decreases and the number of firms increases.

Consider now an increase in replacement ratio ρ . This implies a shift down to the left of the JW curve and up to the right of the PB curve. The former effect stems from the fact that, given t , an increase in ρ enhances the option value of the worker who will claim a higher gross wage. Consequently, given the negative effect on profit, the firms reduce vacancies. This leads to a higher level of wage w and a lower level of tightness θ . The shift of the PB curve is due to the fact that, given θ , an increase in ρ requires a higher tax rate t in order to balance the public budget. A corresponding process with respect to the one discussed above with regard to an increase in σ , leads to a lower equilibrium value of θ and a higher equilibrium tax rate t . Looking at figure 9, we move from equilibrium A to equilibrium B . From equations (35) and (37), the firm size increases and the number of firms decreases.

FIGURE 9



4.3 Discussion

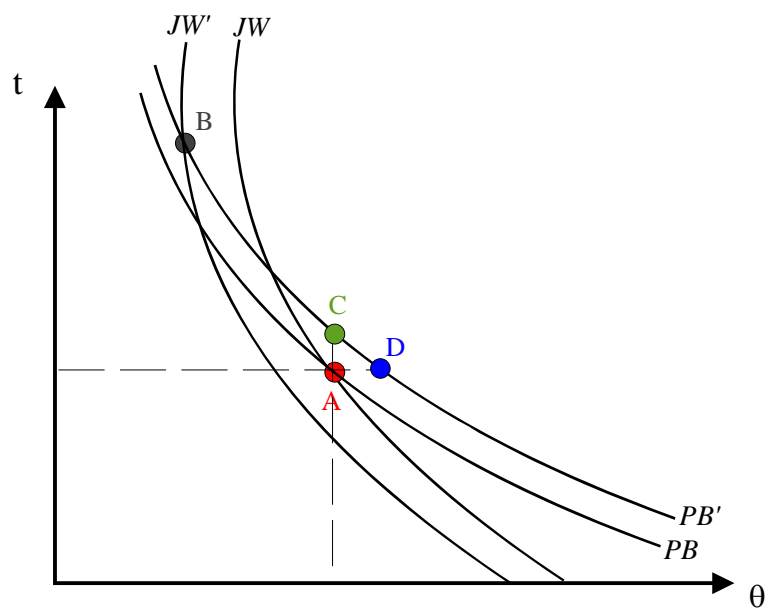
Our framework suggests interesting implications for policy. Looking at the experience of some European countries (especially Italy and Spain), the late Nineties were the years of increasing labor market flexibility, with the introduction of atypical labor contracts and change in employment relationships.⁵

As already argued in the Introduction, labor market flexibility brings about social costs related to the higher turnover. In the particular case of Italy this has raised a policy debate on the possibility of introducing some support for unemployed workers, in a country where the replacement ratio is somewhat low among the *OECD* countries. The results of our model show that the introduction of an unemployment benefit, which produces negative effects on labor market performance, can be conveniently joined with liberalization policies able to increase competition in goods markets sector.

The fact is that subsequent to the labor market flexibilization policies of the Nineties the economy reached equilibrium *A* in figure 10. Our finding is that if we increase the replacement ratio (i.e. per-capita unemployment benefits) letting the tax rate adjust freely, what we get is equilibrium *B*, which is characterized by higher unemployment and a higher tax rate. However, if combining the increase in unemployment benefits with liberalization poli-

⁵In terms of our model, these kinds of labor market reforms can be viewed as reduction of the workers' bargaining power β . The effect of a reduction in β has the same qualitative effect on both the equilibrium value of the tax rate and the unemployment rate as an increase in goods market competition.

FIGURE 10



cies, we could possibly reach equilibrium C , keeping the tax rate constant. Alternatively, we could reach an equilibrium D with the same equilibrium unemployment rate as in equilibrium A and with tax rates slightly higher.

5 Conclusions

In this paper we have analyzed the policy implications in a model with frictions in the labor market and monopolistic competition in the goods market, when the Government has a balanced budget constraint. We have made comparative statics analyzing the effects on equilibrium of a change in the degree of product market competition and a change in the replacement ratio. It is found that: *a)* more competition in the goods market leads to a lower equilibrium unemployment and, given the replacement ratio, a lower tax rate; *b)* higher unemployment benefits make the labor market tighter with a negative effect on equilibrium unemployment and require a higher tax rate in order to balance the public budget. To summarize, increasing competition in the goods market has a positive effect on the Government budget and on equilibrium unemployment; the public budget surplus can finance either higher unemployment benefits or tax expenditure. In the former case, the cost is represented by a lower increase in aggregate employment than in the latter case.

In this paper we do not tackle some interesting issues that could be an object for future research. First of all, the optimal income taxation impli-

cations should be investigated. Secondly, it would be interesting to evaluate the redistributive effects deriving from comparative static analysis. The issue could be treated in two respects: the redistributive effects between labor and entrepreneurs' income and, introducing heterogeneity, the redistributive effects among different types of agents. Finally, modelling progressive taxation could be able to enrich the model. These issues are at the top of our agenda for future research.

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