

Product Market Regulation, Firm Selection and Unemployment *

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Abstract

This paper analyzes the effect of Product Market Regulation (PMR) on unemployment in a search model with heterogeneous multiple-worker firms. In our setup, PMR modifies the distribution of firm productivities, thereby affecting the equilibrium rate of unemployment. We distinguish between PMR related to firms' startup costs and PMR that generates recurrent fixed costs. The latter type of PMR decreases the rate of unemployment through our novel *selection effect*, while they increase it through the conventional *competition effect*. In contrast, higher startup costs always raise the rate of unemployment. We propose econometric evidence consistent with the unemployment effect of sunk versus recurring PMR-induced costs.

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1 Introduction

Observers often blame institutional rigidities for the poor performance of European labor markets. An extensive recent literature focuses on determining which institutions matter. The original emphasis was on labor market flexibility; however, econometric cross-country studies fail to establish a robust link between the time behavior of unemployment rates and changes in labor market regulation. This is why attention has increasingly shifted to the identification of other important institutions. Product Market Regulation (PMR henceforth) quickly emerged as a natural candidate.¹

Empirical cross-country studies document a robust and significantly positive relationship between PMR and unemployment.² Theory links this finding to a *competition effect*: stronger barriers to entry discourage entrepreneurship, thereby allowing incumbent firms to enjoy higher market power. Consequently, firms find it optimal to restrict output which depresses labor demand and raises the rate of unemployment (Blanchard and Giavazzi, 2003). Ebell and Haefke (2006) introduce this feature into a dynamic search model of unemployment. With wage bargaining at the individual level, they find that more stringent PMR increases unemployment via the *competition effect*. However, there is a countervailing decrease in the overhiring externality. Hence, their analysis provides little support for a quantitatively strong PMR-unemployment nexus.

This paper attempts to reconcile evidence with theory by introducing firms with heterogeneous productivities. That hypothesis is supported by extensive empirical evidence substantiating the existence of significant and persistent productivity differences across firms.³ Firm heterogeneity introduces an additional *selection effect* whereby PMR modifies the support of the productivity distribution and consequently affects the level of employment. We find that aggregate labor demand is a positive function of the firms' average productivity because more efficient firms can afford higher recruitment costs. For a given wage level they post more vacancies, so that unemployment is lower when average productivity is higher.

In order to analyze this mechanism, we propose a dynamic equilibrium model with monopolistic competition in the goods market and search frictions in the labor market. To achieve maximum transparency on the novel elements of the model, the theoretical part of the paper

¹Blanchard (2005) discusses the recent history of ideas about the determinants of unemployment.

²See Bassanini and Duval (2006) for an extensive survey.

³See, for example, Cabral and Mata (2003), and in the context of international trade, Del Gatto et al. (2006).

focuses on the effect of PMR for firm selection rather than for market power. This allows to show that the *selection effect* arises from a different origin than the *competition effect* previously analyzed in the literature. As in the standard Mortensen-Pissarides framework, search frictions are captured by an aggregate matching function. An additional complication of the model is due to the fact that firms enjoy market power. Thus marginal revenues are a decreasing function of the number of employees. As explained in Bertola and Caballero (1994) and Stole and Zwiebel (1996a, 1996b), this generates an *over-employment effect* when wages are bargained at the individual level. Because of this additional mechanism, analyzing the problem of the firm in a stochastic environment quickly raises daunting difficulties.⁴ To make the model tractable, we assume that firm productivities remain constant over time. As shown by Ebell and Haefke (2006), this assumption allows one to solve the problem of the firm in closed form.

Our model differs from Ebell and Haefke (2006) in that it introduces firm heterogeneity. We embed search frictions and individual wage bargaining into Melitz's (2003) model of industry equilibrium with heterogeneous firms.⁵ As in Melitz (2003), firms are ex-ante identical, but differ ex-post with respect to their productivity. The timing of the model is such that firms learn about their productivity only after developing a new variety. They first face the decision on whether to incur the sunk cost of inventing a new variety and then, once uncertainty is resolved, whether to enter the market. The *selection effect* arises from the fact that only sufficiently productive firms will be active in equilibrium. Hence, two types of costs are important: (i) sunk *entry costs*, related to the introduction of new varieties, and (ii) period-by-period flow *fixed costs* associated to the production process and red tape.

We find that these two types of PMR have opposing effects on employment. On the one hand, higher *fixed costs* strengthen the *selection effect*, thereby increasing average productivity and hence employment. On the other hand, higher entry costs weaken the *selection effect* as competition between incumbent firms is lower. This allows inefficient producers to stay in the market. Hence, sunk *entry costs* increase unemployment whereas *fixed costs* lower it.

⁴See Bertola and Garibaldi (2001), Cahuc et al. (2004) and Koeniger and Prat (2006).

⁵Several authors discuss the role of labor market imperfections in Melitz's (2003). Egger and Kreickemeier (2006) introduce efficiency wages and focus on the effect of international trade on wage inequality. In their framework, unemployment is invariant to changes in PMR. More closely related to our work is Janiak (2006) who augments the Melitz model with Pissarides-type labor market frictions. His objective is to analyze the effect of trade liberalization on unemployment. Janiak assumes that aggregate productivity increases with the number of varieties. The resulting model may exhibit multiple equilibria (or none). In contrast, in our set-up, existence of a unique equilibrium is ensured without additional restrictions on the elasticity of substitution.

Following the theoretical analysis, we follow Blanchard and Giavazzi (2003) and allow firms' market power to depend on the number of competitors. We calibrate the model to the US economy and show that PMR affects unemployment outcomes mainly through the selection channel. This finding complements the work by Ebell and Haefke (2006) who show that, in a model without firm heterogeneity, changes in PMR lead to offsetting adjustments of the competition and over-employment effects.

Finally, we provide some evidence from cross-country regressions. Using data on administrative regulatory costs compiled by Conway et al. (2005), we find a significantly positive relationship between unemployment rates and regulatory startup costs. On the other hand, red-tape costs turn out to be non significant. More precisely, considering the partial derivatives of unemployment rates with respect to red-tape costs we uncover an inversely U-shaped pattern that is consistent with our theory.

The remainder of the paper is organized as follows. Section 2 introduces the theoretical setup, section 3 characterizes the simultaneous equilibrium on product and labor markets, section 4 calibrates the model towards U.S. data, section 5 provides some econometric cross-country evidence, and section 6 concludes.

2 The model

2.1 Setup

Final output producers. There is a single final consumption good, Y . Labor is the unique factor of production. It is inelastically supplied by a mass of worker-consumers that we normalize to unity without loss of generality and whose utility is linear in Y . Using a continuum of intermediate inputs, a large number of firms produce the final consumption good under conditions of perfect competition.

Denoting the quantity of such an input $q(\omega)$, we posit the following production function

$$Y = \left[M^{-(1-\rho)} \int_{\omega \in \Omega} q(\omega)^\rho d\omega \right]^{\frac{1}{\rho}}, \quad 0 < \rho < 1, \quad (1)$$

where the measure of the set Ω is the mass M of available intermediate inputs. The normalization by $M^{-(1-\rho)}$ implies that an increase in the variety of intermediate inputs does not improve the efficiency of the production process. This assumption is necessary to rule out scale effects that would generate a negative correlation between unemployment and the size of the economy.

Since empirical evidence does not document such a relationship, scale effects are not a desirable property of the model.⁶ Notice that, if we allowed ρ to be an increasing function of the number of producers, the production technology would be identical to the one considered in Blanchard and Giavazzi (2003). We will consider this extension in section 5.2, but until then we focus on the *selection effect* by neutralizing the potential interactions between market power and firm entry. The price index associated to (1) is

$$P = \left[\frac{1}{M} \int_{\omega \in \Omega} p(\omega)^{1-\sigma} d\omega \right]^{\frac{1}{1-\sigma}}, \quad (2)$$

where $\sigma \equiv 1/(1-\rho)$ denotes the elasticity of substitution between any two varieties of inputs, and $p(\omega)$ is the price of input ω . We choose the final output good as the numéraire good so that $P = 1$. Given this normalization, the profit maximizing quantities of intermediate inputs are given by

$$q(\omega) = \frac{Y}{M} p(\omega)^{-\sigma}. \quad (3)$$

Intermediate inputs producers. At the intermediate inputs level, a continuum of monopolistically competitive firms produce each a unique variety. Hence, we may index firms by ω . Firms differ with respect to their labor productivity $\varphi(\omega)$ so that the conditional labor demand of firm ω is given by $l(\omega) = q(\omega)/\varphi(\omega)$. Following Blanchard and Giavazzi (2003), we assume that firms incur two types of flow fixed costs: f_T , which denotes a minimum input required for positive production values and which is essentially a technology parameter, and f_R , which is related to administrative regulatory costs. These costs are identical across firms and are measured in terms of the final output good. Given that both types of costs have similar economic effects, we lump them together into a single parameter $f \equiv f_T + f_R$. Denoting $w(\omega)$ the wage rate of firm ω in terms of the *numéraire*, total production costs are

$$c(\omega) = w(\omega) \frac{q(\omega)}{\varphi(\omega)} + f. \quad (4)$$

Labor market. Search frictions impede trade in the labor market. Following the search-matching literature, we postulate that marginal recruitment costs are increasing at the aggregate level because of congestion externalities. From the point of view of the firm, however, the cost of recruiting a worker is constant. The aggregate matching function exhibits constant returns

⁶Neutralizing the scale effect has the additional advantage that it guarantees the existence of a unique equilibrium.

to scale so that the contact rates between firms and workers solely depend on the ratio θ of vacancies, v , to job seekers, u . Firms post vacancies which are filled at the rate $m(\theta)$. The vacancy filling rate $m(\theta)$ is a decreasing function of the tightness parameter θ . The cost of posting vacancies is proportional to the parameter c , so that increasing employment by Δ entails spending $\Delta(c/m(\theta))$ in recruitment costs. The adjustment cost function for labor is therefore linear and depends on aggregate conditions through $m(\theta)$.

2.2 Pricing behavior on product markets

Intermediate producers exit the market at the exogenous rate δ . Jobs are also destroyed because of match-specific shocks which occur at rate χ . Under the assumption that these two sources of job separation are independent, the actual rate of job separation is equal to $\delta + \chi$. When bargaining over the wage of a new worker, firms act as monopsonists. They take into account how the marginal worker affects the wages of workers already employed. The market value of an intermediate producer with productivity φ is therefore given by

$$\begin{aligned} J(l, \varphi) &\equiv \frac{\pi(l, \varphi)}{r + \delta} = \frac{p[q(l)]q(l) - w(l, \varphi)l - \left(\frac{c}{m(\theta)}\right)\chi l - f}{r + \delta} \\ &= \frac{\left(\frac{Y}{M}\right)^{\frac{1}{\sigma}}(\varphi l)^{\rho-1} - w(l, \varphi)l - \left(\frac{c}{m(\theta)}\right)\chi l - f}{r + \delta}, \end{aligned} \quad (5)$$

where $\pi(l, \varphi)$ is firm φ 's profits, r is the exogenous discount rate and the dependence of l on φ is understood. The second line takes into account the firm's production and demand functions. The asset value of a marginal worker is equal to

$$\frac{\partial J(l, \varphi)}{\partial l} = \frac{1}{r + \delta} \left[\rho \varphi \left(\frac{Y}{M}\right)^{\frac{1}{\sigma}} (\varphi l)^{\rho-1} - \left(\frac{c}{m(\theta)}\right)\chi - w(l, \varphi) - \frac{\partial w(l, \varphi)}{\partial l} l \right]. \quad (6)$$

The first term in the square brackets corresponds to marginal revenue, the second term to steady-state mobility costs, while the third and fourth terms give the marginal costs of expanding the labor force. The cost of the marginal worker differs from the wage since the firm takes into account the effect of additional employment on the wage of inframarginal workers. As explained in Bertola and Caballero (1994) and Stole and Zwiebel (1996a; 1996b), this will lead to "over-employment" relative to the benchmark case where the firm takes the wage as given.

Finally, notice that profit maximization implies that the firm sets the asset value of the marginal worker equal to the recruitment cost. Hence

$$p(l, \varphi) = \frac{1}{\rho \varphi} \left[w(l, \varphi) + \frac{\partial w(l, \varphi)}{\partial l} l + \left(\frac{c}{m(\theta)}\right)(r + \delta + \chi) \right], \quad (7)$$

where $p(l, \varphi) = \left(\frac{Y}{M}\right)^{\frac{1}{\sigma}} (\varphi l)^{\rho-1}$. Without search frictions and local monopsony power of the firm, marginal costs would just be w/φ . In the present case, this term is augmented by the *over-employment effect* and recruitment costs.

2.3 Wage bargaining

Let $E(\varphi)$ and U denote the asset values of a worker employed at a firm with productivity φ and of an unemployed worker, respectively. The advantage of holding a job over unemployment is equal to the difference between the wage rate and the opportunity cost of unemployment rU . The surplus from being employed by a firm with productivity φ is therefore equal to

$$E(\varphi) - U = \frac{w(l, \varphi) - rU}{r + \delta + \chi} . \quad (8)$$

The firm negotiates individually with each of its employees. The alternating offer game is analyzed in Stole and Zwiebel (1996a). They show that its equilibrium is given by the Nash-bargaining solution

$$(1 - \beta)(E(\varphi) - U) = \beta \left(\frac{\partial J(l, \varphi)}{\partial l} - V \right) , \quad (9)$$

where V is the value of an unfilled vacancy and $\beta \in [0, 1]$ is the bargaining power of the worker.⁷ Individual bargaining implies that each employee is treated as the marginal worker. This is why the value of the job is equal to the derivative of the firm's market value with respect to employment. In equilibrium, all profit opportunities are exploited and so firms post vacancies until $V = 0$. Reinserting (6) and (8) into (9), and solving for the first-order condition yields

$$w(l, \varphi) = \beta \rho \varphi p(l, \varphi) + (1 - \beta)rU - \beta \frac{\partial w(l, \varphi)}{\partial l} l , \quad (10)$$

The first and second terms of the above expression is the Nash-weighted average of the worker's outside option and average revenue per worker of the firm. The third term reflects the fact that (as long as $\sigma < \infty$), the marginal revenue being bargained upon declines as more and more workers are employed. Equation (10) is a linear differential equation in l whose solution reads⁸

$$w(l, \varphi) = (1 - \beta)rU + \beta \varphi p(l, \varphi) \left(\frac{\sigma - 1}{\sigma - \beta} \right) .$$

⁷One can endogenize the bargaining power by explicitly modeling the bargaining game. For instance, in Binmore et al. (1986), β is equal to the ratio of the firm's and worker's discount factors.

⁸See Ebell and Haefke (2006) for a detailed solution of this ODE by the method of variation of parameters. Note also the similarity of expression (10) to equation (17) in Bertola and Caballero (1994).

Reinserting this expression into (7), we obtain

$$w(l, \varphi) = \varphi p(l, \varphi) \left(\frac{\sigma - 1}{\sigma - \beta} \right) - (r + \delta + \chi) \frac{c}{m(\theta)}. \quad (11)$$

This equation is the counterpart of the *Job Creation* condition in the standard search-matching model. Combining the two previous equations, we find that wages are constant across firms. Thus we drop the dependence of w on both l and φ in the remainder of the paper. The equilibrium wage is equal to

$$w = rU + \left(\frac{\beta}{1 - \beta} \right) (r + \delta + \chi) \frac{c}{m(\theta)}. \quad (12)$$

This equation is the counterpart of the *Wage Curve* in the standard search-matching model. Let us mention for future reference that equations (11) and (12) imply that prices are a linear function of φ , so that $p(\varphi_1)\varphi_1 = p(\varphi_2)\varphi_2$.

2.4 Firm entry and exit

The timing of the entry process is in two stages. First, prospective entrants have to develop a new intermediate good variety. By sinking f_I units of the final output good, they acquire a new blueprint with certainty. To set up shop, firms have to pay f_{ER} in regulatory startup costs. Since their respective roles in the model are identical, we set the total costs of entry $f_E \equiv f_I + f_R$. Only after firms have sunk f_E , do they discover their productivity levels. Hence, sinking f_E gives access to three things: a blueprint, a regulatory permit to start operations, and a productivity draw.

As in Melitz (2003), the firm-specific value of φ is constant through time and uncorrelated to the destruction rate δ , which is identical across firms. Firms draw their productivity from a sampling distribution with c.d.f. $G(\varphi)$ and p.d.f. $g(\varphi)$. This distribution is known to prospective entrants. Free entry therefore requires that *expected* profits be zero. Since f_E is sunk, firms which draw a realization of φ too low to generate sufficient revenue to cover fixed costs f will not find it optimal to start production at all. This gives a second relation, the *zero cutoff profit* (ZCP) condition, which ensures that the marginal entrant makes zero profits. Before turning to an analysis of these conditions, we need to define the average productivity level.

Let $\mu(\varphi)$ denote the ex-post distribution of productivity among *active* firms, i.e., conditional on a productivity draw that makes entry into the market worthwhile. Let φ^* denote the productivity of the marginal entrant. Following Melitz (2003), we define an average productivity

level $\tilde{\varphi}$, which has the property that the quantity $q(\tilde{\varphi})$ is equal to average output per firm Y/M . Given the demand function (3), this choice implies $p(\tilde{\varphi}) = P = 1$. Using the proportionality of optimal prices to simplify the aggregate price index given in (2), we obtain an explicit expression for the average productivity level

$$\tilde{\varphi}(\varphi^*) \equiv \left[\int_0^{+\infty} \varphi^{\sigma-1} \mu(\varphi) d\varphi \right]^{\frac{1}{\sigma-1}} = \left[\frac{\int_{\varphi^*}^{+\infty} \varphi^{\sigma-1} g(\varphi) d\varphi}{1 - G(\varphi^*)} \right]^{\frac{1}{\sigma-1}}. \quad (13)$$

where the second equality follows from the definition of $\mu(\varphi)$. The above expression gives a mechanical link between the average productivity $\tilde{\varphi}$ and the cutoff productivity φ^* . Notice that $d\tilde{\varphi}(\varphi^*)/d\varphi^* > 0$ iff $\tilde{\varphi} > \varphi^*$, which is a regularity assumption that always holds in the present model. We may now use the definition of $\tilde{\varphi}$ to analyze the *zero cutoff profit* and *free entry* conditions.⁹

The market value of firms with a productivity above φ^* is positive. At the margin, the cutoff productivity φ^* is such that

$$\frac{\pi(\varphi^*)}{r + \delta} - \frac{cl(\varphi^*)}{m(\theta)} = 0, \quad (14)$$

since $\pi(\varphi^*)$ is the stream of operating profits and $l(\varphi^*)c/m(\theta)$ is the firm's expected recruitment costs at the time of entry into the market. Given the demand function (3) and the equilibrium wage rate w paid by all firms, the operating profit of a firm with productivity φ is

$$\pi(\varphi) = l(\varphi) \left(\tilde{\varphi} - w - \left(\frac{c}{m(\theta)} \right) \chi \right) - f, \quad (15)$$

The proportionality of prices enables us to relate the operating profits of the cutoff firm φ^* and of the average firm $\tilde{\varphi}$

$$\frac{\pi(\tilde{\varphi}) + f}{\pi(\varphi^*) + f} = \frac{l(\tilde{\varphi})}{l(\varphi^*)} = \left(\frac{\tilde{\varphi}}{\varphi^*} \right)^{\sigma-1},$$

Reinserting this expression into (14) yields the *zero cutoff profit* (ZCP) condition

$$\pi(\tilde{\varphi}) = (r + \delta) \left(\frac{c}{m(\theta)} \right) l(\tilde{\varphi}) + f \left(\left(\frac{\tilde{\varphi}}{\varphi^*} \right)^{\sigma-1} - 1 \right). \quad (\text{ZCP})$$

The *free entry* condition (FE) ensures that the entry costs f_E match the expected discounted stream of profits of firms participating in the entry stage match. Thus free entry is satisfied

⁹Note that the model features pure rents in equilibrium as firms with $\varphi > \varphi^*$ will make strictly positive profits. These profits are completely absorbed *in expectations* by the costs of entry paid by firms that end up with productivity levels $\varphi < \varphi^*$

when

$$f_E = \int_{\varphi^*}^{+\infty} \left(\frac{\pi(\varphi)}{r + \delta} - \frac{cl(\varphi)}{m(\theta)} \right) g(\varphi) d\varphi = (1 - G(\varphi^*)) \left(\frac{\pi(\tilde{\varphi})}{r + \delta} - l(\tilde{\varphi}) \left(\frac{c}{m(\theta)} \right) \right) . \quad (FE)$$

Combining (ZCP) and (FE) we find that in equilibrium

$$\left(\frac{\tilde{\varphi}}{\varphi^*} \right)^{\sigma-1} = (r + \delta) \frac{f_E/f}{1 - G(\varphi^*)} + 1 . \quad (16)$$

This condition is similar to equation (12) in Melitz (2003). It implies that, given the average productivity $\tilde{\varphi}$, there exists a unique cutoff productivity φ^* such that (FE) and (ZCP) are simultaneously satisfied. One can now use the definition of the average productivity given in (13) and combine it with (16) to jointly determine $\tilde{\varphi}$ and φ^* .

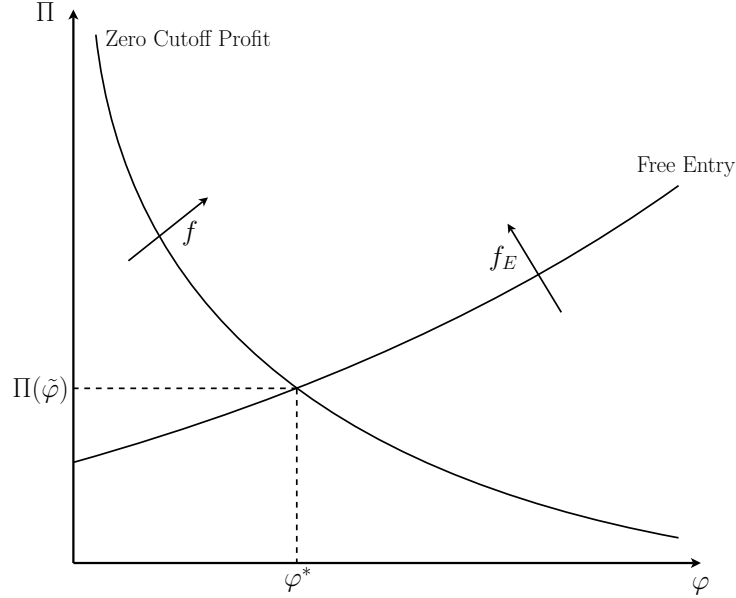


Figure 1: Equilibrium threshold productivity

The cut-off productivity is independent of the labor market tightness. On the other hand, it directly depends on both entry and fixed costs. Figure 1 plots the equilibrium in $\{\tilde{\varphi}, \pi(\tilde{\varphi})\}$ space. The *free entry* condition shifts up as entry costs increase. The new equilibrium moves along the downward-sloping (ZCP) locus so that $\tilde{\varphi}$ decreases. Symmetrically, higher fixed costs of production raise the (ZCP) condition. But this has an opposite effect on $\tilde{\varphi}$ since the (FE) locus is weakly increasing.¹⁰ Hence, fixed costs of production increase the average productivity

¹⁰When the sampling distribution is Pareto, as in section 5, the (FE) locus is actually horizontal. This, however, does not change the qualitative adjustments analyzed in this paragraph.

while entry costs decrease it.

The *selection effect* of fixed costs is quite intuitive: they reduce profits so that firms with a low productivity are forced to exit the market. The adverse *selection effect* of entry costs arises because of a reduction in the competition between firms. The higher the entry costs, the less attractive it is for firms to enter the market. Once the entry costs are sunk, however, barriers to entry alleviate the competition between incumbent firms and so allows inefficient producers to remain in operation. The following section shows that these opposite effects on $\tilde{\varphi}$ have unambiguous implications for the rate of unemployment: the higher the fixed costs and the lower the entry costs, the smaller is the equilibrium rate of unemployment.

3 Equilibrium

We have the following set of equilibrium conditions. First, the definition of the average productivity given in (13) together with (16) determines $\tilde{\varphi}$ and φ^* as a function of exogenous parameters only. Given $\tilde{\varphi}$, the wage and job creation curves displayed in (11) and (12) can be solved jointly to yield equilibrium values of the wage rate w and labor market tightness θ . In order to express the equilibrium tightness as a function of the fundamental parameters, we decompose the asset equations for E and U

$$\begin{aligned} rU &= b + \theta m(\theta) \int_{\varphi^*}^{+\infty} (E(\varphi) - U) \mu(\varphi) d\varphi \\ rE(\varphi) &= w + (\delta + \chi)(U - E(\varphi)) , \end{aligned}$$

where b is the flow value of non market activity. Combining these two equations and noticing that $\partial J(l, \varphi) / \partial l = c/m(\theta)$, we can solve for the opportunity cost of employment

$$rU = b + \left(\frac{\beta}{1-\beta} \right) c\theta .$$

Reinserting that latter expression into (11) and (12), due to our normalization $p(\varphi)\varphi = \tilde{\varphi}$, the job creation curve simplifies further so that we obtain

$$\begin{aligned} W : \quad w &= b + \left(\frac{\beta}{1-\beta} \right) c\theta + \left(\frac{\beta}{1-\beta} \right) (r + \delta + \chi) \frac{c}{m(\theta)} \\ JC : \quad w &= \tilde{\varphi} \left(\frac{\sigma-1}{\sigma-\beta} \right) - (r + \delta + \chi) \frac{c}{m(\theta)} . \end{aligned} \tag{17}$$

The *Job Creation (JC)* condition is a decreasing function of θ whereas the *Wage (W)* curve is increasing. Thus, if $b < \left(\frac{\sigma-1}{\sigma-\beta} \right) \int_0^\infty \varphi dG(\varphi)$, the model has a unique equilibrium.¹¹ Figure

¹¹Given that $\tilde{\varphi} > \int_0^\infty \varphi dG(\varphi)$, the existence condition proposed in the main text is sufficient but not necessary.

2 shows how those two curves pin down the equilibrium value of θ . Once θ is known, the unemployment rate can be solved for via the standard Beveridge curve

$$u = \frac{\delta + \chi}{\delta + \chi + \theta m(\theta)} . \quad (18)$$

The JC curve provides a relationship between average productivity and the wage rate, thereby allowing changes in the composition of firms to affect the unemployment rate. A higher average productivity $\tilde{\varphi}$ shifts the JC curve up and leaves the W curve unchanged.¹² It follows that $\tilde{\varphi}$ raises θ and so lowers the rate of unemployment. The economics behind this finding is intuitive: as the average productivity increases, active firms post more vacancies¹³ and the equilibrium labor market tightness increases.

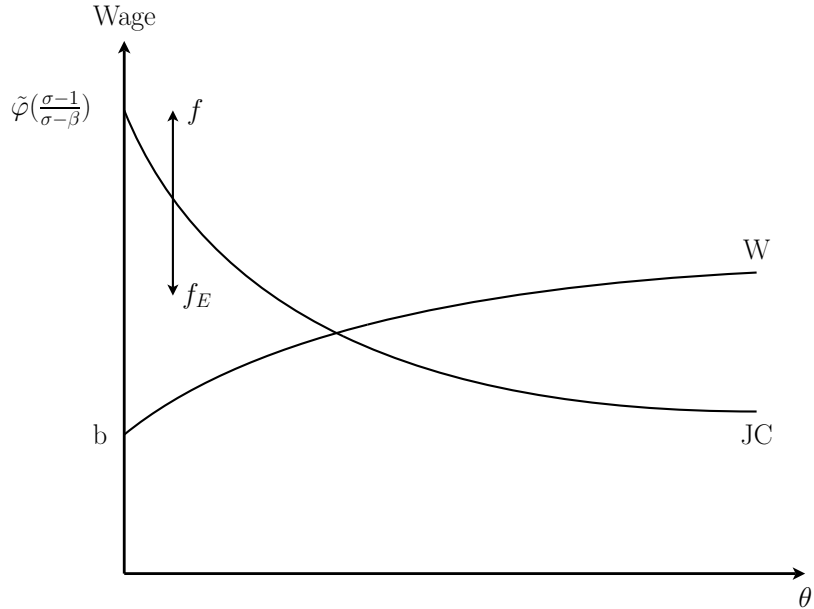


Figure 2: Equilibrium labor market tightness.

On the other hand, the labor share of aggregate output does not directly depend on the

¹²This discussion and Figure 2 make it clear that the results are not driven by our modelization of the bargaining process. One could derive a qualitatively similar impact of PMR by using the large-firm model of Pissarides (2000) or even more directly by taking wages as exogenous. The crucial feature is that the Wage Curve does not shift upward with $\tilde{\varphi}$. This would not be true if wages were directly indexed to the firm's idiosyncratic productivity, as in the *fair wage* model analyzed by Egger and Kreickemeier (2006).

¹³Notice that this mechanism is similar to the effect of an increase in the match productivity in the standard search-matching model (see Pissarides, 2000; page 20). Yet, it does not lead to the same undesirable negative correlation between growth and unemployment.

firms' composition. To see this, multiply both sides of (W) by $(1 - u)$. Recognizing that $\tilde{\varphi}(1 - u) = Y$, we find that the sum of wage payments equals a constant share, $(\sigma - \beta) / (\sigma - 1)$, of total revenues net of recruitment costs. When workers have no bargaining power, the labor share is equal to $(\sigma - 1) / \sigma = \rho$ as in the model without search frictions.

We close the characterization of the equilibrium by deriving the equilibrium mass of operating firms. First, we use the (ZCP) condition to solve for the average value of employment. Reinserting the expression of firm's profits (15) into (14), we obtain

$$l(\varphi^*) \left(\tilde{\varphi} - w - (r + \delta + \chi) \frac{c}{m(\theta)} \right) = f.$$

Inserting the (JC) condition and recognizing that $l(\varphi) = (\varphi / \varphi^*)^{\sigma-1} l(\varphi^*)$, we find

$$l(\varphi) = \left(\frac{\varphi}{\varphi^*} \right)^{\sigma-1} \left(\frac{f}{\tilde{\varphi}} \right) \left(\frac{\sigma - \beta}{1 - \beta} \right). \quad (19)$$

Finally, the mass of operating firms follows from the labor market equilibrium condition $ml(\tilde{\varphi}) = 1 - u$.

4 Quantitative analysis

In this section, we parametrize the model to match the statistics of interest for the U.S. economy. Then we perform comparative statics to analyze the effect of PMR on the rate of unemployment. Finally we extend the production technology for the final good so that inputs diversity increases the elasticity of substitution. This general specification allows us to simulate the interactions between the competition and selection effects.

4.1 Baseline calibration

Productivity distribution. We assume that firms sample their productivity from a Pareto distribution, so that

$$G(\varphi) = 1 - \left(\frac{\bar{\varphi}}{\varphi} \right)^\gamma.$$

The shape parameter $\gamma > 0$ measures the rate of decay of the sampling distribution and $\bar{\varphi} > 0$ is the minimum possible value of φ . This parametric assumption is standard in the literature on heterogeneous firms. It is justified by the observation that the log-density of firms' log-sizes

is well approximated by an affine function. Reinserting the expression of $G(\varphi)$ into (13) yields

$$\tilde{\varphi} = \left(\frac{\gamma}{\gamma + 1 - \sigma} \right)^{\frac{1}{\sigma-1}} \varphi^*. \quad (20)$$

As expected, the average productivity $\tilde{\varphi}$ is an increasing function of the cut-off productivity φ^* . Notice that this expression implies that, for the the average productivity to be bounded, the rate of decay γ has to be higher than $\sigma - 1$. The shape parameter γ is inversely related to the degree of productivity dispersion and so to the importance of firm heterogeneity. Clearly, a higher degree of dispersion (lower γ) strengthens the effect of truncation on average productivity. Using (20) to simplify the equilibrium condition (16), we obtain

$$\varphi^* = \left(\left(\frac{\sigma - 1}{\gamma + 1 - \sigma} \right) \left(\frac{1}{r + \delta} \right) \frac{f}{f_E} \right)^{\frac{1}{\gamma}} \bar{\varphi}.$$

By definition, φ^* has to be greater than $\bar{\varphi}$, so that the term on the right-hand side must be greater than one. For reasons explained before, φ^* is increasing in f and decreasing in f_E . The effect of f/f_E on average productivity is larger the higher the elasticity of substitution σ . The reason for this is that a higher σ corresponds to a lower markup, which makes it more difficult for low productivity firms to survive.

In order to parametrize $g(\varphi)$, we notice that the density of firm size $s(l)$ is given by¹⁴

$$s(l) = \mu(\varphi) \frac{d\varphi}{dl} = \frac{\gamma}{\varphi} \left(\frac{\varphi^*}{\varphi} \right)^{\gamma} \left(\frac{\varphi}{(\sigma - 1)l} \right) = \left(\frac{\gamma}{\sigma - 1} \right) \left(\frac{l^*}{l} \right)^{\frac{\gamma}{\sigma-1}} \left(\frac{1}{l} \right).$$

Thus employment levels are also Pareto distributed with a rate of decay equal to: $\gamma/(\sigma - 1)$. Empirical evidence suggests that the Zipf distribution accurately approximates the dispersion of firm sizes. This implies that the rate of decay should be close to one. We target the value estimated by Axtell (2001) using the 1997 data from the U.S. Census Bureau, so that $\gamma = 1.098(\sigma - 1)$.¹⁵

In order to pin down the value of the lower bound of the distribution, we notice that the absolute value of φ is intrinsically meaningless. Hence we can set, without loss of generality, $\bar{\varphi}$ so as to normalize to one the mean of the sampling distribution. Since

$$E[\varphi] = \int_{\bar{\varphi}}^{+\infty} \varphi g(\varphi) d\varphi = \left(\frac{\gamma}{\gamma - 1} \right) \bar{\varphi},$$

¹⁴The expression of $l(\varphi)$ follows from reinserting (20) into (19) to obtain

$$l(\varphi) = \varphi^{\sigma-1} \left(\frac{f}{\tilde{\varphi}^\sigma} \right) \left(\frac{\sigma - \beta}{1 - \beta} \right) \left(\frac{\gamma}{\gamma + 1 - \sigma} \right).$$

¹⁵We use the estimate in Axtell (2001) for the restricted sample without self-employed workers.

it follows that $\bar{\varphi} = \left(\frac{\gamma-1}{\gamma}\right)$.

Matching function. We normalize the time period to one year. The matching function is assumed to be Cobb-Douglas

$$m(\theta) = m_0 \theta^{-\alpha} . \quad (21)$$

We follow the standard practice in the search-matching literature and set the elasticity parameter α to 0.5. In the absence of well-established estimates, we set the bargaining power $\beta = \alpha$.¹⁶

To calibrate the scale parameter m_0 , we use empirical estimates of the job finding rate and labor market tightness. Given the CRS property of the matching function, the equilibrium tightness must be equal to the ratio of these two rates. Shimer (2005) estimates the monthly rate at which workers find a job to be equal to 0.45. Hall (2005) finds an average ratio of vacancies to unemployed workers of 0.539 over the period going from 2000 to 2002. Accordingly, we match an equilibrium tightness of 0.5 by setting the monthly job filling rate to 0.9. Reinserting these values into (21), we find that $m_0 = 7.63$.

Separation shocks. Job separations occur either because the firm leaves the market or because the match itself is destroyed. We consider that the first type of shock arrives at a Poisson rate of 0.11 per year. This implies that the annual gross rate of firm turnover is equal to 22%, as suggested by the estimates in Bartelsman et al. (2004). The match-specific shocks account for the job separations which are left unexplained by the firm-specific shock. Given that Shimer (2005) estimates the monthly rate of job separation to be 0.034, it follows that the rate of arrival of match-specific shock χ should be equal to 0.298 per year.

Elasticity of substitution. We use the implied mark-up to parametrize the elasticity of substitution σ . There exists some disagreement in the empirical literature about the actual value of the aggregate mark-up. Most of the estimates lie between 5% and 15%. We choose a conservative number and target an equilibrium mark-up of 5%. This value accords well with the estimates in Martins *et al.* (1996) and with the evidence discussed in Rotemberg and Woodford (1995) according to which aggregate real profits are close to zero. In the model, the mark-up

¹⁶The equality of the bargaining power and matching function elasticity is known as the “Hosios condition” in the search-matching literature. But in our case, the overhiring externality implies that the “Hosios condition” is not sufficient to ensure that the allocation is efficient.

Table 1: *Parameter Values*

<i>Parameter</i>	<i>Interpretation</i>	<i>Value</i>	<i>Source</i>
r	Discount rate	0.050	Standard
b	Value of non-market activity	0.400	Standard
α	Elasticity of Matching function	0.500	Standard
m_0	Scale of Matching function	7.630	Job finding rate=5.4%
β	Bargaining power	0.500	Standard
δ	Rate of firm exit	0.110	Firm turnover rate=22%
χ	Rate of match-specific separation	0.298	Job separation rate=0.4
σ	Elasticity of substitution	11.000	Mark-up=5%
γ	Decay of Prod. distribution	10.980	Decay of firm-size distribution=1.098
$\bar{\varphi}$	Support of Prod. distribution	0.908	Normalization of $E[\varphi]$ to 1
c	Cost of posting a vacancy	1.350	Recruitment costs=5.7 weekly wage
f_E	Entry costs	3.482	$\theta = 0.5$
f	Flow fixed costs	0.115	Average firm size = 21.8

Note: All parameter values and statistics are for yearly time period.

over marginal costs is equal to: $(\sigma - \beta) / (\sigma - 1)$. As $\beta = 0.5$, this implies that the elasticity of substitution $\sigma = 11$. This in turn yields a rate of decay $\gamma = 10.98$.

Cost parameters. As it is common in the real business cycle literature, we set the interest rate to 4% per year. In order to calibrate the value of non-market activity, we follow Shimer (2005) and set $b = 0.4$ to match an earnings replacement ratio close to 40%. The cost of posting a vacancy, c , is set 50% above the vacancy filing rate. Given that the equilibrium wage $w = 1.14$, this value yields an average recruitment cost of 5.7 weeks of workers' earnings, as suggested by empirical estimates.

We still have to determine the value of two parameters: the entry costs, f_E , and the flow fixed costs, f . We use their values to match the following two moments. Firstly, we ensure that the equilibrium tightness is $\theta = 0.5$. Secondly, we target an average firm size equal to 21.8 employees, as estimated by Axtell (2001). These two moments are perfectly matched for the set of parameters reported in Table 1.

The calibrated entry costs are equivalent to 3 years of income per capita. This figure can be

compared to the assessment by Ebell and Haefke (2006) that regulatory barriers to entry in the US amount to 0.6 month of yearly income. The parametrization therefore suggests that, in the US, technological innovation costs outweigh entry fees by an order of magnitude.

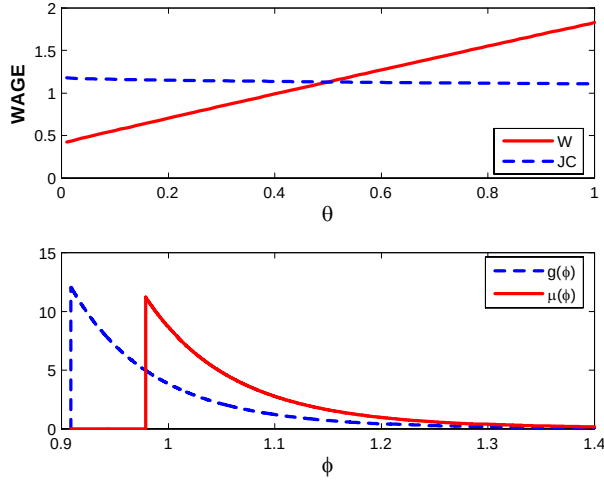


Figure 3: Equilibrium tightness and productivity distribution.

Results. The Job Creation and Wage curves are reported in the upper-panel of Figure 3. Given that vacancies are filled at a relatively high rate, the effect of θ on the average recruitment costs is quite low. This is why the JC curve is nearly horizontal. The impact of the labor market tightness is therefore almost entirely due to its positive effect on the workers' outside option.

The lower-panel of 3 reports the actual cross-sectional distribution $\mu(\varphi)$ against the sampling distribution $g(\varphi)$. A substantial share of innovations do not lead to market entry since 55.3% of the productivity draws are below the entry threshold $\varphi^* = 0.978$. This implies that the expected cost of a successful innovation is close to 6.8 years of income per capita. The figure might seem high at first sight, but one has to remember that the entry costs must offset the expected gains from drawing a productivity far in the tail of the firm distribution.

The impact of PMR. Figure 4 reports the equilibrium unemployment rate as a function of f_E and f . We use the estimates in Ebell and Haefke (2006) to determine the range of variation. More precisely, the lower bound is given by the entry costs in the US, while the upper bound of 8.6 months of yearly income per capita corresponds to the estimated entry fees in Greece. Due to the absence of estimated fixed costs, we vary them over the same range in order to ease the

interpretation of Figure 4.

As expected, the correlation between unemployment and innovation costs is positive. Increasing regulatory entry barriers to the level observed in Greece raises unemployment by slightly more than 0.1%. The relationship between unemployment and fixed costs is reported in the lower-panel of Figure 4. Their effect is of opposite sign and of larger magnitude than that of entry costs. To see why it is the case, consider equation (16). The equilibrium value of φ^* is a function of the ratio f/f_E . Given that the calibrated fixed costs are an order of magnitude smaller than the entry costs, it is clear that their marginal impact is higher.

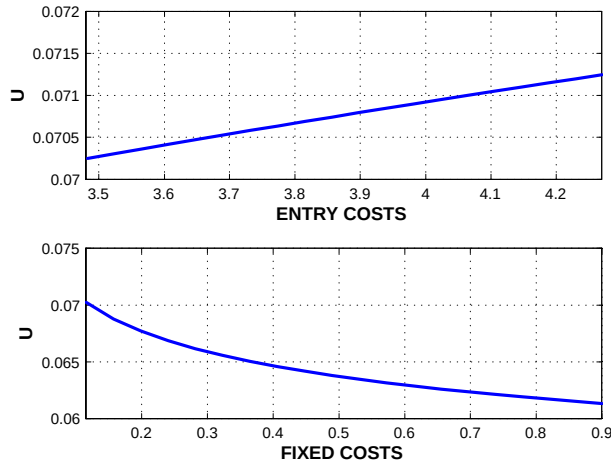


Figure 4: Selection effect of PMR on the unemployment rate.

4.2 Calibration with competition effect

The theoretical prediction that recurring fixed costs decrease unemployment seems to run counter to common sense which suggests that increasing red tap costs should eventually hurt labor demand. To reconcile that intuition with theory we reintroduce the *competition effect* considered in Blanchard and Giavazzi (2003). More precisely, we model the elasticity of substitution $\sigma(M)$ as an increasing function of the number of intermediate producers.

To solve the extended model, we can proceed as before. First of all, we fix the elasticity σ and compute the equilibrium mass of producers M . Given that a higher elasticity of substitution makes market entry less attractive, this yields a downward-sloping locus $M(\sigma)$. The equilibrium of the model is given by the point where this locus intersects the upward-sloping function $\sigma^{-1}(\sigma(M))$. Hence the uniqueness of the equilibrium is preserved.

The quantitative assessment of the *competition effect* is complicated by the lack of empirical estimates of the correlation between M and σ . Given this limitation, we choose a functional form for $\sigma(M)$ to pin down parameters without imposing further assumptions: $\sigma(M) = \lambda(1 - e^{-\bar{\sigma}M})$. To parametrize λ , we use the fact that the value of entry is bounded if: $\sigma(M) < 1 + \gamma$. We ensure that this requirement is satisfied as M goes to infinity by setting $\lambda = 1 + \gamma$. Then the value of $\bar{\sigma}$ follows from our parametrization where $\sigma(0.0426) = 11$, which implies that $\bar{\sigma} = 58.7$.

The upper-panel of Figure 5 reports the unemployment rate as a function of the entry costs when the elasticity of substitution is variable. The relationship is increasing. This should not be surprising because innovation costs lower the mass of producers. Thus the *competition effect* reinforces the *selection effect*. Yet, one can see by comparing Figure 4 with Figure 5 that the correlation is almost the same than in the model with constant mark-up. After decomposing the impact of f_E , we find that the *competition effect* is offset by the decrease in the *over hiring effect*. This finding is actually quite robust and analyzed in details by Ebell and Haefke (2006). They conclude that PMR deregulation cannot generate large improvement in labor market outcomes if bargaining occurs at the individual level. The simulation confirms their finding when attention is restricted to the relationship between competition and firm entry. But, in an economy with heterogeneous firms, the additional *selection effect* is likely to be relevant so that the benefits from lowering entry barriers need not be marginal.

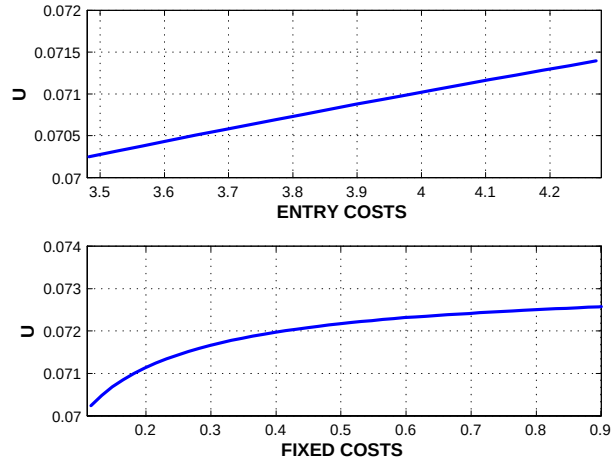


Figure 5: Effect of PMR with varying mark-up.

The impact of fixed costs is plotted in the lower-panel of Figure 5. As expected, the negative *competition effect* counteracts the *selection effect*. This is because fixed costs also reduce the number of producers and so increase the market power of incumbent firms. More surprising is

the size of the *competition effect*, as it reverses the sign of the correlation. To see formally why it is the case, we reinsert the expression of firm size into the definition of M to obtain

$$M = \left(\frac{\theta m(\theta)}{\delta + \theta m(\theta)} \right) \left(\frac{\gamma + 1 - \sigma}{\gamma} \right)^{\frac{1}{\sigma-1}} \left(\frac{1 - \beta}{\sigma - \beta} \right) \left(\frac{1}{f} \right).$$

An increase in f directly reduces the equilibrium number of producers. To the contrary, the entry costs f_E solely have an indirect impact due to the decrease in θ discussed in Section 3. This explains why the *competition effect* of fixed costs is much more noticeable. Another interesting feature, which will be substantiated by the empirical analysis in Section 6, is the concave profile of the relationship. As f increases, φ^* moves to the right of the productivity distribution. Since the distribution becomes thinner, a given change in the entry threshold φ^* is associated to a smaller decrease in M . As a result, the selection and competition effects eventually cancel out. Before closing this section, we would like to underline that the results of this simulation are mostly qualitative. In the absence of empirical data about the relationship between σ and M , quantitative predictions remain tentative. Indeed it is easy to modify the parametrization of $\sigma(M)$ so as to generate an inverted U-shaped relationship between f and u . We therefore believe that the main insight from the calibration of the extended model is that red tape costs and unemployment are likely to exhibit an ambiguous correlation, especially when the regulation is particularly stringent.

To take stock, we have found that: (i) entry barriers have a significantly positive effect on unemployment, (ii) red tape costs have an ambiguous effect on unemployment. Our analysis therefore calls for a detailed analysis of the underlying components of aggregate PMR indicators. The next section proposes some preliminary evidence in that direction.

5 Empirical analysis

In this section we present tentative cross-country evidence on the interplay between different components of PMR and unemployment that is consistent with our theoretical predictions. We do not attempt to structurally test our model which would require firm-level data.

A crucial problem in the existing empirical literature is the low time-coverage and reliability of data both on labor market institutions and on PMR. In the present context, these difficulties are augmented by the need to appropriately decompose PMR into two parts: one associated to *sunk setup costs* and the other related to *recurring fixed costs*. Moreover, we need to empirically

separate cross-country differences in administrative cost induced by PMR from differences in technology.

Data While several authors suggest aggregate indicators of PMR, we are aware of only one study that allows to address the cross-country variation in the incidence of different types of administrative PMR. Conway *et al.* (2005), at the OECD, have proposed a hierarchical system of subindicators that builds into an aggregate measure of PMR; see figure ?? for an illustration. The authors distinguish between *economic regulation*, such as antitrust policies, international trade and investment rules, or public ownership of firms, and *administrative regulation*, which the authors divide into two subindices: (i) regulatory and administrative opacity, and (ii) administrative burdens on startups. In our theoretical model, PMR is essentially wasteful, so we focus on administrative regulation. In particular, we proxy recurring (period-by-period) regulatory fixed costs by the subindex (i) and sunk regulatory startup costs to subindex (ii). We term the first measure $REDTAPE_{it}$; it reflects the “administrative burden of interacting with the government”, while the latter, $SETUP_{it}$, relates to the “administrative burdens on the creation of corporations” and “sole proprietor firms” (Conway et al., 2005, p. 9). The data is based on questionnaires, and probably offers the cleanest way to distinguish between different types of PMR. There are two major drawbacks. First, the that the data is available for 1998 and 2003 only. Second, the data can only be interpreted in terms of cross-country or time comparisons; the absolute value of the indicators are essentially meaningless.

Figure 7 sets 1998 indices of administrative startup costs and administrative red tape costs against their 2003 values. Clearly, over time, the situation has improved or stayed constant in all countries. Moreover, the cross-country variance has been fairly large to start with and has shrunk for startup costs but not for red tape costs. Figure 7 also suggests, that countries are pursuing vastly different policy approaches. For instance, Austria has relatively high and constant startup costs, while red tape costs are low and falling. Denmark has low startup costs but high red tape costs. Spain, starting from high values for both PMR indicators, has reduced both, but red tape by a higher proportion.

The World Bank Doing Business data base also provides information on the administrative cost of starting a business, but it is less helpful in addressing the extent of PMR induced red tape. Rather, it holds information on the ease of getting credit or on the efficiency of courts, which is not straightforwardly associated to PMR. Moreover, the data is available only for 2005 and 2006 (with the exception of startup costs, where comparable data can be constructed for 1999

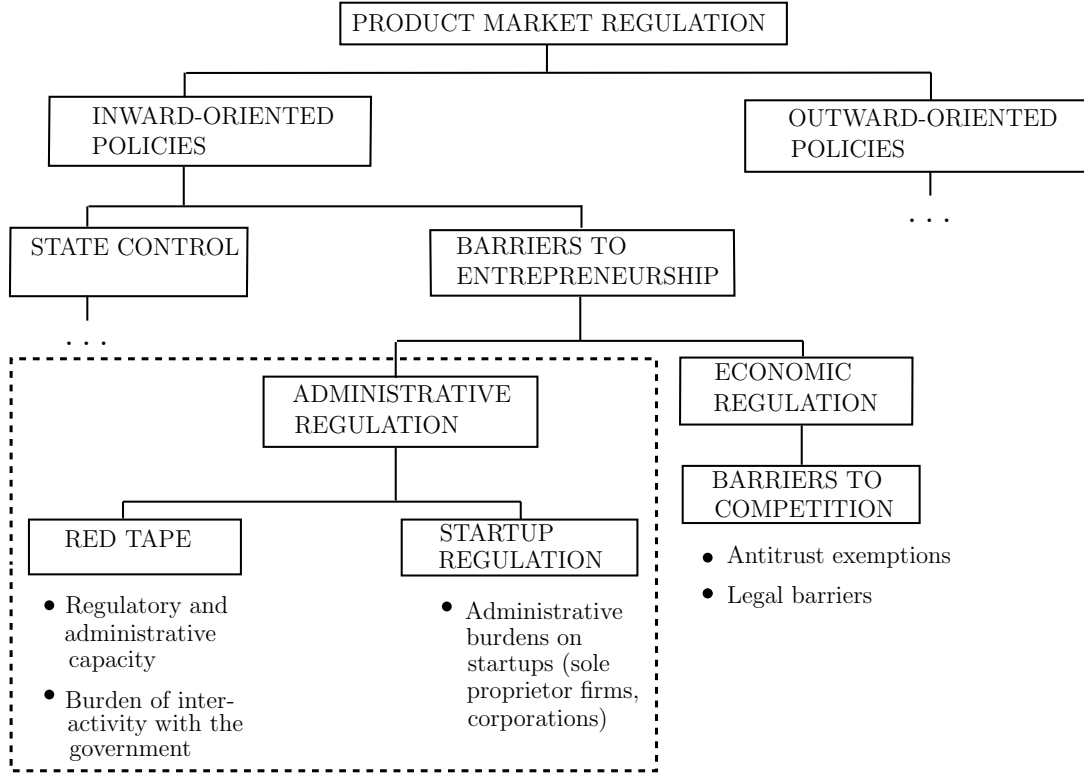
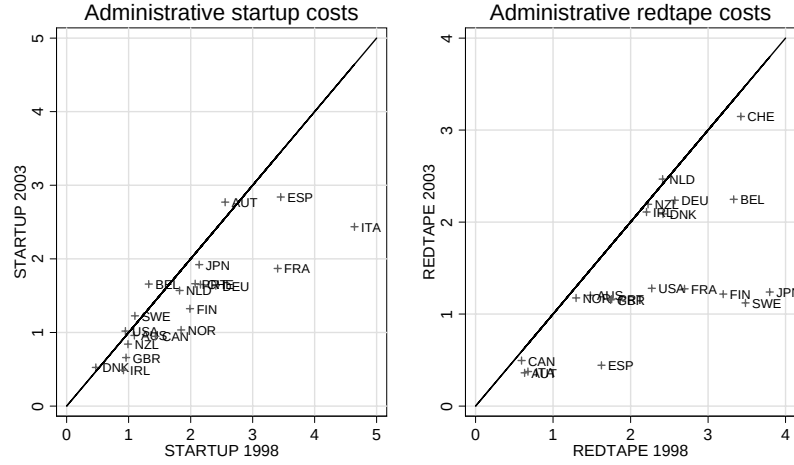


Figure 6: PMR Classification of Conway *et al.* (2005).

from Djankov *et al.* (2002)). Yet another source of information is Fraser Institute's Economic Freedom of the World data base. However, these data bases do not allow to disentangle in a clean way sunk and recurring costs associated to PMR and are therefore less appropriate for our analysis. We do, however, offer some robustness checks using those sources.

Information on labor market outcomes and institutions comes from Bassanini and Duval (2006). Those authors have compiled an extensive data set of different indicators of labor market policies, including variables on the incidence of minimum wages, collective bargaining, active labor market policies, employment protection legislation, and so on. Amongst other things, they provide country-specific estimates of the output gap, which allows to control for cyclical determinants of unemployment. That data is available for 20 high-income OECD countries.¹⁷

¹⁷Australia (AUS), Austria (AUT), Belgium (BEL), Canada (CAN), Switzerland (CHE), Germany (DEU), Denmark (DNK), Spain (ESP), Finland (FIN), France (FRA), United Kingdom (GBR), Ireland (IRL), Italy (ITA), Japan (JPN), Netherlands (NLD), Norway (NOR), New Zealand (NZL), Portugal (PRT), Sweden (SWE), and United States (USA).



Source: Conway et al. (2005)

Figure 7: Change over time in administrative PMR costs.

Table 2 reports summary statistics.¹⁸ Note that all regulatory variables are scaled such that higher values are associated with higher costs at the firm level. Table 2 shows that the average unemployment rate has fallen from 1998 to 2003; also the coefficient of variation is lower so that the improvement was relatively homogeneous. It is also transparent that both measures of administrative PMR have improved substantially.

Empirical strategy Bassanini and Duval (2006) provide an extensive survey of existing literature on the empirical explanation of cross-country unemployment patterns. We closely follow their empirical strategy and control for unobserved time-invariant cross-sectional heterogeneity by including country fixed effects.¹⁹ In particular, this strategy accounts for unobserved differences in the relative importance of technology induce sunk to recurring fixed costs, or in the parameters governing the size distribution of firms across countries. In all specifications, the dependent variable is the rate of unemployment in the economically active population (aged 15 to 64). Our results are robust to defining the rate of unemployment over the prime age labor market (24 to 54 years) or the total population.

¹⁸The full data and STATA batch files are available on demand.

¹⁹Given that we have only two years of data, the fixed effects model is identical to a specification in first differences.

Our main specification is

$$u_{it} = \bar{u} + \beta_1 SETUP_{it} + \beta_2 REDTAPE_{it} + X_{it}\gamma' + \nu_i + \nu_t + \varepsilon_{it}, \quad (22)$$

where $SETUP_{it}$ refers to administrative setup costs, $REDTAPE_{it}$ measures recurring administrative regulatory costs, X_{it} is a vector collecting labor market covariates, ν_i is a set of country dummies, ν_t is a time dummy (for 2003) and ε_{it} is an error term with the usual properties. We are mainly interested by estimates of β_1 and β_2 . We expect β_1 to be positive and β_2 to be ambiguous, see figure 5 in our calibration exercise.

Results We present our main empirical findings in table 2. All regressions use country fixed effects. Standard errors are corrected for clustering at the country level. Our most preferred (and most general) models are those shown in columns (5) and (7).

Our main findings are as follows.

(i) Evidence on the importance of *labor market institutions* is mixed. As in Bassanini and Duval (2006), employment protection legislation (*EPL*) has the wrong sign, but is anyway not statistically significant. Union density (*UNDENS*) does not turn out to exhibit a robust effect neither, as it becomes non-significant when an aggregate measure of PMR is introduced. This, too, is in line with earlier empirical research. Other potential variables describing labor market regulation, such as unemployment benefits, replacement rates, or active labor market policies only marginally improve the F-statistic and do neither exhibit robust sign patterns nor do they feature statistical significance. Since degrees of freedom are scarce in our setup, we do not use these variables. The unemployment effects of our variables of interest *SETUP* or *REDTAPE* do not depend on including or excluding those variables.

(ii) *Aggregate conditions* are important. We use a single variable, the output gap, to capture macroeconomic conditions. This variable turns out highly significant. A one standard deviation change in the output gap (i.e., of 1.3, see the summary statistics in the Appendix) leads to a change in the unemployment rate of 0.6 to 0.9 points, depending on the point estimates presented in columns (1) to (7).

(iii) *Product market regulation* is highly relevant. In column (2) we include the aggregate measure of product market regulation into the regression. Remember, that measure lumps together economic and administrative regulation. Our results suggest that a one standard deviation improvement (i.e., reduction) in that index reduces the unemployment rate on average

Table 2: *Baseline fixed-effects regression results*

Dependent variable: Unemployment rate in economically active population							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
AGGPMR		3.740*** (1.03)					
SETUP			1.634** (0.61)	1.674*** (0.41)	1.431*** (0.45)	0.985** (0.39)	0.711* (0.41)
REDTAPE				0.990** (0.47)	0.743 (0.50)	6.322*** (2.14)	6.042** (2.46)
REDTAPE ²						-1.170** (0.46)	-1.159** (0.52)
UNDENS	0.600*** (0.13)	0.118 (0.13)	0.420*** (0.093)		0.304*** (0.081)		0.277** (0.10)
EPL	-2.993 (1.91)	-0.423 (1.25)	-0.883 (1.72)		-0.390 (1.65)		-1.771 (1.38)
GAP	-0.427*** (0.14)	-0.703*** (0.18)	-0.507*** (0.15)	-0.518*** (0.17)	-0.562*** (0.18)	-0.522*** (0.16)	-0.526*** (0.15)
Constant	-8.488* (4.89)	-2.704 (3.02)	-9.178* (4.69)	2.092* (1.08)	-7.086* (4.03)	-1.573 (1.72)	-6.898* (3.52)
Adjusted R^2	0.34	0.68	0.51	0.53	0.57	0.68	0.72
RMSE	1.060	0.743	0.915	0.895	0.854	0.740	0.691
F	8.553	12.63	9.251	8.098	10.70	16.76	13.38
Robust standard errors in parentheses (corrected for within group clustering);							
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. All regressions include country fixed effects (not shown).							
Number of observations is 40. Panel is balanced.							

(over 1998 to 2003) by 1.14 points (-3.74×0.3). This strong effect is known from the literature, see Bassanini and Duval (2006) for a survey ²⁰.

(iv) *Entry regulation* increases unemployment. In columns (3) to (5), we use SETUP as an additional covariate. A one standard deviation improvement in the setup cost index leads to a reduction in unemployment rate of about 1.41 points (-1.634×0.87). The size and direction of this effect is robust to dropping the labor market variables UNDENS and EPL. In columns (4) and (5), our measure of red tape (REDTAPE) is added to the regression. Whether that variable is significant or not depends on whether the regression includes the standard labor

²⁰In their larger sample with yearly observations, those authors find that a one standard deviation decrease in the PMR index lowers unemployment by about 0.8 points

market variables or not. However, in line with our theoretical expectations, the variable has the right sign in both columns. Moreover, the effect of SETUP is only marginally affected by including REDTAPE.

(v) *Red tape* regulation affects unemployment positively, but its marginal effect is decreasing. In columns (6) and (7) we have added the square term of REDTAPE. This modification of the baseline regression turns out to reduce the importance of SETUP PMR substantially: the unemployment reduction due to a one standard deviation decrease in SETUP is now only 0.62 points on average (0.71×0.87). However, our measure of red tape becomes hugely important quantitatively: on average, a decrease of REDTAPE by one standard deviation leads to a reduction in the unemployment rate of 3.24 points ($((6.042 - 2 \times 1.159) \times 0.87)$). Even more interestingly, the unemployment rate is concave in REDTAPE.

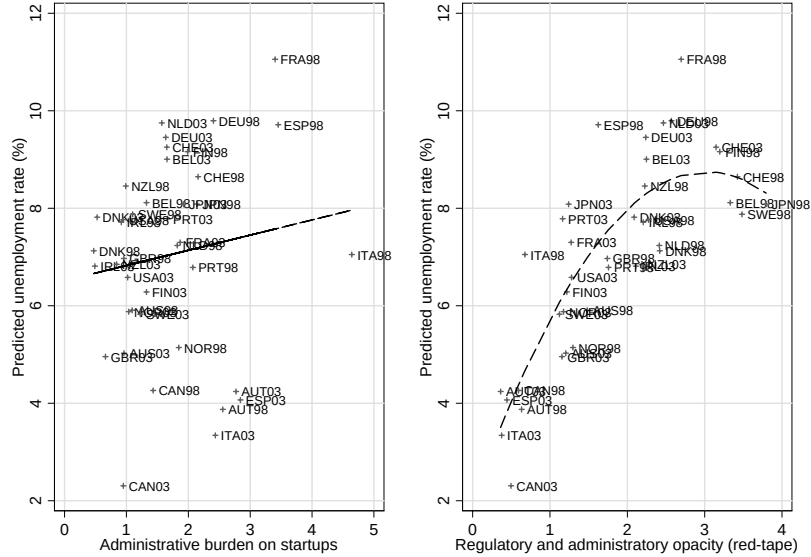


Figure 8: Conditional unemployment rate as a function of SETUP and REDTAPE.

In figure 8 we plot the partial effect of SETUP and REDTAPE on the unemployment rate. The plots are obtained from using the fixed effects regression (6) of table 2, (which excludes labor market institutions, but including the output gap). Each plot in figure 8 shows the unemployment rate predicted in that regression as a function of SETUP and REDTAPE, respectively. Hence, one can interpret the graphs as the partial conditional effect of our two types of PMR on the unemployment rates, where conditioning relates to the fact that the unemployment rate reflects aggregate conditions (i.e., the output gap). The picture that emerges from this analysis

shows a pattern that is strikingly similar to the results of our calibration exercise showed in figure 5.

The overall picture emerging from our analysis of OECD data – tentative as it is – is consistent with the prediction of our model. Note that coefficients of interest are identified only by within variation. Hence, our results suggest that countries that have reduced administrative setup costs most aggressively have reduced unemployment rates most. By contrast, countries that have put emphasis on reducing regulatory costs for incumbent firms have gained little.

Robustness In their literature overview, Bassanini and Duval (2006) find that PMR matter in an economically and statistically significant way. They seem to be more important than labor market institutions and turn up significant in almost all specifications. Whether our results are similarly robust needs to be seen. The key problem is that a neat decomposition of administrative regulation into a sunk and a recurring part is possible only with Conway *et al.* (2005) data set.

We have experimented using the startup cost measure developed in Djankov *et al.* (2002) and updated by the World Bank in its Doing Business database. That measure relates to the cost in percent of per capita income of opening a generic enterprise. It includes official costs (such as stamp taxes) and the time cost incurred by management. Djankov *et al.* provide data for 1999, while the World Bank has similar data for 2005 on its web page.²¹ Unfortunately, it is not possible to compute a proxy for red tape PMR costs.

In table 3 we redo columns (6) and (7) of table 2 with the World Bank measure of setup costs instead of the one produced by the OECD by Conway *et al.* (2005). It turns out that our results are entirely robust to using this alternative measure of setup costs: qualitatively the picture is unchanged - setup costs and red tape costs both increase the rate of unemployment. Quantitatively the results are also fairly similar.

We do not claim that our empirical exercise generates conclusive results. Better data on sunk versus non-sunk components of administrative regulation will help to sharpen the econometrics. However, we are confident that setup costs are economically and statistically more important for unemployment rates than recurring fixed costs.

²¹Djankov et al. (2002) and the World Bank report the official costs of registering a new business and the time spent in this undertaking. Djankov et al. (2002) aggregate these two measures into total setup costs in percentage of per capita income. The World Bank does not produce a similar measure. To construct one, we assume that labor dedicated to setup is paid the average income.

Table 3: *Robustness check*

Dep. var.: Unemployment rate in econ. active population	(1)	(2)
SETUP (World Bank)	0.0745*** (0.023)	0.0674** (0.024)
REDTAPE	5.614** (1.98)	5.294** (2.27)
REDTAPE ²	-0.983** (0.43)	-0.971* (0.49)
Adjusted R^2	0.71	0.76
RMSE	0.706	0.638
Robust standard errors in parentheses (corrected for within group clustering); *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. All regressions include a measure of the output gap, country fixed effects, and a constant (all not shown). Column (2) contains additional variables on labor market institutions (EPL, UNDENS). Number of observations is 40. Panel is balanced.		

6 Conclusion

This paper has described an additional channel through which PMR matters for unemployment. The model allows us to distinguish between regulation of startups on the one hand, and regulation of incumbent firms on the other. We find that the interaction between unemployment and firm selection depends on the type of PMR. Only sufficiently productive firms are able to afford flow fixed costs associated to production and regulation. Hence, the larger those costs, the higher is average productivity. In contrast, sunk setup costs reduce the intensity of product market competition since fewer firms find it optimal to enter. In turn, less efficient firms survive and average productivity decrease. Thus our analysis suggests that entry regulation matters more for unemployment than administrative regulation of incumbents. This result is potentially important for economic policy since the model suggests that governments would be well-advised to focus their deregulation efforts on the former type of PMR.

The implicit assumption in much of the literature following Blanchard and Giavazzi (2003) is that PMR is intrinsically worthless. This is certainly easier to justify for administrative than for economic regulation, since the latter is associated to the correction of market imperfections, such as the protection of consumers, the control of monopoly power, and so on. In our model,

even if red tape administrative costs do not address those imperfections, they may nevertheless not be useless. They reduce the equilibrium number of firms, which represents an aggregate saving in spending on fixed cost. This strong result is due to the absence of external economies of scale in the aggregate production function. However, even if the number of varieties is relevant for aggregate productivity, there remains a potential for a beneficial effect from PMR as long as the variety effect is not too strong.

The model lends itself naturally to several extensions. One obvious direction of research is to follow Melitz (2003) and allow for international trade. It would be interesting to study how the interaction of globalization scenarios with different PMR environments affects labor market outcomes. Another worthwhile extension would look at the transitional dynamics triggered by PMR reform. Finally, we see our empirical results as encouraging first steps towards more elaborated econometric studies on the empirical relevance of the *selection effect*. More disaggregate evidence on the interaction between PMR and the productivity distribution on the one hand, and average productivity and unemployment on the other hand would clearly be desirable.

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A Summary statistics

Table 4: *Summary Statistics*

Variable	Description	1998		2003	
		Mean	Std. Dev.	Mean	Std. Dev.
u	Unemployment rate ^a	7.67	3.79	6.52	2.18
SETUP	Admin. burdens on startup ^b	1.89	1.04	1.45	0.69
SETUP (WB)	Admin. burdens on startup ^d	21.24	16.69	14.02	10.40
REDTAPE	Regulatory and administrative opacity ^b	2.19	0.97	1.45	0.77
REDTAPE2	Regulatory and administrative opacity ^b	5.70	4.25	2.67	2.56
PMR	Aggregate index of PMR ^b	1.85	0.38	1.33	0.23
GAP	Output gap ^a	-0.12	1.37	-1.21	1.24
UNDENS	Union density (percent) ^a	36.48	21.77	34.62	21.74
EPL	Employment protection legislation ^a	2.04	0.93	2.04	0.89

Sources: ^aBassanini and Duval (2006), ^bConway et al. (2005), ^cFraser Institute EFW Index, ^dWorld Bank (Doing Business).