

Product Market Regulation in the Presence of Unions: Quantitative Implications *

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Abstract

We contribute to the growing literature which aims to link product market regulation and competition to labor market outcomes, in an attempt to explain the divergent US and continental European labor market performance over the past two decades. We calibrate the model to assess the quantitative magnitude of our results. We find that moving from the high EU regulation economy to the low US regulation leads to an implausibly large reduction in equilibrium unemployment rates and conclude that product market deregulation cannot be studied in isolation from union formation.

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1 Introduction

A growing literature examines the consequences of product market regulation and competition for labor market outcomes. Indeed, product market regulation is one of the most striking ways in which the US and continental European economies differ. To give an idea of the magnitudes involved, Figure 1 presents barriers to entry in the US and in the European Union, compiled by Djankov et al (2002). The index combines the average time required to establish a standardized firm with the number of procedures necessary into a weeks-based measure of entry delay. The measured delays range from 4 business days in the United States to a whopping 85 days in Spain. The population-weighted EU average of 54.7 days is many times larger than the corresponding American figure. Djankov, et.al. (2002) also report data on a second dimension of entry barriers, namely the pecuniary cost of establishing a standardized firm as a percentage of the per capita GDP of the respective country. This data is also reproduced in figure 1. Once again, the gulf between the Anglo-American world and Europe is striking: establishing a firm in the US costs less than 1% of per capita GDP, while establishing the average continental European firm costs 18.4% of per capita GDP. The European barriers to entry are an order of magnitude larger. It seems reasonable that such large differences in entry barriers might translate into large differences in labor market outcomes. Krueger and Pischke (1997) also conjecture that large parts of the U.S. American employment miracle can be attributed to its flexible product markets.

Indeed, there is a growing body of empirical evidence to support the link between product market regulation and labor markets. Bertrand and Kramarz (2002) examine the impact of French legislation¹, which regulated entry into French retailing. They find that those regions (departements) which restricted entry more strongly, experienced slower rates of job growth. Boeri, Nicoletti and Scarpetta (2000), using an OECD index of the degree of product market regulation, also report a negative relationship between their regulation measure and employment. Fonseca, et. al. (2001) show that their index of entry barriers is negatively correlated with employment and positively correlated with unemployment rates. Moreover, the timing of US and UK product market deregulation efforts, which began in the late 1970's, fits neatly into the picture of labor market performance which began to diverge in the early 80's. Hence, product market deregulation is a sort of smoking gun for divergent US and European labor market performance, whose implications are worth investigating.

Relatively little previous theoretical work has analyzed whether and how product market rigidities may affect equilibrium labor market outcomes. Nickell (1999) provides an insightful overview of early work which is either partial equilibrium or employing some form of collective bargaining. Recent important contributions are the papers of Pissarides (2001) and Blanchard and Giavazzi (2003). Pissarides (2001) focuses on the impact of entry barriers on the decision to become an entrepreneur or a worker, finding that entry barriers can indeed lead to lower rates of entrepreneurship and hence job creation, and ultimately to higher rates of equilibrium unemployment. However, those firms which have overcome the barriers to entry then face perfect competition. In contrast, Blanchard and Giavazzi (2003) study labor market outcomes in a model with monopolistic competition but with a more stylized labor-market setting. They find that equilibrium unemployment is decreasing in the degree of product market competition, and

¹Loi Royer of 1974

also emphasize that equilibrium wages are increasing in the degree of product market competition. In a similar vein, Spector (2002) studies the effects of changes in the intensity of product market competition in a model with capital and concludes that product-market and labor-market regulations tend to reinforce each other. The latter two papers consider static or two-period setups. Finally, Ebell and Haefke (2003) present a fully dynamic model which combines monopolistic competition in goods markets and Mortensen-Pissarides-style search frictions with multi-worker firms and individual bargaining. In this earlier contribution, we show that the impact of product market reform on unemployment rates is surprisingly small under individual bargaining.

In the present paper we extend the work of Blanchard and Giavazzi to a fully dynamic setting. We calibrate the model to data for the UK, U.S. and Italy and find that effects of deregulating European product markets to U.S. levels are implausibly large, virtually eliminating unemployment in Italy. Combining this finding with the earlier result of Ebell and Haefke (2003) we conclude that product market deregulation cannot be studied in isolation from endogenous union formation.

The remainder of the paper is organized as follows: section 2 presents partial equilibrium results for the basic model. Section 3 discusses short-run (exogenous firm entry) and long-run (endogenous firm entry) general equilibrium and section 4 presents numerical results. Section 5 concludes.

2 The Basic Model

In this section we present the basic model. Its main elements are monopolistic competition in the goods market and Mortensen-Pissarides-style matching with multi-worker firms in the labor market. We restrict our analysis to the steady state.

2.1 Households

2.1.1 Search and Matching in the Labor Market

The labor market is characterized by a standard search and matching framework. Unemployed workers u and vacancies v are converted into matches by a constant returns to scale matching function $m(u, v) = s \cdot u^\eta v^{1-\eta}$. Defining labor market tightness as $\theta \equiv \frac{v}{u}$, the firm meets unemployed workers at rate $q(\theta) = s\theta^{-\eta}$, while the unemployed workers meet vacancies at rate $\theta q(\theta) = s\theta^{1-\eta}$.

In the basic model, workers are identical and employed at firms where wages are bargained collectively. Since firms are atomistic with respect to the economy at large, they ignore the impact of their own decision on aggregate variables, such as aggregate labor market tightness θ . For each worker, the value of employment is given by $V^E(\theta)$,

which satisfies²:

$$rV^E(\theta) = w(\theta) - \chi(V^E(\theta) - V^U(\theta)) \quad (1)$$

where χ is the total separation rate. Firms and workers may separate either because the match is destroyed, which occurs with probability $\tilde{\chi}$ or because the firm has exited, which occurs with probability δ . We assume that these two sources of separation are independent, so that the total separation probability is given by $\chi = \tilde{\chi} + \delta - \tilde{\chi}\delta$. Explicit firm exit is incorporated mainly for quantitative reasons. If firms were counterfactually infinitely lived, then the impact of a given level of entry costs would be greatly understated, since firms could amortize those entry costs over an infinite lifespan.

The value of unemployment is standard and is the same for all workers.

$$rV^U(\theta) = bP + \theta q(\theta) \{V^E(\theta) - V^U(\theta)\}, \quad (2)$$

where P denotes the aggregate price level and b real unemployment benefits.

2.1.2 Monopolistic Competition in the Goods Market

Households are both consumers and workers. As consumers they are risk neutral in the aggregate consumption good. Agents have Dixit-Stiglitz preferences over a continuum of differentiated goods. Goods demand is derived from the household's optimization problem:

$$\max \left(\int c_{i,n}^{\frac{\sigma-1}{\sigma}} di \right)^{\frac{\sigma}{\sigma-1}} \quad (3)$$

subject to the budget constraint $I_n = \int c_i \frac{P_i}{P} di$ where I_n denotes the real income of household n and $c_{i,n}$ is household n 's consumption of good i . In order to focus the dynamics on the labor market, there is no saving. Thus we obtain aggregate demand for good i given as:

$$Y_i^D \equiv \int c_{i,n} dn = \left(\frac{P_i}{P} \right)^{-\sigma} I \quad (4)$$

where $I \equiv \int I_n dn$ is aggregate real income and $P = \left(\int P_i^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}}$ is the price index. Equation (4) is the standard monopolistic-competition demand function with elasticity of substitution among differentiated goods given by $-\sigma$.

2.2 Modeling Competition

In principle, there are two ways in which greater competition may manifest itself: as greater competition *within* each industry or as greater competition *among* industries. Greater competition among industries would imply an increase

²We assume that all payments are made at the end of a period so that our value functions in discrete time actually coincide with their continuous time counterpart. Equation (1) can be obtained from

$$rV^E(\theta) = \frac{1}{1+r} (w(\theta) + (1-\chi)V^E(\theta) + \chi V^U(\theta))$$

in the elasticity of substitution among differentiated goods σ . In fact Bertrand and Kramarz (2002) find some evidence for increased product differentiation in the French retail industry in response to the Loi Royer and we follow this route in Ebell and Haefke (2003). However, it is often argued that σ is a preference parameter rather than a measure of competition. We address this concern here by treating σ as a fixed preference parameter. That is, we will not rely on variations in σ to model differing degrees of competition. Rather, we follow Zilibotti and Galí (1995) and Galí (1995) in assuming that each differentiated good i is produced by an industry populated by n_i firms. An increase in the number of firms in each industry leads to an increase in the degree of competition within each industry, as captured by an increase in the demand elasticity faced by each individual firm.

The firms within each industry compete by Cournot.³ Under Cournot competition, firm j in industry i has output Y_{ij} which satisfies:

$$Y_i^S = Y_{ij} + (n_i - 1)\bar{Y}_{i,-j}, \quad (5)$$

where Y_i^S is aggregate output of good i and $\bar{Y}_{i,-j}$ is the average output of its $n_i - 1$ competitors. From (4), firm j faces demand function

$$\frac{P_i(Y_{ij}|n_i, \bar{Y}_{i,-j})}{P} = \left(\frac{Y_{ij} + (n_i - 1)\bar{Y}_{i,-j}}{I} \right)^{-\frac{1}{\sigma}}. \quad (6)$$

This leads to a definition of firm-level elasticity of demand as:

$$\xi_{ij} \equiv -\frac{\partial Y_{ij}}{\partial P_i} \cdot \frac{P_i}{Y_{ij}} = \sigma \left(1 + \frac{(n_i - 1)\bar{Y}_{i,-j}}{Y_{ij}} \right). \quad (7)$$

When firms within an industry are symmetric, each firm faces a demand elasticity which depends only on the total number of firms present in the industry:

$$\xi_i = n_i \sigma. \quad (8)$$

In the basic model we will assume symmetric firms in equilibrium. In what follows we will label firms only by their industry i .⁴

2.3 Multiple-worker Firms

The standard Mortensen-Pissarides setup assumes one-worker firms. Under perfect competition in goods markets, this assumption is harmless, since the number and size of firms is indeterminate. Under monopolistic competition, however, firms react to downward sloping demand by restricting output. The only way to vary output with a given technology

³In the basic model, we focus on the collusion-free equilibrium of the dynamic Cournot game. Collusive equilibria would involve even greater output restriction at each industry size, which would generally strengthen our results. It is important to emphasize that the assumption of Cournot is not overly restrictive. Kreps and Scheinkman (1983) have shown that the Bertrand equilibrium of firms who compete and face predetermined production factors (like labor here) is equivalent to the Cournot equilibrium.

⁴To avoid confusion, we denote aggregate demand facing industry i by Y_i^D , while industry i 's aggregate supply is denoted Y_i^S and the output of an individual firm in industry i is denoted Y_i .

is to vary the amount of labor employed either on the intensive margin or on the extensive margin.⁵ Consistent with stylized facts we assume that firms adjust employment by varying the number of workers (extensive margin) rather than the number of hours per worker. In our multi-worker firm model the number of workers employed is determined endogenously, as a function of the elasticity of demand ξ_i .

The firm bargains with a coalition of all workers employed at its firm. In the collective bargaining setting, it is natural to make the total number of workers subject to negotiation as well, since the collectively bargaining workers do have the power to refuse to work at all if their hiring preferences are not respected.

Firms maximize the discounted value of future profits, and the firm's state variable is the number of workers currently employed, H_i , where index i represents the industry. Firms' key decision is the number of vacancies. Firms open as many vacancies v_i as necessary to hire in expectation the desired number of workers next period, while taking into account that the real cost to opening a vacancy is Φ_V . Each firm's problem becomes:

$$V^J(H_i) = \max_{v_i} \frac{1}{1+r} \left\{ P_i(Y_i) Y_i - w(H_i) H_i - \Phi_V P v_i + (1-\delta) V^J(H_i') \right\} \quad (9)$$

subject to

$$\text{demand function:} \quad \frac{P_i(Y_i)}{P} = \left(\frac{Y_i + (n_i - 1) \bar{Y}_i}{I} \right)^{-\frac{1}{\sigma}} \quad (10)$$

$$\text{production function:} \quad Y_i = A H_i \quad (11)$$

$$\text{transition function:} \quad H_i' = (1 - \tilde{\chi}) H_i + q(\theta) v_i \quad (12)$$

$$\text{wage curve:} \quad w(H_i) \quad (13)$$

where the wage curve represents the outcome of the wage bargaining process.

2.4 Collective Bargaining

Under collective bargaining, all workers employed by a given firm form a coalition. Essentially, they agree to negotiate wages together, and to refuse to work (to strike) for one period in the case that negotiations break down. This joint bargaining agreement also gives workers the power to negotiate over hiring, so that the two negotiated quantities are the wage w and the steady-state employment level H_i . Formally, the multi-worker firm collective bargaining problem is:

$$\max_{w, H_i} \beta \ln \{ H_i (V^E(\theta) - V^U(\theta)) \} + (1 - \beta) \ln V^J(H_i) \quad (14)$$

From (9), the steady-state value of a collective bargaining firm with H_i workers is given by:

$$V^J(H_i, \theta) = \frac{1}{r + \delta} \left(A P_i(Y_i) H_i - w(H_i, \theta) \cdot H_i - \frac{\Phi_V P \tilde{\chi}}{q(\theta)} H_i \right)$$

⁵In a model with capital, firms could also vary output by varying only the amount of capital employed. In order to maintain an optimal capital-labor ratio, however, firms would also generally adjust by varying labor as well.

The collective workers' surplus is standard, and can be obtained by multiplying the expression in (2) by firm-level employment. The first order conditions for wages and employment are:

$$w(H_i, \theta) = (1 - \beta) rV^U(\theta) + \beta \left(AP_i(Y_i) - \frac{\Phi_V P \tilde{\chi}}{q(\theta)} \right) \quad (15)$$

$$w(H_i, \theta) = AP_i(Y_i) \left(1 - \frac{1 - \beta}{\xi_i} \right) - \frac{\Phi_V P \tilde{\chi}}{q(\theta)} \quad (16)$$

Combining the two first order conditions (15) and (16) yields an expression for the collectively bargained real wage, as well as an implicit expression for the collectively bargained level of employment.

$$\frac{w(\theta)}{P} = \left(1 + \frac{\beta}{\xi_i - 1} \right) \frac{rV^U(\theta)}{P} + \frac{\beta}{\xi_i - 1} \frac{\Phi_V \tilde{\chi}}{q(\theta)} \quad (17)$$

$$A \frac{P_i(\theta)}{P} = \frac{\xi_i}{\xi_i - 1} \left(\frac{rV^U(\theta)}{P} + \frac{\Phi_V \tilde{\chi}}{q(\theta)} \right) \quad (18)$$

We can also compute the collectively bargaining firm's optimal employment explicitly by combining (18) with the demand curve facing firm i (10).

$$H_i(\theta) = \left\{ \frac{\xi_i}{\xi_i - 1} \left(\frac{rV^U(\theta)}{P} + \frac{\Phi_V \tilde{\chi}}{q(\theta)} \right) \right\}^{-\sigma} A^{\sigma-1} I - (n_i - 1) \bar{H}_i \quad (19)$$

Under symmetry, $\bar{H}_i = H_i(\theta)$, so that in symmetric Cournot equilibrium:

$$H_i(\theta) = \left\{ \frac{\xi_i}{\xi_i - 1} \left(\frac{rV^U(\theta)}{P} + \frac{\Phi_V \tilde{\chi}}{q(\theta)} \right) \right\}^{-\sigma} A^{\sigma-1} \frac{I}{n_i}. \quad (20)$$

2.5 Reservation Utilities

In order to complete the description of firm-level equilibrium, it is necessary to derive expressions for the reservation values of unemployment. The reservation value of unemployment becomes

$$\frac{rV^U(\theta)}{P} = \frac{(r + \chi)(\xi_i - 1)}{(r + \chi)(\xi_i - 1) - \beta \theta q(\theta)} b + \frac{\beta \theta q(\theta)}{(r + \chi)(\xi_i - 1) - \beta \theta q(\theta)} \frac{\Phi_V \tilde{\chi}}{q(\theta)} \quad (21)$$

where $\theta \equiv \theta_1$.

3 Short-run General Equilibrium

Now, we determine the 'short-run' general equilibrium taking as given the number of firms n_i in each industry. In our setting, this is equivalent to pinning down all equilibrium variables as functions of the degree of competition ξ_i . This will allow us to determine the impact of increasing competition on equilibrium unemployment and wages.

Definition 1: Short-run General Equilibrium

A short-run general equilibrium is defined for given (ξ_i, n_i) and parameters $(\beta, \sigma, b, \Phi_V, \delta, \chi, r, A)$ as a value of θ which:

(i) is a firm-level equilibrium satisfying (17) and (19) and (21).

(ii) is a symmetric Cournot equilibrium satisfying (20).

(iii) satisfies the aggregate resource constraint:

$$I = \int \left(\left(\frac{w(\theta)}{P} H_i(\theta) + \frac{\pi_i(\theta)}{P} H_i(\theta) + \Phi_V v_i(\theta) \right) \right) n_i df(i)$$

where $\pi(\theta)/P$ are the real profits of a firm.

When all industries i produce with identical technology A we obtain a simpler version of the aggregate resource constraint:

$$I = \left(\left\{ \frac{w(\theta)}{P} H_i(\theta) + \frac{\pi_i(\theta)}{P} + \Phi_V v_i(\theta) \right\} \right) n_i \quad (22)$$

where firm-level profits are defined as the difference between revenues on the one hand and labor and vacancy posting costs on the other.

$$\frac{\pi_i(\theta)}{P} = A \frac{P_i(\theta)}{P} H_i(\theta) - \frac{w(\theta)}{P} H_i(\theta) - \Phi_V v_i(\theta) \quad (23)$$

Substituting in from (23) leads to a simplified aggregate resource constraint, namely that aggregate income be equal to aggregate production, valued at equilibrium prices:

$$I = \left(\frac{P_i(\theta)}{P} A H_i(\theta) \right) n_i \quad (24)$$

Substituting (18), and (20) into (24), immediately leads to the short-run equilibrium condition

$$A = \frac{\xi_i}{\xi_i - 1} \left(\frac{rV^U(\theta)}{P} + \frac{\Phi_V \tilde{\chi}}{q(\theta)} \right) \quad (25)$$

where $\frac{rV^U(\theta)}{P}$ is taken from equation (21).

After substituting in for the reservation wage we have:

$$A = \frac{(r + \chi) \xi_i}{(r + \chi)(\xi_i - 1) - \beta \theta q(\theta)} \left(b + \frac{\Phi_V \tilde{\chi}}{q(\theta)} \right) \quad (26)$$

The RHS of the collective bargaining short-run general equilibrium condition (26) is monotonically increasing in θ , so that existence of equilibrium is guaranteed if

$$A > \frac{\xi}{\xi - 1} b. \quad (27)$$

For $\theta > 0$, it must also be the case that $(r + \chi)(\xi - 1) > \beta \theta q(\theta)$. When the economy approaches full competition (as $\xi \rightarrow \infty$), (27) reduces to the standard condition $A > b$ that workers' productivity be greater in employment than in unemployment.

Equation (26) describes the short run equilibrium, since for each level of competition ξ_i it describes the equilibrium labor market tightness θ as a function of parameters. These equilibrium conditions are key, since they relate the degree of competition ξ to short-run equilibrium labor market tightness θ . Once we have $\theta(\xi)$, we can obtain the equilibrium unemployment rate from the Beveridge curve:

$$u(\xi) = \frac{\chi}{\chi + \theta(\xi) q(\theta(\xi))}. \quad (28)$$

The remainder of equilibrium variables are found as follows: Given the total number of agents in the economy N , we can find equilibrium aggregate employment as $n_i(H_i(\xi)) = N(1 - u(\xi))$. We will find it convenient to normalize $N = 1$. With $H_i(\xi)$ in hand, we can find aggregate output and subsequently the equilibrium quantity of good i , and of course equilibrium prices $P_i(\xi)$ all in terms of the given degree of competition.

3.1 Long-run General Equilibrium

Now we are ready to endogenize the degree of competition, or equivalently, the number of firms in each industry. In the long-run, firms may enter each industry by paying a real entry cost Φ_E . Entry by firms will continue until profits net of entry costs within each industry have been competed down to zero. Hence, free entry in the presence of barriers to entry leads to equilibrium industry size n^* , which is defined implicitly by:

$$\frac{r + \delta}{1 + r} \Phi_E = \frac{\pi_i(n^*)}{P} \quad (29)$$

where the firm's equilibrium profits per period are given by (23). The free entry condition (29) states that the entry cost must be amortized by profits over the firm's expected lifespan. The greater is the firm's exit probability δ , the higher must be the equilibrium profits to amortize a given level of entry costs. Since equilibrium profits are decreasing in competition, free entry forges a negative link between barriers to entry and the number of firms.

Entry barriers may take two complementary forms, time and pecuniary costs. Both the data on entry costs collected by Logotech, S.A. for the OECD (as reported in Fonseca, et. al. (2001)) and that of Djankov, et. al. (2002) report the time it takes to satisfy all regulatory entry requirements. In addition, Djankov, et. al. (2002) present data on the official fees which must be paid in order to obtain all licenses and permits, as a percentage of annual per capita GDP.

We combine the fee and regulatory delay measures to obtain a single quantification of barriers to entry. We convert the regulatory delay (measured in months) into a pecuniary opportunity cost consisting of lost profits during the setup-period, plus the wages of one worker who is charged with setting up the firm. This implies that a day of waiting is more costly in a high-profit and/or high-wage economy. Formally, total barriers to entry are found as:

$$\Phi_E(n) = (d + f) \cdot \frac{I(n)}{n}. \quad (30)$$

where d is the regulatory delay and f are entry fees as a share of aggregate monthly income. By adjusting entry costs to reflect the number of firms in the economy, we are implicitly assuming that the costs to starting a small firm are lower than those required to start a larger one. Combining (30) with the free entry condition (29) yields:

$$\frac{r + \delta}{1 + r} \left((d + f) \cdot \frac{I(n^*)}{n^*} \right) = \frac{\pi}{P}(n^*). \quad (31)$$

Equation (31) closes the long-run equilibrium. It implicitly determines the endogenous long-run industry size n^* , or equivalently, it determines the endogenous degree of competition $\xi^* = \sigma n^*$ in long-run equilibrium. As long as $d < \frac{1+r}{r+\delta}$, as is the case in all the data reported in figure 1, equation (31) defines a negative relationship between barriers to entry and the degree of competition in long-run equilibrium. Hence, an increase in entry barriers of either form leads to a long-run equilibrium decrease in industry size n^* or equivalently, to a decrease in the demand elasticity faced by firms ξ^* .

3.2 Income Taxes

In order to run policy experiments and be able to match the data we take into account that unemployment benefits must generally be financed by taxes. We impose equal magnitude income and payroll taxes, which are just large enough to finance the equilibrium expenditures on unemployment benefits and an exogenous government spending component g^x :

$$(\tau_I + \tau_P) \frac{w}{P} (1 - u) = bu + g^x \quad (32)$$

It is straightforward to confirm that the short-run equilibrium condition for collective bargaining becomes:

$$A = \frac{\xi(r + \chi)}{(r + \chi)(\xi - 1) - \beta\theta q(\theta)} \left(\frac{1 + \tau_P}{1 - \tau_I} b + \frac{\Phi_V \tilde{\chi}}{q(\theta)} \right). \quad (33)$$

4 Quantitative Results

We are now in a position to calibrate our model and approach our quantitative questions. We first explain in detail how we calibrate the basic model to match a set of labor market data for Italy, the UK and the U.S.. Then, for this calibration we run a simple policy experiment which is designed to evaluate the quantitative impact of product market deregulation on the labor market.

4.1 Calibration

One model period is one month. All parameters are reported in Table 2. We use estimates from the literature to guide our choices for the first group of parameters. Petrongolo and Pissarides (2001) report η , the elasticity of the matching function with respect to unemployment, to be in the range of (0.4;0.7). We set $\eta = 0.5$, thus choosing standard values inside this range. For simplicity, we normalize the level of technology A to unity. Our choice for the annualized real interest rate approximates its average value over the period under consideration. Unemployment benefits replacement ratios are taken directly from the labor market institutions database and reported in table 5

We choose the remaining parameters to match some stylized labor market data during the period 1989–1992. Specifically, we replicate the unemployment rate and average unemployment duration for each country as reported in table 5.

The exogenous total separation rate χ , is pinned down by the Beveridge curve in conjunction with our values for unemployment and unemployment duration. We set $\delta = 0.01$, so that the monthly probability that a firm will cease to exist is in line with the one and five year firm survival probabilities reported in Dunne, Roberts and Samuelson (1988), Mata and Portugal (1994) and Wagner (1999).

We close the model by choosing a value for Φ_V to match unemployment duration as reported in table 5. Calibrated entry costs are mostly consistent with Hamermesh and Pfann (1996), who report fixed hiring costs in the range of 20% to 100% of annual payroll expenses for a worker. Finally, our calibrations are for a balanced budget version of the model in which unemployment benefits are financed by equal magnitude income and payroll taxes (τ_I, τ_P) . Government spending is chosen to match the observed tax wedge in the data.

The model had no difficulties to fit the stylized facts of the three different countries when bargaining power β , vacancy posting costs Φ_V and government spending g^x were adjusted to match unemployment rates, unemployment duration, and tax wedge of the target country. Unemployment benefit replacement ratios and entry barriers were taken directly from the data as reported in table 5.

4.2 A Simple Policy Experiment

We now use the balanced budget version of the model to run a simple policy experiment, whose goal is to gauge the ability of product market institutions in accounting for the US-continental Europe unemployment differential. In particular, differing product market institutions (PMI) are represented as differing entry cost regimes $\{d_{Euro}, f_{Euro}\}$ and $\{d_{US}, f_{US}\}$.

Hence, to assess the impact of product market reform, we measure the difference in unemployment between the high entry cost long run equilibrium on the one hand, and the low American entry cost on the other. So the experiment amounts to confronting Italy and the UK with American levels of entry barriers to the product market. Results are reported in Table 3. We would conclude that deregulation of product market entry could reduce the UK unemployment rate by 2.5 percentage points, which seems implausibly high, given the only minor adjustment in administrative fees from 1.4% to 0.5% of per capita GDP. Similarly, deregulating the Italian product market would lead to virtual elimination of unemployment — again a rather implausible finding.

5 Conclusions

The main contribution of this paper has to show that the bargaining regime is crucial for the effect of product market competition on unemployment rates. Effects of deregulation are implausibly high for collective bargaining and considerably more modest under individual bargaining (Ebell and Haefke, 2003). How can this be explained? The driving mechanism behind the strong reduction in unemployment under collective bargaining is that the increase in firm demand elasticities after deregulation reduces their monopoly power and thus increases output. Under individual bargaining, however, an additional countervailing overhiring effect exists. Briefly, under individual bargaining all workers are treated as the marginal worker, so that if the marginal product of labor is decreasing, then the wages of all workers can be depressed by expanding employment. At low levels of competition, the overhiring effect is especially strong, and serves to counteract the positive impact on unemployment due to output expansion. Furthermore, this implies that firms extract the largest rents from workers when product market competition is low.

Since the choice of bargaining institution is so important, the next step should be to endogenize it. It seems reasonable to assume that individual bargaining can emerge as equilibrium wage-setting institution for highly competitive product markets and unionization will emerge in less competitive product markets to counteract firms monopoly power.

Such a combination could suggest that the strong decline in collective bargaining coverage and unionization in the US and UK over the last two decades might have been a direct consequence of the Reagan/Thatcher product market

reforms of the early 80's.

References

- [1] Abowd, J.A. and L. Allain (1996), "Compensation Structure and Product Market Competition," *Annales d'Economie et de Statistique*, (41/42), 207–218.
- [2] Bertrand, M. and F. Kramarz (2002), "Does Entry Regulation Hinder Job Creation? Evidence from the French Retail Industry," *Quarterly Journal of Economics* 117, 1369–1413.
- [3] Binmore, K., A. Rubinstein and A. Wolinsky (1986), "The Nash Bargaining Solution in Economic Modeling," *RAND Journal of Economics* 17, 176–188.
- [4] Blanchard, O. and F. Giavazzi (2002), "Macroeconomic Effects of Regulation and Deregulation in Goods and Labor Markets," *Quarterly Journal of Economics* 118, 879–907.
- [5] Boeri, T., G. Nicoletti and S. Scarpetta (2000), "Regulation and Labour Market Performance," CEPR Discussion paper 2420.
- [6] Bresnahan, T.F. (1989), "Empirical Studies of Industries with Market Power," in Schmalensee, R. and R.D. Willig (eds), "*Handbook of Industrial Organization*", Volume II, chapter 17, 1012–1057.
- [7] Burgess, S.M. and J.J. Dolado, (1989), "Intertemporal Rules with Variable Speed of Adjustment: An Application to U.K. Manufacturing Employment," *Economic Journal*, 99, 347–365.
- [8] Cahuc, P. and E. Wasmer (2001), "Does Intrafirm Bargaining Matter in the Large Firm's Matching Model?" *Macroeconomic Dynamics* 5, 178–89.
- [9] Cahuc, P., C. Gianella, D. Goux, and A. Zylberberg (2002), "Equalizing Wage Differences and Bargaining Power: Evidence From a Panel of French Firms," *CEPR Discussion Paper 3510*.
- [10] Djankov, S., R. La Porta, F. Lopez-de-Silanes and A. Shleifer (2002), "The Regulation of Entry," *Quarterly Journal of Economics* 117, 1–37.
- [11] Dunne, Timothy, Mark J. Roberts and Larry Samuelson (1988), "Patterns of Firm Entry and Exit in U.S. Manufacturing Industries," *The RAND Journal of Economics*, 19(4), 495–515.
- [12] Ebell, M. and Haefke, C. (2003), "Product Market Deregulation and Labor Market Outcomes," *IZA Working Paper*.
- [13] Fonseca, R., Lopez-Garcia, P. and C. Pissarides (2001), "Entrepreneurship, Start-up Costs and Unemployment," *European Economic Review* 45, 692–705.
- [14] Galí, J., (1995), "Non-Walrasian Unemployment Fluctuations," *NBER Working Paper 5337*.

- [15] Gersbach, H., "Promoting Product Market Competition to Reduce Unemployment in Europe: An Alternative Approach?," *Kyklos*, 2000, *LIII*, 117–133.
- [16] den Haan, W.J., C. Haefke, and G. Ramey, (2001), "Shocks and Institutions in a Job Matching Model," *NBER Working Paper 8463*.
- [17] den Haan, W.J., G. Ramey, and J. Watson (2000), "Job Destruction and Propagation of Shocks," *American Economic Review* 90, 482–498.
- [18] Hamermesh, D.S. and G.A. Pfann, (1996), "Adjustment Costs in Factor Demand," *Journal of Economic Literature* 34, 1264–1292.
- [19] Hirsch, Barry T. and David A. Macpherson, "Union Membership and Coverage Database from the Current Population Survey: Note," *Industrial and Labor Relations Review*, Vol. 56, No. 2, January 2003, pp. 349-54.
- [20] Hosios, A.J., "On the Efficiency of Matching and Related Models of Search and Unemployment," *Review of Economic Studies*, 1990, *57*, 279–298.
- [21] Hu, L. (2002), "The Hiring Decisions and Compensation Structures of Large Firms," *Industrial and Labor Relations Review*, forthcoming.
- [22] Jean, S. and G. Nicoletti (2002), "Product Market Regulation and Wage Premia in Europe and North America: An Empirical Investigation," *OECD Economics Dept Working Paper 318*.
- [23] Kreps, D.M. and Scheinkman, J.A. "Quantity Precommitment and Bertrand Competition Yield Cournot Outcomes," *Bell Journal of Economics* 14, 326–337.
- [24] Ljungqvist, L. and T.J. Sargent (1998), "The European Unemployment Dilemma," *Journal of Political Economy* 106, 514–550.
- [25] Ljungqvist, L. and T.J. Sargent (2002), "European Unemployment and Turbulence Revisited in a Matching Model," *mimeo* 2002.
- [26] Machin, Stephen (2000), "Union Decline in Britain," *mimeo*, University College London.
- [27] Mata, Jose and Pedro Portugal (1994), "Life duration of new firms," *Journal of Industrial Economics*, 44, 227–245.
- [28] Mortensen, D.T., (2001), "How Monopsonistic is the (Danish) Labor Market," *Northwestern University*, *mimeo*.
- [29] Nickell, S. (1999), "Product Markets and Labour Markets," *Labor Economics* 6, 1–20.
- [30] OECD Employment Outlook, June 2001.
- [31] Oswald, A. (1993), "Efficient Contracts are on the Labour Demand Curve: Theory and Facts," *Labor Economics* 1, 23–38.

- [32] Petrongolo, B. and Pissarides, C.A., (2001), “Looking into the Black Box: A Survey of the Matching Function,” *Journal of Economic Literature* 39, 716–741.
- [33] Pissarides, C.A. (2000), *Equilibrium Unemployment Theory*, 2nd edition, Cambridge, Mass: MIT Press.
- [34] Pissarides, C.A. (2001), “Company Start-Up Costs and Employment,” *CEP Discussion Paper 520*.
- [35] Rotemberg, J.J. (2000), “Wages and Labor Demand in an Individualistic Bargaining Model with Unemployment,” *Harvard Business School*, mimeo.
- [36] Spector, D. (2002), “Competition and the Capital-Labor Conflict,” *CEPREMAP-CNRS Working paper 2002-07*.
- [37] Seldeslachts, J. (2002), “Interactions between Product and Labor Market Reforms,” *Universitat Autònoma de Barcelona*, mimeo.
- [38] van Reenen, J., (1996), “The Creation and Capture of Rents: Wages and Innovation in a Panel of UK Companies,” *Quarterly Journal of Economics*, 111, 195–226.
- [39] Wagner, J. (1994), “The Post-Entry Performance of New Small Firms in German Manufacturing Industries,” *Journal of Industrial Economics*, 42(2), 141–54.
- [40] Yashiv, E. (2001), “Wage Bargaining, the Value of Unemployment, and the Labor Share of Income,” *Tel Aviv University*, mimeo.
- [41] Zieseemer, T. “Monopolistic Competition and Search: A Pissarides-Dixit-Stiglitz Model” MERIT-Infonomics Research Memorandum Series 2001-006.

Tables and Figures

Table 1: Stylized Facts for countries under consideration.

	France	Italy	UK	US
GDP	13918	12602	12724	17945
Real Interest Rate	0.07	0.07	0.05	0.04
Labor Share	0.53	0.45	0.57	0.6
Adj. Labor Share	0.68	0.71	0.72	0.66
Employment Ratio	60.31	55.81	70.08	72.31
Unemployment Rate	9.63	7.07	8.67	6.63
Unemployment				
Duration (months)	11.26	17.9	11.42	3.92
Benefit Duration	0.5	0.14	0.68	0.19
Replacement Ratio	0.58	0.22	0.23	0.25
Tax Wedge	0.66	0.66	0.47	0.45
Union Density	10.1	38.93	37.26	15.03
Entry Costs: Days	53	62	4	4
Entry Costs: Fees	14.3	20.0	1.4	0.5

Source: *Union Density*: OECD Labor Force Statistics, average 1990 – 1992. *Unemployment Duration*: based on OECD Labor Force Statistics, unemployment by duration, average 1990–1992. *Labor Share and GDP*: for the year 1992 (Italy 1991), Gollin, (2002); *Entry Costs*: Based on Djankov et al, (2002); *All other series*: are taken from the labor market institutions database of Nickell and Nunziata, available from the CEP website. Again reported data are an average over 1990 – 1992.

Table 2: Calibration

	Italy	UK	US	
β	0.73	0.97829	0.979	Worker bargaining power
Φ_V	0.04	1.18	2.5	Vacancy Posting Costs
r	0.07	0.05	0.04	Annualized interest rate
χ	0.0034	0.0083	0.0191	Total separation rate
δ	0.001	0.001	0.001	Probability of firm exit
\bar{A}	1	1	1	Average level of labor productivity
η	0.5	0.5	0.5	Elasticity of the matching function

Table 3: Policy Experiment

	Italy		UK		US
	US Φ_E	Italian Φ_E	US Φ_E	UK Φ_E	US Φ_E
Unemployment $u(\xi^*)$	0.4 %	7.23 %	6.22 %	8.88 %	6.88 %
Unemployment duration $\frac{1}{q(\theta)}$	1.0	18.1	8.0	11.7	3.9
Firm demand elasticity ξ^*	105.1	6.5	18.7	12.3	22.1
Real net wage $\frac{w(\xi^*)}{P} (1 - \tau_I)$	0.72	0.71	0.69	0.73	0.67
Exogenous Government Spending	0.47 %	0.42	0.30	0.31	0.28
Tax rates $\tau_I = \tau_P$	0.33	0.33	0.24	0.24	0.23
Replacement rate	0.22	0.22	0.23	0.23	0.25

This table presents the equilibrium values for main variables of each economy. For each country column (1) gives results for the US-level entry costs while column (2) gives results for the same economy, but with its respective entry costs.

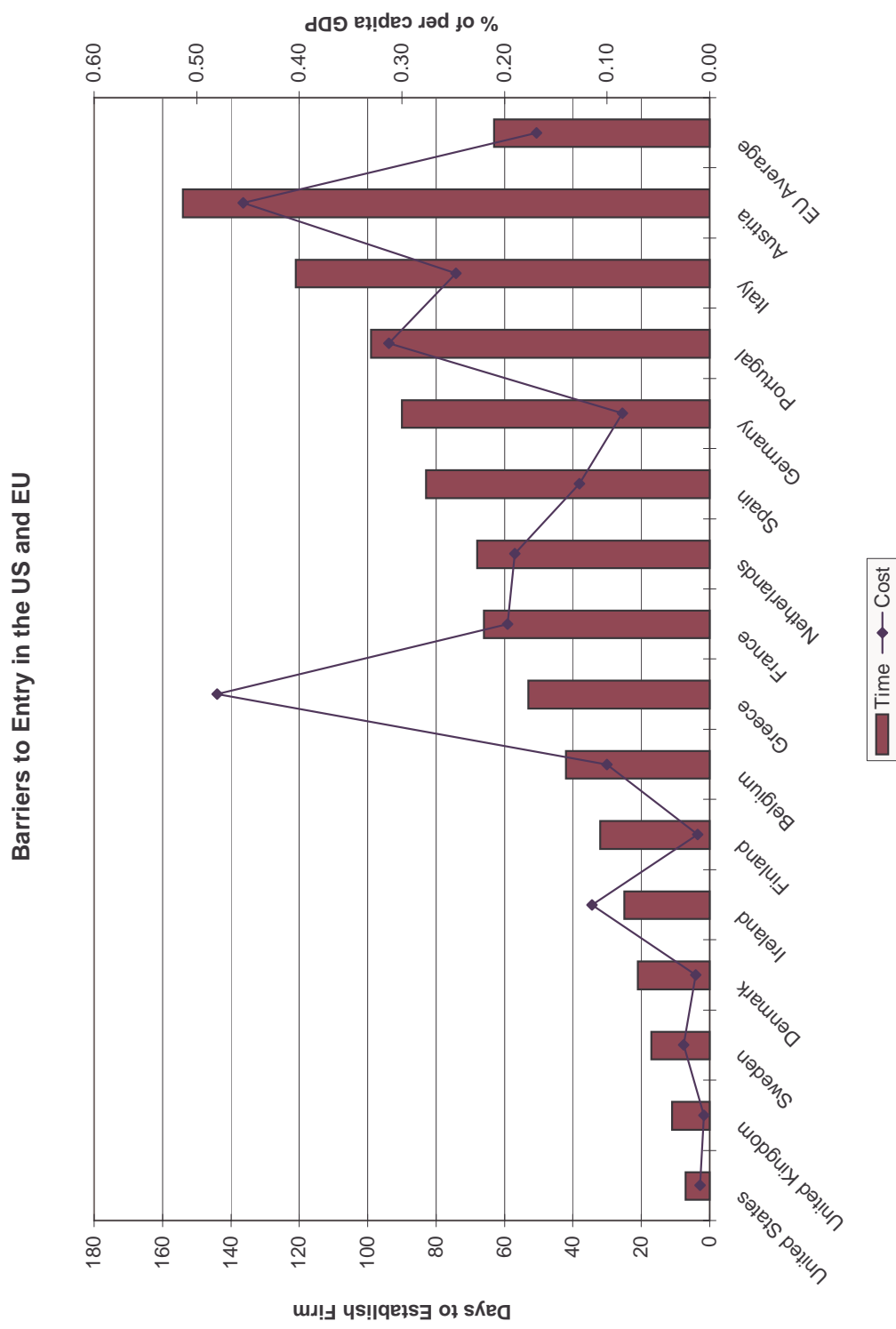


Figure 1: Entry Costs across Europe and the U.S.