Employment Outcomes and the Interaction Between Product and Labor Market Deregulation: Are They Substitutes or Complements?

Giuseppe Fiori
(Boston College)

Giuseppe Nicoletti
(OECD)

Stefano Scarpetta
(OECD and IZA)

Fabio Schiantarelli
(Boston College and IZA)

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Abstract

This paper provides a systematic empirical investigation of the effect of product market liberalization on employment when there are interactions between policies and institutions in product and labor markets. Using panel data for OECD countries over the period 1980-2002, we present evidence that product market deregulation is more effective at the margin when labor market regulation is high. Moreover, there is evidence in our sample that product market deregulation promotes labor market deregulation. We show that these results are mostly consistent with the basic predictions of a standard bargaining model, such as Blanchard and Giavazzi (2003)), extended to allow for a richer specification of the fall back position of the union and for taxation.

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1 Introduction

Over the past two decades, many OECD countries have sought to promote productivity and long term growth by improving the efficiency of goods and services markets through liberalization and privatization. An important question is whether these reforms have favorable effects on employment. A few recent theoretical and empirical studies suggest that this may well be the case,[1] but robust evidence is still lacking, especially in the context of dynamic econometric models that control for the many observed and unobserved factors that determine employment. Moreover, product market deregulation has been implemented in countries that have very different labor market settings and the deregulation itself has created pressure to reform the labor market. This raises two related questions. First, are employment gains from product market liberalization affected by labor market policies and institutions that shape the bargaining power of workers and, if so, how? Second, is stronger product market competition conducive to changes in labor market policies and institutions? While the effects on employment outcomes of labor market policies, and the interactions between various measures, have been explored extensively,[2] much less work has been done on the employment effects of interactions between product and labor market policies. Moreover, the predictions about these interactions often are not based on well specified bargaining models and empirical results differ across studies. While, for instance, Nicoletti and Scarpetta (2005) and Griffith et al. (2006) find that product market deregulation is more effective at the margin in highly-regulated labour markets, Berger and Danninger (2006), Bassanini and Duval (2006), and Amable et al. (2006) find the opposite: product market deregulation is more effective when labor market policies are less restrictive. All these results are obtained in the context of static econometric models.

In this paper we take a close look at the interactions between product and labor market policies, and their political economy underpinnings. *First* we extend the model of bargaining and monopolistic competition developed by Blanchard and Giavazzi (2003) to include a fuller specification of the

[1] Theoretical models include Blanchard and Giavazzi (2003), Spector (2002), Amable and Gatti (2001) and Ebell and Haefke (2003). Empirical analyses include Boeri et al. (2000), Nicoletti and Scarpetta (2005), Griffith et al. (2006), Berger and Danninger (2006), Amable et al. (2006) and Bassanini and Duval (2006).

[2] Interactions between labor market policies have been explored, for instance, by Saint-Paul (2000) and Belot and van Ours (2004). See Nickell, Nunziata and Oechl (2005) and Blanchard (2006) for an overview of the effects of labor market policies, shocks and institutions on unemployment.

fallback position of the union and taxation. Treating initially product regulation and labor market regulation as set exogenously, the model suggests that employment gains from product market deregulation are largest in situations in which labour market settings provide strong bargaining power to workers.[3]The basic intuition behind this result is that, with low unions' bargaining power, real wages will be close to the level that clears the labor market and employment close to its full employment level. In this case liberalization measures that lead to a decrease in the markup have the potential to generate only small changes in employment If the unions' bargaining power is high and the economy is far away from full employment, a decline in the markup can lead, instead, to large employment responses. We show that this result also holds in the short-run and in both efficient bargaining and right-to-manage frameworks. Finally, consistent with a burgeoning political economy literature, the model also implies that when unions are allowed to lobby for higher labor market regulation, product market deregulation is likely to lead to subsequent changes in labour market settings that lower workers' bargaining power.[4]

Second, we test the model's predictions on harmonized panel data for OECD countries over the period 1980-2002, using dynamic model specifications. We approximate product market reforms with a new set of indicators that include both changes in domestic regulation and in border barriers to investment, while labour market settings are described by standard indicators of policies and institutions. The results confirm that past product market reforms have produced substantial employment gains in the average OECD country. When policy interactions are accounted for in a systematic way, there is also evidence that employment gains have been larger when workers' bargaining power was initially high, due to labor market policies. In this sense, product and labour market deregulation can be classified as "substitutes". However, we also find evidence that product market deregulation has led, over time, to a decline in workers' bargaining power. In this sense, product and labour market deregulation can be considered as "complements". Thus, in assessing the total employment effect of product market deregulation one needs to consider both its direct effect and the effect it has through the induced changes in labour market policies and institutions.

The structure of the paper is as follows. In Section 2 we summarize the predictions obtained from

[3]In discussing employment/unemployment the role of taxes is also relevant, and some authors have contended that they are an important explanation of the difference between the US and (continental) Europe unemployment experience in the nineties. On these general issues see Daveri and Tabellini (2000) and Prescott (2004).

[4]See also Dang, Galasso, Hoj, and Nicoletti (2006) and Checchi and Nunziata (2006).

extending the Blanchard and Giavazzi (2003) model. In section 3 we discuss the data. In section 4 we present the econometric results. Section 5 concludes the paper.

2 A simple bargaining model with interactions between product and labour markets

In this section we present a simple bargaining model that allows an assessment of the effects of product market liberalization on employment and considers interactions between product and labour markets. The first question the model addresses is whether, for exogenously set policies, a deregulation of the product market has more beneficial employment effects when the labor market is highly or lightly regulated. The second question is whether product market deregulation may actually lead to labor market deregulation. We discuss these issues in the context of the bargaining model proposed by Blanchard and Giavazzi (2003, BG thereafter), extended to allow for a richer specification of the fall back position of the union and for taxation. This yields interesting predictions about the interaction between product and labor market policies both in the short and long run. We first summarize the basic set up and predictions in the context of an efficiency bargaining model (details are confined to Appendix A). In the following section we then discuss the results in the case of a right to manage model. We finally endogenize workers' bargaining power.

2.1 Efficient bargaining model

Employment and the wage are determined by solving a cooperative Nash Bargain between unions and imperfectly competitive firms. Denoting by V_i the union's utility function and by Π_i the firm's profits, the efficient bargain solution is obtained maximizing with respect to both the wage and employment the generalized Nash maximand , $\beta \ln(V_i - \overline{V_i}) + (1-\beta)\ln \Pi_i$, where β captures the union bargaining power. We will assume that β is affected by labor market policies, such as employment protection legislation or the generosity of income support systems that reduce the pressure of outsiders on incumbent workers. It can also be affected by institutional characteristics of the labor market such as union density and the contract coverage rate. V_i is equal to the sum of the income of employed workers, L_i,who earn a wage equal to $\frac{W_i}{P}$ and the income of union members

not employed by the firm, whose expected income is $\frac{W_i^A}{P}$. $\overline{V_i}$ represents total income expected by the union if a bargain is not struck with the firm and equals $\frac{W_i^A}{P}$ times union membership, N. In defining $\frac{W_i^A}{P}$ we will assume that the alternatives to employment with the present firm are either unemployment benefits, public employment, or a job with another firm. Unemployment benefits are not taxed and public employment is assumed to be fixed exogenously. Firm i uses one unit of labor, L_i, to produce one unit of output, Y_i. Each firm faces a downward sloping demand function with elasticity $\sigma = \overline{\sigma} g(m)$, with $g' > 0$. σ captures the elasticity of substitution among goods, $\overline{\sigma}$ is a constant, and m denotes the number of firms. The markup over marginal costs, μ, equals $\frac{1}{1+\sigma}$.We will assume that the markup is affected by product market policies, such as legal impediments to entry or to rivalry among firms. Labor income is subject to an income tax rate of τ^L, while employers are subject to a payroll tax of τ^p. Finally, to close the model, we will assume that the government budget is kept in balance (and there is no public spending on goods).

In the efficient bargain, at an optimum, relative output prices, $\frac{P_i}{P}$, and the real wage, $\frac{W_i}{P}$, are proportional to the alternative wage, with constants of proportionality equal to $(1+\mu)(1+\tau^p)$ and $(1+\mu\beta)$ respectively. In the symmetric short run equilibrium ($\frac{P_i}{P} = 1$, $\frac{W_i}{P} = \frac{W^o}{P} = \frac{W}{P}$, fixed number of firms), the alternative wage and the real wage are:

$$\frac{W^A}{P} = \frac{1}{(1+\mu)(1+\tau^p)} \tag{1}$$

$$\frac{W}{P} = \frac{(1+\mu\beta)}{(1+\mu)(1+\tau^p)} \tag{2}$$

Using the definition of the alternative wage, the assumption that private and government wages are equal, and the balanced budget condition, we can obtain an upward sloping relationship between the alternative wage and the employment rate:

$$\frac{W^A}{P} = \frac{(1+\mu\beta)}{(1+\mu)(1+\tau^p)} l \tag{3}$$

where $l = \frac{L}{N}$ is the employment rate. Its short run equilibrium value is obtained by solving (1) and (3):

$$l = \frac{1}{(1+\mu\beta)\frac{(1+\tau^p)}{(1-\tau^L)}} \tag{4}$$

Note that the use of the balanced budget condition has eliminated public employment and unemployment benefits from the solution. Moreover, contrary to BG, employment depends on β also in the short run equilibrium due to the fuller specification of the fallback position of the union. As a result, a decrease in the union bargaining power leads to an increase in employment. As in BG, a decrease in the markup, due, for instance, to an increase of substitutability between products, captured by an increase in $\overline{\sigma}$, or to an exogenous increase in the number of firms also leads to an increase in employment. The increased substitutability could be for instance the result of measures that decrease border barriers, thereby facilitating the entry of foreign products into the domestic market. An increase in the number of firms, may be due to a policy-induced decrease in entry barriers, which will be analyzed more fully below. Finally, employment will be adversely affected by payroll or income taxes.

What is of particular interest for us here is the interaction between product and labor market regulation, captured by μ and β, respectively, assuming for the time being that they are set independently from one another. It is easy to see that the cross derivative of employment with respect to μ and β is negative in our model. This implies that, at the margin, a reduction in the markup has greater positive effects on employment when the labor market is more regulated and unions have greater bargaining power. Some authors define product and labor market deregulation as substitutes in this case. When the cross derivative is positive and it pays more in terms of employment to reduce the markup when the union bargaining power is low, then product and labor market deregulation are classified as complements.[5]

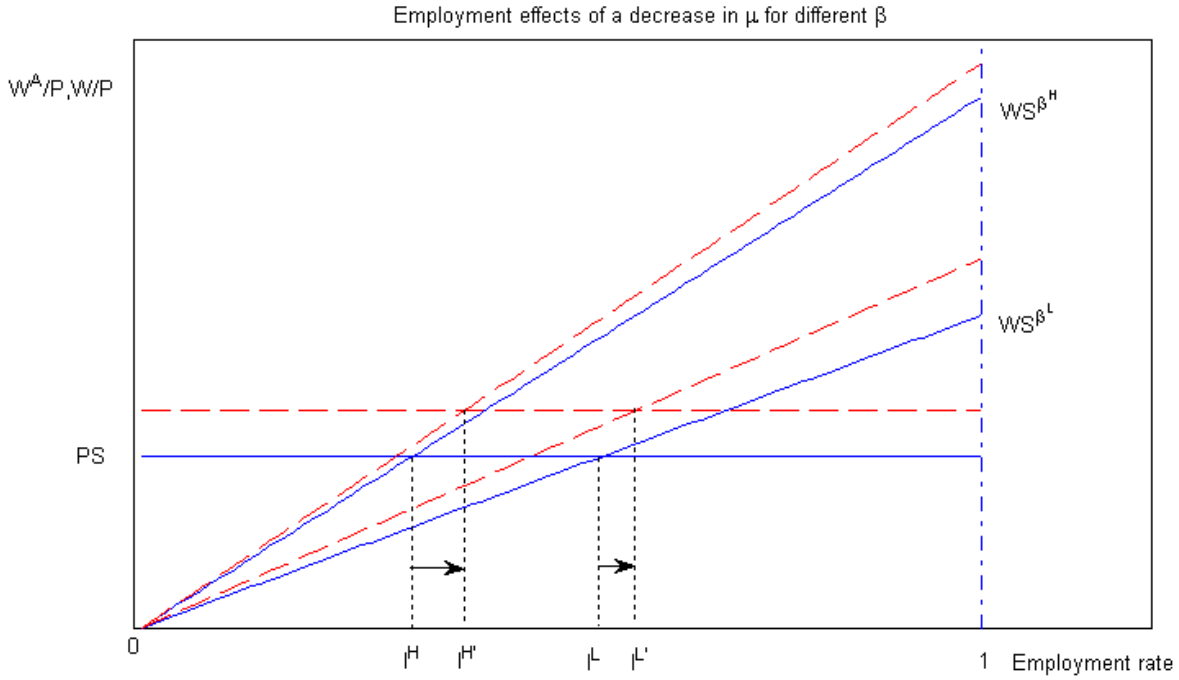
We can give a graphical presentation of this general equilibrium result by plotting equation (1) and (3) in a graph with the employment rate on the horizontal axis and the alternative wage on the vertical axis. In Figure 1 (1) is denoted by PS and (3) by WS^{β^H} when drawn for a high value of β and by WS^{β^L} for a low value of β.[6] The relationship between the alternative wage and employment is steeper when β is high. A decrease in μ, due, for instance, to product market deregulation that increases the substitutability among goods (reflected in an increase in $\overline{\sigma}$), shifts PS upward by the

[5] In Blanchard and Giavazzi (2003) the effect of product market deregulation is independent of labor market regulation in the short run, since employment in the efficient bargain does not depend upon the bargaining power parameter,β.

[6] Note that PS and WS are general equilibrium loci. For instance PS identifies the level of the alternative wage compatible with $\frac{P_i}{P} = 1$ in the symmetric equilibrium. One could also draw in the graph the marginal revenue product schedule for an individual firm, which would shift with changes in μ, buth this would clutter the figure.

same amount, whatever the value of β. Moreover it makes the relationship between the alternative wage and employment, WS, steeper. The first effect dominates, generating always an increase in employment. However, following the decrease in μ , the increase in the slope of WS^{β^H} is greater than the one for WS^{β^L}. As a result, there is a larger positive employment response when unions' bargaining power is high: employment increases from l^H to $l^{H'}$when β is high, and from l^L to $l^{L'}$when β is low. [7]

Figure 1



[7] For given l the increase in $\frac{W^A}{P}$ following an infinitesimal decrease in μ equals $\frac{1-\beta}{(1+\mu)^2(1+\tau^L)}l$.

Note that both the numerator of the fraction and l are smaller when β is higher. The relative size of the rotation for different values of β is crucial in generating the result that product and labor market deregulation are "substitutes". This is what matters, not the fact that (3) is flatter for low levels of β. This may give the mistaken impression that a decrease in μ generates a greater employment response when β is low. This would be true if only PS shifted upward. However, the decrease in μ also makes WS steeper (by less when β is greater).

The basic intuition behind this result is that low unions' bargaining power will be associated with low real wages and employment close to the full employment level. In this case product market deregulation measures that lead to a decrease in the markup have the potential to generate only small changes in employment. If the unions' bargaining power is high and the economy is far away from full employment, a reduction in the markup can lead, instead, to large employment responses. This intuition holds, not only when the economy literally hits the full employment constraint, but also when it is below full employment. To see this, consider that when β is close to one, workers are already extracting most of the rents and it is not possible for decreases in μ to be associated with further wage increases (when $\beta = 1$ the wage will be actually independent of μ). This explains why the upward rotation of the WS locus is smaller when β is high and why, as a result, the decrease in the markup generates a greater increase in employment.

Note, instead, that in this model the cross derivatives between μ and taxes, or between β and taxes, are positive. This means that the positive employment effect of deregulating the product or labor market are greater when taxes are low.

The qualitative results concerning the effect of product and labor market deregulation and their interaction also hold in the long run. In long run steady state equilibrium the number of firms in the markets and hence the markup will be determined by the condition that profits, (A1), must be equal to (annualized) entry costs, c, assumed to be a fraction of output. Using this condition together with the equations defining the optimal value of employment and the real wage, (2)and (4), the long-run equilibrium levels of employment and wages are:[8]

$$l = \frac{(1-\beta-c)\left(1-\tau^{L}\right)}{(1-\beta-c+c\beta)\left(1+\tau^{p}\right)} \tag{5}$$

$$\frac{W}{P} = \frac{(1-c)}{(1+\tau^{p})} \tag{6}$$

A decrease of entry costs, c, union power, β,or taxes will all have a positive employment effect. The cross derivative with respect to β and c is negative, provided $\beta < \frac{1}{\mu}$ which is the case for any realistic value of μ. This implies that a reduction in entry barriers is more effective in highly regulated labor markets where union power is high. As in the short run, the interaction between taxes and c or β is positive.

[8] The equation defining the markup is $\mu = \frac{c}{1-\beta-c}$, so that μ is increasing in c and β.

2.2 Extensions: Right to Manage model

The results we have obtained so far concerning first and cross derivatives are fundamentally robust to assuming that firms and unions bargain only about the wage and firms are allowed to hire along their labor demand function (the Right to Manage model). In this case, profit maximization implies that prices will be set by the firm as a markup above the real wage, adjusted for payroll taxes so that $\frac{P_i}{P} = (1+\mu)(1+\tau^p)\frac{W_i}{P}$.In the symmetric short run equilibrium, the wage will be:

$$\frac{W}{P} = \frac{1}{(1+\mu)(1+\tau^p)} \tag{7}$$

This equation can be thought of as the aggregate price setting equation. Using the first order condition for the wage, together with the definition of the alternative wage and the *balanced* budget condition, one can obtain the following relationship between the real wage and the employment rate:

$$\frac{W}{P} = \frac{(1+\mu\beta)}{(1+\mu)(1+\tau^p)}l \tag{8}$$

This equation can be interpreted as the aggregate wage setting locus. Note that the aggregate price setting and wage setting equations, (7) and (8), in the Right to Manage model are identical to the corresponding equations in the Efficient Bargain model, (1) and (3), the only difference being that the actual wage has now replaced the alternative wage in the expressions. As a result the short run solution for employment in the Right to Manage model is identical to the one in the Efficient Bargain model (see (4)) and all the conclusions reached before about first and cross derivatives still hold. In particular the effect of a decrease in the markup is greater when unions have greater bargaining power. Note also that the graphical presentation of the model in Figure 1 and 2 remains valid by simply relabelling the vertical axis to represent the real wage and not the alternative wage. In this case the horizontal line, PS, is the aggregate price setting locus, while the upward sloping one is the aggregate wage setting locus, WS. When the markup decreases, PS shifts upward by the same amount, while WS becomes steeper, but by a lesser degree when β is high. In other terms, the wage becomes less sensitive to changes in employment along the aggregate wage setting function, but to a lesser degree when unions are more powerful. Again, the intuition is that there is little room to extract higher wages, following a decrease in μ, when the unions are already appropriating most of the rents. This is reflected in a smaller increase in the slope of the wage setting locus and, therefore, the decrease in the markup will result in a larger increase in employment.

In the long run, however, the employment solution for the Efficient Bargain and for the Right to Manage model differ from one another. More precisely, when the number of firms is endogenized by equating monopoly profits to entry costs, long run employment and wages are[9] :

$$l = \frac{(1+\tau^p)}{(1-\tau^L)}\frac{1-c}{1-c+c\beta} \tag{9}$$

$$\frac{W}{P} = \frac{1-c}{1+\tau^p} \tag{10}$$

The first derivatives of employment with respect to β and c and taxes are negative as before, and so is the cross derivative between β and c. Therefore, also for the Right to Manage model the effect of reducing entry barriers on employment is greater when labor market policies or institutions lead to a high bargaining power for the unions.

2.3 Extensions: endogenizing union's bargaining power

We now ask the question whether product market deregulation may lead to labor market deregulation. Blanchard and Giavazzi (2003) endogenize β by assuming that it is the solution to the problem of maximizing the labor income share (equal to the wage in the model), net of lobbying costs, that are assumed to be quadratic in β. They show that lower product market regulation will result in lower labor market regulation in the short run. We modify their set up by assuming that the objective function of the lobby (union confederation, political party) representing the union in the first stage of the game is union utility in excess of the fall back position minus quadratic lobbying costs. This is more consistent with the union utility function used in the Nash bargaining stage of the game. We assume that the lobby knows that employment and wages are determined by the efficient solution to such Nash bargain (or to the Right to Manage model), and their resulting equilibrium values.[10] The optimal value of β is a solution to:

$$\underset{\beta}{Max}\left[\left(1-\tau^L\right)\left(\frac{W_i}{P}-\frac{W_i^A}{P}\right)L_i-\frac{a}{2}\beta^2\right] \tag{11}$$

[9] The expression for the markup is now $\mu = \frac{c}{1-c}$.

[10] One can think that a portion of lobbying costs are split equally among the various unions, but they will not affect the solutions derived so far for wages and employment as they disappear from the Nash maximand, since they are subtracted from both the union utility and from its disagreement level (both assumed to be linear in income). A fraction of lobbying cost falls directly on the lobbying organization itself (that we do not model fully). See Rama and Tabellini (1998) for a fuller analysis of lobbying for trade protection and labor market policies.

Using the short run equilibrium wages and employment for the efficient bargain, equations (2)and (4) in (11), one can show that $V_i - \overline{V_i}$ is increasing in both β and μ.[11] Most importantly for us, a decrease in μ will generate a decrease in β. The sign of the effect depends upon the cross derivative of $V_i - \overline{V_i}$ with respect to μ and β. This cross derivative is positive in our model and this implies that the losses from a decrease in β are smaller when markups, and hence the monopoly profits to be shared between firms and workers, are low. This reduces the incentive to lobby or fight for a high β and explains why lower product market regulation (and the associated lower μ) leads to lower labor market regulation. These results carry through to the long run , in the sense that lower entry costs lead to lower bargaining power for the unions, but only if the union is not too powerful to start with. More precisely, β is decreasing in c if $\beta < \frac{1-2c+c^2}{1+2c-c^2}$. They also tend to extend to the Right to Manage model in the short run for realistic values of μ (or c) and β.[12] Ultimately, whether product market deregulation induces or not labour market deregulation is an empirical issue.

3 Data

The empirical analysis is based on harmonized annual data for a sample of 20 OECD countries over the period 1980-2002.[13] We relate the employment rate to labour and product market policies and institutions that are likely to affect firms' markups and workers' bargaining power. In addition,

[11] The fact that union utility above the fall back position decreases when the markup decreases may explain by itself why unions may not be supportive in practice of product market reform, independently of possible effects of μ on β.

[12] More precisely, the condition for β to be increasing in μ in the short run is:

$$1 + \beta^2\mu^2(1 + 2\mu) > 4\beta\mu(1 + \mu)$$

In the long run β is increasing in c if:

$$1 + 4\beta c^2 > 4c^2 + 2\beta c + c$$

Remember that c is expressed as a share of output. If, in the first stage the union lobby maximizes the wage per worker (equal to the labor share of income) as in Blanchard and Giavazzi (2003), there is a positive association between μ (c) and β only for the efficient bargain in the short run. In all other cases there is no effect of product market deregulation on unions' bargaining power.

[13] The countries are Australia, Austria, Belgium, Denmark, Germany, Greece, Finland, France, Italy, Japan, Ireland, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, the United Kingdom and the United States.

we control for the business cycle and other unobservable country specific effects, country specific trends, and general time specific effects. The description of the key variables is provided below. Further details on data sources and definitions are provided in Appendix B.

Employment Rates. The dependent variable in our equations is the non-agricultural employment rate (ERB), the component of employment most directly influenced by labour and product market policies and institutions. [14]

Product market regulations. We use time-series data on product market policies that restrict competition to measure market liberalization in the OECD countries covered by the analysis. The data cover both domestic regulations and border barriers. For domestic regulations we draw on Conway and Nicoletti (2006) who provide indicators over the 1975-2003 period for the following non-manufacturing industries: gas, electricity, post, telecommunications, air transport, rail transport and road freight. [15] Their indicators cover three main areas: public ownership of business sector firms, legal barriers restricting access to markets and other barriers to entry related to market or industry structure (e.g. market dominance and vertical integration in network industries). [16] Indicators for each of these areas are based on detailed information on laws, rules and market and industry settings. In each period and each area, country-industry observations are scored along a cardinal scale from least to most restrictive. Area-wide indicators (e.g. for public ownership or legal barriers) are subsequently obtained by averaging these scores across industries and an overall indicator of regulation in energy, transport and communication is obtained by averaging across both areas and industries. To account for the effects on employment of different areas of regulation, in our regressions we use both the overall indicator (REG), and three area-wide indicators: one including only public ownership (REGPO), one excluding public ownership (RNOPO) and the third focusing more narrowly on barriers to entry and vertical integration (RBEVI). We supplement

[14] We separately control for the share of public employees in the working-age population (the public employment rate – ERG) to test for the hypothesis that the latter may crowd out business sector employment opportunities. In preliminary analysis, we experimented with both total non-agricultural and business non-agricultural employment rates. Here we focus on the unrestricted version of the model in which the effect of public employment is estimated. A significantly negative coefficient on the public employment variable would support the crowding out hypothesis.

[15] Nicoletti and Scarpetta (2003) and Alesina et al. (2005) used an earlier version of these indicators to estimate the effects of anticompetitive regulation on productivity and investment, respectively.

[16] The coverage of these three areas varies across industries. Legal barriers are reported in all industries; public ownership is covered in all industries except road freight; vertical integration is documented for gas, electricity and railways; market structure is reported for gas, telecoms and railways.

this information on domestic regulations with the indicator of FDI restrictions provided by Golub (2003) and Golub and Koyama (2006). This indicator covers limitations on foreign ownership, restrictive screening and notification procedures and operational restrictions for foreign affiliates in the manufacturing sector and eight non-manufacturing industries over the 1980-2006 period. The construction of this indicator follows the same steps as for the indicator of domestic regulation: the basic information is scored from least to most restrictive in each period and area-wide indicators are derived for each industry and across industries; finally an aggregate indicator for the whole economy is obtained by averaging. [17] To account for both domestic and border barriers to competition, in the empirical analysis we also use a summary indicator (NOPOFI) obtained as the first principal component of RNOPO and the aggregate indicator of FDI restrictions. It should be noted that, even though barriers to foreign investment in the manufacturing sector are covered, our measures of restrictive product market policies focus mostly on the non-manufacturing industries, where restrictions are covered in more detail. Unfortunately, littel time-series information is currently available on restrictions affecting the manufacturing industries. [18] This may not necessarily be a serious empirical problem, however. In the OECD countries covered by our regressions, the non-manufacturing industries account for a large and increasing share of aggregate employment. Moreover, anti-competitive regulations are usually concentrated in these sectors. Finally, deregulation in these sectors can have important consequences for the structure of costs in manufacturing, given the input-output linkages.

Employment protection legislation and unemployment benefits. The indicator of EPL covers restrictions concerning workers on both permanent and temporary contracts. This information was collected and coded for the late 1980s, the late 1990s and 2003 by OECD (2004), which also provides details on sources and methodologies. Individual dismissal protections for workers with permanent contracts include: procedural inconveniences that employers face when trying to dismiss a worker; notice and severance payments at different job tenures; and prevailing standards of and penalties

[17] The aggregate indicator of FDI is an average of the indicators for the various industries weighted by a combination of industry shares in trade and FDI flows (see Golub (2003)).

[18] Detailed information on economy-wide regulations is provided by Conway et al. (2006) only for the 1998 and 2003 periods. Some authors (e.g. Griffith et al.(2006)) have used information on economy-wide domestic and border regulations provided by Gwartney and Lawson (2006) for the 1975-2003 period. However, their data are based on less detailed and more heterogeneous information than that provided in our sources and are only complete (on a quinquennial basis) from the beginning of the 1990s.

for "unfair" dismissals. The indicator for temporary contracts covers, for both fixed-term contracts and contracts through temporary work agencies: the "objective" reasons under which they could be offered; the maximum number of successive renewals; and the maximum cumulated duration of the contract. The EPL indicator used in the econometric analysis below is time varying, with the shifts in regime from the late 1980s to the early 2000s being defined on the basis of information about the timing of major EPL reforms (concerning both temporary and regular workers) in OECD countries. To capture the effect of unemployment benefits we use gross replacement rates (BEN), which are a summary measure of the fraction of income replaced by unemployment benefits over a five years period for three family types and two earnings levels. [19] In some regressions, we combine EPL and BEN into a single measure of labour market regulation (LMR) by taking their first principal component.

Taxes on labour use. Tax wedges (WEDGE) are defined as the share in total labour costs of the difference between the costs of labour and the take-home pay of a married worker with two children and earning the average wage (average of three family situations depending on spouse's earnings). This measure includes income taxes and both employer's and employee's social security contributions.

Unions' power and bargaining regimes. We consider two sets of indicators of unions' power in the bargaining process. First, union density (UDENS) – the proportion of workers who are members of the unions. This variable provides a *prima facie* indication of the strength of unions. However, in countries where there is administrative extension of collective agreements (e.g. many Continental EU countries) it provides a poor proxy for bargaining power. The second indicator is the share of workers covered by these agreements. Available data on coverage are too limited to be used as a separate variable in empirical analysis (OECD (2004)). However, we tried to account for both these dimensions of union power by constructing a variable that combines union density and coverage (UDCO) by means of principal components analysis.

Consistent with an extensive literature (e.g. Bruno and Sachs (1985); Calmfors and Driffil (1988); Elmeskov et al.(1998); Nickell and Layard (1998)), we also consider in the regressions the wage bargaining regime. Indeed, it has been argued that both decentralized and centralized systems are

[19] The net replacement rate would be a preferable indicator, but unfortunately it is currently available only for a few years. For a discussion of the different definitions of replacement rates, see Martin (1996).

preferable to intermediate ones based on bargaining at the industry level (OECD (1997); Flanagan (1998)). The form of bargaining indicator we use combines two features: the level of bargaining, which can be centralized, intermediate (at the industry or regional level), or decentralized (at the firm level); and the degree of coordination among, on the one hand, employers' associations and, on the other hand, trade unions. Combining these two features into a low-corporatism (LLCORP), intermediate corporatism (MDCORP) and high corporatism (HGCORP) variable makes it possible to consider cases where cooperation between employers and unions in an industry-level bargaining system (e.g., Germany and Austria and, more recently, Italy, Ireland and the Netherlands) may be a functionally-equivalent alternative to centralized systems. This is because strong coordination allows industry unions to internalize the aggregate effects of their wage decisions into the negotiation process, de facto mimicking the outcomes of a highly centralized bargaining regime.

4 Econometric results

The model we have discussed in the previous section leads to three main predictions. First, product and labour market regulation that curb competition among firms and strengthen workers' bargaining power have a negative effect on equilibrium employment. Second, reforms in these markets are substitutes, in the sense that product market deregulation has a larger effect on employment when the labor market is highly regulated. However, if product market competition is allowed to influence workers' bargaining power, regulations in the two markets can be seen as complementary as, under certain conditions, product market deregulation can lead to labor market deregulation. In this section we discuss whether the econometric evidence supports these main predictions of the model.

We present estimates of a dynamic model for the business (non agricultural) employment rate for a panel of OECD countries over the period 1980-2002. The model is estimated by feasible GLS, allowing for the variance to differ across countries and for an AR(1) structure in the error term, both with a common and country-specific autocorrelation coefficient ρ. We use a specification that includes lagged employment, since it is likely that the short run and long run effects of regulation differ. All regressions include country dummies, year dummies and country-specific time trends,and also two additional country dummies for Germany post-reunification (1991-2002) and for Finland

after the collapse of the Soviet Union (1991-2002). The main conclusions, however, do not hinge on the inclusion of these dummies. We also explore the determinants of product and labor market regulation and of labor market institutions and address the issue of their potential endogeneity in the employment equation.[20]

Previous empirical work on the interaction between product and labor market regulation has relied on static model specifications for employment (unemployment). Static regressions may be thought to capture a cointegrating relationship between the employment (unemployment) rate and the explanatory variables. However, this interpretation is questionable. For instance, using the Levin, Lin, and Chu (2002) test for unit roots in panels, one can reject the unit root hypothesis for the business employment rate at the 5% level.[21] Moreover, many of the variables representing product and labor market regulation are also unlikely to be well described by unit roots. These variables often display regime changes and could be erroneously interpreted as unit root processes.

Consistent with our theoretical model and previous empirical findings, our results provide a strong support to the idea that anti-competitive product market regulation has a negative effect on the employment rate. There is also some evidence in our data that labor market regulation also tends to hinder employment. Moreover, product and labor market regulations interact. In particular, using the principal component of unemployment benefits and employment protection legislation as a measure of labor market regulation, we find that reducing barriers to entry in goods markets is more beneficial in terms of employment when the labour market is highly regulated. While the coefficient of the interaction term between product market regulation and measures of employment protection tends to be not significant, the one for the interaction with unemployment benefits is negative and significant. Finally, there is some evidence that past product market deregulation has lead to labor market deregulation by affecting either labour market policies or the power of unions, measured as the principal component of union density and union coverage. Conversely, there is no evidence that labor market deregulation has affected product market regulation. Interestingly, the principal component of union density and coverage is found to Granger cause both product and labor market policies, a result that calls for further investigation.

[20] Nickell et al. (2005) estimate dynamic unemployment models by feasible GLS, but do not address the issue of the interaction between product and labor market regulation.

[21] This is true in specifications with or without trends, including either two or three lags of ERB.

4.1 Dynamic models for employment and product and labor market regulation: main effects

We start from a basic specification of the employment equation that includes only the main effects of product and labour market regulations. We focus on employment in the non agricultural business sector, ERB and use different measures of PMR: REG, that includes all dimension of regulation in seven non-manufacturing sectors, RNOPO that excludes measures of public ownership, RBEVI, that focuses more narrowly on barriers to entry and vertical integration, and NOPOFI, which is a principal component of RNOPO and a measure of foreign direct investment restrictions covering all sectors of the economy. As a measure of labour market regulation we use the first principal component of employment protection, EPL and unemployment benefits (replacement rate), BEN, which we will denote by LMR. Alternatively, we will use EPL and BEN as separate regressors. EPL is one element that strengthens workers' bargaining power. Moreover, it tends to increase labour adjustment costs, thereby potentially affecting both the equilibrium level of employment and its dynamics. The unemployment benefit replacement rate provides a proxy for the workers' fallback position included in our model. Generous unemployment benefit systems are also likely to increase the bargaining power of incumbent workers by reducing wage pressures from outsiders. With a balanced budget the effect of BEN on the fall back position should be captured by the tax rate. In reality, however, government budgets are often not balanced for all countries. Moreover, taxes finance other social provisions over and above unemployment benefits. Thus,it makes sense to include both BEN and WEDGE in the empirical model for multiple reasons. For similar reasons, we also control for a moving average of public employment at t-1 and t-2, ERGM.[22] Public employment may crowd out business employment to the extent that it improves the fall back position for the union. A negative effect on private employment may also reflect the fact that public employment produces services that are close substitute for private activities and, as well, because it has to be financed by taxation. However, public employment may increase the productivity of private employment, with favorable consequences for the latter.

We also consider the principal component (UDCO) of union density and union bargaining coverage to account for labor market institutions. We think this is a better choice than union density,UDENS,

[22] Taking a moving average of past public employment is a way to account for the possible endogeneity of this variable to employment fluctuations.

alone, which may be a partial proxy for the bargaining power of the unions. For example union density in France is 11%, the same as in the United States, but coverage is high. In addition to lagged employment, country dummies, year dummies and country-specific trends, we include the tax wedge,WEDGE, the indicator of corporatism discretized in low, medium and high (LLCORP , MDCORP and HGCORP), the average of t-1 and t-2 public employment, ERGM, a measure of the importance of state owned enterprises in the service sector, RPO, and the output gap, GAP, to account for fluctuations at business cycle frequency.

Estimation results obtained by using Feasible GLS are reported in Table 1 and 2. In all cases we allow for country specific variance and common or country specific first order serial correlation. Test results reject at the 1% level the equality of variance across countries and the absence of serial correlation in all specifications. It is worth noting at the outset that the lagged employment variable, ERBL, is always very significant with a coefficient of around .7, pointing to a strong persistence of employment over time. Moreover, the output gap is a very important explanatory variable in all specifications, pointing to strong cyclical effects as well. In the rest of this section, we comment briefly on the main effects of labour market policies and institutions, before turning to product market policies, which are the main focus of our analysis. We look at policy interactions in the next section.

When included separately, our measures of labour market regulation, EPL and BEN, display coefficients that are often statistically not significant (particularly EPL). However, when considered jointly, these regulations generally have a negative and statistically significant effect on the employment rate. This is consistent with the fact that EPL and BEN represent two alternative ways to protect workers against dismissal. For example, Buti et al. (1998) suggest that protecting jobs - through EPL – may act as a substitute for protecting workers after the dismissal by supporting their job search with unemployment insurance benefits. Under this hypothesis, countries might opt for either generous unemployment benefits with lax EPL or the reverse. [23] Indeed, across the OECD area - and in particular within Europe - there is a negative relationship between the stringency of EPL and the generosity of BEN. Therefore, it seems appropriate to consider them jointly in regression analysis. As to public employment, results suggest that an increase in EGRM crowds out business employment. Its coefficient is negative, but its level of significance varies across

[23] Boeri et al., (2003) document and formalize this policy complementarity in a political economy context.

specifications.

Somewhat more surprisingly, the tax wedge does not appear to be an important determinant of the employment rate: the coefficient is insignificant in all model specifications[24] This result is at variance with the implications of the theoretical model as well as with previous empirical findings, which however are largely based on static employment models.[25]

Turning to bargaining institutions, the impact of UDCO on the employment rate is consistently negative and significant across specifications. As for corporatism, Calmfors and Driffil (1988) suggested that it is likely to have a non-linear effect. In our analysis, we find some evidence that decentralized bargaining systems lead, ceteris paribus, to higher levels of employment, while the sign of the effect of high centralization/coordination varies across specifications and is characterized by a large standard error.

Turning to product market regulations, the coefficient of REG is negative but generally not significant at 5% levels with both common and country specific ρ (column 1 and 2). However, when we break down REG in two parts, regulation in the private sector exclusive of public ownership (RNOPO, RBEVI or NOPOFI) and public ownership (RPO) (see columns 3 to 8), all the measures of regulation that exclude public ownership have a negative effect on the employment rate (the tighter is regulation the lower is the employment rate). Their coefficients are always significant at the 5% level in the specification with common ρ (columns 3, 5, 7). With country specific $\rho's$ (columns 4, 6, 8), their standard errors tend to be larger in some cases. The coefficient of RPO is generally positive but insignificant (except in the specification with common ρ and NOPOFI as a measure of product market regulation). State owned firms constitute a barrier to entry in a sector, but at the same time they are likely to be characterized by over-manning, and the two effects seem to be offsetting each other. These results are robust across different specifications and are not affected by whether we summarize EPL and BEN by the first principal component, LMR (as in Table 1) or we keep them as separate regressors (as in Table 2). In both cases, liberalizing

[24] Interacting the tax wedge with the corporatism variable – to account for the possible effects of bargaining systems on the ability of firms to shift labour taxes on to wages – does not change this result.

[25] To our knowledge, the only dynamic employment model that finds some evidence of a negative effect of the tax wedge is Nickell et al. (2005). However, their estimates concern unemployment and exploit a longer time series (1961-1995) that covers wider fluctuations in the taxation of labour. Moreover, they use a different definition of the tax wedge based on tax receipts from national accounts data.

product markets increases the employment rate.

4.2 Policy Interactions

In this section, we investigate the interactions between product market regulation and labor market settings, focusing on employment protection and unemployment benefit policies. We extend the specifications considered in Tables 1-2 by introducing interactions between product market regulation and LMR (the first principal component of EPL and BEN) or between such regulation and EPL and BEN separately. As a proxy for product market regulation we focus on RNOPO, the measure that captures business sector regulations other than public ownership. [26] We also allow the persistence of the employment process to depend upon labor market policies by interacting the lagged dependent variable with LMR (ERBLLMR) or EPL (ERBLEPL). In this way, we are trying to capture the idea that more rigidly regulated labor markets may lead to greater persistence in the employment process. [27]

The results are reported in Table 3. In column 1 and 2, we use LMR as a proxy for labor market regulation. The coefficient ERBLLMR is positive and significant, which implies that a tighter labour market regulation increases the persistence of employment.[28] LMR is now negative and significant at 1% level in most cases. Similarly, the direct effect of product market regulation is always negative and significant at the 5% level. Most importantly, the interaction between RNOPO and LMR is negative and significant at 1% and 5% with common and country-specific ρ, respectively. Note that the variables in the interaction terms are defined as deviations from their sample means, so that the coefficient of the main effects can be interpreted as the effect of a variable at its sample mean. Hence, deregulating the product market is more effective at the margin when the labour market is highly regulated. In this sense, product and labor market deregulation can be seen as substitutes. This is an important result because it suggests that in situations where deregulating the labour market may prove to be difficult politically, deregulating the product market first may

[26] The results obtained using RBEVI are very similar and are not reported.

[27] We have also interacted the lagged dependent variable with BEN, but the interaction is always insignificant, and therefore it has been set equal to zero.

[28] This is consistent with the results of Scarpetta (1996). In a dynamic unemployment rate equation, the author allowed the speed of unemployment adjustment to be a function of labour market policy and institutions and found that stricter regulations and more generous benefits led to stronger persistence in unemployment.

later facilitate labour market reform.

The quantitative difference in the effect of product market deregulation, depending upon the tightness of labor market policies is substantial. Consider, for instance, the (ceteris paribus) effect of a product market deregulation that moves a country from the third quartile (5.25) of RNOPO to the first quartile (3.08). When labor market regulation is low and equal to the first quartile of LMR (-.89), the increase in the employment rate is not statistically significant at the 5% level and equals only .07 percentage points on impact and .17 percentage points in the long run (using the results in column 1 of Table 3). When labor market regulation is high and equal to the third quartile of LMR (.95), the effect of deregulation is larger, quite substantial and significant at the 1% level. It generates an employment gain of .91 percentage points on impact and 3.26 percentage points in the long run. Another way to highlight the different effect of product market deregulation in different labor market settings is to consider that one standard deviation decrease in RNOPO generates a long run gain in the employment rate of 1.37 percentage points in France (a high LMR country) and of only .13 percentage points in Ireland (a low LMR country).

The theoretical model discussed earlier in this paper also suggests that there should be interactions between the tax rate and measures of market and bargaining power. However, when interactions between WEDGE and RNOPO and LMR were added to the specification they were never individually or jointly significant.

As in previous regressions, we also allow BEN and EPL to enter as independent regressors (column 3 and 4) and we include separate interactions between each one of them and both the lagged dependent variable and product market regulation. As expected, higher EPL increases the persistence of the employment rate. EPL also has a negative and significant effect on the employment rate. The coefficient of BEN is not significant. The interaction between RNOPO and EPL (NOPOEPL) is never significant. The one with BEN (NOPOBEN) is negative and significant at the 2% level with common ρ and at the 5.3% level with country specific $\rho's$. Save for one regression (common $\rho's$ and separate EPL and BEN) these results are confirmed when we consider NOPOFI as the measure of product market regulation (in this case, the interaction terms are NOPOFILMR, NOPOFIBEN and NOPOFIEPL). The general message is that product and labour market regulations are substitutes. Moreover, it appears that the negative interaction between the various measures of product market regulation and LMR is mostly driven by the interaction with our measure of the unemployment

benefit replacement rate (BEN). However, as already mentioned, there are good reasons to believe that considering EPL and BEN jointly (within LMR) is a better approximation of the effects of policies on workers' bargaining power, because the two policies can often be seen as substitutes.[29]

We have also explored the sensitivity of our results to the exclusion of the unobserved time effects. In column 9 and 10 we estimate the same specification of columns 1 and 2 without country-specific trends. A number of results change when the country-specific trends are omitted. Notably, the coefficient of the interaction between product and labor market regulation becomes insignificant. It should be stressed, however, that omitting country specific trends may lead to a serious misspecification insofar as they capture low frequency movements in the structure of the labour force (e.g. changes in participation or demographics) and/or (potentially non neutral) technological progress. Their omission blurs the substitutability between product market regulation and labour market settings. Results not reported here also show that omitting trends in a static employment model results in a positive and significant coefficient of the interaction term, leading to wrongly conclude that product and labor market deregulation are complements.

In Table 4 we further extend the estimated model by including the interaction between product market regulation and labor market institutions. More specifically, we introduce an additional interaction between RNOPO or NOPOFI and the principal component of union density and coverage, UDCO(NOPOUDCO and NOPOFIUDCO, respectively). Moreover, we also interact UDCO with the degree of corporatism (UDCOLLCORP, UDCOHGCORP) to check whether the negative effects of unions' power on employment depend on the type of bargaining system. The findings show that none of these interactions are significant, but previous results concerning the interaction between labor market policies and product market regulation remain unchanged.[30]

[29] In the context of static models without country specific trends, Berger and Danninger (2006), Bassanini and Duval (2006) and Amable et al. (2006) find that product market deregulation and labor market deregulation (proxied by EPL) are complements.

[30] Griffith et al. (2006) find in a static model that decreases in profitability caused by product market deregulation have a more favorable effect on unemployment when union density or collective bargaining coverage is high.

4.3 Determinants of product and labor market regulation and endogeneity issues.

So far we have assumed that product and labor market policies are set independently from one another. Yet there may be interconnections between the two. Indeed the simple model of Section 2.3, that generalizes the result in Blanchard and Giavazzi (2003), suggests that product market deregulation may lead to labor market deregulation. In Table 5 we present (extended) Granger causality tests of product and labour market regulation. That is, we investigate whether our measures of product market regulation Granger cause LMR and UDCO (and vice-versa), after controlling for additional macroeconomic and political economy variables.

More specifically, we regress LMR on its own two lags and two lags of RNOPO (or NOPOFI) and we do a parallel exercise for RNOPO (and NOPOFI). Following Dang et al. (2006), we control for a number of potential political economy influences on the reform process. Given that reforms are sometimes set in motion by economic crises, we include as controls the first and the second lag of a dummy that takes value 1 if the output gap drops by more than 4% (BIGCRISIS). We also take into account other political economy variables: the political orientation of the government (left or right of center), captured by the dummy variable LEFT that equals one if the government is left-of-center; and the length of time the government has been in power, OGOV. All the regressions are estimated again by feasible GLS, allowing for a different error variance in each country. With two lags of all the regressors, there is no need for autocorrelation corrections. All specifications also include country dummies, country-specific trends and year dummies. We test whether the coefficients of the first two lags are jointly significant and also if their sum is different from zero.

Political economy variables help explain both product and labour market regulation. Notably, crises have opposite effects on the two markets: labour regulation tends to be tightened while product markets tend to be liberalised after severe downturns. At the same time, mature governments are more likely to implement product market reforms and, not surprisingly, left-of-center governments are more willing to tighten regulations in both labour and product markets.[31]

More importantly, the results suggest that RNOPO Granger-causes LMR, while the converse is not true. In addition, the sum of the coefficients on the two lags of RNOPO is positive and significant,

[31] These results are broadly consistent with the finfings of Dang et al. (2006) and Duval and Elmeskov (2005).

which means that domestic deregulation of the product market leads to lower regulation in the labor market. By contrast we do not find evidence that NOPOFI Granger-causes LMR.

Next, we also include in the regression lags of UDCO as a robustness check (columns 5-10). The findings in columns 1-4 are confirmed: RNOPO Granger causes LMR, but the same is not true for NOPOFI. However NOPOFI Granger causes UDCO, which in turn Granger causes LMR. There appears to be some evidence, therefore, that deregulating the product market has a positive indirect effect on employment because it induces either lower labour market regulation or weaker unions' power. Interestingly, UDCO Granger causes RNOPO and NOPOFI, but with a negative sign: higher levels of UDCO lead to lower level of product market regulation. This result deserves further investigation.

Allowing for the impact of product market deregulation on labor market policies (or institutions), increases its employment effect substantially. For instance, consider the long run effect on employment of a product market deregulation that moves a country from the third quartile of RNOPO to the first quartile. Using the results in column 1 of Table 3 and Table 5, the long run increase in the employment rate goes from .17 percentage points (when the effect of product market deregulation on labor market policies is not considered) to 1.86 percentage points (when such interaction is taken into account), under the assumption that labor market regulation is low and equal the first quartile of LMR. When labor market regulation is high and equal to the third quartile of LMR, the employment gain following product market deregulation increases from 3.26 to 5.59 percentage points in the long run. Comparing again the effect of product market deregulation in different countries, note that a that one standard deviation decrease in RNOPO generates a total long run gain in the employment rate of 2.48 percentage points in France (a high LMR country) and of .83 percentage points in Ireland (a low LMR country).

The final issue we will address in this section is the potential endogeneity of product and labor market regulation (and of the unionization-coverage variable) in the employment equation. More specifically, if the error term in the employment equation is uncorrelated with the ones in the equations generating LMR, NOPO (NOPOFI) and UDCO then there are no endogeneity problems. However, if the correlation is non zero, then the estimates of the employment effects of product and labor market policies and of labor market institutions obtained so far by GLS are inconsistent. Endogeneity tests and estimation results obtained by accounting for the potential endogeneity of

some policy variables (as well as of the GAP) are reported in Table 6. At the bottom of columns we report the endogeneity test for the employment model of columns (1) and (2) of Table 3 (results for other specifications are qualitatively similar). The test is based on the control function approach of Rivers and Vuong (1988) and is implemented by introducing the estimated errors from the first stage equations for LMR, NOPO, and UDCO and interactions of the errors with other variables (due to the presence of interaction effects) in the employment equation.[32] The test of joint significance of the terms containing the errors is a test of endogeneity of LMR, NOPO, and UDCO. Moreover, in the presence of endogeneity, the estimated coefficients on the variables of interest obtained by adding the first stage errors (and the appropriate interaction among them) are consistent, although their standard errors are incorrect due to the generated regressor problem. We report such estimates in columns (1) and (2) with corrected standard errors, using an extension of the formulas in Murphy and Topel (1985).

The tests suggest that one cannot reject the absence of endogeneity problems at a marginal significance level of .430 in the specification with common ρ and .110 with country specific ρ (i.e. the error in the employment equation is not significantly correlated with those in the equations for LMR, NOPO, and UDCO). Thus the GLS estimates in columns (1) and (2) of Table 3 are consistent. In any case the instrumental variable estimates presented in columns (1) and (2) of Table 6 confirm the results obtained so far on the sign and significance of the interactions between product and labor market regulation.[33]

Another potential problem in obtaining consistent estimates of the effect of product and labor market regulation could result from the endogeneity of the GAP variable. It should be stressed, however, that the spill over of the endogeneity of GAP on such estimates is very unlikely to be a serious problem since there is little correlation between GAP and NOPO, LMR and UDCO (the correlation coefficients are respectively -.10, .03, -.07). In columns (3) and (4) of Table 6 we report the endogeneity test and the instrumental variable estimates when only the GAP variable is assumed to be endogenous (lag one and two of the GAP variable are used as instruments). Again the tests do not suggest the presence of endogeneity problems and the instrumental variable

[32] More specifically, in addition to the error in the LMR, NOPO, and UDCO equations, denoted respectively by u^L, u^P, u^U, we also add to the employment equation $u^L u^P, u^P LMR$, $u^L PMR$, $u^L ERBL$..See also Lewbel (2005) to whom we are indebted for very useful discussions and suggestions on this issue.

[33] There is some loss in efficiency so that the main effect of NOPO is less precisely estimated.

estimates confirm the results obtained so far. Finally in columns (5) and (6) we allow for the endogeneity of GAP, NOPO, LMR and UDCO at the same time. Once more we cannot reject the absence of endogeneity problems and our conclusions still stand.

5 Conclusions

The results obtained from dynamic model specifications confirm that past reforms have produced substantial employment gains in OECD countries. Hence, there is evidence that product market reform not only has favorably affected the level and growth rate of productivity,[34] but that also employment outcomes can be enhanced by the same policies. Tight labor market regulation or high union density and coverage tends to reduce employment.

Our main result is that there is a negative and significant interaction between product and labor market regulation: employment gains from reducing barriers to entry in product markets are larger when labour market policies are tight, thereby increasing the bargaining power of workers. In this sense, product and labour market deregulation can be classified as "substitutes". This has important policy implications for those countries where it may be politically difficult to deregulate the labor market.

In addition, we find that product market reforms and labour market policies are linked. Results are consistent with the idea that domestic product market deregulation has generated a decline in the bargaining power of workers, by promoting deregulation in the labor market. The reverse is not true: labor market deregulation does not affect the setting of product market regulation. The measure of regulation that includes FDI restrictions provides evidence that product market deregulation also leads to an easing of bargaining institutions, as measured by a decrease in the principal component of union density and union coverage. Thus, from a political economy perspective, product and labour market deregulation can be classified as "complements ".

A possible implication of these results is that in assessing the effect of product market deregulation one should consider also its indirect effects through subsequent changes in labour market policies

[34] See Schiantarelli (2005), Nicoletti and Scarpetta (2006) and Crafts (2006) for a review of the cross country evidence.

or institutions. In other words, deregulating product markets would imply a "double dividend" in terms of employment gains in the long run. A related implication is that sequencing reforms to deal first with product markets could make it easier to overcome political opposition to labour market deregulation later on. Finally, there are also interesting feedbacks from labor market institutions to product and labor market policies that deserve further discussion and investigation.

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7 Appendix A: Derivations

The (net) profit function for the firm, Π_i, is:

$$\Pi_i = \frac{P_i}{P} L_i - \frac{W_i}{P} L_i (1 + \tau^p) \tag{A1}$$

where $\frac{P_i}{P}$ denotes the price of the firm's product relative to the aggregate price level

Union utility in excess of the disagreement point is

$$V_i - \overline{V_i} = \left(1 - \tau^L\right) \left(\frac{W_i}{P} - \frac{W_i^A}{P}\right) L_i \tag{A2}$$

where $\overline{V_i} = \frac{W_i^A}{P} N_i$.The alternative wage is:

$$\frac{W_i^A}{P} = \frac{N - L - L^g}{N} \frac{B}{P\left(1 - \tau^L\right)} + \frac{L^g}{N} \frac{W^g}{P} + \frac{L}{N} \frac{W_i^o}{P} \tag{A3}$$

where L is aggregate employment, N the labor force, assumed equal to total union membership, L^g public employment. $\frac{B}{P}$ are unemployment benefits which are untaxed. $\frac{W^g}{P}$is the government wage and $\frac{W^o}{P}$.the wage with another private employer. We will assume a balanced budget (and no public spending on goods):

$$\frac{B}{P} \frac{N - L - L^g}{N} + \frac{L^g}{N} \frac{W^g}{P} = \left(\tau^L + \tau^p\right) \frac{L}{N} \frac{W_i}{P} + \tau^L \frac{L^g}{N} \frac{W^g}{P} \tag{A4}$$

The first order conditions yield:

$$\frac{P_i}{P} = (1 + \mu)(1 + \tau^p) \frac{W_i^A}{P} \tag{A5}$$

$$\frac{W_i}{P} = (1 + \mu\beta) \frac{W_i^A}{P} \tag{A6}$$

Using (12) and (12) and $\frac{P_i}{P} = 1$,and $\frac{W_i}{P} = \frac{W^o}{P} = \frac{W}{P}$ we can obtain (2) and (1) in the text. Using (2), the definition of the alternative wage, (A3), the assumption that private and government wages are equal, and the balanced budget condition, (A4), one can obtain an upward sloping relationship between the alternative wage and the employment rate,(3) in the text.

8 Appendix B: Data sources and definitions

Employment

Non-agricultural business employment rate

Definition: non-agricultural business employment as a share of the working-age population (15-64 group), in %

Source: Business employment and working-age population from OECD Analytical Database; agricultural employment and from OECD Labour Force Statistics.

Data adjustments: the share of agricultural employment in total employment in Labour Force Statistics was used to estimate an agricultural employment series consistent with the businessemployment series drawn from the OECD Analytical Database

Public employment rate

Definition: public employment as a share of the working-age population (15-64 age group), in %.

Source: OECD, Analytical Database;

Data adjustments: missing observations are obtained by linear interpolation when possible.

Product and labour market policies

Domestic Product Market Regulation

Definition: OECD summary indicator of regulatory impediments to product market competition in seven non-manufacturing industries. The data covers regulations and market conditions in seven non-manufacturing industries: gas, electricity, post (basic letter, parcel, express mail), telecommunications (fixed and mobile services), passenger air transport, railways (passenger and freight services) and road freight. Detailed qualitative and quantitative data on several dimensions of ownership, regulation and market or industry structure are coded and aggregated into synthetic indicators that are increasing in the degree of restrictions to private ownership and competition.

Dimensions covered are degree of public ownership, legal impediments to competition, degree of vertical integration of natural monopoly and competitive activities in network industries, market share of incumbent or new entrants in network industries, price controls in competitive activities. The data are yearly over the 1975-2003 period and cover 21 OECD countries.

Source: Conway and Nicoletti (2006). The underlying data and the indicators are available online at www.oecd.org/eco/pmr .

Foreign direct investment restrictions

Definition: OECD summary indicator of restrictions to entry and post-entry restrictions to foreign direct investment in business services (legal, accounting, architecture, engineering), telecommunications (fixed and mobile), construction, retail and wholesale distribution, finance (insurance and banking), hotels & restaurants, transport (air, maritime, road), electricity and manufacturing. Restrictions cover limits on foreign equity ownership, constraints on business operation and obligations to undergo screening procedures. The data are collected every 5 years over the 1980-2005 period and cover 30 OECD countries.

Source: Golub (2003) and Golub and Koyama (2006).

Data adjustments: Intermediate years are interpolated.

Average unemployment benefit replacement rate

Definition: average unemployment benefit replacement rate across two income situations (100% and 67% of APW earnings), three family situations (single, with dependent spouse, with spouse in work) and three different unemployment durations (1st year, 2nd and 3rd years, and 4th and 5th years of unemployment).

Source: OECD, Benefits and Wages Database.

Data adjustments: original data are available only for odd years. Data for even years are obtained by linear interpolation.

Tax wedges on labour income

Definition: The share of personal income tax and all social security contributions (net of social benefits) to total labour cost and averaged over two family types (single household and a couple with a dependent spouse and two children, both family types earning 100% of an APW income).

Source: OECD, Taxing Wages.

Employment Protection Legislation (EPL)

Definition: OECD summary indicator of the stringency for Employment Protection Legislation for:

Indefinite contract (regular) workers

Fixed-term contract (temporary) workers

All contracts (measured as a simple average of indefinite and fixed-term contracts).

Information on regular contracts include procedural inconveniences that employers face when trying to dismiss a worker; notice and several payments at different job tenures; and prevailing standards of and penalties for unfair dismissals. Information on fixed-term and temporary work agency contracts include: the objective reasons under which they can be offered; the maximum number of successive renewals; and the maximum cumulated duration of the contract. Detailed data sets were collected for end of 1980s, end of 1990s and 2003 for 30 OECD countries.

Source: OECD (2004).

Data adjustments: Less detailed information on the timing of EPL reforms was used to construct an yearly series over 1985-2003. The 1985 value was extrapolated back to 1980.

Labour market institutions

Degree of corporatism:

Definition: indicator of the degree of centralisation/co-ordination of the wage bargaining processes, which takes values 1 for decentralised and uncoordinated processes, and 2 and 3 for intermediate and

high degrees of centralisation/co-ordination, respectively. The "low corporatism" dummy variable frequently used in this paper takes value 1 when bargaining is decentralised and uncoordinated and zero otherwise.

Source: OECD, Employment Outlook 2004.

Data adjustments: original data are five-year averages and classify countries in each period along a 0-5 scale from least to most "corporatist" countries. In the present paper, annual data have been reconstructed based on various sources on the timing of past changes in centralisation and/or co-ordination of wage bargaining. Furthermore, the indicator has been rescaled along a 1-3 scale. In this process, it has been assumed that wage bargaining in France predominantly occurs at the intermediate level, while original data describe it as a mix of firm-level and industry-level bargaining. For other countries, values 1, 2 and 3 correspond to values 1-2, 3 and 4-5 in the original dataset, respectively.

Union density

Definition: trade union density rate, i.e. the share of workers affiliated to a trade union, in %.

Source: OECD, Employment Outlook 2004.

Data adjustments: data for missing years are obtained by linear interpolation. Furthermore, original data are typically available until 2001 for most OECD countries. Extrapolations have therefore been made in order expand data availability up to 2003. These are mainly based on national sources but, in some cases, an assumption of unchanged union densities over the period 2001-2003 had to be made due to lack of data.

Union coverage

Definition: collective bargaining coverage rate, i.e. the share of workers covered by a collective agreement, in %.

Source: OECD, Employment Outlook 2004. In the case of Ireland, the average bargaining coverage rate is taken from Belot and van Ours (2004).

Macro-economic conditions

Output gap

Definition: OECD measure of the gap between actual and potential output as a percentage of potential output.

Source: OECD (2005) Economic Outlook 77.

Big economic crisis

Definition: Dummy variable set to 1 when output gap is larger than -4%.

Source: Dang et al. (2006).

Political institutions

Ideology left-of-centre government

Definition: Dummy variable set to 1 for when the political orientation of the government is left-of-centre. The dummy is based on an ideology variable, which is measured as a simple average of the chief executive's ideology and the average of the two main parties in the coalition (if applicable). Ideological scores were attributed as follow: 2 = right-of-centre, 1 = centre and 0 = left-of-centre. The dummy is set to 1 for when the average value of ideology is lower than 0.8.

Source: Dang et al. (2006) based on World Bank, Database of Political Institutions, 2004

Mature government

Definition: Dummy variable set to 1 for when government has been in office for more than two years.

Source: Dang et al. (2006) based on World Bank, Database of Political Institutions, 2004

Table 1 : Dynamic Models main effects only, using LMR and various PMR measures

	(1) ERB	(2) ERB	(3) ERB	(4) ERB	(5) ERB	(6) ERB	(7) ERB	(8) ERB
ERBL	0.675***	0.671***	0.683***	0.673***	0.682***	0.674***	0.664***	0.673***
	(35.82)	(34.20)	(36.13)	(34.84)	(35.99)	(34.79)	(35.45)	(35.48)
REG	-0.149	-0.0744						
	(-1.61)	(-0.82)						
LMR	-0.0326	0.216	-0.138	0.100	-0.152	0.0865	0.0568	-0.0553
	(-0.17)	(1.13)	(-0.70)	(0.52)	(-0.77)	(0.45)	(0.30)	(-0.28)
UDCO	-0.913***	-1.315***	-0.977***	-1.355***	-0.974***	-1.350***	-1.401***	-0.850**
	(-2.77)	(-4.57)	(-2.99)	(-4.59)	(-2.95)	(-4.56)	(-4.62)	(-2.55)
WEDGE	0.00842	0.0176	0.00765	0.0188	0.00768	0.0182	0.0182	0.00354
	(0.53)	(1.14)	(0.48)	(1.22)	(0.48)	(1.18)	(1.19)	(0.22)
EGRM	-0.305***	-0.0720	-0.257***	-0.0618	-0.263***	-0.0614	-0.131*	-0.280***
	(-3.96)	(-0.95)	(-3.24)	(-0.82)	(-3.32)	(-0.81)	(-1.74)	(-3.50)
LLCORP	0.499	0.323	0.518	0.302	0.502	0.293	0.335	0.514
	(1.20)	(0.93)	(1.25)	(0.88)	(1.21)	(0.85)	(1.19)	(1.50)
HGCORP	-0.00787	-0.226	-0.0715	-0.268	-0.0739	-0.265	-0.219	-0.0731
	(-0.02)	(-0.66)	(-0.19)	(-0.79)	(-0.19)	(-0.78)	(-0.78)	(-0.22)
GAP	0.307***	0.319***	0.306***	0.321***	0.305***	0.320***	0.322***	0.309***
	(20.36)	(22.44)	(20.37)	(22.80)	(20.30)	(22.71)	(23.32)	(20.75)
RNOPO			-0.229***	-0.163*				
			(-2.70)	(-1.95)				
RPO			0.125	0.0946	0.120	0.0869	0.172**	0.140
			(1.37)	(1.17)	(1.31)	(1.09)	(2.03)	(1.51)
RBEVI					-0.181**	-0.119*		
					(-2.46)	(-1.72)		
NOPOFI							-0.256**	-0.230**
							(-2.31)	(-2.07)
N	460	460	460	460	460	460	440	440

t statistics in parentheses; * denotes p<0.10, ** p<0.05, *** p<0.01, where p is the marginal probability level.
Estimation method: feasible GLS. The error follows an AR(1) structure, where the rho is common in columns 1-3-5-7 and country specific in columns 2-4-6-8.
All the equations include country dummies, country-specific trends, year effects, a Finland(1992-2002) dummy and a Germany(1991-2002) dummy.
Sample period: 1980-2002.

Table 2 : Dynamic Models main effects only, using EPL and BEN and various PMR measures

	(1) ERB	(2) ERB	(3) ERB	(4) ERB	(5) ERB	(6) ERB	(7) ERB	(8) ERB
ERBL	0.667***	0.665***	0.675***	0.667***	0.674***	0.668***	0.667***	0.658***
	(34.41)	(33.73)	(34.78)	(34.33)	(34.53)	(34.26)	(34.40)	(34.99)
REG	-0.216**	-0.125						
	(-2.16)	(-1.29)						
EPL	0.277	0.318**	0.200	0.242	0.191	0.225	0.180	0.245
	(1.64)	(2.02)	(1.18)	(1.55)	(1.13)	(1.45)	(1.05)	(1.54)
BEN	-0.0199	-0.00755	-0.0243*	-0.0132	-0.0255**	-0.0140	-0.0140	-0.0137
	(-1.59)	(-0.55)	(-1.94)	(-0.97)	(-2.01)	(-1.01)	(-1.13)	(-1.06)
UDCO	-0.753**	-1.223***	-0.810**	-1.256***	-0.822**	-1.262***	-0.782**	-1.329***
	(-2.32)	(-4.32)	(-2.51)	(-4.30)	(-2.53)	(-4.32)	(-2.37)	(-4.47)
WEDGE	0.00245	0.0154	0.00199	0.0165	0.00205	0.0159	0.000726	0.0162
	(0.15)	(1.00)	(0.12)	(1.07)	(0.13)	(1.03)	(0.05)	(1.06)
EGRM	-0.237***	-0.0548	-0.193**	-0.0410	-0.197**	-0.0394	-0.232***	-0.101
	(-3.01)	(-0.73)	(-2.38)	(-0.55)	(-2.43)	(-0.52)	(-2.82)	(-1.34)
LLCORP	0.715*	0.481	0.725*	0.457	0.708*	0.441	0.663*	0.501*
	(1.70)	(1.36)	(1.73)	(1.30)	(1.69)	(1.26)	(1.90)	(1.75)
HGCORP	0.0862	-0.158	0.0189	-0.210	0.0144	-0.210	-0.0158	-0.160
	(0.22)	(-0.46)	(0.05)	(-0.62)	(0.04)	(-0.62)	(-0.05)	(-0.57)
GAP	0.305***	0.318***	0.303***	0.321***	0.303***	0.320***	0.307***	0.320***
	(20.15)	(22.51)	(20.16)	(22.86)	(20.12)	(22.80)	(20.50)	(23.23)
RNOPO			-0.267***	-0.195**				
			(-3.04)	(-2.28)				
RPO			0.0950	0.0771	0.0911	0.0718	0.125	0.161*
			(1.05)	(0.96)	(1.00)	(0.90)	(1.35)	(1.91)
RBEVI					-0.217***	-0.148**		
					(-2.86)	(-2.08)		
NOPOFI							-0.258**	-0.299***
							(-2.25)	(-2.66)
N	460	460	460	460	460	460	440	440

t statistics in parentheses; * denotes p<0.10, ** p<0.05, *** p<0.01, where p is the marginal probability level.
Estimation method: feasible GLS. The error follows an AR(1) structure, where the rho is common in columns 1-3-5-7 and country specific in columns 2-4-6-8.
All the equations include country dummies, country-specific trends, year effects, a Finland(1992-2002) dummy and a Germany(1991-2002) dummy.
Sample period: 1980-2002.

Table 3 : Dynamic Models and interaction between product market and labor market policies

	(1) ERB	(2) ERB	(3) ERB	(4) ERB	(5) ERB	(6) ERB	(7) ERB	(8) ERB	(9) ERB	(10) ERB
ERBL	0.662***	0.659***	0.529***	0.549***	0.652***	0.646***	0.531***	0.547***	0.741***	0.738***
	(32.69)	(33.01)	(14.69)	(16.23)	(31.96)	(32.80)	(14.53)	(16.16)	(40.26)	(40.78)
ERBLLMR	0.0587***	0.0534***			0.0617***	0.0619***			0.0323**	0.0293**
	(4.11)	(3.87)			(4.25)	(4.50)			(2.31)	(2.16)
RNOPO	-0.221**	-0.189**	-0.216**	-0.218**					-0.191**	-0.135
	(-2.46)	(-2.20)	(-2.29)	(-2.37)					(-2.20)	(-1.60)
RPO	0.153	0.134	0.103	0.117	0.177*	0.200**	0.128	0.171*	0.175**	0.154*
	(1.64)	(1.57)	(1.12)	(1.35)	(1.88)	(2.25)	(1.36)	(1.94)	(2.02)	(1.89)
LMR	-2.699***	-2.290***			-2.706***	-2.626***			-1.656**	-1.431**
	(-3.97)	(-3.45)			(-3.91)	(-4.00)			(-2.46)	(-2.21)
NOPOLMR	-0.213***	-0.162**							0.0344	0.0300
	(-3.07)	(-2.30)							(0.77)	(0.70)
UDCO	-1.477***	-1.776***	-1.075***	-1.501***	-1.235***	-1.722***	-0.872***	-1.446***	0.0555	-0.00522
	(-4.55)	(-5.90)	(-3.23)	(-4.93)	(-3.79)	(-5.84)	(-2.61)	(-4.71)	(0.26)	(-0.02)
WEDGE	-0.00570	0.0117	-0.0129	0.00490	-0.00768	0.00720	-0.0135	0.00284	0.00642	0.0123
	(-0.37)	(0.78)	(-0.82)	(0.32)	(-0.51)	(0.49)	(-0.87)	(0.19)	(0.55)	(1.02)
EGRM	-0.133	-0.00555	-0.164**	-0.0567	-0.152*	-0.0380	-0.209**	-0.100	-0.270***	-0.266***
	(-1.59)	(-0.07)	(-2.04)	(-0.74)	(-1.74)	(-0.48)	(-2.49)	(-1.27)	(-5.33)	(-5.78)
LLCORP	0.461	0.298	0.436	0.304	0.481	0.316	0.390	0.275	0.984***	0.778***
	(1.10)	(0.84)	(1.01)	(0.81)	(1.42)	(1.15)	(1.08)	(0.89)	(2.99)	(2.91)
HGCORP	-0.102	-0.286	-0.101	-0.277	-0.123	-0.276	-0.118	-0.228	0.975***	0.820***
	(-0.26)	(-0.82)	(-0.26)	(-0.79)	(-0.37)	(-1.00)	(-0.35)	(-0.79)	(3.33)	(3.08)
GAP	0.299***	0.310***	0.288***	0.305***	0.297***	0.311***	0.289***	0.306***	0.275***	0.276***
	(20.10)	(21.89)	(19.50)	(21.43)	(19.80)	(22.21)	(19.37)	(21.47)	(17.58)	(18.19)
ERBLEPL			0.0658***	0.0544***			0.0653***	0.0544***		
			(4.88)	(4.32)			(4.66)	(4.23)		
EPL			-2.862***	-2.268***			-2.821***	-2.261***		
			(-4.49)	(-3.77)			(-4.20)	(-3.63)		
BEN			-0.0116	-0.00697			0.00345	0.00442		
			(-0.88)	(-0.51)			(0.24)	(0.31)		
NOPOEPL			0.00177	-0.00990						
			(0.02)	(-0.13)						
NOPOBEN			-0.0104**	-0.00918*						
			(-2.33)	(-1.94)						
NOPOFI					-0.278**	-0.331***	-0.216*	-0.289**		
					(-2.41)	(-2.93)	(-1.78)	(-2.48)		
NOPOFILMR					-0.241***	-0.259***				
					(-2.77)	(-3.00)				
NOPOFIEPL							0.0471	-0.00756		
							(0.43)	(-0.07)		
NOPOFIBEN							-0.0112**	-0.0125**		
							(-2.01)	(-2.19)		
N	460	460	460	460	440	440	440	440	460	460

t statistics in parentheses; * denotes p<0.10, ** p<0.05, *** p<0.01, where p is the marginal probability level.
Estimation method: feasible GLS.The error follows an AR(1) structure, where the rho is common in columns 1-3-5-7-9 and country specific in columns 2-4-6-8-10.
The equations include country dummies, country-specific trends, year effects, a Finland(1992-2002) dummy and a Germany(1991-2002) dummy, with the exception of column 9 and 10 that do not include country-specific trends.
Sample period: 1980-2002.

Table 4 : Dynamic Models and interaction between product market, labor market policies and institutions

	(1) ERB	(2) ERB	(3) ERB	(4) ERB	(5) ERB	(6) ERB	(7) ERB	(8) ERB
ERBL	0.656***	0.655***	0.656***	0.656***	0.647***	0.641***	0.647***	0.644***
	(32.02)	(32.73)	(31.81)	(32.69)	(31.25)	(32.15)	(30.97)	(32.24)
ERBLLMR	0.0573***	0.0533***	0.0571***	0.0513***	0.0615***	0.0647***	0.0605***	0.0605***
	(4.03)	(3.91)	(4.01)	(3.74)	(4.25)	(4.72)	(4.16)	(4.38)
RNOPO	-0.235***	-0.200**	-0.233***	-0.202**				
	(-2.63)	(-2.35)	(-2.59)	(-2.40)				
RPO	0.150*	0.116	0.156*	0.153*	0.194**	0.212**	0.201**	0.247***
	(1.65)	(1.38)	(1.66)	(1.75)	(2.07)	(2.38)	(2.08)	(2.69)
LMR	-2.665***	-2.347***	-2.659***	-2.258***	-2.724***	-2.778***	-2.666***	-2.555***
	(-3.95)	(-3.57)	(-3.93)	(-3.41)	(-3.96)	(-4.23)	(-3.85)	(-3.86)
NOPOLMR	-0.234***	-0.179**	-0.230***	-0.160**				
	(-3.33)	(-2.53)	(-3.16)	(-2.21)				
NOPOUDCO	0.0881	0.0934*	0.0828	0.0750				
	(1.59)	(1.80)	(1.41)	(1.40)				
UDCO	-1.461***	-1.685***	-1.397**	-1.339**	-1.333***	-1.745***	-1.049*	-1.141**
	(-4.54)	(-5.57)	(-2.26)	(-2.32)	(-4.06)	(-5.93)	(-1.79)	(-2.11)
WEDGE	0.000606	0.0180	0.000805	0.0199	-0.00365	0.0110	-0.00356	0.0107
	(0.04)	(1.18)	(0.05)	(1.30)	(-0.23)	(0.73)	(-0.23)	(0.71)
EGRM	-0.155*	-0.0256	-0.157*	-0.0355	-0.166*	-0.0497	-0.171*	-0.0737
	(-1.82)	(-0.33)	(-1.82)	(-0.45)	(-1.87)	(-0.61)	(-1.92)	(-0.90)
LLCORP	0.521	0.364	0.564	0.577	0.513	0.347	0.770	0.886*
	(1.25)	(1.03)	(0.99)	(1.08)	(1.51)	(1.27)	(1.39)	(1.70)
HGCORP	-0.119	-0.297	-0.118	-0.318	-0.142	-0.297	0.0378	0.00346
	(-0.30)	(-0.85)	(-0.22)	(-0.63)	(-0.43)	(-1.08)	(0.07)	(0.01)
GAP	0.303***	0.313***	0.303***	0.312***	0.299***	0.314***	0.298***	0.311***
	(20.40)	(22.21)	(20.38)	(22.21)	(19.92)	(22.30)	(19.87)	(22.17)
UDCOLLCORP			-0.102	-0.497			-0.368	-0.782
			(-0.16)	(-0.85)			(-0.61)	(-1.44)
UDCOHGCORP			0.0409	0.286			-0.159	-0.0865
			(0.07)	(0.54)			(-0.30)	(-0.18)
NOPOFI					-0.324***	-0.374***	-0.328***	-0.400***
					(-2.66)	(-3.19)	(-2.68)	(-3.43)
NOPOFILMR					-0.268***	-0.297***	-0.261***	-0.271***
					(-3.01)	(-3.31)	(-2.81)	(-2.97)
NOPOFIUDCO					0.0847	0.0837	0.0711	0.0459
					(1.07)	(1.13)	(0.84)	(0.60)
N	460	460	460	460	440	440	440	440

t statistics in parentheses; * denotes p<0.10, ** p<0.05, *** p<0.01, where p is the marginal probability level.
Estimation method: feasible GLS.The error follows an AR(1) structure, where the rho is common in columns 1-3-5-7 and country specific in columns 2-4-6-8.
All the equations include country dummies, country-specific trends, year effects, a Finland(1992-2002) dummy and a Germany(1991-2002) dummy.
Sample period: 1980-2002.

Table 5: Granger Causality

	(1) LMR	(2) NOPO	(3) LMR	(4) NOPOFI	(5) LMR	(6) LMR	(7) NOPO	(8) NOPOFI	(9) UDCO	(10) UDCO
L.LMR	0.918***	-0.0413	0.937***	-0.0140	0.908***	0.923***	-0.0687	-0.0351	0.0117	0.0101
	(19.72)	(-0.45)	(19.69)	(-0.27)	(19.49)	(19.34)	(-0.75)	(-0.68)	(0.78)	(0.63)
L2.LMR	-0.224***	-0.0114	-0.265***	-0.00122	-0.218***	-0.260***	0.00822	0.0107	-0.00654	-0.00852
	(-5.09)	(-0.13)	(-5.81)	(-0.02)	(-4.99)	(-5.74)	(0.10)	(0.22)	(-0.47)	(-0.56)
L.NOPO	0.00319	0.945***			0.000905		0.937***		-0.00219	
	(0.20)	(20.47)			(0.06)		(20.35)		(-0.33)	
L2.NOPO	0.0309*	-0.159***			0.0278*		-0.158***		0.00615	
	(1.87)	(-3.27)			(1.71)		(-3.27)		(0.90)	
lbigcrisis	0.0198*	0.000822	0.0222*	0.0282	0.0254**	0.0280**	0.0138	0.0372**	-0.00132	-0.00162
	(1.70)	(0.03)	(1.87)	(1.50)	(2.16)	(2.34)	(0.43)	(1.99)	(-0.26)	(-0.30)
L.lbigcrisis	-0.00670	-0.0973***	-0.00652	-0.0685***	-0.00478	-0.00386	-0.0974***	-0.0643***	-0.00662	-0.00849
	(-0.58)	(-3.08)	(-0.55)	(-3.78)	(-0.41)	(-0.33)	(-3.08)	(-3.58)	(-1.33)	(-1.60)
L.left	0.0120*	0.0339*	0.0120*	0.00817	0.0140**	0.0144**	0.0416**	0.0146	0.00508*	0.00507*
	(1.75)	(1.79)	(1.71)	(0.75)	(2.07)	(2.08)	(2.18)	(1.32)	(1.84)	(1.68)
ogov	0.00244	-0.0326**	0.00446	-0.0165*	0.00200	0.00458	-0.0332**	-0.0159*	-0.000512	-0.000478
	(0.42)	(-2.08)	(0.75)	(-1.86)	(0.34)	(0.78)	(-2.12)	(-1.80)	(-0.23)	(-0.20)
L.NOPOFI			-0.00907	1.103***		-0.0213		1.073***		-0.0105
			(-0.34)	(24.20)		(-0.80)		(23.41)		(-0.86)
L2.NOPOFI			0.0265	-0.299***		0.0287		-0.272***		0.0272**
			(1.02)	(-6.75)		(1.12)		(-6.10)		(2.29)
L.UDCO					0.0478	0.0539	-0.000565	-0.00817	1.408***	1.355***
					(0.55)	(0.62)	(-0.00)	(-0.06)	(33.90)	(30.95)
L2.UDCO					-0.126	-0.138	-0.222	-0.186	-0.546***	-0.505***
					(-1.43)	(-1.54)	(-1.00)	(-1.46)	(-13.16)	(-11.38)
N	441	462	420	441	441	420	462	441	441	420
joint_rnopo	0.00545				0.0213				0.568	
sum_rnopo	0.00175				0.00786				0.384	
joint_nopofi			0.349			0.515				0.00382
sum_nopofi			0.215			0.606				0.00481
joint_lmr		0.701		0.911			0.584	0.720	0.726	0.811
sum_lmr		0.401		0.675			0.329	0.493	0.618	0.891
joint_udco					0.0824	0.0771	0.0417	0.00141		
sum_udco					0.0451	0.0417	0.0128	0.000357		

t statistics in parentheses; * denotes p<0.10, ** p<0.05, *** p<0.01, where p is the marginal probability level.
Estimation method: feasible GLS.
All the equations include country dummies, country-specific trends, and year effects.
Sample period: 1980-2002.

Table 6: Endogeneity: Testing and Estimation

	(1) ERB	(2) ERB	(3) ERB	(4) ERB	(5) ERB	(6) ERB
ERBL	0.652***	0.654***	0.643***	0.638***	0.653***	0.655***
	(30.75)	(13.89)	(28.45)	(28.85)	(29.08)	(29.60)
ERBLLMR	0.0461***	0.0451***	0.0504***	0.0512***	0.0463***	0.0451***
	(2.89)	(2.75)	(3.21)	(3.42)	(2.89)	(2.90)
RNOPO	-0.114	-0.180	-0.171*	-0.159*	-0.117	-0.182*
	(-1.04)	(-1.14)	(-1.93)	(-1.84)	(-1.07)	(-1.70)
RPO	0.252***	0.304***	0.221**	0.237***	0.254***	0.305***
	(2.74)	(3.17)	(2.42)	(2.80)	(2.74)	(3.44)
LMR	-2.413***	-2.355**	-2.254***	-2.267***	-2.424***	-2.357***
	(-3.06)	(-2.54)	(-2.95)	(-3.13)	(-3.07)	(-3.09)
NOPOLMR	-0.187**	-0.225**	-0.190***	-0.205***	-0.186**	-0.224***
	(-2.34)	(-2.15)	(-2.62)	(-2.92)	(-2.32)	(-2.89)
UDCO	-0.878**	-1.359**	-0.981***	-1.423***	-0.870**	-1.355***
	(-2.33)	(-2.42)	(-2.69)	(-4.24)	(-2.31)	(-3.86)
WEDGE	-0.0219	-0.00877	-0.0210	-0.00882	-0.0221	-0.00897
	(-1.46)	(-0.56)	(-1.38)	(-0.59)	(-1.47)	(-0.61)
EGRM	-0.228**	-0.159*	-0.212**	-0.146*	-0.227**	-0.158*
	(-2.55)	(-1.68)	(-2.26)	(-1.65)	(-2.53)	(-1.84)
LLCORP	0.525	0.382	0.472	0.312	0.531	0.385
	(1.52)	(1.19)	(1.34)	(1.08)	(1.53)	(1.31)
HGCORP	-0.0382	-0.107	-0.0421	-0.106	-0.0367	-0.106
	(-0.11)	(-0.31)	(-0.12)	(-0.37)	(-0.11)	(-0.36)
GAP	0.304***	0.303***	0.307***	0.307***	0.303***	0.302***
	(21.22)	(13.62)	(17.13)	(18.15)	(17.35)	(18.89)
N	420	420	420	420	420	420
Endogeneity test	0.430	0.110	0.692	0.369	0.536	0.164

t statistics in parentheses; * denotes p<0.10, ** p<0.05, *** p<0.01, where p is the marginal probability level.
Estimates obtained by Control Function Approach. Standar errors have been corrected.
Variables treated as endogenous: in column(1) and (2) LMR, RNOPO and UDCO; in column (3) and (4) GAP; in column (5) and (6) LMR, RNOPO, UDCO and GAP.
The error follows an AR(1) structure, where rho is common in columns 1-3-5 and country specific in 2-4-6.
Endogeneity test: p-values reported.
Sample period:1980-2002.