

## PRODUCT MARKET REFORMS, LABOUR MARKET INSTITUTIONS AND UNEMPLOYMENT\*

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We analyse the impact of product market competition on unemployment, and how this depends on labour market institutions. Theoretically, both firms with market power and unions with bargaining power are constrained in their behaviour by the elasticity of demand in the product market. We use differential changes in regulations across OECD countries over the 1980s and 1990s to identify the effects of competition. We find that increased competition reduces unemployment, more so in countries with labour market institutions that increase worker bargaining power. We also find that competition increases real wages but less so when bargaining power is high.

High rates of unemployment remain a key policy concern in many European countries. Following the OECD Jobs Study (1994) a large literature has investigated the role of unions, taxes and other labour market institutions in explaining cross-country variation in unemployment rates.<sup>1</sup>

Theory suggests that competition in the *product* market is also an important determinant of employment – in imperfectly competitive markets firms restrict output and thus employment. A number of recent theoretical papers have emphasised the role of product market competition, as well as potentially important interactions between competition and labour market institutions.<sup>2</sup> A recognition of the role of competition also lies behind many of the current attempts to reform product markets in Europe, including those laid out in the Lisbon Agenda and the Services Directive.

In this article we investigate the impact of increased product market competition on employment using data across OECD countries over the 1980s and 1990s. Our contribution to the literature is twofold. First, we use time-varying policy reforms as a source of exogenous variation in product market conditions, enabling us to provide stronger evidence that competition increases employment than exists so far. We show that this effect has been quantitatively important in explaining movements in unemployment in OECD countries over the past twenty years.

Secondly, we provide evidence that the size of these effects varies with labour market institutions. Theory suggests that the positive impact of competition on employment is greater where workers' bargaining power is high. The reason for this is that unions which care about employment as well as wages are constrained from demanding high

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<sup>1</sup> See, amongst others, Elmeskov *et al.* (1998), Nickell and Layard (1999), Blanchard and Wolfers (2000) and Belot and van Ours (2001). In a recent contribution to this literature, Nickell *et al.* (2005) find that changes in these factors can explain about 55% of the rise in European unemployment from the 1960s to the first half of the 1990s. Blanchard (2005) argues that a complex interaction between institutions and other shocks provides an important part of the explanation.

<sup>2</sup> See for example Blanchard and Giavazzi (2003), Spector (2004) and Ebell and Haefke (2004).

wages by the level of competition in the product market. Therefore an increase in competition in an economy with both monopolistic firms and unions will lead to greater reductions in prices and greater increases in output than in an economy without unions. We also investigate the parallel predictions of theory for the impact of product market competition on real wages (using real labour costs as a proxy measure). In contrast to the case with employment, under some conditions the positive impact of competition on real wages may be smaller when workers have more bargaining power, since the negative impact of competition on the general price level may be partially offset by a reduction in the level of rents captured by workers. Finally, we also test whether these effects of competition on employment and labour costs depend on the degree of bargaining coordination.

We use the substantial market liberalisations that have occurred across countries over the past two decades to provide exogenous variation in competitive conditions. These include reforms that reduce barriers to entry, tariff rates, regulatory barriers to trade and reduce public involvement in production. We find strong evidence that reforms such as these decrease the average level of profits in the economy, which in turn increases employment and real wages. The positive effect on employment is found to be greater, and the positive effect on real wages lower, in economies with greater worker bargaining power (those with higher collective bargaining coverage and/or higher union membership).

Our work is related to three key literatures. First, as discussed above, there is a substantial empirical literature investigating the labour market determinants of unemployment. In general this work finds that labour market institutions, taxes and benefits have important effects on the level of employment, although the nature and size of the effects vary somewhat across studies.

Secondly, there is a body of theoretical work suggesting that increasing product market competition increases employment and real wages.<sup>3</sup> Several recent contributions to this literature emphasise that the employment increase is greater when workers bargain collectively, even when the workers' choice of bargaining regime is endogenised as in Ebell and Haefke (2004).

Thirdly, there is a recent and smaller empirical literature on the impact of product market regulations on employment and wages.<sup>4</sup> Most similar to this article, Nicoletti and Scarpetta (2005) estimate the impact of product market reforms on employment rates across OECD countries. Consistent with the discussion above, they find that restrictive product market regulations have reduced employment rates in some OECD countries, particularly those where labour market institutions provide strong bargaining power to insiders. Our approach differs from Nicoletti and Scarpetta (2005) in a number of important ways: we use indicators of product market reforms that affect both traded and non-traded sectors of the economy, rather than a selection of seven regulated network industries as in their case; we allow the impact of product market reforms to vary across

<sup>3</sup> The basic framework of several recent papers draws on elements of Dixit and Stiglitz (1977) and Blanchard and Kiyotaki (1987), combining monopolistic competition in the goods market and bargaining over employment and wages in the labour market. Blanchard and Giavazzi (2003) is a recent model without capital. Spector (2004) introduces capital and finds that real wages may actually decrease following an increase in competition.

<sup>4</sup> Studies at the micro level include Bertrand and Kramarz (2002) and Kugler and Pica (2003). At the country level, Pissarides (2001) finds a negative correlation between a measure of business start-up costs and employment rates across a sample of OECD countries.

different types of reform, rather than imposing strong *a priori* restrictions by calculating a single index of regulation;<sup>5</sup> we investigate the parallel predictions of theory for real wages as well as employment; and, drawing on the underlying theoretical motivation, we explicitly model the impact of product market reforms on competition, as proxied by the average level of profits in the economy. Without this last step the channel for the impact of product market regulations on employment and wages is not clear.

In summary, there is strong empirical evidence that labour market institutions matter in determining labour market outcomes, there are strong theoretical reasons to believe that product market regulations are also important but there is little empirical evidence to support this. In addition, some theory suggests that the impact of product market competition on labour market outcomes varies with labour market institutions. There is, however, even less empirical evidence to support this latter prediction.

The structure of the article is as follows. Section 1 sets out a theoretical framework. In Section 2 we explain our empirical methodology and discuss the data. Section 3 presents the results, and Section 4 concludes.

## 1. Theoretical Framework

The main contribution of the article is empirical, however, it is useful to explain briefly the theoretical framework we use. It is based on a standard closed economy model with monopolistic competition in the goods market and bargaining over wages in the labour market. Models of this type have been widely used in the literature and form the basis of several recent papers investigating the impact of product market reforms, including Blanchard and Giavazzi (2003) and Spector (2004) amongst others.<sup>6</sup> The exact predictions for the impact of product market reforms on employment depend on a number of factors, including the precise nature of the bargaining process. However, the main theoretical intuition that we investigate empirically is best explained as the result of double marginalisation by firms and unions.

Consider a closed economy with  $N$  sectors, each consisting of one firm and one consumer-worker, and each represented by one union. Firms use labour to produce a single good, and the goods are imperfect substitutes. Worker-consumers have constant elasticity of substitution preferences and an increasing aversion to work.<sup>7</sup> Firms monopolise their sectors and unions monopolise firms, as they control all of the labour in their sector. The expression for equilibrium employment under this double monopoly case takes the following form:

$$\log E^{\text{DoubleMonopoly}} = A \log \left[ B \left( \frac{1}{1 + \mu} \right)^2 \right], \quad (1)$$

<sup>5</sup> Previous work has suggested that this is an important consideration. See Griffith and Harrison (2004).

<sup>6</sup> Our exposition is based closely on the simple model in Chapter 15 of Carlin and Soskice (2006), consisting of elements from the classic models of Dixit and Stiglitz (1977) and Blanchard and Kiyotaki (1987). Very similar results arise in the model of Jackman *et al.* (1991).

<sup>7</sup> The increasing marginal disutility of work is necessary for a unique equilibrium in the presence of constant returns to scale production. It captures the idea that workers have a higher reservation wage in times of high employment, due for example to increased personal wealth, household income or more opportunities for employment.

where  $E$  is equilibrium employment, the constant  $A$  contains the employment elasticity of the disutility of employment,  $B$  is a scaling parameter, and  $\mu$  is the mark-up of price over marginal cost. Compare this, first, to a situation with imperfect product market competition but no unions (2) and, second, to the perfectly competitive outcome with no unions (3):

$$\log E^{\text{FirmMonopoly}} = A \log \left[ B \left( \frac{1}{1 + \mu} \right) \right], \quad (2)$$

$$\log E^{\text{Competitive}} = A \log B. \quad (3)$$

As we would expect  $\log E^{\text{Competitive}} > \log E^{\text{FirmMonopoly}} > \log E^{\text{DoubleMonopoly}}$ . A single margin, due to imperfect competition in the product market, reduces equilibrium employment below the perfectly competitive level, while a second margin, due to the presence of monopoly unions, reduces it still further. From (1) and (2) it is also clear that an increase in product market competition that reduces the mark-up will increase employment and will increase it more in the presence of a monopoly union. This is the key idea that we investigate empirically.

In our empirical application we use country level measures of collective bargaining coverage and trade union membership to capture variation in the nature of wage and employment setting.<sup>8</sup> One way to interpret this is that countries with a higher proportion of workers covered by collective bargaining agreements, or belonging to unions, correspond more closely to the double-monopoly case, while countries with lower levels of bargaining coverage or union membership correspond more closely to the single firm-monopoly case. For example, we could think of countries with higher levels of bargaining coverage or union membership as having a higher proportion of sectors characterised by the double-monopoly case.

An alternative interpretation is that collective bargaining coverage or union membership are summary measures of workers' bargaining power in a setting where there is bargaining between firms and unions. Union power may be constrained by a number of factors such as regulations on the right to strike, the extent of control over the workforce or the presence of other unions. At one extreme of workers' bargaining power lies the monopoly union and at the other extreme is the single firm monopoly, with a range of bargaining power in between. The intuition described above then has an equivalent as follows: an increase in product market competition that decreases the mark-up will increase employment more when workers' bargaining power is higher.<sup>9</sup>

From this discussion we take the following empirical predictions to the data.

**PREDICTION 1** *Increased product market competition reduces unemployment.*

**PREDICTION 2** *The reduction in unemployment is larger when workers' bargaining power is higher.*

<sup>8</sup> We also consider the role of bargaining coordination – see below for a discussion of this.

<sup>9</sup> This result also comes directly out of recent theoretical models of product and labour market regulation. For example, in the case where firms have the right to manage it is implicit in equation (14) of Blanchard and Giavazzi (2003) and equation (6) of Spector (2004). The equivalent results for the case of efficient bargaining are equation (6) in Blanchard and Giavazzi (2003) and equation (7) in Spector (2004). In a dynamic framework, Ebell and Haefke (2004) find that the positive effect of competition on employment is greater when workers bargain collectively than when they bargain individually, even when the choice of bargaining institution is endogenous.

### 1.1. *Wages*

Our main interest in this article is in the impact of product market competition on employment. However, it is also interesting to consider the parallel implications for wages. These are less clear than the impact on employment. In the simple model described above, the effect of increased competition on real wages is independent of union bargaining power. The equilibrium real wage,  $w^e$ , is entirely determined by product market conditions and it increases with competition as follows:

$$w^e = \frac{1}{1 + \mu}. \quad (4)$$

The result that the real wage is independent of union bargaining power is a direct consequence of the assumption that firms can set prices and employment conditional on the bargained wage. In this *right to manage* framework firms set prices as a mark-up over the bargained wage and the impact on the general price level offsets any increase in the bargained wage. If, on the other hand, we assume *efficient bargaining*, where firms and unions bargain over employment and the real wage simultaneously, then the real wage becomes a positive function of union bargaining power – workers are able to capture a proportion of the available rents, and it is increasing in their bargaining power. In this case an increase in competition that reduces the available rents will increase the real wage by a smaller amount when workers have higher levels of bargaining power. Competition hurts individuals as workers but, through its effect on the price level, benefits them as consumers.

As discussed in Blanchard and Giavazzi (2003), while efficient bargaining may not be a complete description of the actual bargaining processes, it does capture the possibility that, when there are rents, stronger workers may be able to obtain a higher wage without suffering a decrease in employment, at least in the short run. To the extent that this is the case, we would expect to see that the positive impact of competition on wages is smaller when workers have more bargaining power.

Another consideration with regard to wages concerns the role of fixed capital. In the presence of fixed capital in the production function, workers and firms will bargain over the resulting quasi-rents. Spector (2004) shows that in this case the overall impact of product market competition on wages may be negative, as the reduction in workers' rents and quasi-rents more than offsets the reduction in the price level.

From this discussion we take the following empirical predictions to the data.

**PREDICTION 3** *Increased product market competition increases the real wage.*

**PREDICTION 4** *The increase in the real wage may be smaller when workers' bargaining power is higher, to the extent that bargaining deviates from the right to manage framework.*

### 1.2. *A Note on Coordination*

Finally, an important characteristic of union bargaining is the degree to which unions coordinate their activities. Calmfors and Driffill (2000) argue that there should be a

U-shaped relationship between employment and the degree of coordination.<sup>10</sup> The reason for this is that unions have an incentive to coordinate in sectors that are close substitutes in order to decrease the elasticity of demand for their (combined) product. However, as the combined union becomes larger the effect of its wage demands on aggregate prices increases. Its members suffer from this and worker-consumers therefore moderate their wage demands, and employment increases. In this way an intermediate level of coordination, at the industry level for example, results in the lowest employment, since union bargaining power is high, but worker-consumers have little incentive to take into account the impact of their wage demands on the aggregate price level.

To the extent that true economy-wide coordination that leads to more moderate wage demands does exist, we should expect to see that the interaction between product market competition and measures of union density or bargaining coverage is less strong in coordinated countries. However, to the extent that the main effect of coordination is to increase workers' bargaining power we should expect to find that the impact of competition on employment is larger (and the impact on wages smaller) in more coordinated economies. We look for these effects in the results Section.

## 2. Empirical Implementation and Data

The discussion above suggests that competition will affect the unemployment rate, and will do so differently in economies with different labour market institutions. We are therefore interested in exploring the following relationship empirically:

$$UR_{it} = \alpha_1 \mu_{it} + \alpha_2 \mu_{it} BP_i + \mathbf{LMR}'_{it} \alpha_3 + \mathbf{X}'_{it} \alpha_4 + f_i + t_t + \varepsilon_{it}^U, \quad (5)$$

where  $i$  indexes countries and  $t$  years,  $UR$  is the unemployment rate,  $\mu$  is a measure of the average level of profits firms earn,  $BP_i$  captures labour market regulations that indicate the bargaining power of workers in the economy (at the start of the sample period – see below),  $\mathbf{LMR}_{it}$  is a vector of other labour market regulations and institutions, and  $\mathbf{X}_{it}$  contains a set of cyclical and other controls, including a measure of the deviation of output from trend growth, the real exchange rate, the change in the inflation rate and the public sector employment rate to control for any potential impact of public sector employment in crowding out private sector employment. We check that our results are robust to this set of control variables, and also check that the results are robust to using employment rather than unemployment as the dependent variable. Country fixed effects are captured by country dummies,  $f_i$ , and common macro shocks by year dummies,  $t_t$ .

We capture the extent of product market competition by the average level of firm profitability in the economy,  $\mu$ . Therefore, a key issue in estimating (5) and (6) is the potential for endogeneity of  $\mu$ , as well as measurement error. For example, a positive

<sup>10</sup> The original paper made predictions concerning bargaining centralisation, although subsequent work focussed on coordination as a fuller measure of the level at which bargaining occurs. Robust empirical evidence for the hump-shaped relationship has proved elusive and the debate on the impact of centralisation/coordination continues. See Flanagan (1999) for a discussion.

demand shock might increase both output and firm profitability. We pay careful attention to instrumenting  $\mu$  using policy reforms to product markets. We show that the reforms affect average profitability in the economy in a way that accords with theory, and we confirm the power of our instruments. Our approach assumes that such reforms affect labour market outcomes only through their impact on competition and not directly. We test the statistical validity of these exclusion restrictions. It is crucial that we have indicators of product market regulations and reforms that vary differentially over time across countries as this allows us to identify the key parameters of interest separately from other cross country differences.

In examining how the effect of competition depends on labour market institutions we focus on labour market characteristics that affect workers' bargaining power. We capture these using indicators of collective bargaining coverage and trade union membership, which in themselves may be endogenous: for example, an adverse shock on employment or wages may trigger an increase in union membership. Therefore, we use initial values of coverage and union density to capture variation in workers' bargaining power across countries.

We also explore two auxiliary results. First we estimate an exactly equivalent specification for real labour costs as follows:

$$w_{it} = \beta_1 \mu_{it} + \beta_2 \mu_{it} BP_i + \mathbf{LMR}'_{it} \boldsymbol{\beta}_3 + \mathbf{X}'_{it} \boldsymbol{\beta}_4 + f_i + t_t + \varepsilon_{it}^w, \quad (6)$$

where  $w$  is the log of real labour costs per hour and all other notation is as above. As with unemployment, we pay careful attention to instrumenting  $\mu$  using policy reforms to product markets. Secondly, we investigate whether the relationships described in (5) and (6) depend on the degree of bargaining coordination. The exact specification we use to do this is described later on in Section 3.5.

In order to investigate these issues empirically we need data on

- (i) unemployment,
- (ii) wages or labour costs,
- (iii) the extent of product market competition and indicators of exogenous product market reforms,
- (iv) labour market regulations, and
- (v) other country characteristics.

We discuss each of these in turn. For precise definitions, means and standard deviations see Tables A.1–A.3 in the Appendix. We provide further description of the key variables over time for each country in a web appendix available at <http://www.ifs.org.uk/ghm07>.

### 2.1. Unemployment

We use the OECD's standardised unemployment rate, which is the number of unemployed persons as a percentage of the civilian labour force. This is important because, in general, decreases in the unemployment rate are associated with increases in participation; see Blanchard (2005). Our story is one of bargaining power and the medium run equilibrium in the labour market, so we are keen to isolate these from

participation effects. However, we also check that our results are robust to using employment rather than unemployment as a dependent variable.

## 2.2. *Wages and Labour Costs*

Unfortunately, comparable wage data are not available for all countries in our sample at the total economy level. We therefore use total economy labour costs, which includes payroll taxes. We control for the tax wedge in our main results. We also show that our results are robust to the use of a real wage index for manufacturing, which is available for a sub-sample of country-year observations.

## 2.3. *Product Market Competition and Reforms*

We capture changes in the extent of competition using a measure of the average level of firm profitability (excluding the public sector, agriculture and the real estate sector).<sup>11,12</sup> In a simple model of bargaining, such as that set out in Section 2, this corresponds closely to the equilibrium mark-up over costs. We calculate the average level of profits as value added over costs:

$$\mu_{it} = \frac{\text{Value Added}_{it}}{\text{Labour Costs}_{it} + \text{Capital Costs}_{it}}, \quad (7)$$

where all variables are in nominal prices.<sup>13</sup> We use the US long term interest rate to proxy the time variation in the cost of capital, under the assumption that this proxies the world interest rate.<sup>14</sup> The average level of profitability in our sample is 1.31. The measure is pro-cyclical and varies both within and between countries (see Table A.2 and <http://www.ifs.org.uk/ghm07>).<sup>15</sup> We therefore include a measure of deviation from trend output growth and the change in the rate of inflation to control for country specific business cycles, as well as the real exchange rate to control for trade shocks. In addition, country dummies control for any differences in measurement that are constant over time.

A drawback of our measure is that it contains the implicit assumption of constant returns to scale. This measure of profitability is biased downwards (upwards) in the presence of increasing (decreasing) returns to scale. However, any bias that might arise due to different levels of increasing returns to scale across countries should be captured by the country fixed effects in our econometric analysis, since the industrial mix does

<sup>11</sup> We can think of this as an estimate of the mark-up or price cost margin (similar to a Lerner Index) if average costs are close to marginal costs. This is shown by Boone (2000) to be theoretically preferable to most other commonly used measures of competition, especially those based on market concentration or the number of firms, and it most closely corresponds to the parameter specified in theoretical models

<sup>12</sup> Real Estate suffers from inflated values due to rising property prices. In Portugal we cannot make these exclusions due to lack of data so we use the total economy. We can remove the real estate sector in Austria, Denmark, Finland, France, the Netherlands, Norway and the US.

<sup>13</sup> This can be shown to be equivalent to that proposed by Roeger (1995). See also Klette (1999) for a discussion.

<sup>14</sup> We repeat the analysis using time-varying country specific interest rates (see the robustness Section for discussion).

<sup>15</sup> Overall, our measures are similar to other examples in the literature, for example those calculated for manufacturing industries by Martins *et al.* (1996).



Table 1  
*Measures of Product Market Reform and Bargaining Power*

Country	Industry Sensitive to Single Market Programme (%)	Collective Bargaining Coverage in 1986 (%)	Union Density in 1986 (%)
Australia	0	85	45.1
Austria	0	99	50.6
Belgium	50.2	90	51.5
Canada	0	39	33
Denmark	49.4	74	77.4
Finland	0	95	88.2
France	50.8	90	12.5
UK	50.0	64	44.8
Italy	52.2	85	40.4
Netherlands	44.9	80	27.3
Norway	0	70	57.1
Portugal	68.1	70	51.4
Sweden	0	86	82.5
US	0	21	17

*Notes.* The size of industries that were deemed sensitive to the SMP is measured as % of employment.

not change very quickly over time. Similarly, any trends that are common across countries will be captured by year effects.

Key to our identification strategy is the use of time-varying indicators of product market reforms for each country. We use information on four types of reform – the implementation of the EU Single Market Programme (SMP), changes in tariff and non-tariff barriers and the burden of government bureaucracy.

The SMP was concerned with eradicating cross-country differences in product and service standards, administrative and regulatory barriers, VAT and capital controls which inhibited the free flow of goods, services and factors of production between EU countries. Of the 14 countries in our sample, seven were involved in the programme (Belgium, Denmark, France, UK, Italy, the Netherlands and Portugal) and seven were not (Australia, Austria, Canada, Finland, Norway, Sweden, US). We also exploit the fact that, among participants, the SMP both had a differential impact across countries and was implemented at different rates.

To capture variation in the impact across countries we use a survey carried out before the programme was implemented. Cecchini *et al.* (1988) surveyed 11,000 firms in different industries asking respondents to rate the current level of various barriers to trade. Based on this survey Buiges *et al.* (1990) identified 40 out of 120 industrial sectors that were deemed to be most sensitive to the programme. They consulted individual country experts to confirm their findings and to add or remove sectors from the list according to country-specific circumstances. Table 1 lists the percentage of industry employment in each country that Buiges *et al.* (1990) identified as sensitive to the programme, showing that the Netherlands was deemed the least sensitive and Portugal the most sensitive. As well as different *ex ante* sensitivity to the SMP, different countries passed the necessary reforms into law at different rates. The European Commission recorded this from 1997 onwards in its Internal Market

Scoreboard and we modify our SMP variable accordingly using differences across countries in the average rate of implementation.<sup>16</sup>

We combine these sources of variation to construct a variable that indicates the percentage of industry liberalised over time, the exact form of which can be seen in <http://www.ifs.org.uk/ghm07>.

We use three other indicators of product market reform. The first is an indicator of the administrative burden on business due to government bureaucracy, which may constitute a barrier to firm entry. The second is a measure of the extent of hidden import barriers and costs to importing equipment, which may inhibit competition. Both of these indicators are based on survey responses from 10,000 business leaders carried out in the Executive Opinion Survey and published in the World Economic Forum's Global Competitiveness Report. These indicators are available for the 1990s. The third is an index of average tariff rates, reported in Fraser Institute (2002) based on data from a number of sources, including the World Bank, the OECD, UNCTAD and GATT.

In the results reported below we pay careful attention to showing that these reforms provide powerful instruments for the degree of profitability (in that they enter significantly in the first stage regression) and that they are valid instruments (in that statistical tests suggest that they can be excluded from the second stage).

#### 2.4. *Labour Market Regulations*

To measure worker bargaining power we use two variables – the proportion of workers who are paid wages determined by firm/union bargaining, whether or not they belong to a union (referred to as bargaining coverage), and the proportion of workers who are actual members of a union (referred to as union density). We find bargaining coverage a more convincing and accurate measure of bargaining power, and use it in the first instance, and then consider union density for robustness.<sup>17</sup> The start of sample values of bargaining coverage and union density are listed for each country in Table 1.

As controls we use a set of labour market variables that have been found to be important in the unemployment literature. They are: an index of employment protection legislation; the benefit replacement ratio; the tax wedge between the production wage and the consumption wage; and a measure of the degree of coordination of bargaining in the economy.<sup>18</sup>

### 3. Results

We now turn to an empirical investigation of the predictions set out in Section 1. We start by considering the first stage, or reduced form, regression of average profitability on the indicators of product market reforms, before moving on to the main results examining the effects of changes in competition on unemployment. We follow with an investigation of the further predictions on wages and the effect of bargaining coordination.

<sup>16</sup> The scoreboard is available at [http://europa.eu.int/comm/internal\\_market/score/index\\_en.htm](http://europa.eu.int/comm/internal_market/score/index_en.htm).

<sup>17</sup> The classic example is that of France, which has the lowest union density in our sample (12.5%), but a very high level of bargaining coverage (90%).

<sup>18</sup> See Nickell *et al.* (2005) for a discussion of these variables and their impact on unemployment outcomes.

### 3.1. *The Effect of Product Market Reforms on Average Profitability*

The first stage regression of average profitability on indicators of product market reforms and all other controls takes the following form:

$$\mu_{it} = \mathbf{PMR}'_{it}\gamma_1 + \mathbf{LMR}'_{it}\gamma_2 + \mathbf{X}'_{it}\gamma_3 + f_i + t_t + \varepsilon_{it}^{\mu}, \quad (8)$$

where  $i$  indexes country,  $t$  year,  $\mathbf{PMR}_{it}$  represents a vector of time and country varying indicators of product market regulation,  $\mathbf{LMR}_{it}$  represents a vector of time and country varying indicators of labour market regulation (which are also included in the employment and wage regressions later on), and  $\mathbf{X}$  includes the output gap, changes in inflation, the real exchange rate, and the share of employment accounted for by the public sector, as discussed in Section 2.

All of the product market variables are increasing with liberalisation, so a negative coefficient suggests that reforms which liberalise product markets are associated with lower average profitability. Column (1) in Table 2 shows the first stage using the SMP variable alone. We can see that it is statistically significant and negative, meaning that entering the SMP was associated with a reduction in average profitability, which we interpret as a positive impact on competition. The magnitude of the SMP effect is such

Table 2  
*The Impact of Product Market Reforms on Competition*

Dependent variable:	Profitability ( $\mu_{it}$ )			Profitability ( $\mu_{it}$ ) $\times$ Bargaining Coverage in 1986
	(1)	(2)	(3)	(4)
Single Market Programme	-0.00066 (0.00026)	-0.00048 (0.00031)	-0.00060 (0.00032)	-0.01364 (0.02778)
Average Tariff Rate		-0.02813 (0.01601)	-0.02064 (0.05146)	-10.50267 (4.10911)
Government Bureaucracy		-0.00387 (0.00822)	-0.09118 (0.06655)	-5.23088 (5.29911)
Non-Tariff Barriers		0.02075 (0.01435)	0.01997 (0.01516)	1.28659 (1.31458)
Average Tariff Rate $\times$ Bargaining Coverage 1986			-0.00017 (0.00058)	0.09813 (0.04713)
Government Bureaucracy $\times$ Bargaining Coverage 1986			0.00103 (0.00079)	0.05005 (0.06331)
Tax Wedge $\times$ Bargaining Coverage 1986			0.00010 (0.00007)	0.00935 (0.00651)
Labour market controls: Tax wedge, employment protection, benefits, coordination	Yes	Yes	Yes	Yes
Other controls: output gap, change in inflation, real exchange rate, public sector employment rate, country and year dummies	Yes	Yes	Yes	Yes

*Notes.* The regressions include 206 observations on 14 countries over the period 1986–2000. Robust standard errors are in parentheses. See Table 3 for tests of the joint significance and partial  $R^2$  of the four product market reform variables.

that, if the SMP affected 50% of industry, as it did in the case of the UK for example, then we estimate that economy-wide average profitability decreases by 3 percentage points ( $0.00066 \times 50$ ).<sup>19</sup> In Column (2) we include three other product market reforms, and the four variables together are jointly significant at the 1% level. This is the first stage regression used to identify the linear competition effect in column (3) of Table 3.

We estimate (5) and (6) both for the linear case (restricting  $\alpha_2$  and  $\beta_2$  to be zero) and including the interaction terms with bargaining power ( $\alpha_2$  and  $\beta_2$  non-zero). Therefore we need reduced forms for both the linear variable and the interaction. In column (3) we interact the product market reforms with bargaining coverage. In the long run, when the number of firms in the economy is endogenous, Blanchard and Giavazzi (2003) show that the equilibrium level of rents in the economy depends on both entry costs and workers' bargaining power, which justifies including these interactions in the first stage.<sup>20</sup> We show at the bottom of column (5) of Table 3 that the excluded instruments have strong explanatory power, in the sense that they are jointly significant at the 1% level and have a partial R-squared of about 9%. In column (4) we show the reduced form for the interaction term, which has similar properties.

### 3.2. Unemployment

We now turn to the estimation of the determinants of unemployment, as expressed in (5). In Table 3 we start in column (1) by looking at the relationship between labour market regulations and the unemployment rate. The results are consistent with those in Nickell *et al.* (2005), and several other studies, in that taxes and the benefit replacement rate have a significantly positive effect on unemployment and coordination has a negative effect, whereas employment protection legislation has no significant effect on its own.<sup>21</sup> The output gap has a significant negative coefficient as expected, the change in the inflation rate is not significant and the real exchange rate has a significant negative coefficient, indicating that a more appreciated exchange rate is associated with a lower equilibrium level of unemployment. The coefficient on the public sector employment rate is significantly higher than minus one, suggesting that unemployment decreases less than one-for-one with an increase in public sector employment. In the robustness Section we show that the results are robust to dropping some of these controls.

In column (2) we include the linear effect of average profitability on unemployment. The significant positive coefficient suggests that increasing competition (a decrease in profitability) decreases the unemployment rate. Controlling for the endogeneity of competition by using our IV estimator in column (3) indicates that the OLS estimates are negatively biased, as the coefficient becomes more positive when we instrument. This is as expected: for example unobserved shocks that increase profitability are likely

<sup>19</sup> That is, for example, from 0.13 to 0.10, or from 13% to 10%.

<sup>20</sup> See equation (8) of Blanchard and Giavazzi (2003). We also tried including the SMP interacted with bargaining coverage but found that the data rejected this specification in the sense that the Hansen test in the second stage rejected the exclusion restriction.

<sup>21</sup> Nickell *et al.* (2005) find that interactions between different labour market institutions can be important in explaining unemployment. We do not investigate this possibility as our main focus is on the impact of product market competition.

Table 3  
*The Impact of Competition on the Unemployment Rate*

<i>Dependent variable:</i> Unemployment Rate	(1) OLS	(2) OLS	(3) IV	(4) OLS	(5) IV	(6) OLS	(7) IV
<i>Competition Variables</i>							
Profitability		6.857 (2.402)	17.102 (8.612)	-17.858 (5.705)	-0.272 (12.975)	-13.361 (3.855)	1.700 (7.538)
Profitability × Bargaining coverage in 1986				0.300 (0.062)	0.375 (0.134)		
Profitability × Union density in 1986						0.297 (0.049)	0.157 (0.078)
<i>Labour Market Controls</i>							
Tax wedge	0.109 (0.047)	0.118 (0.047)	0.131 (0.048)	0.079 (0.047)	0.099 (0.060)	0.039 (0.044)	0.083 (0.046)
Employment protection legislation	-0.271 (0.289)	-0.225 (0.279)	-0.157 (0.268)	-0.035 (0.266)	0.172 (0.328)	0.193 (0.270)	0.033 (0.281)
Benefits replacement ratio	10.72 (2.984)	9.591 (3.055)	7.905 (3.149)	6.943 (2.948)	2.360 (3.844)	8.810 (2.455)	8.268 (2.525)
Coordination index	-1.328 (0.364)	-1.446 (0.367)	-1.622 (0.384)	-1.172 (0.391)	-1.513 (0.485)	-0.885 (0.327)	-1.245 (0.363)
<i>Other Controls</i>							
Output gap	-0.515 (0.044)	-0.563 (0.047)	-0.635 (0.075)	-0.566 (0.046)	-0.733 (0.074)	-0.545 (0.046)	-0.592 (0.058)
Change in inflation	-1.454 (5.830)	0.246 (5.740)	2.786 (6.325)	-0.231 (5.555)	5.549 (8.278)	-1.259 (4.999)	0.822 (5.007)
Real exchange rate	-0.070 (0.012)	-0.057 (0.013)	-0.037 (0.022)	-0.062 (0.012)	-0.018 (0.023)	-0.063 (0.012)	-0.049 (0.016)
Public sector employment rate	-0.546 (0.122)	-0.537 (-0.109)	-0.523 (0.093)	-0.396 (0.107)	-0.329 (0.119)	-0.491 (0.102)	-0.505 (0.091)
Constant	4.783 (2.829)	-4.778 (4.248)	-19.061 (12.780)	35.951 (8.513)	-29.396 (12.346)	35.451 (7.079)	-8.651 (8.436)
1st Stage p-value: linear			0.0053		0.0016		0.0001
interaction			-		0.0003		0.0000
1st Stage Partial R <sup>2</sup> : linear			0.06		0.09		0.15
interaction			-		0.11		0.26
p-value for Hansen test of over-identifying restrictions			0.20		0.27		0.08

*Notes.* The regressions include 206 observations on 14 countries over the period 1986–2000. Robust standard errors are in parentheses. All specifications include country and year dummies. The 1st Stage p-value is for a test of the joint significance of the excluded product market reforms, and the 1st Stage Partial R<sup>2</sup> is for the excluded product market reforms. In column (3) they are based on the estimates in column (2) of Table 2, in column (5) they are based on the estimates in columns (3) and (4) of Table 2, and in column (7) they are based on the equivalent specification to columns (3) and (4) in Table 2 but with bargaining coverage replaced by union density.

to decrease unemployment. Instrumenting will also help to reduce any attenuation bias that may be present due to classical measurement error in profitability. At the bottom of column (3) we present diagnostics showing the strength and validity of the excluded instruments. The p-value and partial R<sup>2</sup> of the excluded instruments suggest that they have power, and the Hansen test suggests that we cannot reject the over-identifying restrictions that the policy reform variables can be excluded from this regression.

In columns (4) and (5) we look at how the impact of increased competition varies with collective bargaining coverage, measured at the beginning of the sample period to

mitigate potential problems of endogeneity.<sup>22,23</sup> In columns (6) and (7) we consider the equivalent interaction with union density. The results provide evidence of interaction effects with both bargaining coverage and union density, and in both cases they are as theory predicts: an increase in competition decreases the unemployment rate, more so in the presence of strong worker bargaining power. In the case of bargaining coverage the interaction effect becomes slightly larger once we instrument, whereas with union density the interaction becomes smaller. We have no strong *a priori* reason to believe that the direction of the bias in the interaction term should be positive or negative. However, the mean effect in both cases increases, which is consistent with the hypothesis that any bias in profitability dampens the estimated effect of competition. At the bottom of columns (5) and (7) the p-values for the test of significance of the excluded instruments and the partial  $R^2$  suggest that the instruments have power. In column (5) we cannot reject the validity of the overidentifying exclusion restrictions, while in column (7) we cannot reject at the 5% level, but can at the 10% level.

### 3.3. Economic Significance

What are the economic magnitudes of these effects? The magnitude of the results in column (3) suggest that the 3 percentage point drop in profitability predicted for the UK's entry into the SMP would, all else equal, result in a decrease in the unemployment rate of 0.51 of a percentage point ( $17.10 \times -0.03$ ). To assess the magnitude of the interaction in column (5) we can compare the effect of a 3 percentage point drop in profitability on economies that have a bargaining coverage one standard deviation either side of the mean (which is 75%). An economy with an initial coverage of 53%, somewhere between that of Canada (39%) and the UK (64%), will experience a decrease in the unemployment rate of 0.60 percentage points ( $-0.03 \times (-0.27 + 0.38 \times 53)$ ), whereas an economy with an initial coverage of 97%, similar to that of Austria (99%), will experience a decrease of 1.10 percentage points ( $-0.03 \times (-0.27 + 0.38 \times 97)$ ), a difference of half a percentage point. The coefficient when we use union density is smaller and the comparable difference in the unemployment effect between a low density economy and a high density economy is 0.21 percentage points, again corresponding to one standard deviation either side of the cross-country mean. The smaller interaction effect with union density is consistent with our view that, perhaps, it does not measure bargaining power as well as coverage.

Table 4 further quantifies the economic significance of our estimates by comparing the actual changes in unemployment for each country between 1988 and 1998 (the years between which we have a balanced panel of countries) to the predicted changes from product market reforms based on our estimates. We first examine the predicted

<sup>22</sup> The results are robust to letting bargaining coverage vary over time in the interaction, and including it as a control. In this case the coefficients (standard errors) on profitability and the interaction between profitability and bargaining coverage are  $-4.533$  (9.856) and  $0.376$  (0.104) respectively. The result also holds with time-varying union density

<sup>23</sup> We exclude Germany as we expect the effects of re-unification to swamp any impact of product market reforms around that time period. When we do include data for Germany, controlling for re-unification with a dummy variable, the coefficients (standard errors) on profitability and the interaction between profitability and bargaining coverage are  $-4.293$  (12.371) and  $0.404$  (0.129).

Table 4  
*Predicted Effects of Product Market Reforms, 1988 to 1998*

Country	(1) Unemployment	(2) Explained by SMP	(3) Explained by all product market reforms	(4) Explained by labour market reforms
Australia	0.2	0.0	-0.2	0.3
Austria	2.9	0.0	-0.2	0.9
Belgium	-1.6	-1.0	-0.4	0.1
Canada	-3.5	0.0	0.2	0.3
Denmark	-0.4	-0.8	-2.2	0.1
Finland	4.8	0.0	1.6	0.4
France	1.3	-1.0	-1.3	0.7
UK	-5.9	-0.7	-1.3	-0.3
Italy	0.2	-1.0	-1.1	-0.9
The Netherlands	-1.2	-0.8	-2.9	-0.7
Norway	2.7	0.0	-1.4	0.8
Portugal	-1.1	-1.1	-2.6	-0.5
Sweden	2.5	0.0	-0.3	-0.4
US	-1.0	0.0	-0.2	-0.2

*Notes.* All columns are calculated using de-trended values, controlling for the business cycle, the real exchange rate, changes in the inflation rate, and the public sector employment rate. Predictions are based on coefficient estimates reported in column (5) of Table 3.

impact of the SMP for participant countries and then the predicted impact of changes in all the product market reform variables. In all cases we control for common year effects, country-specific business cycles and macroeconomic shocks, so changes are relative to the cross-country average. We also control for the share of employment in the public sector. The predicted changes use estimates from column (5) of Table 3.

The Table shows that the predicted effects of product market reforms in reducing unemployment are substantial. For some of the countries the SMP variable accounts for a large part of the impact but the other product market variables also explain a significant amount of variation. For example, our estimates suggest that the SMP was associated with a 1.1 percentage point reduction in the unemployment rate in Portugal, while all the product market reforms that we measure were together associated with a 2.6 percentage point reduction. This compares with an actual reduction in the unemployment rate relative to the cross-country average trend of 1.1 percentage points. Thus, factors other than product market reforms appear to have been responsible for an increase in the unemployment rate relative to the cross-country average trend of 1.5 percentage points. Overall the predicted changes due to all the product market reforms are positively correlated with the actual changes across countries, with a correlation coefficient of 0.35.

The predicted effect of the SMP, on the seven countries that participated, was an average decrease in the unemployment rate of 0.9 of a percentage point. This is sizeable when compared to the average change in the unemployment rate for the same seven countries between 1988 and 1998, which was, with controls, a decrease of 1.2 percentage points (0.5 percentage points without any controls).

These effects vary substantially with different levels of bargaining coverage. Still using the values from column (2) of Table 4 we can compare the impact of the SMP on unemployment in the UK to that in Belgium (the estimated impact of the SMP on

average profitability for these two countries is the same – a reduction of 3.0 percentage points). We estimate that the SMP reduced unemployment in the UK (where bargaining coverage was 64%) by 0.7 percentage points, whereas in Belgium (where bargaining coverage was 90%) the SMP reduced unemployment by 1.0 percentage points.

There is, however, a lot of variation in unemployment that we do not explain. Continuing to consider the seven SMP countries, the predicted effect of all product market reforms (including the SMP) is an average decrease of 1.7 percentage points and the predicted net effect of labour market reforms is a decrease of 0.2 percentage points. This leaves an increase in unemployment of 0.7 percentage points unexplained. It is possible that our results underestimate the overall impact of reforms to labour market institutions. In particular, Nickell *et al.* (2005) find that interactions between labour institutions are significant determinants of unemployment; for the sake of parsimony, we have not explored this here.

### 3.4. Labour Costs

Table 5 presents the results for the wage regression as written in (6). As mentioned previously, comparable total economy wage data is unavailable for these countries. Therefore, we present results for real labour costs per hour for the total economy. This includes payroll taxes and other non-wage labour costs.

We start in column (1) by ensuring that the simple labour cost regression is consistent with existing literature. The coefficients on the labour market institutional variables are consistent with Nunziata (2005) in that the tax wedge and benefit replacement ratio increase labour costs, and the coordination index decreases labour costs (although it is only significant at 10% here). However, whereas in our sample the employment protection index has a negative coefficient, Nunziata (2005) finds a positive coefficient. The theoretical predictions for the impact of employment protection are ambiguous – see Blanchard (2005) for a discussion – and the results may differ due to the difference in samples: Nunziata (2005) uses 20 OECD countries over the period 1960–94.

In column (2) we include profitability in an OLS regression on real labour costs for the total economy and find that increased rents reduce real labour costs, as expected. In column (3) we use an instrumental variables estimator to control for the potential endogeneity of profitability. At the bottom of the Table we show that the instruments are both powerful and valid for profitability in this specification. The significant negative coefficient on profitability suggests that competition has a positive effect on wages. The difference between the OLS and IV estimates suggests that the OLS coefficient is biased upwards, as would be expected if there was a positive correlation between profitability and wages due to unobserved shocks or other factors. To assess the economic significance of these results consider as before the impact of joining the SMP on a country such as the UK where 50% of industry was expected to be affected. The coefficient on profitability in column (3) of Table 5 implies that the predicted impact of the SMP in the UK was an increase in real labour costs of about 3.4% ( $-0.03 \times -114.64$ ). Thus, if we interpret labour costs as a proxy for wages, workers were on average made better off by this amount.



Table 5  
*The Impact of Competition on Labour Costs*

<i>Dependent variable: Log Real Labour Costs per Hour</i>	(1) OLS	(2) OLS	(3) IV	(4) OLS	(5) IV
<i>Competition Variables</i>					
Profitability		-21.025 (10.336)	-114.644 (56.607)	-124.116 (28.126)	-176.422 (61.486)
Profitability × Bargaining coverage in 1986				1.245 (0.313)	1.803 (0.569)
<i>Labour Market Controls</i>					
Tax wedge	0.593 (0.163)	0.568 (0.160)	0.459 (0.197)	0.368 (0.161)	0.272 (0.167)
Employment protection legislation	-2.028 (1.072)	-2.189 (1.037)	-2.909 (1.359)	-0.945 (1.040)	-0.436 (1.055)
Benefit replacement ratio	24.208 (8.814)	27.759 (8.750)	43.571 (13.152)	14.893 (8.350)	10.175 (9.550)
Coordination index	-3.225 (1.894)	-2.847 (1.850)	-1.163 (1.946)	-2.035 (1.899)	-1.561 (1.824)
<i>Other Controls</i>					
Output gap	0.109 (0.150)	0.255 (0.146)	0.908 (0.421)	0.261 (0.148)	0.307 (0.314)
Change in inflation	14.657 (32.625)	9.349 (29.936)	-14.284 (32.477)	9.295 (31.640)	7.714 (32.918)
Real exchange rate	0.218 (0.051)	0.177 (0.054)	-0.004 (0.128)	0.160 (0.052)	0.141 (0.087)
Constant	136.958 (11.394)	166.248 (17.923)	296.666 (80.801)	416.462 (33.395)	217.467 (56.449)
1st Stage p-value:					
linear			0.0227		0.0329
interaction					0.0013
1st Stage partial R <sup>2</sup> :					
linear			0.05		0.06
interaction					0.10
p-value for Hansen test of over-identifying restrictions			0.61		0.08

*Notes.* The regressions include 206 observations on 14 countries over the period 1986–2000. Robust standard errors appear in parentheses. Country and year dummies are included throughout. The 1st Stage p-value is for a test of the joint significance of the excluded product market reforms, and the 1st Stage Partial R<sup>2</sup> is for the excluded product market reforms. In column (3) they are based on estimates similar to those shown in column (2) of Table 2 but with non-tariff barriers excluded, in column (5) they are based on equivalent specifications to columns (3) and (4) in Table 2 but with non-tariff barriers excluded. The dependent variable has been multiplied by 100, to aid presentation.

In column (4) we include the interaction with bargaining coverage in an OLS regression, and in column (5) we use our IV estimator. Recall from Section 1 that, to the extent that bargaining deviates from right-to-manage, we expect the positive impact of competition on real wages to be smaller in countries where workers have high levels of bargaining power. The results in column (5) are consistent with this prediction. Consider the same 3 percentage point reduction in average profitability as a result of the SMP. The size of the effect in column (5) is such that a low bargaining coverage country (53% as before) would experience an increase of about 2.4% in real labour costs ( $-0.03 \times (-176.42 + 1.80 \times 53)$ ), whereas a high coverage country (97% as before) would experience an increase of only 0.1% ( $-0.03 \times (-176.42 + 1.80 \times 97)$ ). Theory suggests that workers should be better off on average in all countries and our

results are largely consistent with this: with bargaining coverage up to 98% the interaction effect does not outweigh the linear effect. In our sample only Austria has coverage higher than this.

As a robustness check we estimated an equivalent specification to that in column (5) but for an index of real wages in manufacturing.<sup>24</sup> The results are similar, with coefficients (standard errors) on the linear profitability variable and the interaction of  $-79.082$  (23.550) and  $0.546$  (0.306) respectively. Combining these with the coefficient on the SMP variable from the first stage (from which we estimate that the SMP reduced average profitability in UK manufacturing by about 9 percentage points) implies that a low bargaining coverage country would experience a 4.5% increase in real manufacturing wages as a result of joining the SMP, while a high coverage country would experience an increase of only 2.3%. In this case the average effect on real wages is positive even with 100% coverage.

### 3.5. Bargaining Coordination

As described in Section 1.2 we may expect that our results will vary with the degree of bargaining coordination in the economy. If the degree of coordination is high enough that it successfully moderates wage demands we expect our interaction result to be less strong in highly coordinated countries, however to the extent that it increases workers' bargaining power then we expect the impact of competition on employment to be larger (and the impact on wages to be smaller) in more coordinated economies. To investigate this we split the countries in our sample into three groups according to the average value of their coordination index. The highly coordinated countries are Austria, Denmark, Finland, The Netherlands and Norway; the intermediate ones are Belgium, France, Italy, Portugal and Sweden; and the low coordination countries are Australia, Canada, the UK and the US.<sup>25</sup> We then estimate a modified version of equation (5) for the unemployment rate as follows:

$$\begin{aligned} UR_{it} = & \alpha_1 \mu_{it} + \alpha_2 \mu_{it} BP_i + \alpha_3 \mu_{it} INT_i + \alpha_4 \mu_{it} HIGH_i \\ & + \alpha_5 \mu_{it} INT_i BP_i + \alpha_6 \mu_{it} HIGH_i BP_i \\ & + \mathbf{LMR}'_{it} \boldsymbol{\alpha}_7 + \mathbf{X}'_{it} \boldsymbol{\alpha}_8 + f_i + t_t + \varepsilon_{it}^U, \end{aligned} \quad (9)$$

where *INT* and *HIGH* are dummies for intermediate and high coordination respectively and all other notation is as before. If the effect of competition on unemployment is higher in intermediate or highly coordinated countries we expect  $\alpha_3$  or  $\alpha_4$  to be positive. This would be the case if the main effect of coordination was to increase workers' bargaining power by lowering the elasticity of demand for their (combined) product. If coordination also leads to moderated wage demands through the internalisation of negative externalities then we expect the interaction between competition and bargaining coverage to be weaker in more highly coordinated countries, in which case we expect  $\alpha_5$  or  $\alpha_6$  to be negative.

<sup>24</sup> We lose observations for Portugal and some years for other countries, leaving 176 observations.

<sup>25</sup> The results are robust to changing the categorisation so that only Finland, The Netherlands and Norway are considered as highly coordinated.

Table 6  
*Coordinated Bargaining*

Dependent variable:	Unemployment rate		Log of real labour costs per hour, Total economy	
	(1) OLS	(2) OLS	(3) OLS	(4) OLS
Profitability	-22.012 (6.489)	-20.089 (5.595)	-125.531 (33.393)	-121.213 (27.465)
Profitability × Bargaining coverage in 1986	0.230 (0.083)	0.201 (0.079)	0.989 (0.547)	0.923 (0.430)
Profitability × Intermediate coordination dummy	36.675 (37.627)	12.735 (4.465)	-9.509 (421.416)	0.809 (23.411)
Profitability × High coordination dummy	17.706 (17.954)	10.918 (4.169)	53.641 (58.575)	35.417 (20.570)
Profitability × Intermediate coordination dummy × Bargaining coverage in 1986	-0.289 (0.442)	-	0.104 (4.883)	-
Profitability × High coordination dummy × Bargaining coverage in 1986	-0.088 (0.204)	-	-0.233 (0.782)	-
Labour market controls: Tax wedge, employment protection, benefits, coordination	Yes	Yes	Yes	Yes
Cyclical controls: output gap, change in inflation, real exchange rate, public sector employment rate	Yes	Yes	Yes	Yes
Observations	206	206	206	206

*Notes.* Robust standard errors appear in parentheses. All specifications include country and year dummies. The highly coordinated countries are Austria, Denmark, Finland, Netherlands and Norway; the intermediates are Belgium, France, Italy, Portugal and Sweden; and the low coordination countries are Australia, Canada, UK and US. The results are robust to changing the categorisation so that only Finland, The Netherlands and Norway are considered as highly coordinated.

The first column of Table 6 shows the results of estimating (9). While the estimated coefficients on the three way interactions between profitability, bargaining coverage and the coordination dummies are indeed negative, they are both insignificant, and the same is true for the two-way interactions between profitability and the coordination dummies. In the second column we set  $\alpha_5$  and  $\alpha_6$  to zero and include only the interactions between the coordination dummies and profitability. As well as a significant positive coefficient on our main interaction of interest – between profitability and bargaining coverage – we also find significant positive coefficients on both of these additional interactions. Thus the largest effect of increased competition on unemployment appears to be in countries where bargaining coverage is high and coordination is also intermediate or high.

In columns (3) and (4) we repeat the same exercise for the log of real labour costs per hour in the total economy and the results are qualitatively similar.<sup>26</sup> As before, our previous results are robust and the three-way interactions between profitability, the coordination dummies and bargaining coverage are insignificant in column (3). In column (4) the interaction between profitability and the high coordination dummy is positive and significant but only at the 10% level. Overall these results are consistent

<sup>26</sup> The results using the manufacturing real wage index are also similar.

with the idea that the main effect of the degree of bargaining coordination actually observed in our sample is to increase workers' bargaining power, rather than to internalise the negative externalities of excessive wage demands. At the very least they suggest that the impact of competition on unemployment is larger in more coordinated countries.

### 3.6. *Robustness*

Finally, we turn to a number of potential robustness concerns, not previously discussed. We consider whether our main results are robust to the following: a different measure of the cost of capital used in calculating profitability; changing the control variables used; and using employment instead of unemployment as the dependent variable. These are discussed in turn.

In our main results we use the US long-term interest rate to proxy variation over time in the cost of capital for all countries. This assumes that capital markets are fully open throughout the sample period, which we find to be the most plausible assumption. If capital markets were liberalised by some countries during the sample period in a way that was correlated with reforms to product markets this could potentially affect our results. To check the robustness of our results we re-ran all results making the extreme assumption that capital markets are fully closed, and hence used domestic interest rates to proxy for changes in the cost of capital. Our main results are robust to this change.<sup>27</sup>

We also check that our main results are robust to the set of control variables included. For example, if we drop the change in the inflation rate, the real exchange rate and the public sector employment rate from the specification in column (5) of Table 3 the main results are not significantly affected. In this case, the coefficients (standard errors) on profitability and the interaction between profitability and bargaining coverage are 5.826 (10.980) and 0.345 (0.137) respectively.

Another potential measurement concern is with our use of the unemployment rate as the dependent variable. To investigate this we instead use the log of employment as the dependent variable and include the size of the labour force as a control, as well as the log of public sector employment. The key difference between this and the unemployment regressions is that we no longer restrict the coefficient on the labour force to equal one. The key coefficients on profitability, and the interaction between profitability and bargaining coverage, are robust to this change of specification. For example the equivalent coefficients (standard errors) on profitability and its interaction with bargaining coverage to those in column (5) of Table 3 are  $-0.042$  (0.150) and  $-0.004$  (0.001). The magnitude of these estimated effects are very similar to those using the unemployment rate. For example, consider again the impact of joining the SMP for a country with high bargaining coverage (97% as before). Using the coefficients above this is associated with a 1.30% increase in employment ( $-0.03 \times 100 \times (-0.042 -$

<sup>27</sup> For example, for the instrumented unemployment regression (Table 3 column 3) the coefficient (standard error) on profitability, for the 185 observations for which the domestic interest rate is available, is 12.792 (4.777). In Table 3 column (5) the coefficients (standard errors) on profitability and the profitability  $\times$  bargaining coverage terms are  $-1.093$  (9.100) and 0.168 (0.103) respectively. For the instrumented wage regression, using real labour costs per hour for the total economy (Table 5 column 5) the equivalent coefficients (standard errors) are  $-115.751$  (28.206) and 1.556 (0.310).

$0.004 \times 97$ )), which is comparable with a predicted reduction in the unemployment rate of 1.10 percentage points calculated from column (5) of Table 3. The equivalent changes for a low bargaining coverage country (53% as before) are a 0.76% increase in employment ( $-0.03 \times 100 \times (-0.042 - 0.004 \times 53)$ ) and a 0.60 percentage point reduction in the unemployment rate predicted by column (5) of Table 3.

#### 4. Conclusion

High rates of unemployment remain a key policy concern across many European countries. Attention has focused on labour market institutions as the main determinant of unemployment but recent work suggests that they cannot fully explain the variation across countries and over time. We have shown here that conditions in the product market are important determinants of unemployment, as well as interactions between product markets and labour markets. Having said that, there remains significant variation in unemployment to be explained.

Empirically we have shown that the significant product market de-regulation experienced in the 1990s by some OECD countries was associated with an increase in competition as measured by average firm profitability. Such exogenous increases in competition are further associated with increases in aggregate employment and the real wage. We estimate that in countries with higher levels of collective bargaining coverage and/or union density the increase in employment is more pronounced, and the increase in real wages (labour costs) less so. Although some of the key reforms that we have used specifically targeted manufacturing, we find that even manufacturing workers with very high bargaining coverage were, in real wage terms, better off on average as a result of the product market reforms.

Our results have interesting implications for policy. First, widespread product market reforms will tend to benefit workers and the economy as a whole through increased employment and higher real wages. Second, the presence of strong unions is not a reason to shy away from product market reform – if anything there is more incentive to reform as the employment benefits may be larger. However, given that we find a positive average impact of product market reforms on wages, our results raise the question of why workers and unions are often hostile to reforming product markets. One answer suggested by our results is that existing workers with more bargaining power have less to gain on average from product market reforms. However, our results have focused solely on average effects across the whole economy. We have not considered the possibility of piecemeal reforms that only affect the sector in which an individual works and not the goods they consume. In this case workers with bargaining power may lose out overall. This suggests that widespread reforms are less likely to be resisted by workers than reforms that only affect a small number of sectors.

#### Data Appendix

Our data consist of an unbalanced panel on 14 countries over the period 1986–2000. Table A.1 shows the structure of the panel. Spain and Greece are excluded from the analysis due to a lack of data availability, and Germany is excluded due to re-unification, which is likely to have swamped any effects from product market reform. The second panel of Table A.1 shows

the mean and standard deviation of our measure of profitability. It is important to note that the inclusion of country dummies in all specifications controls for average differences across countries in the level of measured profitability due to differences in measurement or other differences that are constant over time. Thus the main results are identified from differential within-country changes over time.

Table A.1  
*Sample Composition and Average Profitability by Country*

Country	Total economy	Manufacturing	Mean of average profitability	Standard deviation
	<i>unemployment, labour costs</i>	<i>wages</i>		
Australia	1986–2000	1986–2000	1.2944	0.0596
Austria	1986–2000	1986–1999	1.2716	0.0505
Belgium	1986–2000	1986–1998	1.2995	0.0349
Canada	1986–2000	1986–2000	1.3972	0.0534
Denmark	1986–2000	1986–2000	1.4980	0.0456
Finland	1986–2000	1986–2000	1.2120	0.1011
France	1986–2000	1986–1997	1.2828	0.0259
UK	1986–2000	1986–2000	1.3679	0.0527
Italy	1986–2000	1986–2000	1.4889	0.0832
The Netherlands	1986–2000	1986–1999	1.2419	0.0560
Norway	1986–1999	1997–1999	1.2297	0.1283
Portugal	1988–1999	–	1.2222	0.0275
Sweden	1986–2000	1986–2000	1.2029	0.0664
US	1986–2000	1986–2000	1.3698	0.0376
Total	206	176	1.3127	0.1123

Table A.2  
*Descriptive Statistics and Variable Definitions – Profitability, Labour Market Outcomes and Control Variables*

Variable	Description and source	Mean (s.d.)
Profitability (priv. sec.)	$\mu_{it} = \frac{ValueAdded_{it}}{Labour\ Costs_{it} + Cost_{it}\ of\ Capital \times Capitalstock_{it}}$	1.3127 (0.1123)
Profitability (manuf.)		1.2128 (0.0986)
Value added	Value added at basic prices plus taxes, less subsidies on production, excluding imports and VAT. At factor costs for Canada and producer's prices for USA; OECD STAN database.	669345 (1136497)
Labour costs	Wages and salaries plus supplements, such as contributions to social security, private pensions, health insurance, life insurance. OECD STAN database	390341 (671321)
Cost of capital	Yield on USA Government composite bond (10 Years), minus inflation rate, plus assumed depreciation of 7%. OECD Main Economic Indicators for bond yields and consumer price index.	0.1118 (0.0075)
Capital stock	Calculated using the perpetual inventory method. Depreciation rates are calibrated so that the stocks are similar to the OECD estimates when both are available. OECD STAN database.	1094195 (1431343)
Unemployment rate	Standardised unemployment rate for all countries except Austria, for which we use the 'commonly used definition'. OECD Main Economic Indicators.	7.3650 (2.7414)

Table A.2  
*Continued*

Variable	Description and source	Mean (s.d.)
Employment	All persons engaged in domestic production including the self-employed. Countries are advised to report the number of jobs, rather than headcounts, subject to availability. OECD STAN database.	18698 (33187)
Real labour costs per hour	Wages and salaries plus supplements, such as contributions to social security, private pensions, health insurance, life insurance per hour worked. Deflated by the CPI, expressed here in US dollars (2000 exchange rate). OECD STAN database.	13.4592 (3.4204)
Real wages (manufacturing)	Real wage index for manufacturing; ILO, Key International Labour Market statistics.	102.7 (6.6)
Output gap	Percentage deviation of output from trend; OECD Economic Outlook.	-0.3488 (2.4411)
Change in inflation	Change in growth of consumer price index for all goods, from previous year; OECD Main Economic Indicators.	-0.0020 (0.0140)
Real exchange rate	Ratio of home country's prices to a weighted average of competitor country's prices, relative to a base year (2000) and measured in US dollars. Therefore an increase is an appreciation of the home country's real exchange rate. OECD Main Economic Indicators.	106.2 (12.2)

Table A.3  
*Descriptive Statistics and Variable Definitions – Product and Labour Market Regulations*

Variable	Description and source	Mean (s.d.)
Single Market Programme	We use the percentage of employment (value added in the case of Belgium due to lack of data availability) in industry 'liberalised' by the SMP. The variable from 1997 onwards is calculated as % of industry identified <i>ex ante</i> to be sensitive to SMP times the EU's transposition index measuring % of reforms actually implemented. The variable is linearly extrapolated back to the programme start date, and is everywhere zero for those countries not in the programme	10.660 (18.450)
Average Tariff Rate	This is an index of the average tariff rate constructed by Fraser Institute from a number of sources, including the World Bank, the OECD, UNCTAD and GATT. It varies between 1 and 10, where 1 indicates very high tariffs and 10 indicates none at all.	8.670 (0.437)
Government Bureaucracy	This is an index constructed from responses to the question: 'How much time does your firm's senior management spend dealing/negotiating with government officials?'. This is available for the years 1995 and 2000. The World Economic Forum	7.418 (0.552)
Non-Tariff Barriers	This is based on survey questions on hidden import barriers and the cost of importing equipment to measure changes in the trade environment that are not captured in the SMP variable. Fraser Institute	8.326 (0.830)

Table A.3  
Continued

Variable	Description and source	Mean (s.d.)
Union density	Actual union members as percentage of employees. OECD Labour Force Statistics.	45.25 (25.16)
Union coverage	Percentage of employees covered by collective bargaining, whether they are union members or not. Nickell (2003), originally obtained from Wolfgang Ochel.	73.78 (23.20)
Employment protection legislation	An average of an indicator of legislation for regular contracts (covering procedural inconveniences, direct cost of dismissal, notice and trial period) and an indicator for legislation for temporary contracts (covering types of work admissible under temporary contracts and maximum cumulative duration allowed). Nicoletti <i>et al.</i> (2000).	2.129 (1.193)
Benefits replacement ratio	Based on replacement ratio of the first year of unemployment. Nickell (2003), originally obtained from OECD Jobs Study 1994.	0.482 (0.181)
Tax wedge	Average of the tax wedge for one-earner family with two children and single persons without children. OECD, Taxing Wages, 2003.	36.20 (8.85)
Coordination index	The degree of coordination of bargaining: 1- firm level, 2- industry level, 3- economy level. We use coordination index 2 from Nickell(2003), originally obtained from Wolfgang Ochel.	1.926 (0.607)

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