

# Labor Market Deregulation and Wage Dispersion: Does Product Market Competition Matter? The case of the EU Electricity Industry

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## Abstract

In this work we analyze possible interaction effects of product and labor market deregulation on sectoral wage dispersion. In particular, we consider firm level data for the electricity generation sectors of twelve EU countries observed over the period 2002-08 which have been the subject of important deregulatory reforms. Our results suggest that higher barriers to entry in the product market are associated to a higher wage dispersion. Moreover, we find that the effects of a more liberalized labor market depend on the degree of product market regulation: when the goods market is tightly regulated, a less stringent employment protection legislation raises earnings inequality, while wages dispersion decreases when the labor market deregulation is introduced in a more competitive environment. We argue these results derive from the combined effects of competition intensity on workforce composition and labor market deregulation.

*Keywords:* deregulation, wage differentials, electricity

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## 1. Introduction

The interplay between product market competition and labor market performance has been the subject of a vast theoretical and empirical literature. A large majority of these studies stresses the beneficial effects on employment and real wages generated by labor market deregulation and by reductions of entry barriers in the product market (see for instance Blanchard and Giavazzi (2003), Nicoletti and Scarpetta (2005), Fiori et al. (2008), Griffith et al. (2007))<sup>1</sup>.

As far as the link between product market competition and the earnings structure is concerned, the literature has mainly focused on the effects of different degrees of regulation in the goods market on wage premia: such issue has caught scholars' attention since the work of Katz et al. (1989). Wage premia are defined as the difference between the wage that would accrue to a single worker based on observable characteristics and the one actually paid. Jean and Nicoletti (2004), for instance, find that anticompetitive regulations enhance inter-industry wage differentials in non-manufacturing industries in twelve OECD countries and that wage premia are larger in industries in which legislation stifles competition. The explanation they

offer is that part of the product market rents enjoyed by firms in poorly competitive markets translates into higher wages<sup>2</sup>.

Turning to the issue of wage dispersion, previous literature has usually analyzed it within the framework of the analysis of the impact of labor institutions on the labor market. Freeman (1980) has investigated the effects of a less centralized wage bargaining scheme, which induces a reduction in unions' impact on wages, and has shown that de-unionization has augmented inequality, since the reduction of wage dispersion between sectors is outweighed by its increase within each sector. This result has been confirmed by Card et al. (2004) in an empirical analysis on US, UK, and Canada. Di Nardo et al. (1996) suggest that labor market institutions play an important role in explaining the change in wage inequality observed in the US during the '80s; in particular, they point to the decline in the real value of the minimum wage as the main driver of the augmented earnings dispersion.

Koeninger et al. (2007) focuses on a wider range of labor market institutions – namely replacement ratios, minimum wages, unemployment benefits, union density – and find a negative relationship between their generosity and male earnings dispersion in eleven OECD countries during the period 1973 - 1998. The rationale behind this result lies on the positive impact that such institutions have on the fall-back positions of workers in the bargaining process. If this effect is stronger for a low-skilled worker than for a high-skilled one, the wage of the former will get a greater benefit; in turn, this tends to compress the skill wage differential.

Within the labor economics literature less attention has been devoted to the analysis of the relationship between products market deregulation and earnings dispersion, both within and between sectors.

A notable exception is Guadalupe (2007) who tries to fill this gap by focusing on the interplay between competition in goods market and within-sector wage inequality. By considering a panel of UK workers with employment histories going from 1975 to 1999, she finds that a reduction in firms concentration widens the gap between high-skilled and low-skilled workers' pay. Her claim is that tougher competition in goods market makes firms more eager to hire high-skilled workers capable to produce at lower costs: hence returns to skill are higher in more competitive markets, increasing within-sector wage differentials<sup>3</sup>.

In this work we jointly analyze possible effects of products and labor market deregulation on sectoral wage dispersion. In particular, we consider firm level data for the electricity generation sectors of twelve EU countries observed over the period 2002-08 in order to assess the impact of both product and labor market deregulation on the sector level wage dispersion as proxied by the sector level standard deviation of firm level wages. We focus on the EU electricity generation industry because, towards the end of the 1990s, it was characterized by a series of EU Directives that have led to the separation of the generation stage from the natural monopolistic components of the industry (i.e. distribution and transmission) and, more generally, to the removal of administrative barriers to entry into the sector<sup>4</sup>. The fact that the transposition of the EU directive was not contemporaneous across the EU gives us a source of country level variation in the actual degree of product market liberalization that can be reasonably considered exogenous, after we control for possible determinants of EU directives' transposition lags by including country fixed effects in the econometric specification. Moreover, each country is characterized by different degrees of employment

protection which changed over the sample period, thus allowing us to combine possible effects of products and labor market deregulation on sectoral wage dispersion<sup>5</sup>.

Our empirical estimates suggest that higher barriers to entry in the product market are associated to a higher wage dispersion within the energy generation sector. More interestingly, we find evidence that the effects of a more liberalized labor market depend on the degree of product market regulation. When the goods market is tightly regulated, a less stringent EPL raises earnings inequality. This effect changes sign when competition in the goods market becomes fiercer, and reducing the strictness of EPL lowers wage inequality<sup>6</sup>.

A common interpretation for the direct effect of product market regulation on the wage distribution is that the increase in competition makes firms less willing to pay some workers well above their marginal value, so that earnings dispersion decreases<sup>7</sup>.

As far as the interaction between product market and labor market deregulation is concerned, a possible intuition hinges on the stronger negative effects that a less generous EPL has on the fall-back positions of the low-skilled workers compared to the high-skilled ones<sup>8</sup>.

The huge rents implied by a poorly competitive market may weaken firms' incentives to adopt the most efficient capital/labor ratio. This implies that, within the same sector, some firms may have a higher proportion of low-skilled workers; hence when EPL becomes less generous, the decrease in the average pay would be proportionally larger for those firms located in the left tail of the earnings distribution, given that they employ a higher proportion of low-skilled workers. As a result, sector wage dispersion might increase.

When competition in the goods market is stronger, each employer should have the incentive to make the most efficient inputs choice, so that the proportion of high skilled/low skilled workers would be more homogenous across firms. If this is the case, a reduction in EPL should generate a similar percentage decrease in the average wage thus lowering sector wage variance.

The remainder of the paper is organized as follows: Section 2 presents the data, section 3 illustrates the empirical results and section 4 concludes.

## 2. Data

The main data source for our empirical analysis has been the Amadeus data base which provides annual company accounts at a disaggregated level. In particular, we focus on company engaged in the generation and production of electricity as classified under Nace Rev.1.1 code 4011. We consider only companies which report unconsolidated financial statements so that we avoid double counting. As far as the cleaning of the data is concerned, we dropped firms/observations whose main variables of interest are missing or display anomalous rates of growth in inputs and output (higher/lower than 90th/10th percentile). The dataset obtained includes 12 countries (Austria, Belgium, Finland, Germany, Italy, France, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom) observed over the period 2002-2008. The process of data cleaning and of variables construction makes the panel strongly unbalanced, with 60 country-years observations<sup>9</sup>.

The measure of wage dispersion that we have considered in this work is simply the country-year standard deviation of labor unit costs (defined as labor costs divided by employees) of

firms active in the electricity production industry. Summary statistics reported in Table 1 show that there are large differences in standard deviations: it is important to note that these differences have both a significant between and within component, i.e. there are important country changes in wage dispersion along the time dimension.

The indicator of employment protection legislation (EPL) is the OECD index  $ep\_v2$ , which is a weighted sum of sub-indicators for regular contracts (weight 5/12), temporary contracts (weight 5/12) and collective dismissals (weight 2/12). The significance of this measure relies on the observation that strong employment regulations induce firms to make intensive use of fixed-term positions, which are associated to different degrees of employment protection if compared to regular ones; hence such index should account for different structural characteristics which characterize each country. Furthermore, this index takes into account the fact that employment protection regulations characterizing individual and collective dismissals might have a different effect on various economic outcomes. In the case of the EPL index most of the variability is cross sectional, even if the changes that occurred within countries over the sample period are not negligible.

In some regression specifications we have also controlled for the degree of wage coordination (WC) at the country level: this variable has been taken from the Database on Institutional Characteristics of Trade Unions, Wage Setting, State Intervention and Social Pacts, 1960-2010 (Visser, 2011) and takes on values between 5 (economy wide bargaining) and 1 (fragmented bargaining, mostly at company level).

Finally, we adopted the OECD index of entry barriers (EB), ranging between [0 6], where higher values denote the presence of higher entry barriers in the sector. This index is a weighted sum of sub-indices based on how the terms and conditions of third party access (TPA) to the electricity transmission grid are determined (weight 1/3), on whether there is a liberalized wholesale market for electricity (weight 1/3) and on what is the minimum consumption threshold that consumers must exceed in order to be able to choose their electricity supplier (weight 1/3). As the data reported in Table 1 suggest, the entry barriers index is characterized by significant variability, which reflects both a between and a within component.

### 3. Empirical results

We assess the link between entry barriers, employment protection legislation and wages dispersion by estimating the following equation:

$$W\_SD_{i,t} = \alpha + \beta EPL_{i,t-5} + \gamma EB_{i,t-5} + \delta (EB_{i,t-5} * EPL_{i,t-5}) + X' \Xi_{i,t} + \lambda_t + \mu_i + w_{i,t} \quad (1)$$

where EB stands for the OECD index of entry barriers in the electricity market and EPL is the OECD index of employment protection legislation;  $\mu_i$  reflects a country specific effect capturing time invariant unobserved heterogeneity (associated to institutions, for instance),  $\lambda_t$  is a year effect accounting for common macroeconomic shocks and  $X'$  is a vector of country controls, such as the unemployment rate, GDP, government's political orientation, the Fraser index of bureaucracy costs, the degree of wage coordination, etc., while  $w_{i,t}$  is an error term.

The entry barriers and employment protection legislation indicators are included with a five years lag because it might take time before a change in product and labor market regulations have any material effect on wage dispersion; moreover such approach may help to alleviate endogeneity concerns<sup>10</sup>. It is important to recall that, by using a fixed effect model, we are identifying the effects of our main variables of interest using only their within variation, so that our results are not driven by the omission of persistent factors correlated with both wage dispersion and product and labor market regulation<sup>11</sup>.

In column 1 of Table 2 we report regression results of a model where we allow product and labor market regulation to have only a direct effect on wage dispersion, and we can see that, *ceteris paribus*, an increase in EPL is weakly associated to higher wage dispersion, although the coefficient is marginally significant (the *p* value is 0.11) while the level of entry barriers seems to be positively associated with an increase in wage dispersion<sup>12</sup>.

In column 2 we include an interaction term between employment protection legislation and entry barriers in the product market. As we can see, the direct effect of EPL is now significantly positive, suggesting that a reduction in labor market regulation would tend to decrease wage dispersion; however, the interaction term between EPL and EB is negative and strongly significant, suggesting that the marginal effect of EPL on wage dispersion depends on the level of entry barriers in the product market.

In particular, when the entry barriers index is null, a reduction in the employment protection legislation induces a reduction of 27 points in our measure of wage dispersion, while the effect is reversed for values of the entry barrier index approximately higher than 2. For instance, if the entry barriers index takes on a value 3, a reduction in employment protection legislation by one standard deviation (which roughly corresponds to moving from the 75th to the 25th percentile of EPL) induces an increase in the wage dispersion measure of about 7 points and such increase becomes significantly higher (31 points) when the product market is highly regulated (EB=6).

In other words, when the product market is highly regulated, so that the scope for enhancing competition is expected to be quite high, deregulating the labor market would trigger an increase in wage dispersion; in turn, in an environment of very low entry barriers, the same deregulation of the labor market might be associated with a reduction in wage inequality between firms.

As far as the effect of product market regulation on wage dispersion is concerned, the coefficients reported in Table 2 suggest that reducing entry barriers by one unit would reduce wage inequality only in the case of a country with an already deregulated labor market, while in the case of a tightly regulated labor market the effect would be very low and highly insignificant.

In column 3 we report estimates of an extended model where we include a proxy for the degree of wage coordination in each country (and its interaction with the employment protection legislation index). In fact, it has often been argued that some of the effects of employment protection legislation might depend on the degree of country level centralization in wage setting; however, results displayed in column 3 suggest that differences in the degree of wage coordination across countries do not affect our main findings. Finally, in column 4 we have included, among control variables, the Fraser index of bureaucracy costs as well as the Fraser index capturing the easiness of doing business. The rationale for including these

two variables is to control for the possibility that other factors, possibly associated with both product and labor market regulation as well as with wage dispersion, have changed over our sample period: in this case, our regression results could be biased even if we account for country unobserved time invariant heterogeneity. However, regression results displayed in column 4 suggest that our main results are qualitatively similar to those reported in previous columns<sup>13</sup>.

#### 4. Conclusions

This paper evaluates the impact of labor market deregulation on wage dispersion by taking explicitly into account the role of product market liberalization reforms.

By analyzing firm level data for the electricity generation sectors of twelve EU countries observed over the period 2002-08, we find that higher barriers to entry in the product market are associated to a higher wage dispersion within the energy generation sector. More interestingly, we find evidence that the effects of a more liberalized labor market depend on the degree of product market regulation. When entry barriers in the goods market are high, a less stringent EPL raises wage dispersion; however, when goods markets are more competitive, deregulating the labor markets has an opposite impact on wage inequality which becomes lower.

Our empirical results do not allow us to precisely detect which mechanisms generate such results. However, we suggest an explanation related to possible heterogeneity in the workforce composition induced by different degrees of competition in the products markets. When competition in the products markets is low, firms' cost structure and workforce composition tend to be more heterogeneous within the industry, so that changes in employment protection legislation, which usually affect low-skilled workers more intensively, induce an increase in wage dispersion. An opposite argument might be suggested for explaining the reduction in wage inequality induced by deregulatory reforms of the labor markets in more competitive markets.

We believe that the interaction between goods and labor markets deregulation reforms deserves further scrutiny, especially at theoretical level.

#### Endnotes

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<sup>1</sup> While Fiori et al. (2012) find that product and labor market deregulation raises employment only, Griffith *et al.* (2007) obtain a positive effect of these policies on real earnings too.

<sup>2</sup> Their result, however, is not monotonic, with wage premia declining as the regulation becomes too severe.

<sup>3</sup> See also Cardullo (2011).

<sup>4</sup> A few country level studies have analyzed the impact of electricity sector reforms on efficiency and productivity. See the short survey in Gao and Van Biesebroeck (2011).

[5](#) Fabrizio, Rose, and Wolfram (2007) analyze the effect of regulatory restructuring on U.S. electricity generation efficiency. Their results suggest, among other things, that labor efficiency of investor-owned utilities (IOUs) in the states that passed restructuring legislation increased by 3 to 5 percent relative to IOUs in non-restructuring states, and by 6 to 12 percent relative to municipal and federal plants insulated from restructuring incentives.

[6](#) Our empirical findings are not in line with Guadalupe (2007), however given that we analyze a significantly different sample we believe results are not directly comparable.

[7](#) Syverson (2004) finds, in a model with heterogeneous firms, that increased product market competition lowers productivity dispersion within a given sector; in turn, Faggio et al. (2010) find that increased wage inequality between workers is mainly associated to an increase in productivity dispersion across firms within industries.

[8](#) Recall this is the point made by Koeninger *et al.* (2007).

[9](#) Price indices used for deflating gross output, materials and fixed assets have been retrieved from EU-KLEMS, EUROSTAT and STAN data bases.

[10](#) However, results are qualitatively similar if we use the (t-1) lags of both EPL and EB.

[11](#) We obtain very similar results if we assume that  $w_{i,t} = \zeta w_{i,t-1} + \xi_{i,t}$  and estimate the model by feasible GLS allowing for the variance of the error term to differ across countries, as in Fiori et al. (2012). Results are omitted for reasons of space but are available from the authors upon request.

[12](#) Main results are robust to dropping the country-year observations with the highest and lowest standard deviation of wages.

[13](#) Overall results are robust to using the coefficient of variation instead of standard deviation as a measure of wage dispersion.

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**Table 1. Descriptive Statistics**

	Mean	St.dev	min	max
<i>W_SD</i>	16.4	12.6	0.1	75
<i>EPL</i>	2.28	0.59	0.98	3.07
<i>EB</i>	2.02	2.35	0	6
<i>WC</i>	3.31	1.05	1	5

**Table 2. Regression Results**

<i>Dep. Var: W_SD</i>	(1)	(2)	(3)	(4)
<i>EPL</i> <sub><i>t-5</i></sub>	-9.5 (-1.59)	27.1 (2.48)	32.7 (1.89)	50.1 (1.8)
<i>EB</i> <sub><i>t-5</i></sub>	4.3 (2.63)	41.1 (3.95)	34.1 (3.02)	35.0 (3.06)
<i>(EPL</i> <sub><i>t-5</i></sub> <i>* EB</i> <sub><i>t-5</i></sub> <i>)</i>	- -	-13.2 (-3.52)	-10.7 (-2.61)	-11.0 (-2.67)
<i>WC</i> <sub><i>t-5</i></sub>	- -	- -	17.1 (1.14)	27.7 (1.14)
<i>(EPL</i> <sub><i>t-5</i></sub> <i>* WC</i> <sub><i>t-5</i></sub> <i>)</i>	- -	- -	-3.5 (-0.78)	-7.1 (-0.94)
<i>R</i> <sup>2</sup>	0.30	0.45	0.48	0.50
Time effects	Yes	Yes	Yes	Yes
Country effects	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Controls: unemployment rate, GDP, gov. political orientation, in columns 1 - 4				
Controls: Fraser index of bureaucracy costs and of easiness of doing business in column 4				
Standard errors clustered-robust at country level; t statistics in parenthesis				