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SUMMARY

This paper investigates the role of policies and institutions for aggregate labour market dynamics during the global financial crisis using firm-level data. The use of firm-level data is important if firms are heterogeneous in their labour input adjustment technologies. In this case, cross-country differences in aggregate labour market dynamics may not just stem from cross-country differences in average labour input technologies - here assumed to be largely due to differences in institutional settings -, but also from differences in the distribution of shocks across firms within countries and the composition of firms across countries. The contribution of this paper is threefold. First, the paper provides comparable estimates of the labour input adjustment behaviour of firms in response to output shocks across countries, industries and firm-size groups. Second, it makes use of decomposition methods to get a first indication of the importance of cross-country differences in adjustment technologies, the distribution of shocks across firms and the composition of firms across countries. We find that differences in the adjustment behaviour of firms account for about 40% of the cross-country variation in aggregate employment growth during the global financial crisis. We interpret this as *prima facie* evidence that differences in institutional settings accounted for a substantial part of the variation in aggregate employment growth during the crisis. Third, we find that employment-protection provisions with respect to regular workers reduce the output elasticity of employment, but increase the output elasticity of earnings per worker. Thus, employment protection tends to shift the burden of adjustment from the extensive to the intensive margin. However, the quantitative impact of employment protection for explaining the variation in aggregate labour dynamics during the global financial crisis is relatively small.

RÉSUMÉ

Cet article étudie le rôle des politiques et des institutions sur la dynamique générale du marché du travail au cours de la crise financière mondiale au moyen de données au niveau des entreprises. Le recours aux données au niveau des entreprises devient nécessaire si les entreprises sont hétérogènes en termes de techniques d'ajustement du facteur travail. Dans ce cas, les différences entre pays en matière de dynamique générale du marché du travail peuvent non seulement provenir de différences des techniques de l'ajustement moyen du facteur travail entre pays - supposées ici être dues en grande partie à des différences d'environnement institutionnel -, mais également d'écarts au niveau de la répartition des chocs entre les entreprises au sein des pays et de la composition des entreprises entre pays. La contribution de cet article est triple. Tout d'abord, cet article fournit des estimations comparables du comportement d'ajustement du facteur travail des entreprises en réponse à des chocs de production entre pays, branches d'activité et taille d'entreprise. Deuxièmement, il fait appel à des méthodes de décomposition pour obtenir une première indication de l'importance des différences entre pays en matière d'ajustement, de répartition des chocs entre les entreprises et de composition des entreprises entre pays. Nous constatons que les différences dans le comportement d'ajustement des entreprises représentent environ 40% de la variation entre pays de la croissance globale de l'emploi pendant la crise financière mondiale. Nous interprétons cela comme une preuve *prima facie* que les différences d'environnement institutionnel représentent une part substantielle de la variation de la croissance globale de l'emploi pendant la crise. Troisièmement, nous constatons que les dispositions en matière de protection de l'emploi des travailleurs réguliers réduisent l'élasticité de l'emploi à la production, mais augmentent l'élasticité des gains par travailleurs à la production. La protection d'emploi incite les entreprises à ajuster moins à la marge extensive mais davantage à la marge intensive. Pourtant l'impact quantitatif de la protection de l'emploi est limité pour expliquer la variation globale de la dynamique du travail au cours de la crise financière mondiale.

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1. Introduction

1. All OECD countries have been severely hit by the global crisis starting in 2008. But the extent to which the decline in aggregate demand translated into lower employment has differed dramatically across countries (OECD, 2012). In some of them, much of the adjustment in the labour market has been in terms of labour shedding (*e.g.* Spain and the U.S.). In others, where firms have tended to hoard labour (*e.g.* Germany, Japan), employment declined less.

2. The large variation in the unemployment impact of the crisis across countries raises important questions about the role of policies and institutions. A number of studies have sought to analyse the role of policies and institutions for shaping the impact of economic downturns on labour markets using aggregate data (*e.g.* Blanchard and Wolfers, 2000; Bassanini and Duval, 2009; OECD, 2012). While these studies have provided useful insights about the potential role of policies and institutions for the way labour markets adjust in response to shocks, it tends to be difficult, in practice, to isolate the impact of specific policies and institutions using the cross-country variation in the data because of their correlation across countries. Moreover, there is also a risk that aggregate studies of this kind leave a considerable part of the cross-country variation unexplained by ignoring the role of firm heterogeneity.

3. This paper investigates the role of policies and institutions for aggregate labour market dynamics during the global financial crisis using firm-level data. The use of firm-level data is important if firms are heterogeneous in their labour input adjustment technologies. In this case, cross-country differences in aggregate labour market dynamics may not just stem from cross-country differences in average labour input technologies - here assumed to be largely due to differences in institutional settings -, but also from differences in the distribution of shocks across firms within countries and the composition of firms across countries. For example, in Germany and Japan, the bulk of the decline in aggregate demand during the crisis was concentrated in manufacturing, both countries with a comparatively large manufacturing base, whereas the construction sector was hit particularly hard in countries such as the Ireland, Spain and the US, countries where construction had tended to grow rapidly before the crisis as a result of the housing bubble. Since firm-specific human capital tends to be less important in construction than in manufacturing, construction firms tend to adjust their labour inputs more quickly in response to falling output demand. As a result, cross-country differences in the distribution of demand shocks across firms within countries and the composition of firms may account for some of the observed differences in aggregate labour-market adjustment patterns across counties.[1]

4. The present paper makes three key contributions. First, using comprehensive and comparable firm-level data for 20 OECD countries for the period 1993-2009, we econometrically estimate the responsiveness of employment and earnings per worker to output shocks across countries, industries and firm-size groups. Second, using a semi-aggregated dataset of estimated output elasticities, employment shares and output shocks by firm size, industry and country, we employ variance decomposition methods to assess the relative contribution of cross-country differences in economic structure ("structure heterogeneity"); the distribution of output shocks across different types of firms ("shock heterogeneity"); and the responsiveness of labour inputs to output shocks ("response heterogeneity") in explaining the cross-country variation in aggregate employment growth between 2008 and 2009. The share of the cross-country variation that may be attributed to response heterogeneity is interpreted as an upper bound on the potential role of policies and institutions. Third, the role of specific policies and institutions for response

[1] Indeed, it can be shown that during the global financial crisis, labour market outcomes not only diverged across countries but also within countries. The increase in within-country dispersion during a downturn is consistent with previous work by Bloom (2009) and provides an first indication that using disaggregate data instead of aggregate data can be provide valuable information for understanding aggregate labour market dynamics.

heterogeneity is analysed. The analysis considers employment protection, the incidence of temporary work and collective wage bargaining. The impact of policies and institutions is identified using the within-country variation that is provided by the presence of firm-size exemptions in the case of employment protection and differences in the incidence of temporary work and collective bargaining agreements across firmsize and industry groups.[2] Under the assumption that institutional settings do not affect the composition of employment across firms or the distribution of shocks of output shocks in the short-run, we also assess the implications of our key findings for aggregate labour market dynamics.

5. The paper contributes to various strands of the existing literature. First, it contributes to the vast literature on the role of market institutions for labour market outcomes. Most previous studies have tended to use either macro-economic approaches that exploit the variation across many countries (*e.g.* Layard and Nickell, 1999; OECD, 2006 and 2012; Bassanini and Duval, 2009) or micro-level data for a single country or a group of countries that allow exploiting the witin-country variation (*e.g.* Bassanini *et al.*, 2009; Cingano *et al.,* 2010). An interesting paper by Lafontaine and Sivadasan (2009) falls somewhere in between in the sense that it uses plant-level data for a single multinational firm across more than 40 countries, but exploits the cross-country variation to assess the role of labour market rigidities for employment adjustment. Second, the present paper relates to the literature that assesses the aggregate implications of the way firms adjust to shocks at the micro level (Caballero *et al.*, 1997; Davis et al., 2011). These studies have generally tended to emphasise the importance of non-linearities in adjustment technologies, while the present paper instead emphasises the importance of firm heterogeneity in adjustment technologies.

6. The remainder of this paper is organized as follows. Section 2 describes: i) the methodology that is used to estimate the responsiveness of employment and earnings per worker with respect to output; ii) puts forward a variance decomposition that is used to quantify the relative importance of structure, shock and response heterogeneity for aggregate employment growth during the crisis; and iii) introduces the framework to analyze the role of institutions for the responsiveness of employment and earnings per worker to output shocks. Section 3 gives a short description of the data used for the different parts of the analysis. Section 4 presents the results. Section 5 draws out the aggregate implications of our key findings. Section 6 concludes.

2 . Firm size exemptions have been used before to analyse the role of employment protection in specific countries, but not yet in a cross-country context (see Venn, 2010, for details). We are not aware of any previous studies that have looked at the role of collective bargaining coverage and the incidence of temporary work for the adjustment behaviour of firms.

2. Methodology

7. Throughout the analysis, two assumptions are made. First, labour market institutions affect the adjustment responses of firms to output shocks, but not the distribution of output shocks or employment across different groups of firms in the short-run. This assumption allows us to use our micro-economic estimates for making inferences about aggregate labour market dynamics during the global financial crisis. As this assumption may be less reasonable in the longer-term, we limit ourselves to aggregate inferences based on the short-term responses of employment to output shocks. Second, within firm groups, the adjustment technology is assumed to be homogeneous and constant over time. The assumption that adjustment technologies are constant over time provides another rational for focusing on aggregate employment dynamics only in the short-term.

2.1. Modelling and estimating labour adjustment at the firm level

8. The estimable equation, derived from a simple model of partial adjustment, is the following:

$$(1)\ l_{it} = \gamma l_{it-1} + \beta y_{it} + \eta_i + \varepsilon_{it}$$

where l_{it} denotes the labour input variable of interest in firm i in year t, y_{it} denotes output in firm i in year t, η_i denotes firm-fixed effects and ε_{it} denotes an error term. Both the labour input variable and output are expressed in logs. Note that, under the assumption of quadratic adjustment costs, the sum of the coefficients on the lagged dependent variable and output equals one such that $\beta = 1 - \gamma$ (Lafontaine and Sivadasan, 2009). This suggests that it will be sufficient to focus either on the coefficient on output or that on the persistence parameter. Given the short-term focus of the present paper, the analysis will focus on the short-term output elasticities given by β.

9. We consider both employment and earnings per worker as labour input variables. The focus on earnings per worker in addition to employment is motivated by the desire to account for different margins of labour input adjustment. Macroeconomic evidence shows that in countries such as Spain and the United States, labour market adjustment related to the crisis has overwhelmingly taken the form of labour shedding. In countries such Germany and Japan, where firms have tended to hoard labour and reduce working hours, much of the decline in employment has been avoided. Macro-economic evidence with respect to real hourly wages is less reliable due to the role of composition effects. Nevertheless, there is suggestive evidence that real wage adjustments have been relatively important in Central and Eastern European countries (OECD, 2012). As our data do not allow differentiating between changes in working time and real wage effects, the analysis focuses on earnings per worker instead.

10. Equation (1) can be derived from a variety of different structural models. For example, it is consistent with labour demand models which assume that firms do not fully adjust instantaneously because of the presence of quadratic adjustment costs (Gould, 1968; Hamermesh, 1993), but also provides a valid approximation when adjustment costs have a more complex structure (*e.g.* non-convex) due to the smoothing effect of aggregation across firms and over time.[3]

11. Equation (1) is estimated on a cell-by-cell basis to allow for variation in the coefficients across cells and countries. Cells are defined by industry and firm size. To control for the endogeneity of output and lagged labour inputs, we apply a generalized method of moments estimator described in Arellano and

3 . Annual data likely is overaggregated in time in the sense that it does not match the timing of firm decisions. Consequently, annual employment data may signal smoother adjustment than quarterly or monthly data. Therefore, estimating a linear model using annual firm-level data is not inconsistent with underlying models that specify non-linear adjustment costs.

Bond (1991).[4] The estimated output elasticities are used as inputs for the variance decomposition and the analysis of institutions. In order to ensure that the estimated output elasticities are reasonable, we make use of the following rules. First, we disregard any output elasticities that do not satisfy the restriction $0 < \hat{\beta} < 1$ as these are considered to be implausible. Second, we disregard any output elasticities if (*i*) the number of instruments (*j*) is large relative to the sample size (*N*) and (*ii*) Hansen's test of over-identifying restrictions rejects the null of the orthogonality of the instrument matrix and estimated errors. An estimate is considered to be acceptable if (*i*) $j/N<0.2$ and (*ii*) Hansen's test does not reject at the 10% level.[5]

2.2. Decomposing cross-country heterogeneity in aggregate employment growth

12. What accounts for the increased dispersion in aggregate employment growth across countries during the global financial crisis and what is the potential role of policies and institutions? We take a first pass at these questions by decomposing the cross-country variation in aggregate employment growth into the respective contributions of three sources of heterogeneity: cross-country differences in economic structure ("structure heterogeneity"); the distribution of output shocks across different types of firms ("shock heterogeneity"); and the responsiveness of labour inputs to output shocks ("response heterogeneity").[6]

13. In order to be able to assess the importance of these three sources of heterogeneity, we start by defining the predicted growth rate of log employment, $\Delta\hat{e}_{cjs}$, in country *c*, in industry *j* and size class *s* as:

$$(2)\ \Delta\hat{e}_{cjs} = \beta_{cjs}\Delta y_{cjs}$$

where β_{cjs} denotes the elasticity of employment with respect to output, y_{cjs} denotes output (in logs) and Δ denotes the difference operator. Time indices are dropped for expositional convenience. Note that the elasticity of employment with respect to output is assumed to be time-invariant.

14. The predicted aggregate employment growth rate at the country level, $\Delta\hat{e}_c$, can then be rewritten as the weighted-average output growth rates across industry and firmsize cells:

$$(3)\ \Delta\hat{e}_c = \sum_{j=1}^{J}\sum_{s=1}^{S}\beta_{cjs}\, w_{cjs}\Delta y_{cjs}$$

where w_{cjs} denotes the employment share of size class *s* in industry *j* and country *c* in aggregate employment in the base period. Using this definition, w_{cjs} captures heterogeneity in employment structures, β_{cjs} captures heterogeneity in employment responses, and Δy_{cjs} captures heterogeneity in output shocks.

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4 . We use difference-GMM with the 3rd to the 5th lags of the labour input and output as instruments. These lags were chosen for computational feasibility, such that the lagged instrument levels have sufficient explanatory power while maintaining orthogonality.

5 . The literature does not provide tests or even a rule of thumb to see whether the number of instruments is 'too' large relative to sample size. Increasing j/N filters less $\hat{\beta}_{cjs}$-observations and therefore leads to a larger sample size in stage 2. However, it also increases the probability that observations are noisier. As for Hansen's test, since it is more conservative to use larger confidence intervals, we make use of 10% confidence instead of the usual 5%.

6 . We do not consider earnings-per-worker dynamics during the crisis since in this case the decomposition would also have to account for the role of composition effects adding to the complexity of the exercise.

15. To get a sense of the role of each source of heterogeneity, we decompose equation (3) into two components. The first component is assumed to capture the degree of heterogeneity along one of the three dimensions (*i.e.* response, shock or structure), by rewriting the change in employment in each cell in terms of the deviation from its cross-country mean along this source of heterogeneity. The second component of each term is given by adding back the change in employment calculated at the cross-country mean along this source of heterogeneity. More specifically, the contribution of response heterogeneity is given by calculating the deviation of β from its cross-country mean $\bar{\beta}_{js}$ (with $\bar{\beta}_{js} = \sum_{c=1}^{C} \beta_{cjs} / C$) :

$$(4)\Delta\hat{e}_c = \sum_{j=1}^{J}\sum_{s=s}^{S}\left(\beta_{cjs} - \bar{\beta}_{js}\right)\left(w_{cjs}\Delta y_{cjs}\right) + \sum_{j=1}^{J}\sum_{s=1}^{S}\bar{\beta}_{js}\left(w_{cjs}\Delta y_{cjs}\right)$$

16. The first term in equation (4) is interpreted as the contribution of response heterogeneity to aggregate employment growth. To be more accurate, its contribution includes the *combined* effect of response heterogeneity measured by $\left(\beta_{cjs} - \bar{\beta}_{js}\right)$ and the joint distributions of $(w_{cjs}, \Delta y_{cjs})$. The second term shows the contribution of output changes and employment shares (in the base period) evaluated at the average response, *i.e.* the predicted aggregate employment change that would arise if there were no response heterogeneity.

17. How to implement a variance decomposition in this setting? Consider equation (4). If $\left(\beta_{cjs} - \bar{\beta}_{js}\right)$, w and Δy are correlated, then the variance explained by $\sum\left(\beta_{cjs} - \bar{\beta}_{js}\right)\left(w_{cjs}\Delta y_{cjs}\right)$ is attributed not only to heterogeneity in β, but also to the effect of the combined variation in$\left(\beta_{cjs} - \bar{\beta}_{js}\right)$, w_{cjs} and Δy_{cjs}. We will refer this in the results section as "the contribution of response heterogeneity with interaction effects". To fully isolate the role of response heterogeneity in $\sum\left(\beta_{cjs} - \bar{\beta}_{js}\right)\left(w_{cjs}\Delta y_{cjs}\right)$ we "integrate out" the variation in w_{cjs} and Δy_{cjs},. In other words, the term is further decomposed into a first term with w_{cjs} and Δy_{cjs} set to their respective cross-country averages in each cell and a series of other terms that capture the covariance structure of the variables:[7]

(5)

$$\sum_{j=1}^{J}\sum_{s=1}^{S}\left(\beta_{cjs} - \bar{\beta}_{js}\right)\left(w_{cjs}\Delta y_{cjs}\right) = \sum_{j=1}^{J}\sum_{s=1}^{S}\left(\beta_{cjs} - \bar{\beta}_{js}\right)\left(\bar{w}_{js}\overline{\Delta y}_{js}\right)$$

$$+ \sum_{j=1}^{J}\sum_{s=1}^{S}\left(\beta_{cjs} - \bar{\beta}_{js}\right)\left(w_{cjs} - \bar{w}_{js}\right)\overline{\Delta y}_{js}$$

7 . For example, countries that tend to have an above-average employment sensitivity in a given sector, say construction, may also tend to have a larger employment share (*w*) and/or experience a larger output shock (Δy) in that sector. For instance, the large fall in aggregate employment in Spain may be combination of an above-average output shock in construction, an above-average employment response to the output shock and an above-average employment share. In this case, the contribution of response heterogeneity is likely to be relatively large, partly because of the role of interaction effects along these three dimensions. It is, therefore, also of interest to consider to role of response heterogeneity without taking account of these interaction effects. This boils down to asking what Spain's employment response would have been when employment weights and the output shocks are fixed at the average level in other countries.

$$+\sum_{j=1}^{J}\sum_{s=1}^{S}\left(\beta_{cjs}-\bar{\beta}_{js}\right)\bar{w}_{js}\left(\Delta y_{cjs}-\overline{\Delta y}_{js}\right)$$

$$+\sum_{j=1}^{J}\sum_{s=1}^{S}\left(\beta_{cjs}-\bar{\beta}_{js}\right)\left(w_{cjs}-\bar{w}_{js}\right)\left(z_{cjs}-\bar{z}_{js}\right)$$

18. The first term on the right captures the variation in employment growth that is associated with cross-country heterogeneity in responses alone. We refer to this as the "contribution without interaction effects". The remaining terms capture the covariance structure of the variables.

19. In order to calculate the contribution of each source of heterogeneity to the cross-country variation in employment growth, we make use of an implication of the definition of variance. To calculate the contribution with interaction terms, consider equation (4) and denote the first term as A_c (heterogeneity) and the second term as B_c (average term). Then, the cross-country variance of the left-hand-side of (4) can be written as:

(6) $\mathrm{var}(\Delta e^{c}) = \mathrm{var}(A_c + B_c) = \mathrm{var}(A_c) + \mathrm{var}(B_c) + 2\mathrm{cov}(A_c, B_c)$

$= \mathrm{cov}(A_c, \Delta e^{c}) + \mathrm{cov}(B_c, \Delta e^{c})$.

20. Equation (6) allows one to quantify how much of the cross-country variance of employment growth is explained by A_c and B_c separately. If $cov(A_c, \Delta e^{c})$ is large relative to $cov(B_c, \Delta e^{c})$, then most of the cross-country variation in employment growth is attributed to the variation in A_c. Analogues exercises can be conducted to calculate the role of each source of heterogeneity with and without interactions.

2.3. Analyzing the role of institutions

21. One challenge when trying to identify the role of policies and institutions is that institutions are typically defined at the country-level and are correlated with each other across countries. For instance, employment protection (EP) tends be stronger in countries where the rights of workers are more important in general and, consequently, may be associated with stronger trade unions, more generous unemployment benefits etc. This makes it difficult to isolate the role of a single institution using cross-country data unless all institutional effects are effectively accounted for in the regression analysis. One way to get around this problem is to focus on the available within-country variation of a given institution as this is less likely to be correlated across institutions. We consider three labour market institutions that may have important implications for the adjustment behavior of firms and which allow us to focus on within-country variation: employment protection provisions by exploiting firm-size exemptions; the role of temporary work by considering its incidence across firm types; and the role of collective bargaining by considering its coverage across firm types.

22. The institutional analysis uses the cell-by-cell estimates of the output elasticities of employment and earnings per workers based on equation (1) as the dependent variable. Note that the cell structure is defined separately for each institutional variable in order to ensure that the within-country variation in the estimated output elasticities matches that of the institutional variable of interest. The impact of the institution of interest is identified by relating the within-country variation in output elasticities to the within-country variation, or more precisely, by comparing the variation in these two variables across firm types within countries and comparing them across countries. In this sense, our estimation can be

considered a generalized difference-in-difference approach that controls for both country and cell-specific fixed effects.[8]

23. Formally, the empirical model to identify the role of institutions can be represented in generic form as follows:

$$(7)\ \hat{\beta}_{cjs} = \alpha INST_{cjs} + \mu_c + \eta_{js} + \varepsilon_{cjs}$$

where $\hat{\beta}$ denotes the first-stage estimates of the employment and earnings-per-worker elasticities by industry and firm-size cell and country, $INST_{cjs}$ the institutional variable of interest and μ_c, and η_{js} country and cell-specific fixed effects. Country-specific fixed effects are included in order to control for cross-country differences in labour market institutions. Cell-specific fixed effects are included to control for systematic differences in production technologies across groups of firms and their potential implications for labour adjustment. The coefficient α is the parameter of interest. It captures the effect of institutions on responsiveness under the identifying assumption that the remaining variation in the elasticities after conditioning on cell and country fixed effects can be attributed to institutions. Note that by focusing on differences in adjustment technologies across firm types within countries, the analysis takes account of structure and shock heterogeneity. To account for the fact that the dependent variable is generated by equation (1), the second-stage regressions use robust standard errors.

Employment protection (EP)

24. The effect of EP is identified using variation generated by exemptions from national regulations. Exemptions usually apply to small firms but the exemption threshold may differ across countries. [9] Exemptions may be full or partial and relate to individual or collective dismissals, denoted by EPR_{cs} and EPC_{cs}, respectively.[10] In general, one would expect firm-size exemptions to reduce the fixed cost of adjusting the number of employees (resulting in a negative α in equation (7)).[11] The identification assumption is that firms above and below the size-threshold differ only in terms of the applicable EP-regime and are identical otherwise. If this assumption holds, any measured differences between the elasticities each side of the threshold can be attributed to EP. To maintain the homogeneity of the sample along dimensions other than EP, only those firms are taken into account whose employment level is either above or below the threshold throughout the entire sample period.

25. A first concern of identifying the role of EP from firm-size exemptions is that its estimated impact may be biased because it captures the independent effect of firm size. For example, employment in

8 . The "first" difference is defined by within-country deviations in elasticities and institutional variables. The "second" difference is given by the difference in these differences across countries. Comparing the differences gives a measure of the effect of institutions. Our approach may be considered a generalised DiD approach in the sense that we focus on continuous rather than binary variables (*i.e.* institutions like EP are measured in a continuous way).

9. A number of previous country studies have exploited the firm-size exemptions to study the economic implications of employment protection provisions (see Venn, 2010, and references therein). However, this appears to be the first study to do this on a cross-country basis.

10 . The stringency of EP does not vary across industries, therefore EPLR and EPLC are indexed only by *c* and *s*.

11. Theoretical models give some background to interpret results of the regressions below. For instance, Pissarides (2001) suggests that firing restrictions may be rationalized in the presence of market imperfections, which prevent workers from insuring against the risk of dismissal. On the other hand, EP may hinder labour adjustment and therefore the efficient re-allocation of resources.

small firms has traditionally been considered more sensitive to output shocks than employment in large firms due to the role of credit constraint, leading to a biased estimate of the impact of EP on the responsiveness of employment to output shocks away from zero. However, more recent evidence by Postel-Vinay and Moscarini (2011) as well as the results in Section 4.1 of this paper, which show that the employment elasticity, if anything, increases with firmsize, suggest that the bias may go the other way.

26. We control for the independent effect of firm size in two complementary ways. First, we include firm-size dummies which capture any common effects of firm size across countries. This is done either by assuming that independent firm size effect does not depend on the level of threshold or by allowing for heterogeneous firm-size effects for each threshold. In the first, more restrictive setting, it is sufficient to include a single dummy that equals one for observations above the threshold and is zero otherwise. This dummy is denoted by v below. In the second setting, a separate firm-size dummy is included for each threshold. These are denoted by v_s. The second way of controlling for independent firmsize effects is by including "control" countries that do not practice firm-size exemptions. The inclusion of control countries is important as it may otherwise not be possible to disentangle independent firm-size effects that are common across countries from threshold effects (particularly when using the restricted model that assumes a common threshold effect across different thresholds).

27. Formally, the empirical model used to identify the impact of EP on output elasticities can be represented as follows:

$$\text{(7a)}\ \widehat{\beta}_{cjs} = \alpha_{EPR}\mathrm{EPR}_{cs} + \alpha_{EPC}\mathrm{EPC}_{cs} + \eta_j + \mu_c + v_s + \varepsilon_{cjs}$$

where μ_c denotes a set of country specific dummies, η_j a set of industry dummies, and v_s a set of size dummies which allow for threshold-specific size effects. In the restricted version of the model where there is assumed to be a common threshold effect, the size dummy v_s is replaced by v and the interpretation is effectively a uniform above vs. below threshold difference, irrespective of the exact value of the threshold (e.g. 10 or 15 employees, etc.). The coefficients $\widehat{\alpha}_{EPR}$ and $\widehat{\alpha}_{EPC}$ measure the average effect of EP conditional on size and country-fixed effects.[12]

28. A second potential concern is that firms may sort around the threshold for EP depending on their adjustment technologies. In particular, firms that, all else equal, have higher output elasticities of employment are more affected by the presence of employment-protection provisions and, consequently, may have greater incentives to stay or move below the threshold. The endogenous response of firms to EP is likely to raise the average output elasticity of employment of firms below the threshold relative to those above the threshold, leading to a downward bias in the estimated impact of EP on the employment elasticity, away from zero.[13] One way to check whether the selection problem is serious in our data is to look for signs of bumping or heaping in the firm-size distribution. By increasing the fixed costs of adjusting the number of employees, EP provides incentives to select into size groups. If this is important in

12 . While (7a) provides the intuition, in practice, we also include the interaction of the size-class dummy with an indicator for being above or below the threshold. The reason for this is that in order to have a sufficient number of observations in each cell for the estimation of the elasticities, we make use *overlapping* cells. This means that a firm can be in the "above" group for the sample around the threshold at 10 employment, but in the "below" group for the sample around the threshold at 20 employees. Then the size-class dummy *selects* which threshold we are focusing on, and the above dummy selects whether the firm is above or below the particular threshold. For the control countries, where no EP exemptions exist, we define above and below samples for each possible threshold. For the treatment countries, where EP exemptions exist, we only define above and below samples with respect to the actual threshold.

13. Controlling for independent firm-size effects mitigates this problem as long as the selection problem does not depend on the size of the exemption.

practice, then observations should congregate below size-thresholds, and we should observe spikes in the distribution of firm size. In contrast, in our case, the size distributions do not show unusual bunching at the thresholds. This is shown in Annex A2.

29. While selection does not appear to be a major concern in the present context, we nevertheless conducted an alternative specification that attempts to address the issue directly by controlling for the role of observed employment volatility. Employment volatility captures both the possibility that firms differ in their adjustment technologies or that they operate in environments characterised by different levels of output market volatility. Since both factors may create incentives for self-selection around the threshold, controlling for employment volatility should reduce the problem of selection bias. Employment volatility in a cell is measured using the average time-series variance of firm-level employment: $\hat{\sigma}^2{}_{cjs} = \frac{1}{N_{cjs}}\sum_{i=1}^{N_{cjs}} \hat{\sigma}^2{}_i$ where a N_{cjs} denotes the number of firms in a cell of country *c*, industry *j* and size class *s*, and $\hat{\sigma}^2{}_i$ denotes the timeseries variance of log employment of firm *i*, defined as $\hat{\sigma}^2{}_i = \sum_{t=1}^{T_j} \frac{(e_{it}-\bar{e}_i)^2}{T_i-1}$. Including the volatility measures in equation (7a) yields the following regression:

$$(7b)\ \hat{\beta}_{cjs} = \alpha_{EPR}EPR_{cs} + \alpha_{EPC}EPC_{cs} + \eta_j + \mu_c\ + v_s + \hat{\sigma}^2{}_{cjs} + \varepsilon_{cjs}$$

The incidence of temporary work

30. The effect of temporary work on responsiveness can, in principle, be investigated by using another component of the EP index which refers to provisions with respect to temporary contracts. However, because of concerns over the enforcement of these provisions, we prefer to focus on the incidence of temporary work instead. The main reason why enforcement issues are of particular concern in the context of temporary contracts is that incentives for enforcement are likely to be weak since workers and firms often share a mutual interest in their non-enforcement. As a result of these enforcement problems, it has sometimes been difficult to establish a negative relationship between the incidence of temporary work and the stringency of employment protection provisions with respect to temporary contracts. Bassanini *et al.* (2010) provide empirical evidence that shows that this is, indeed, related to the problem of enforcement.

31. The effect of temporary work on the responsiveness of employment and earnings per worker to output shocks is identified using the following model:

$$(7c)\ \hat{\beta}_{cjs} = \alpha_{temp}TEMP_{cjs} + \mu_c + \eta_j + v_s + \varepsilon_{cjs}$$

where $\hat{\beta}_{cjs}$ denotes the first-stage estimates of the employment and earnings-per-worker elasticities in country *c,* industry j and size class *s*, *TEMP* denotes the incidence of temporary work within a cell (measured on a scale of [0,1]), μ_c a set of country fixed effects, η_j a set of industry fixed effects and v_s a set of firm-size fixed effects.

Collective bargaining coverage (CWB)

32. The effect of collective wage bargaining (CWB) on the responsiveness of employment and earnings-per worker to output shocks is identified using the variation generated in CWB coverage across

cells within countries.[14] We model the heterogeneity in the impact of CWB coverage using data on the level at which CWB agreements are negotiated (firm- and higher level) as follows:

$$(7d)\ \hat{\beta}_{cjs} = \alpha_{firm} CWB_{cjs}^{firm} + \alpha_{higher} CWB_{cjs}^{higher} + \mu_c + \eta_j + v_s + \varepsilon_{cjs}$$

where $\hat{\beta}_{cjs}$ denotes the first-stage estimates of the employment and earnings-per-worker elasticities in country c, industry *j* and size class *s*, CWB_{cjs}^{firm} denotes the intensity (measured on a scale of [0,1]) of CWB agreements negotiated at the firm level in cell *cjs*, CWB_{cjs}^{higher} denotes those negotiated at the industry or country level, μ_c a set of country fixed effects, η_j a set of industry fixed effects and v_s a set of firm-size fixed effects.

33. In addition to (7d), a more flexible specification is considered that allows the impact of CWB to differ across countries. This specification, thus, accounts for the possibility that the role of CWB coverage depends on its broader institutional context as suggested by, for example, Aidt and Tzannatos (2008). Differences in the role of bargaining across different groups of countries are accounted for by the slope dummies (*D*). We consider two groups of countries: group 1 comprises of countries characterised by flexible labour markets, low levels of CWB coverage and a predominance of firm-level bargaining (Estonia, Poland and the UK); group 2 includes countries that have less flexible labour markets, high levels of CWB coverage and a predominance of bargaining at the industry or country levels (Belgium, France, Italy and Spain). We, thus, estimate the following flexible specifications:

$$(7e)\ \hat{\beta}_{cis} = (\alpha_1 + \alpha_2 D_{Group\,1}) CWB_{cis}^{firm} + (\alpha_3 + \alpha_4 D_{Group\,1}) CWB_{cis}^{higher} + \mu_c + \eta_i + v_s + \varepsilon_{cis}$$

where α_1 and α_3 measure the impact of CWB on the output elasticity of interest in group 2 and $\alpha_2$and α_4 measure the differential impact of CWB in group 1 relative to group 2.

3. Data and implementation

34. This section describes the main data sources used for the analysis. For the estimation of output elasticities, we make use of a comprehensive multi-country firm-level panel dataset, called ORBIS. For the purposes of the decomposition exercise discussed in Section 3.2, we make further use of a variety of data sources based on administrative information (OECD STAN, National Accounts, SDBS) or labour force surveys. Third, for the institutional analysis we combine our cell-level output elasticities with semi-aggregated information of employment protection, the incidence of temporary work and the coverage rate of collective wage bargaining.

3.1 Cross-country firm level longitudinal database (ORBIS)

35. We estimate output elasticities using a cross-country, firm-level longitudinal database, called ORBIS. The dataset provides comparable information from balance sheets and income statements for firms

14 . Theoretical models of collective bargaining tend to focus on structural or equilibrium labour market outcomes (*e,g,* the level of unemployment) rather that the role of bargaining for labour input adjustment. Right-to-manage models postulate that workers bargain over wages and the decision about the level employment is at the firm's discretion (Nickell and Andrews, 1983). These models predict that equilibrium employment is lower than in the neoclassical case without bargaining and, therefore, the equilibrium is Pareto-inefficient. Efficient bargaining models assume that unions and firms bargain simultaneously over wages and employment levels, which leads to an efficient outcome where underemployment disappears (McDonald and Solow, 1981).

across many OECD and non-OECD countries. It is collected by Bureau van Dijk via national sources.[15] The Statistics Department (STD) of the OECD has carried out extensive consistency checks and cleaning of the data (see Ragoussis and Gonnard, 2012, for details). The cleaning procedure developed by the Statistics Department was applied and extended to take account of specific issues in relation to the present analysis. For the purposes of this project, the OECD/ORBIS dataset was complemented with previous vintages of ORBIS and Amadeus (the "European edition" of ORBIS) to increase the time-horizon of the data.

36. We make use of firms in the non-farm, non-financial business sector in 20 OECD countries for the period 1993 to 2009. Our "raw" sample for the analysis of employment adjustment was obtained after suppressing all observations with non-positive information on sales and employment. Similarly, our raw sample for the analysis of earnings per worker was obtained after suppressing all observations with non-positive information on sales, employment and earnings per workers. We further cleaned the two raw samples by applying a variety of cleaning rules. The main cleaning rules were: i) to exclude observations with less than three employees; ii) to exclude firms with less than three consecutive observations and less than five observations in total (not necessarily consecutive); iii) to exclude observations with implausibly large changes in employment, sales or earnings per worker and iv) to exclude outliers based on sales per worker (*i.e.* labour productivity). Table 1 provides information on the number of observations before and after applying these additional cleaning rules to the employment and earnings-per-worker samples. Of the 20 OECD countries, Austria and the United States had to be suppressed from the earnings-per-worker sample due the lack of comprehensive information on the wage bill. For more details, see Annex A1.

37. For the purposes of the variance decomposition, described in Section 3.2, wwithin-country heterogeneity is captured by stratifying the dataset along two dimensions: firm size and industry. Firm size is defined in terms of the average number of employees: less than 20 employees; between 20 and 250 employees; more than 250 employees. Industries are grouped into construction, manufacturing and business services.[16] Table 1 gives the minimum and maximum number of observations in a cell in a country when using the cell structure that was used for the decomposition exercise. The number of observations tends to be relatively small in large construction firms, whereas it tends to be relatively large for small business services.

15 . Bureau van Dijk (BvD) is an electronic publishing firm collecting and providing company information and business intelligence. BvD's products range from UK company information to comprehensive global coverage.

16 . While the use of a limited number of groups may lead to ignore some differences in labour adjustment across firms, the use of a coarse cell structure makes it easier to highlight the main messages of the descriptive analysis.

Table 1. **The number of observations in the raw and estimation samples by country**

Nonfarm, nonfinancial business sector, 1993-2009

	Raw data, with nonmissing employment and sales	Employment sample			Raw data, with nonmissing earnings per worker and sales	Earnings per worker sample		
		Total	Smallest cell	Largest cell		Total	Smallest cell	Largest cell
Austria*	95 766	15 821	87	6 125	8 643	0	0	0
Belgium	334 093	199 297	533	66 488	333 696	186 808	530	61 165
Denmark	47 267	27 770	117	9 209	45 204	24 034	109	7 466
Estonia	193 835	76 488	68	39 095	156 854	53 740	41	27 131
Finland	348 238	160 314	193	74 649	333 007	148 181	168	68 382
France	3 731 112	1 315 958	2 671	555 587	2 875 705	1 213 286	2 602	499 346
Germany	751 920	301 071	765	128 329	88 062	24 654	20	7 174
Hungary	167 826	3 342	17	877	160 013	2 923	11	797
Italy	1 799 317	882 582	864	241 819	1 728 013	821 097	796	222 427
Japan	1 316 334	793 330	5 468	261 761	680 111	282 031	1 918	105 581
Korea	559 768	232 362	480	77 311	526 431	191 181	174	64 701
Netherlands	43 989	16 253	142	6 352	29 257	7 759	43	2 981
Norway	412 995	248 630	155	136 147	400 343	95 742	98	40 737
Poland	203 788	113 938	1 254	36 664	148 205	71 593	517	25 731
Portugal	781 587	11 452	156	3 085	761 775	10 433	126	2 903
Slovenia	65 323	33 597	184	12 043	64 985	31 473	176	11 066
Spain	3 826 199	1 874 398	1 834	804 956	3 804 147	1 690 616	1 784	716 133
Sweden	1 077 407	455 476	278	236 718	927 112	360 381	183	186 822
United Kingdom	415 647	342 794	3 193	117 901	387 501	288 927	2 892	101 783
United States*	10 975 640	58 516	453	15 019	10	0	0	0
Overall sum	**27 148 051**	**7 163 389**	**18 912**	**2 830 135**	**13 459 064**	**5 504 859**	**12 188**	**2 152 326**
Overall mean	**1 357 403**	**358 169**	**946**	**141 507**	**708 372**	**289 729**	**641**	**113 280**

Note: The raw sample for the employment (earnings per worker) analysis corresponds to observations with strictly positive values for sales, employment (and earnings per worker). The raw data is different from the estimation sample due to restrictions on minimum firm size (at least 3 employees), basic cleaning and outlier-filtering, and most importantly, concentrating on firms with at least five valid observations. Smallest and largest cells refer to the cells with the least and largest number of observations, considering nine cells based on three broad sectors (manufacturing, construction and business services) and three firm size classes (less than 20 employees, between 20 and 250 employees, more than 250 employees). Countries marked with * are excluded from the earnings per worker sample because of the low number of observations. See for more details the Data Appendix.

Source: Authors' calculations based on ORBIS

3.2 Administrative data sources

38. In order to implement the decomposition of the cross-country variation in aggregate employment growth (see Section 3.2), the estimated output elasticities need to be complemented with cell-level information on output shocks (shock heterogeneity) and employment shares (structure heterogeneity). To ensure that our decomposition is consistent with official aggregate information, we rely as much as possible on external data which are consistent with published national accounts and nationally representative labour force surveys.

39. The measures of structure heterogeneity are constructed using two data sources. First, information on the employment shares of manufacturing, construction and services by country and year are obtained from OECD STAN. Second, since OECD STAN does not provide any information by firm size, we multiply the employment shares by industry by time-invariant employment shares of firm-size groups

within industries obtained from the Structural and Demographic Business Statistics (SDBS).[17] Any missing information in STAN on cell-level employment was imputed using chained labour force surveys.

40. Cell-level output changes by industry and firm size are measured as follows. First, changes in real output by industry, country and year are obtained from OECD STAN. Second, cell-level output changes are calculated using the year-on-year evolution of real sales in ORBIS. Third, the growth rates of size classes within an industry, calculated from ORBIS, are rescaled such that the weighted-average growth rate of these size classes equals the industry-level growth rate observed in STAN.[18] The data on employment shares (structure heterogeneity) and output changes (shock heterogeneity) are summarised in Table 2 below.

17 . While the SDBS, in principle, provides information on employment and the number of firms by country, year, industry and firm-size class, this information is typically missing from 2008 onward. We, therefore, use the average values of the employment shares in 2006-2007 and assume these are constant over time.

18 . Cell-level output growth rates are rescaled as follows:

$$\Delta y_{cjst} \coloneqq \Delta y_{cjst}^{ORBIS} \frac{\Delta y_{cjt}^{STAN}}{\Delta y_{cjt}^{ORBIS}},$$

where Δy_{cjt}^{STAN}, Δy_{cjt}^{ORBIS} denote output growth rates in country *c* industry *j* and year *t* from STAN and ORBIS, respectively. If our assumption that the adjustment behaviour is homogenous within cells is valid, then, we can capture cell-level output shocks by calculating average sales growth weighted by firms shares in aggregate sales.

Table 2. **Cross-country differences in economic structure and the distribution of output shocks**

A. Cross-country differences in economic structure ("structure heterogeneity")
Percentage of employees, 2008

	Firm size group			Industry		
	Less than 20 employees	21-250 employees	251 employees and more	Construction	Manufacturing	Services
Belgium	39.7	27.5	32.8	9.7	22.1	68.2
Denmark	30.1	35.8	34.1	11.3	23.0	65.7
Estonia	37.2	42.7	20.1	18.3	31.1	50.6
Finland	32.0	28.3	39.7	12.5	29.1	58.4
France	34.2	27.9	37.8	11.9	21.3	66.8
Germany	31.4	30.7	38.0	8.6	29.8	61.6
Hungary	43.7	27.9	28.5	12.1	35.6	52.3
Italy	58.7	22.7	18.6	12.0	31.0	57.0
Japan	39.4	29.9	30.7	12.2	25.3	62.5
Korea	41.1	28.8	30.1	11.8	26.4	61.7
Netherlands	38.2	29.8	32.0	9.3	17.7	73.0
Norway	44.7	27.9	27.4	13.0	20.0	67.1
Poland	43.6	27.4	29.0	12.5	36.1	51.4
Portugal	51.9	29.8	18.3	16.7	28.0	55.3
Slovenia	38.0	30.5	31.6	13.1	36.6	50.3
Spain	48.3	29.4	22.2	18.9	22.6	58.5
Sweden	34.3	30.0	35.7	11.0	27.9	61.1
United Kingdom	31.4	24.4	44.2	11.4	15.9	72.7
United States	42.4	25.8	31.8	10.7	16.8	72.5

B. Cross-country differences in output shocks
Percentage change in real output, 2008-09

	Firm size group			Industry		
	Less than 20 employees	21-250 employees	251 employees and more	Construction	Manufacturing	Services
Belgium	-3.6	-4.4	-4.4	-3.6	-7.5	-3.1
Denmark	-10.2	-11.0	-11.0	-13.7	-15.9	-8.6
Estonia	-21.2	-23.6	-21.8	-35.4	-27.7	-15.1
Finland	-9.6	-11.6	-11.5	-13.6	-18.8	-6.6
France	-4.1	-5.4	-5.1	-5.9	-14.1	-1.7
Germany	-5.6	-8.3	-10.1	-0.9	-18.9	-3.9
Hungary	-7.9	-10.5	-11.3	-6.5	-15.4	-6.4
Italy	-7.4	-11.0	-8.9	-7.0	-17.2	-4.2
Japan	-10.9	-12.7	-8.4	-6.9	-16.9	-8.9
Korea	-0.9	-1.3	-1.4	2.5	-2.2	-1.4
Netherlands	-5.6	-6.1	-5.9	-4.3	-9.2	-5.3
Norway	-2.6	-3.1	-3.3	-0.5	-5.2	-2.7
Poland	1.4	0.5	0.7	-0.5	-0.7	2.4
Portugal	-4.4	-6.3	-4.2	-10.6	-9.1	-1.4
Slovenia	-12.7	-15.2	-15.4	-18.8	-20.6	-8.8
Spain	-4.8	-7.2	-5.8	-6.4	-14.4	-2.3
Sweden	-7.7	-9.9	-11.1	-5.6	-19.8	-5.9
United Kingdom	-6.5	-7.2	-6.1	-11.3	-11.3	-4.8
United States	-6.8	-7.1	-6.3	-13.4	-9.1	-5.3

Source: Authors' calculations based on ORBIS.

3.3 Data on labour market institutions

41. The institutional analysis considers employment protection, the incidence of temporary work and collective bargaining coverage. Information on the stringency of employment-protection rules with respect to collective and individual dismissals are obtained from the OECD database on EP described in Venn (2009). Table 3 provides details on the stringency of employment protection provisions for countries that practice firm-size exemptions or are included in our estimation sample as control countries. Exemptions in relation to individual dismissals (EPR) are partial in all countries in the sample, indicating that workers of small firms are subject to more flexible rules than larger firms. This generally reflects shorter or no notice periods, different procedural requirements or lower levels of severance pay. The other sub-component of EP which we include in the analysis refers to collective dismissals rules (EPC). In countries where small firms are exempt from collective dismissal rules, the value of EPC is 0.[19]

Table 3. **Employment protection and firm-size exemptions**

Stringency of employment-protection provisions for regular workers

	Firm size groups	EPLR	EPLC
Austria	Less than 5 employees	1.35	0.00
	5-19 employees	2.19	0.00
	20 employees and more	2.19	3.25
Belgium	Less than 20 employees	3.10	0.00
	20 employees and more	4.14	4.13
Denmark	Less than 20 employees	2.80	0.00
	20 employees and more	3.85	3.13
Finland	Less than 20 employees	3.02	0.00
	20 employees and more	4.49	2.38
France	-	2.60	2.13
Germany	Less than 10 employees	0.43	0.00
	10-19 employees	2.85	0.00
	20 employees and more	2.85	3.75
Hungary	Less than 20 employees	2.94	0.00
	20 employees and more	4.09	2.88
Italy	Less than 15 employees	1.36	4.88
	15 employees and more	1.76	4.88
Japan	-	2.05	1.50
Korea	-	2.29	1.88
Norway	-	2.20	2.88
Poland	-	2.01	3.63
Portugal	Less than 10 employees	3.18	1.88
	10 employees and more	3.51	1.88
Slovenia	Less than 10 employees	2.72	2.88
	10 employees and more	2.98	2.88
Spain	Less than 25 employees	2.26	2.13
	25-49 employees	2.46	2.13
	50 employees and more	2.38	3.38
United Kingdom	-	1.17	2.88
United States	Less than 100 employees	0.56	0.00
	100 employees and more	0.56	2.88

Note: EPLR denotes the stringency of firing regular workers, and EPLC measures the stringency of collective dismissals regulations in 2008.

Source: Venn (2009)

19. This probably reflects the fact that a firm needs to have a certain critical mass in order to engage in collective dismissals.

42. Data on collective wage bargaining (CWB) are obtained from the Structure of Earnings Survey (SES).[20] SES identifies the predominant type of wage agreement (covering at least 50% of the employees of the local unit). Respondents are required to choose one of the following types of wage bargaining: firm-, industry-, country-level, other type or indicate that there is no bargaining at the local unit. CWB_{cjs} in equations (7d) and (7e) is computed as the average proportion of firms covered by any of the above types. Therefore, it measures the intensity of collective wage bargaining in general.[21] Data on the incidence of temporary work by industry and firm-size cell are obtained from the European Labour Force Survey.

4. Results

4.1 Elasticities of labour market outcomes

43. Figure 1 describes the estimated responsiveness of labour input to output shocks.[22] On average, across countries, the short-term elasticities of employment and earnings-per-worker are both between 0.1 and 0.15 (shown in the two rightmost columns), with the sensitivity of employment to output shocks being slightly larger than that of earnings-per-worker. This suggests that, at least in terms of the cross-country averages, contemporaneous adjustments on the extensive (employment) and intensive margins (average hours worked and wages) to output shocks account both for a substantial part of total labour-cost adjustment. However, there appears to be considerable heterogeneity in the cross-country distribution of elasticities, with a strong negative correlation between the output elasticities of employment and earnings per worker (the pairwise correlation is -0.5 and statistically significant). This implies that firms that adjust more on the employment margin tend to adjust less on the earnings-per-worker margin. The elasticity of employment with respect to output is highest in countries such as Denmark and the United States, while it is lowest in CEECs and Japan. The earnings-per-worker elasticity is highest in Hungary, Japan and Poland and lowest in Italy, Portugal and Spain.

44. The cross-country averages of elasticities for each industry show that the responsiveness of employment to output is highest in construction and lowest in manufacturing, while the responsiveness of earnings-per-worker is highest in manufacturing and lowest in construction. The differences in elasticities are quantitatively large, with the employment (earnings-per-worker) elasticity in construction being about twice as large (small) as that in manufacturing. These may reflect differences in production technologies, the skill composition of the workforce or the importance of non-standard contracts. The large differences across sectors in the responsiveness of labour inputs to output shocks imply that cross-country differences in industrial structure and the sectoral concentration of shocks can have important implications for the impact of the crisis on labour markets.

45. Differences in the responsiveness of labour inputs to output shocks across size groups are less pronounced than those across industries, but are of particular interest as they do not appear to conform well to the perceived wisdom at first sight. According to the figure, the responsiveness of both employment and earnings-per-worker to output shocks increases with firm size. This suggests that the sensitivity of the wage bill also increases with firm size. Traditionally, however, employment in small firms has been considered to be more sensitive to output shocks than employment in large firms, because the former were

20 . The European Union *Structure of Earnings Survey*, conducted in 2002 and 2006, is an enterprise survey providing detailed and comparable information on relationships between the level of remuneration, individual characteristics of employees, and their employer. Its website provides aggregated statistics. The current analysis is based on the 2006 vintage of the survey.

21. For more details on CWB, see the Data Appendix.

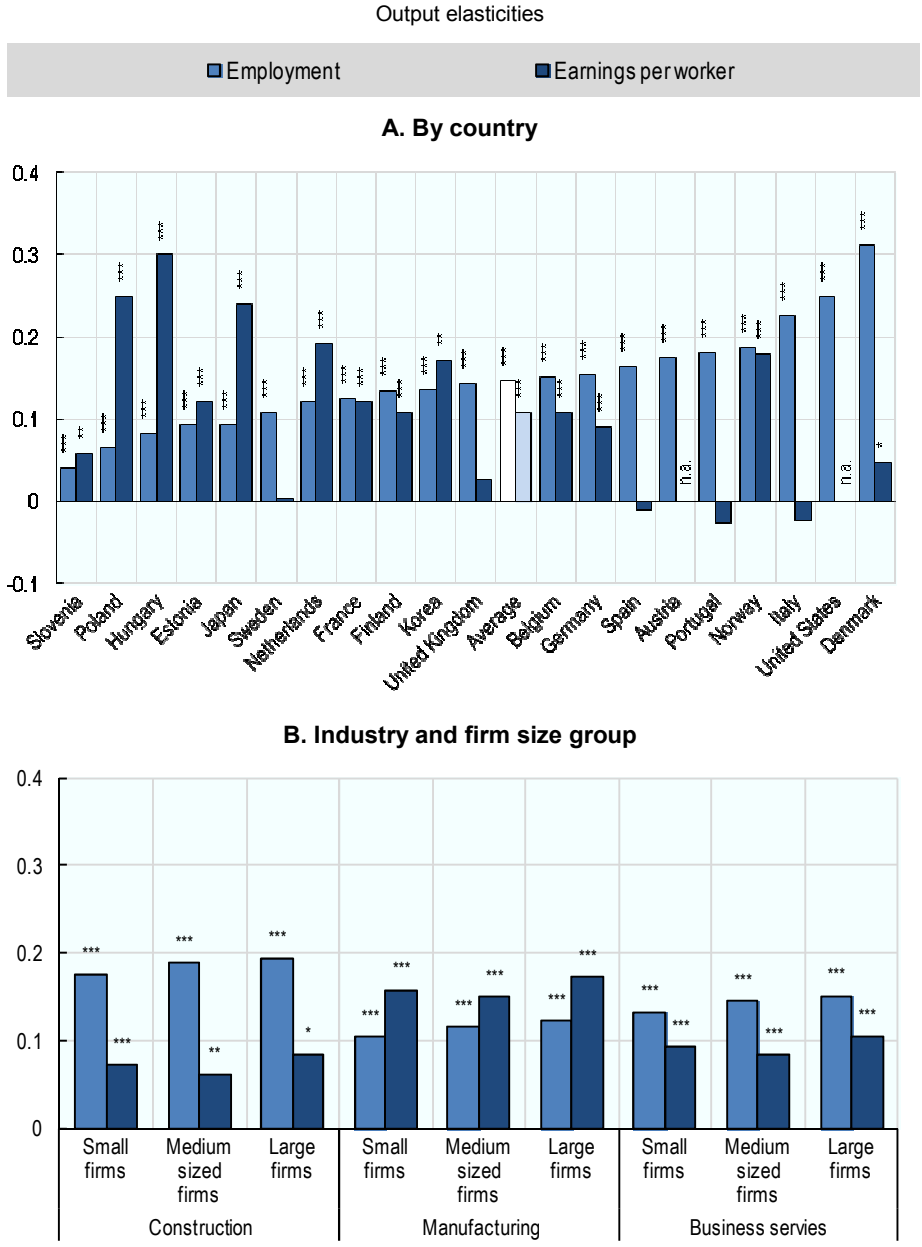
22 . These elasticities are estimated separately for each firmsize, industry and country. In Figure 5, averages are shown. Coefficients on the lagged dependent variable are also of interest but not discussed here as the main purpose is to explain the short-term impact of the crisis on labour markets.

thought to find it more difficult to hoard labour during periods of weak product demand due to financial constraints (Sharpe, 1994).[23] This argument implies that the sensitivity of both employment and earnings-per worker to output should decline with firm size. However, the traditional view that small firms hoard less during a downturn has recently been challenged by Postel-Vinay and Moscarini (2011), who suggest that large firms may have weaker incentives to retain workers during a downturn since they tend to be more productive and offer higher wages and, as a result, find it easier to recruit new workers during a recovery.[24] This argument is, in principle, consistent with the positive relationship between the sensitivity of employment and firm size, but does not explain the positive relationship between earnings-per-worker and firm size.

23 . Small firms tend to have shorter credit histories, to be subject to higher levels of idiosyncratic risk and are less likely to have adequate collateral (Gertler and Gilchrist, 1994).

24 . Descriptive statistics based on firm-level data for a large number of European countries in OECD (2010) are also at odds with the traditional view and consistent with the evidence in Postel-Vinay and Moscarini (2011).

Figure 1. **Differences in the sensitivity of labour inputs to output shocks across countries, industries and firm size groups ("response heterogeneity")**



*, **, ***: statistically significant at the 10%, 5% and 1% level, respectively.
n.a.: Not available.
Note: <To be filled>
Source: Authors' calculations based on ORBIS.

4.2 Variance decomposition of aggregate employment growth during the global financial crisis

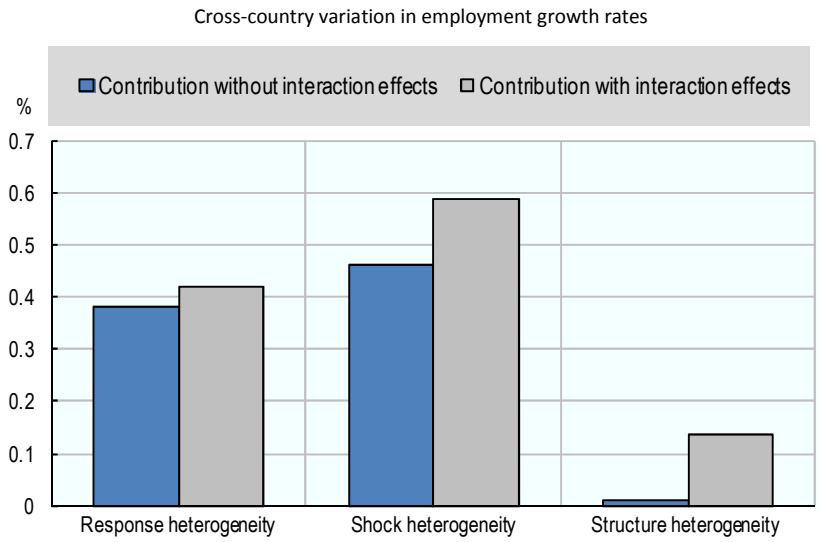
46. In order to examine the role of structure, shock and response heterogeneity for aggregate employment growth during the global financial crisis, the cross-country variation in aggregate employment growth between 2008 and 2009 is decomposed into components that are assumed to capture different sources of heterogeneity (see Section 2.2 for details). The contribution of each source of heterogeneity to the cross-country variance is calculated in two ways. First, for each source of heterogeneity, we switch off

the two other sources of heterogeneity by setting their values to the cross-country average. This is labelled "contribution without interaction effects" in Figure 2. Computing the explained variance in this manner gives a measure of the explanatory power of a single source. Second, for each source of heterogeneity, we leave the other two at the actual values. Computing the explained variance in this manner gives a measure of explanatory power when each source of heterogeneity is evaluated at the actual distribution. If heterogeneity is correlated along these dimensions, computing contributions in this manner should increase the explained variance. This is labelled "contribution with interaction effects".

47. The results from the decompositions are presented in Figure 2. Response heterogeneity appears to explain 38% of the cross-country variation in employment growth when the other variables are kept at their cross-country mean. Considering the sample distributions of employment shares and output shocks, the contribution of response heterogeneity goes up slightly to 42% of the cross-country variation. Repeating the decomposition for shock heterogeneity suggests that this source explains 46% of the cross-country variation in employment growth. After accounting for the covariances between output shocks, on the one hand, and employment shares and output responses, on the other, shock heterogeneity explains about 59% of the cross-country variation in employment growth. The role of structure heterogeneity is negligible without accounting for interaction effects but increases to 14% after accounting for such effects.

48. The results provide two key insights. First, the relative importance of response heterogeneity suggests that differences in policies and institutions across countries account for a potentially large part of the cross-country variation in aggregate employment growth during the crisis. Second, using disaggregate information can greatly enhance one's ability to explain differences in aggregate labour market dynamics. This is neatly illustrated by the share of the cross-country variance that can be attributed to the role of the covariances across different dimensions of heterogeneity.

Figure 2. **Decomposition of cross-country variation in labour market adjustment during the crisis, 2008-09**



Source: Authors' calculations based on ORBIS, STAN, LFS and SDBS.

4.3 Results of the institutional analysis

Employment protection

49. The analysis of employment protection exploits the within-country variation that results from firm-size exemptions to examine the role of employment-protection provisions with respect to individual and collective dismissals for the responsiveness of labour inputs to output shocks. In order to ensure that the results only relate to exemptions with respect to employment-protection provisions and not the independent effect of firm size the analysis control for common firm-size effects across countries and, in addition, includes countries without firm-size exemptions as controls. The results for employment are reported in Panel A of Table 4.

50. The results suggest a negative relationship between the stringency of individual dismissal regulations for regular workers and the responsiveness of employment to output shocks. As shown by the first row of Panel A, a unit-increase in the index of EPL is associated with 4-5 percentage point decrease in the employment elasticity. The stringency of collective dismissals does not seem to be associated with employment elasticities in our sample, as shown by the small *t*-statistics. There is evidence of independent size effects around the threshold: the coefficient of v is positive and statistically significant at 5% when flexible size effects are included (columns 2 and 4), in line with the general description of elasticities by firm-size classes (Figure 1, Panel B). The volatility measure does not seem to be associated with the responsiveness of employment to output shocks. This provides further evidence that firms do not self-select around the threshold.

51. The responsiveness of earnings per worker to output shocks appears to be positively associated with the stringency of individual-dismissal provisions (Panel B). The relationship seems to be robust across specifications but somewhat weaker than for employment. Again, there is evidence of positive size effects around the threshold: the coefficient of *v* is positive and statistically significant when volatility controls are not included. Including both size and volatility effects kills their explanatory power, shown by small *t*-statistics (last two columns), but the effect of dismissal regulations for regular workers remains positive and statistically significant.

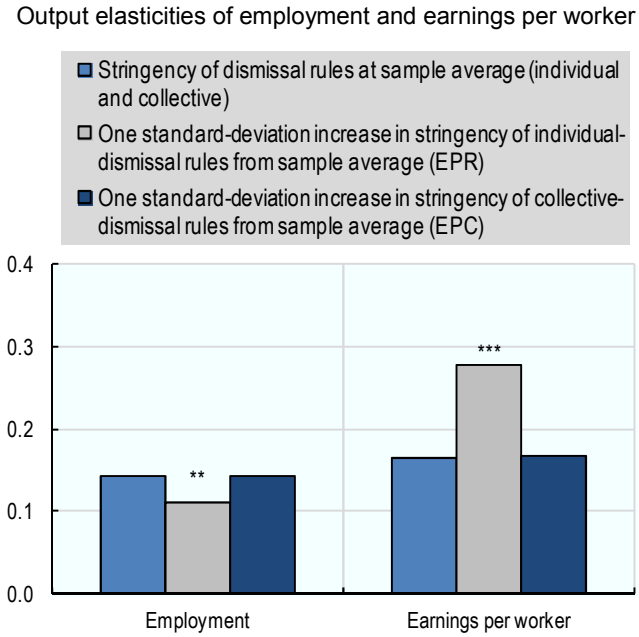
Table 4. **The effect of EPL of responsiveness on the responsiveness of employment and earnings per worker**

	A. Employment				B. Earnings per worker			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
Dismissal for regular workers	-0.031	-0.045 **	-0.038 *	-0.047 **	0.184 *	0.164 *	0.195 *	0.173 *
	(-1.55)	(-2.47)	(-2.03)	(-2.78)	(-2.12)	(-2.13)	(-2.05)	(-2.06)
Collective dismissals	-0.010	0.003	-0.009	0.004	0.001	0.003	0.001	0.003
	(-1.26)	(-0.74)	(-1.11)	(-0.87)	(-0.16)	(-0.32)	(-0.19)	(-0.29)
Size effect	-0.030 ***	0.021 ***	-0.010	0.029 ***	0.045 ***	0.082 **	0.020	0.053
	(-3.71)	(-3.54)	(-0.96)	(-3.43)	(-4.99)	(-2.62)	(-0.7)	(-1.11)
Volatility effect	No	No	0.553 **	0.337	No	No	-0.547	-0.562
			(-2.28)	(-1.54)			(-1.26)	(-1.70)
Flexible size effect	No	Yes	No	Yes	No	Yes	No	Yes
Number of observations	**346**	**346**	**346**	**346**	**264**	**264**	**264**	**264**

*, **, ***: statistically significant at the 10%, 5% and 1% level, respectively.
t statistics in parentheses
Note: **Column 1** shows results for specification 1 with constant size effect and without volatility control; **column 2** shows results for specification 2 with flexible size effects and without volatility controls; **column 3** shows results for specification 3 with constant size effects and including volatility controls; **column 4** shows results for specification 4 where flexible size effects and volatility controls. All specifications include a full set of country and industry fixed effects.
Source: Authors' calculations based on ORBIS.

52. The results of specification (7b) are visualized in Figure 3. They indicate that provisions with respect to both individual and collective dismissals have a tendency to reduce the output elasticity of employment, while provisions with respect to individual dismissals appear to increase the sensitivity of earnings per worker to output shocks. Moreover, the effects of individual dismissal provisions appear to be large. A one standard-deviation increase in the stringency of individual dismissal provisions, which corresponds to an increase in the level from Denmark to Belgium, would result in a 4 percentage-point reduction in the responsiveness of employment to output shocks and a 10 percentage-point increase in the responsiveness of earnings-per-worker to output shocks. These results suggest that more stringent employment-protection provisions for regular employees induce firms to adjust less on the extensive and more on the intensive margin.

Figure 3. **The effect of employment protection on the responsiveness of employment and earnings-per-worker to output shocks**



, *: difference with base effect is statistically significant at the 5% and 1% level, respectively.

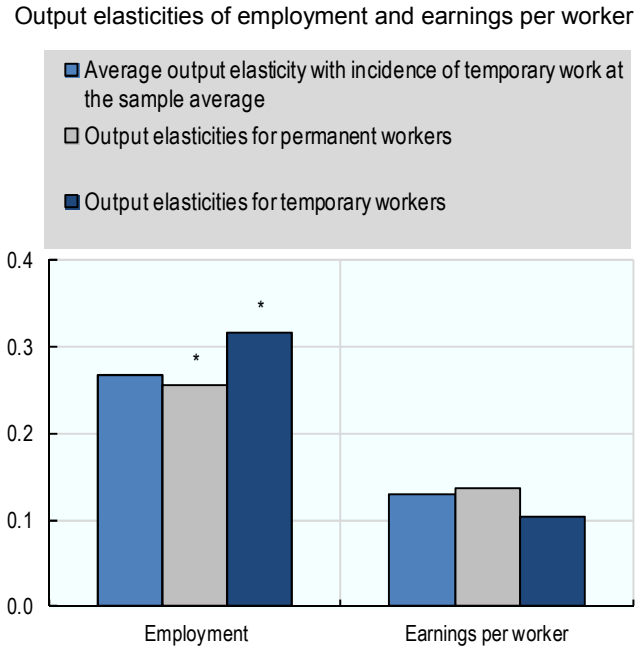
Source: Authors' calculations based on ORBIS and Venn (2009).

The incidence of temporary work

53. Employment protection rules are also likely to have an important impact on the use of temporary contracts (Blanchard and Landier, 2002; Boeri, 2011).[25] Employment protection provisions with respect to regular contracts increase incentives to make use of temporary contracts, while employment protection provisions with respect to temporary contracts regulate their use. In order to capture the impact of employment protection on the adjustment behaviour of firms that comes about through its impact on the incidence of temporary work, Figure 4 analyses the role of the incidence of temporary work for the adjustment behaviour of firms. It shows that, as one would expect, the employment sensitivity of temporary workers with respect to output shocks is substantially higher than that of regular workers. There is some indication that the increased sensitivity of employment reduces the sensitivity of earnings per worker in response to shocks. However, the difference in the sensitivity of earnings per worker to shocks between permanent and temporary workers is not statistically significant.

25 . For empirical evidence on this relationship, see, for example, Autor (2003) and Kahn (2007).

Figure 4. **The effect of the incidence of temporary work on the responsiveness of employment and earnings-per-worker to output shocks**



*: difference with base effect is statistically significant at the 10% level.

Source: Authors' calculations based on ORBIS and EU LFS.

Collective bargaining coverage

54. The analysis of the role of collective wage bargaining takes account of both the pervasiveness and the level of centralization. Its pervasiveness is accounted for by looking at the incidence of collective wage agreements across firms within detailed industry and firmsize cells. Its nature is measured by the level of centralisation at which collective wage agreements are negotiated. Table 5 summarizes regressions results on the effect of collective wage bargaining on the responsiveness of employment and earnings per worker. Panel A shows the estimated effect of wage bargaining intensities without allowing for heterogeneity in slopes (equation 7d). The estimates standard errors are large, which implies that *t*-tests do not reject the null of zero association between bargaining coverage and responsiveness.

55. The specifications reported in Panel B allow for differences in the role of bargaining across different groups of countries (equation 7e). Group 1 includes countries with flexible labour markets, low levels of CWB coverage and a predominance of firm-level bargaining (Estonia, Poland and the UK). Group 2 consists of countries that have less flexible labour markets, high levels of CWB coverage and a predominance of bargaining at the industry or country levels (Belgium, France, Italy and Spain). The main justification for distinguishing between these two groups of countries is that the role of CWB coverage is likely to depend on its broader institutional context as suggested by Aidt and Tzannatos (2008) and Du Caju *et al.* (2008).[26]

56. The results in the first two columns show results based on a set of countries for which appropriate data was available in the SES. The last two columns show results that include in addition Germany and Portugal. Information on collective bargaining for those two countries is obtained from national sources.

26 . Du Caju *et al.* (2008) differentiate between countries with different institutional settings using statistical methods and find similar results.

Since adding Germany and Portugal to the sample also required making a number of data imputations, raising concerns about the reliability of the data used for those two countries, the results without these two countries are preferred. The baseline results suggest that higher bargaining coverage decreases the responsiveness of employment in countries with less flexible labour markets, high levels of CWB coverage and a predominance of bargaining at the industry or country levels (Group 2). This is shown by the last two coefficients in columns 1 and 2. Employment responsiveness appears to be significantly different in countries with flexible labour markets, lower levels and less centralized bargaining (Group 1). The estimated slope dummies - first two coefficients in columns 1 and 2 - are larger in absolute value than the last two implying that higher levels of bargaining increase responsiveness.

Table 5. **The effect of collective wage bargaining (CWB) coverage on the responsiveness of employment and earnings per worker**

A. Homogenous slopes

	Baseline sample		**Extended sample**	
	Employment	Earnings per worker	Employment	Earnings per worker
Firm level	0.138	-0.088	-0.069	-0.067
	(-0.82)	(-0.91)	(-0.58)	(-0.91)
Higher level	0.129	0.020	-0.077	-0.002
	(-0.78)	(-0.25)	(-0.90)	(-0.03)
Number of observations	**200**	**194**	**279**	**256**

B. Heterogenous slopes

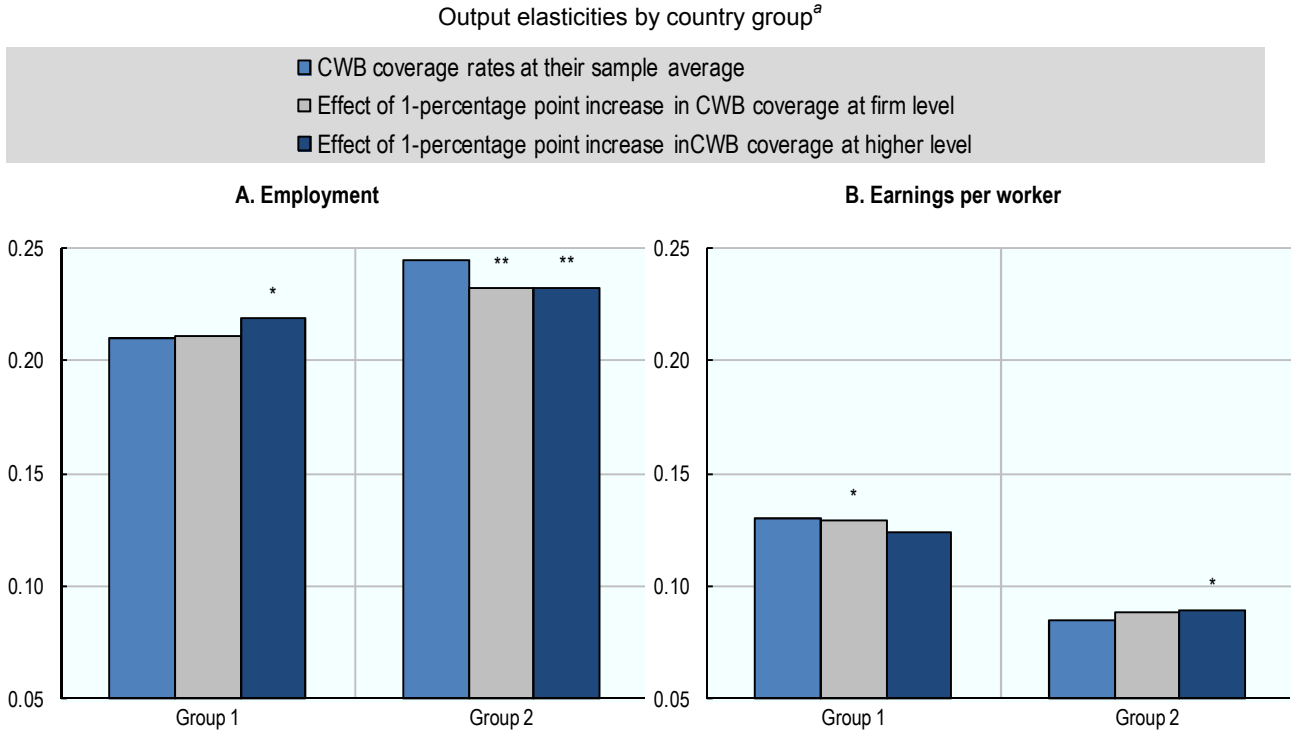
	Baseline sample		**Extended sample**	
	Employment	Earnings per worker	Employment	Earnings per worker
Firm level (group 1 dummy)	1.316 **	-0.423 *	0.449 **	0.002
	(-2.45)	(-1.72)	(-2.22)	(-0.01)
Higher level (group 1 dummy)	2.034 **	-1.030	0.481	-0.164
	(-2.29)	(-1.47)	(-0.79)	(-0.31)
Firm level	-1.215 **	0.350	-0.341 **	-0.058
	(-2.24)	(-1.45)	(-2.32)	(-0.5)
Higher level	-1.164 **	0.447 *	-0.256 **	0.009
	(-2.23)	(-1.95)	(-2.5)	(-0.08)
Number of observations	**200**	**194**	**279**	**256**

*, **: statistically significant at the 10% and 5% level, respectively.
Note: In the small sample, only countries in SES are used: Group1: Estonia, Poland and the United Kingdom; Group 2: Belgium, France, Italy and Spain. In the extended sample, data on Germany and Portugal is obtained from national sources and these two countries were added to Group 2.
Source: Authors' calculations based on ORBIS and SES. All specifications include a full set of country and industry fixed effects.

57. Figure 5 visualizes the baseline results by comparing average employment and earnings-per worker elasticities with the coverage rates of firm and higher-level CWB agreements set at their sample means with those that result when the coverage rates are increased, one-by-one, by one percentage point from their sample mean. In general, the results suggest that more pervasive collective bargaining mitigates the effect of output shocks on employment in Group 2, but has either no effect or reinforces the impact of output shocks on employment in Group 1. The results with respect to earnings-per-worker are very weak. If anything, the results suggest that CWB coverage increases the responsiveness of earnings-per-worker to shocks in Group 2, while it reduces it in Group 1. The effects are small and generally statistically insignificant. The differences in the estimated impact of CWB coverage on the labour input adjustment may indicate that its role depends on the broader institutional environment in which collective bargaining

takes place. However, it may also reflect the role of specific features of the bargaining process that are not taken into account in the present analysis.[27] Whether collective bargaining agreements are negotiated at the firm-level or at high-levels of negotiation does not appear to matter in any of the two groups of countries.

Figure 5. **The effect of collective wage bargaining coverage on the responsiveness of employment and earnings per worker to output shocks**



CWB: Collective wage bargaining.
*, **: difference with base effect is statistically significant at the 10% and 5% level, respectively.
a) Group1: Estonia, Poland and the United Kingdom; Group 2: Belgium, France, Italy and Spain.
Source: Authors' calculations based on ORBIS.

5. Aggregate implications

58. What does the evidence above suggest about the importance of a specific policy or institution in explaining the cross-country variation of employment growth during the crisis? In order to answer this question, we check how much the dispersion of cross-country employment growth is affected by setting the regulation of individual dismissals of regular workers (EPR) to their cross-country average. More specifically, we calculate the dispersion of the implied country-level employment growth rates between 2008 and 2009 across countries, $\sigma(\widehat{\Delta l}_{ct})$. The implied country-level employment changes are calculated using the estimated cell-level employment elasticities, actual output changes and actual employment shares as follows: $\widehat{\Delta l}_{ct} = \sum_{j,s} w_{cjst}\hat{\beta}_{cjs}\Delta y_{cjst}$. The standard deviation of the implied employment changes across countries is 0.9% in 2009. Using the estimated coefficient of EPR on the output elasticity of employment (-0.47), we calculate the predicted elasticities after setting EPR to its cross-country mean using $\hat{\beta}_{cjs}^{EP=\overline{EP}} =$

27 . The results for Group 2 are inconsistent with the predictions from so-called "right-to-manage" models, which suggest that trade unions only care about wages and not about employment, but may be consistent with efficient bargaining models in which trade unions take account of the potentially adverse employment implications of wage bargaining and exercise restraint on wage claims in order to save jobs.

$\hat{\beta}_{cjs} - 0.47(\overline{EPR} - EPR_c)$. The resulting cross-country standard deviation after setting EPR in all countries to its cross-country average is 0.8%, only slightly smaller than the standard deviation based on actual levels in EPR. This simple calculation, therefore, tentatively indicates that differences in the individual dismissals component of EP alone are unlikely to be a major cause for the dispersion in aggregate employment dynamics during the initial phase of the global financial crisis.

6. Concluding remarks

59. This paper investigates the role of policies and institutions for aggregate labour market dynamics during the global financial crisis using firm-level data. It makes the case that using micro-level information can be important for understanding macro-economic outcomes in the context of firm heterogeneity and provides new evidence on the role of labour market institutions for the adjustment behaviour of firms.

60. The use of firm-level data is important if firms are heterogeneous in their labour input adjustment technologies. In this case, cross-country differences in aggregate labour market dynamics may not just stem from cross-country differences in average labour input technologies - here assumed to be largely due to differences in institutional settings -, but also from differences in the distribution of shocks across firms within countries and the composition of firms across countries. Descriptive evidence based on a variance decomposition suggests that this may indeed be important in practice. The covariances across different dimensions of heterogeneity account for a substantial part of the cross-country variation in employment dynamics during the initial phase of the global financial crisis. Thus, using disaggregate information not only enhances one's ability when adjustment technologies are non-linear as emphasised in previous related work, but also when firms are heterogeneous in terms of their adjustment technologies.

61. Firm-level data may also help to shed more light on the role of labour market institutions for the way firms adjust in response to shocks. In contrast to much of the previous literature on the role of labour market institutions the present paper does this by exploiting the within-country variation in the data rather than the cross-country variation. The main advantage of doing so is that the within-country variation is less likely to be correlated across countries, while the correlation of institutions across countries complicates identifying their role from the cross-country variation. Moreover, using disaggregate data also allows controlling for different sources of heterogeneity. Estimates from aggregates studies may be misleading to the extent that cross-country differences in labour market adjustment results, in part, from differences in composition of firms or the distribution of business conditions across firms.

62. This paper shows that labour market institutions account employment-protection provisions for regular workers have a tendency to shift the burden of adjustment from the extensive margin (employment) to the intensive margin (working time and wages), while the incidence of temporary tends to have the opposite effects. Back-of-the-envelope calculations with respect to employment-protection provisions for regular workers suggest that they accounts for only a minor part of the cross-country variation in aggregate employment dynamics during the initial phase of the global financial crisis.

ANNEX

A1. Data description

Sources and construction of international firm-level data

The source of the company-level dataset used in the analysis is the ORBIS dataset, collected by the Bureau van Dijk (BvD).[28] The database is a collection of accounts, mostly at annual frequency, derived from companies' balance sheets and income statements. As such, it is a longitudinal database providing rich variation across countries, industries and firm size, and with a time span of seventeen years (1993-2009).[29] The version we can access contains data from 43 countries (primarily OECD member countries and those who participate in the Enhanced Engagement of the OECD), though not all of them can be used in the analysis. Eventually 21 countries were included in the sample, for which there is a large enough number of firms and the appropriate set of variables for our purposes. See Table X in the main text for the set of countries we use and the number of observations and firms for each.

Our main variable of interest is employment (EMPLOYEES in ORBIS), sales or turnover (OPERATING_REV_TURNOVER) as a proxy for output and labour costs (COSTS_EMPLOYEES). Earnings per worker is defined as labour costs divided by employment.

All firms in our analysis have at least three consecutive years of nonmissing and positive data without implausibly large longitudinal changes. Specifically, as they are likely to be data errors, we filter out observations in any of the conditions are met in Table A1.

We also apply outlier filtering based on the distribution of sales over employment and earnings per worker: we apply the Chebyshev method and filter out observations in each country, industry and sizeclass cell which our outside the interval defined as [p25 – 1.5*iqr, p75 + 1.5*iqr], where p25 and p75 denotes the 25^{th} and 75^{th} percentiles, and iqr is the interquartile range: iqr = p75-p25.

After dropping observations which do not pass these filters, we require that each firm has at least five observations in order to ensure that the GMM type estimation can utilise enough number of lagged values.

The affected number of observation per each country for each of these criteria is available on request.

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28 The ORBIS dataset, which contains countries outside as well as within Europe, is augmented with the Amadeus dataset (also collected by the BvD). This was needed primarily to include more firm-year observations in the 1990's, as the vintage of the ORBIS dataset available at the OECD starts reporting firms mostly only around 1999.

29 The Statistics Department (STD) and at the Directorate of Employment, Labour and Social Affairs (ELS) of the OECD have carried out extensive consistency checks and cleaning of the data. Among others, the role of consolidated accounts, differing accounting years have been addressed. See more details on this by the OECD STD (Ragoussis and Gonnard, 2011).

Table A1. **Criteria for filtering observations**

	Definition	Log changes, controlling for absolute changes as well (in absolute value)[a]	Gross growth rates[b]	Reversals (in gross growth rates)[c]	Log changes at the edges of a firm-spell[d]	
					Log changes	Difference from lagged log changes
A. Readily available variables						
Employment	-	0.5 log-points, more than 1 000 employees	5	1.5	0.5	0.8
Sales	-	-	6	6	0.7	0.9
Value added	-	-	7	4	0.7	0.9
Labor costs	-	-	6	2	0.6	0.6
Fixed tangible capital	-	-	8	2	-	-
B Constructed variables						
Earnings per worker	Labour costs / Employment	-	0.8	0.5	-	-
Labour productivity (using sales)	Sales / Employment	-	2	0.7	-	-
Labour productivity (using value added)	Value added / Employment	-	3	1.5	-	-
Capital-labour ratio	Fixed tangible capital / Employment	-	2.5	0.5	-	-

Note: observations are dropped from the database if any of the criteria (columns) for any variable (rows) is not fulfilled. For example, the first entry in column four corresponds to the following rule: an observation is dropped if the yearly growth rate in employment grows by a factor of 5 or drops by 80%. This rule is equivalent to keeping all observations which satisfy the following rule $1.2<Et/Et-1<5$. The relative magnitude of the intervals across variables are based on an assessment of the relative standard deviation of the variables.

a) Dropping observations with large absolute changes. An observation is dropped if the absolute value of log changes (log(Xt)-log(Xt-1)) is larger than values in the respective cells of the table, and also the absolute value of changes in levels are larger than the value in the cell.

b) Dropping observations with large growth rates. An observation is dropped if Xt/Xt-1 is larger than the cell value or smaller than the inverse of the cell value.

c) Dropping observations with volatile growth rates (reversals). An observation is dropped if Xt/Xt-1 is above the cell value in time t and is below the inverse of the cell value in time t+1.

d) Dropping observations with volatile growth rates (lagged growth). An observation is dropped if the absolute value of log changes is larger than the elements in the first sub-column and the difference with the lagged change is larger than the elements in the second sub-column.

Indicators for labour market institutions: Collective wage bargaining coverage

Table A2. **The incidence of CWB by country, industry and size class**

	A. Industry				B. Size class			
		Overall	Firm level	Higher level		Overall	Firm level	Higher level
Belgium	Manufacturing	1.000	0.249	0.751	Less than 50	1.000	0.065	0.935
	Construction	1.000	0.042	0.958	50-249 empl	1.000	0.211	0.789
	Business services	1.000	0.127	0.873	250-999 emp	1.000	0.358	0.642
					1000 employ	1.000	0.176	0.824
	Total	**1.000**	**0.206**	**0.794**	**Total**	**1.000**	**0.206**	**0.794**
Czech Republic	Manufacturing	0.512	0.350	0.162	Less than 50	0.176	0.092	0.084
	Construction	0.807	0.244	0.563	50-249 empl	0.551	0.364	0.187
	Business services	0.398	0.345	0.053	250-999 emp	0.729	0.592	0.136
					1000 employ	0.000	0.000	0.000
	Total	**0.481**	**0.345**	**0.136**	**Total**	**0.481**	**0.345**	**0.136**
Estonia	Manufacturing	0.075	0.061	0.015	Less than 50	0.011	0.007	0.003
	Construction	0.066	0.054	0.012	50-249 empl	0.167	0.126	0.041
	Business services	0.104	0.070	0.033	250-999 emp	0.000	0.000	0.000
					1000 employees and more			
	Total	**0.085**	**0.064**	**0.021**	**Total**	**0.085**	**0.064**	**0.021**
France	Manufacturing	0.980	0.000	0.980	Less than 50	0.959	0.000	0.959
	Construction	0.974	0.000	0.974	50-249 empl	0.966	0.002	0.955
	Business services	0.944	0.007	0.897	250-999 emp	0.977	0.006	0.939
					1000 employees and more			
	Total	**0.968**	**0.003**	**0.951**	**Total**	**0.968**	**0.003**	**0.951**
Hungary	Manufacturing	0.309	0.255	0.040	Less than 50	0.098	0.077	0.004
	Construction	0.315	0.251	0.035	50-249 empl	0.215	0.179	0.023
	Business services	0.256	0.226	0.017	250-999 emp	0.579	0.492	0.073
					1000 employ	0.000	0.000	0.000
	Total	**0.293**	**0.246**	**0.033**	**Total**	**0.293**	**0.246**	**0.033**
Italy	Manufacturing	0.980	0.000	0.980	Less than 50	0.967	0.000	0.967
	Construction	0.986	0.000	0.986	50-249 empl	0.957	0.000	0.957
	Business services	0.967	0.000	0.967	250-999 emp	0.993	0.000	0.993
					1000 employ	0.989	0.000	0.989
	Total	**0.975**	**0.000**	**0.975**	**Total**	**0.975**	**0.000**	**0.975**

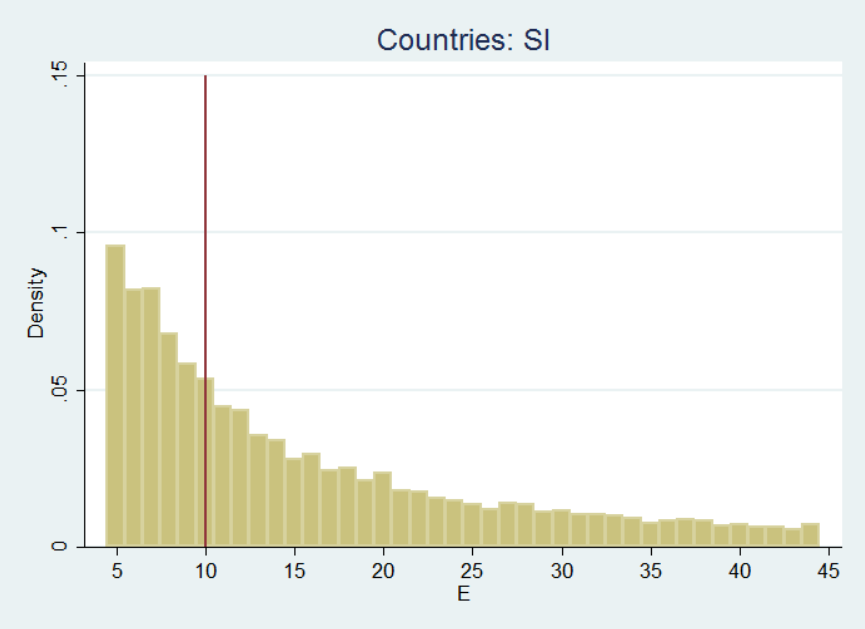
Table A2. **The incidence of CWB by country, industry and size class** *(Cont.)*

	A. Industry				B. Size class			
		Overall	Firm level	Higher level		Overall	Firm level	Higher level
Netherlands	Manufacturing	1.000	0.000	0.000	Less than 50	1.000	0.000	0.000
	Construction	1.000	0.000	0.000	50-249 emplo	1.000	0.000	0.000
	Business services	1.000	0.000	0.000	250-999 emp	1.000	0.000	0.000
					1000 employees and more			
	Total	**1.000**	**0.000**	**0.000**	**Total**	**1.000**	**0.000**	**0.000**
Poland	Manufacturing	0.500	0.493	0.007	Less than 50	0.500	0.490	0.010
	Construction	0.500	0.497	0.003	50-249 emplo	0.500	0.494	0.006
	Business services	0.500	0.485	0.015	250-999 emp	0.500	0.487	0.013
					1000 employees and more			
	Total	**0.500**	**0.490**	**0.010**	**Total**	**0.500**	**0.490**	**0.010**
Portugal	Manufacturing	0.963	0.056	0.787	Less than 50	0.955	0.010	0.663
	Construction	0.990	0.000	0.791	50-249 emplo	0.944	0.022	0.747
	Business services	0.910	0.077	0.537	250-999 emp	0.937	0.168	0.689
					1000 employees and more			
	Total	**0.946**	**0.061**	**0.701**	**Total**	**0.946**	**0.061**	**0.701**
Slovak Republic	Manufacturing	0.439	0.348	0.061	Less than 50	0.122	0.094	0.019
	Construction	0.495	0.443	0.048	50-249 emplo	0.496	0.385	0.074
	Business services	0.461	0.373	0.072	250-999 emp	0.714	0.587	0.097
					1000 employees and more			
	Total	**0.448**	**0.359**	**0.064**	**Total**	**0.448**	**0.359**	**0.064**
Spain	Manufacturing	1.000	0.183	0.810	Less than 50	1.000	0.039	0.951
	Construction	1.000	0.066	0.930	50-249 emplo	1.000	0.148	0.845
	Business services	1.000	0.147	0.838	250-999 emp	1.000	0.363	0.627
					1000 employ	1.000	0.090	0.899
	Total	**1.000**	**0.169**	**0.822**	**Total**	**1.000**	**0.169**	**0.822**
All countries	Manufacturing	0.748	0.184	0.464	Less than 50	0.635	0.081	0.435
	Construction	0.767	0.143	0.511	50-249 emplo	0.729	0.175	0.433
	Business services	0.739	0.158	0.442	250-999 emp	0.850	0.299	0.435
					1000 employees and more			
	Total	**0.745**	**0.174**	**0.458**	**Total**	**0.745**	**0.174**	**0.458**

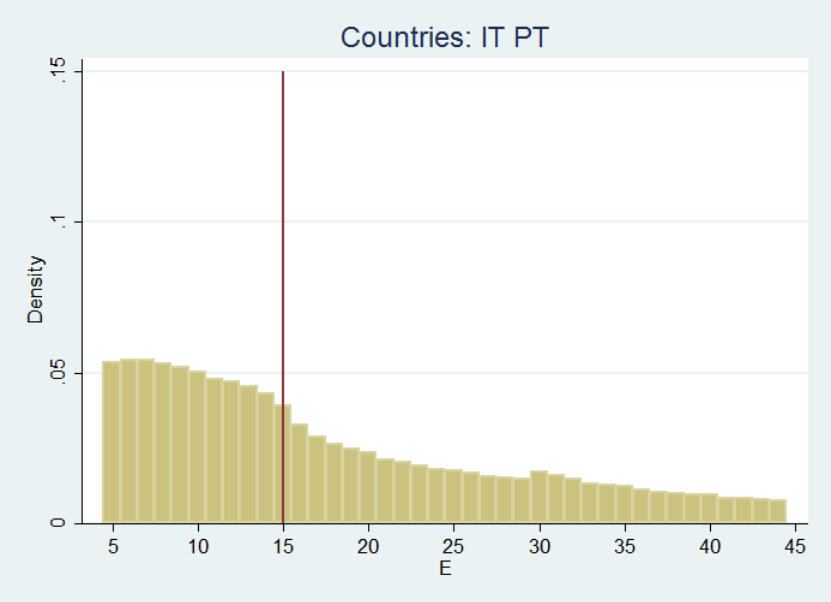
Note: the numbers for each country, industry, size class and bargaining level (overall, firm-level, higher level) give the average of the CWB intensity across cells, where the cell-level intensities are defined by the share of firms taking part in collective wage pay agreements. This share is then averaged across the two waves (2002 and 2006) of the SES survey for each cell. Overall incidence is defined as the sum of firm-level, higher level, and unspecified.

A2. Firm size distributions by employment thresholds for firm-size exemptions

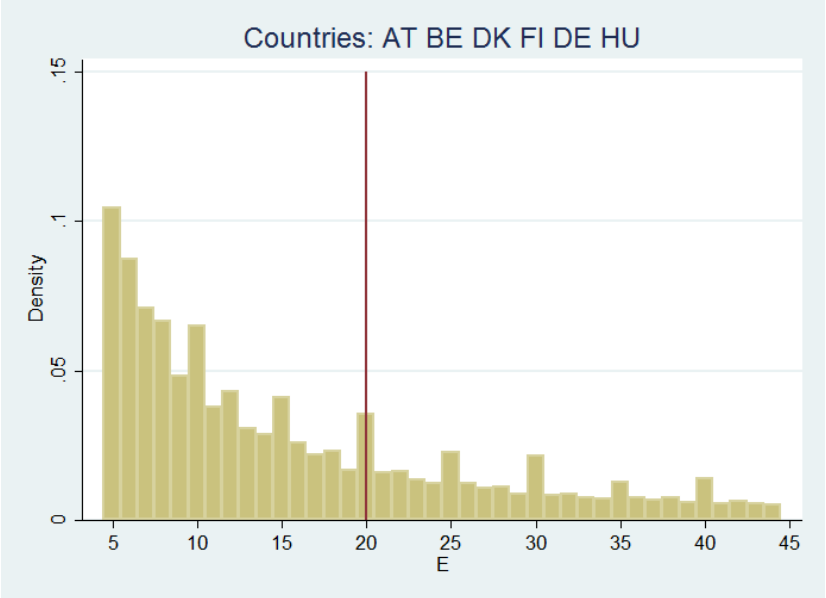
Panel A: Slovenia



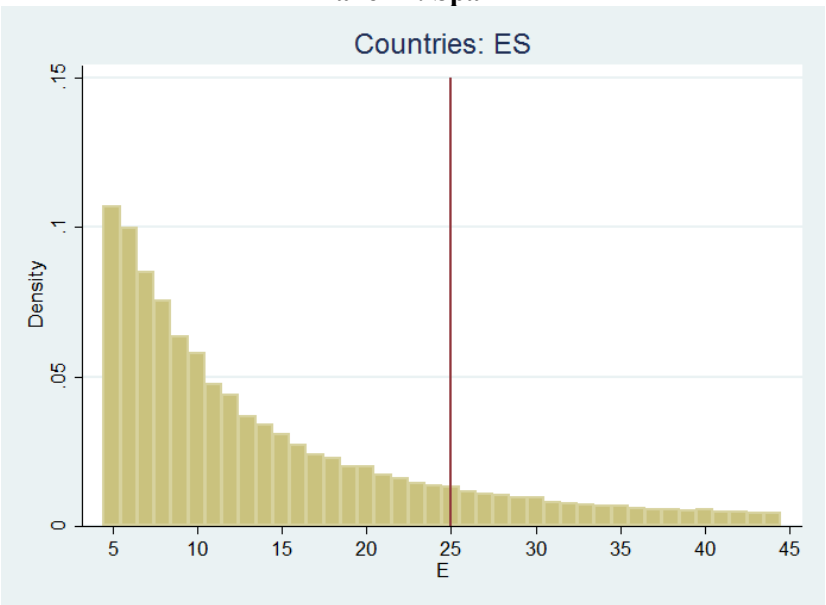
Panel B: Italy, Portugal



Panel C: Austria, Belgium, Denmark, Finland, Germany, Hungary



Panel D: Spain



Note: horizontal axis denotes employment (*E*), the columns indicate the densities of the firms size (measured by employment) distribution by country-groups, grouped by the employment protection thresholds below which exemptions apply. Vertical lines indicate the country-group specific threshold levels (10, 15, 20 and 25).

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