Employment Protection Deregulation and Labor Shares in Advanced Economies*

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Widespread labor market deregulation, originally intended to boost productivity and employment, is one plausible, yet little studied, driver of the decline in labor shares that took place across most advanced economies since the early 1990s. This paper assesses the impact of job protection deregulation in a sample of 26 advanced economies over the period 1970-2010, using a newly constructed dataset of major reforms to employment protection legislation for regular contracts. We apply the local projection method to estimate the dynamic response of the labor share to our reform events at both the country and the country-industry levels. For the latter, we employ a differences-in-differences identification strategy using two identifying assumptions derived from theory—namely that job protection deregulation should have larger negative effects in industries characterized by (i) a higher "natural" propensity to adjust the workforce, and (ii) a lower elasticity of substitution between capital and labor. We find a statistically significant, economically large and robust negative effect of deregulation on the labor share. Our findings call for greater emphasis on the role of deregulation, alongside those of technology and globalization, in the ongoing debate on the drivers of the decline in labor shares. Together with existing evidence regarding the macroeconomic gains from job protection and other labor market reforms, our results also point to the need for policymakers to address efficiency-equity trade-offs when designing such reforms.

Keywords: Structural Reforms, Labor Market, Deregulation, Employment Protection; Labor Share.

JEL Classification: E32; J21; J65; L43; O43; O47

INTRODUCTION

Labor shares in many countries around the world have trended downwards since the 1980s (Karabarbounis and Neiman, 2013). This trend accelerated in the 1990s, and it has been particularly pronounced in advanced economies (IMF, 2017; OECD, 2012). Such a decline flies in the face of the predominant view in macroeconomics, since Kaldor (1957, 1961), that the labor share tends to be stable over the long run. This has triggered renewed interest in the drivers of labor shares, with particular focus on the roles of technological progress in equipment goods and implied substitution of capital for routine labor tasks (Karabarbounis and Neiman, 2013; Alvarez-Cuadrado *et al.*, 2015; Eden and Gaggl, 2015; Acemoglu and Restrepo, 2016; Dao *et al.*, 2017), rising concentration and pricing power across markets (Autor *et al.,* 2017; Barkai, 2017), globalization of trade, finance and production (Elsby, Hobijn and Sahin, 2013; Boehm *et al.*, 2017; Dao *et al.*, 2017; Furceri *et al.*, 2017), and measurement issues (Rognlie, 2015; Koh *et al.,* 2016; Bridgman, 2017). This paper contends that, alongside these (non-mutually-exclusive) drivers, institutions also matter. Our focus is on job protection deregulation aimed at enhancing the functioning of labor markets, which we show contributed to some of the observed decline in labor shares in many advanced economies.

We use country-industry-level (EUKLEMS) data and start by documenting that the decline in labor shares mostly took place within industries. This makes it suitable to build an empirical strategy that focuses on the within (country-industry) variance in labor shares. To capture labor market deregulation, we make use of a unique "narrative" cross-country dataset of major reforms of employment protection legislation (EPL) for regular workers. The analysis covers 26 advanced economies over the period 1970-2010. Strikingly, in the five years after major reforms, the

aggregate labor share declined by more than half percentage point in reforming countries, on average, compared to status quo countries.

To test empirically for this stylized fact, we apply the local projection method (Jordà, 2005)—which has been recently used to study the dynamic impact of macroeconomic shocks such as financial crises (Romer and Romer, forthcoming) or fiscal consolidation episodes (Jordà and Taylor, 2016)—to trace out the response of the labor share to our reform events. In order to gauge the macroeconomic effects of EPL reforms on the labor share we carry out the analysis at the country-time level. Next, to understand the underlying channels, we focus on the country-industry-time level. For the latter analysis, we apply a differences-in-differences identification strategy à la Rajan and Zingales (1998), using two alternative identifying assumptions that we show can be derived from theory. First, following Basannini *et al.* (2009), stringent dismissal regulations are more binding, and therefore should have a larger impact, in industries where firms have a higher "natural" propensity to regularly adjust their workforce—that is, a higher "natural" layoff rate. Second, insofar as job protection legislation affects workers' bargaining power, and firms and workers bargain over wages, deregulation lowers wage rents and triggers substitution of labor for capital, with an impact on the labor share that depends on the elasticity of substitution between both factors: deregulation should reduce the labor share in industries characterized by relative complementarity between capital and labor (elasticity lower than one) and increase it in industries characterized by relative substitutability (elasticity higher than one).

There are two further advantages of having a three-dimensional (*i* industries, *j* countries and *t* time periods) dataset:

- First, it allows us to control for country- and industry-specific time varying shocks as well as country-industry time invariant characteristics by including country-time (j, t), industry-time (i, t) and country-industry (j, i) fixed effects. The inclusion of the country-time (j, t) fixed effects is particularly important as it absorbs any unobserved cross-country heterogeneity in the macroeconomic shocks that affect countries' labor shares. In a pure cross-country time-series analysis, this would not be possible, leaving open the possibility that the impact attributed to EPL reforms would be due to other unobserved macroeconomic shocks. Similarly, the inclusion of industry-time (i, t) fixed effects absorbs any unobserved industry-specific developments that may affect industry labor shares in a similar way across countries, such as for instance the adoption of new technology.

- Second, it mitigates concerns about reverse causality. While it is typically difficult to identify causal effects using cross-country time-series data, it is much more likely that EPL reforms affect cross-industry differences in labor shares than the other way around. Since we control for country-time fixed effects—and therefore for aggregate labor shares—reverse causality in our set-up would imply that differences in labor shares across industries influence the probability of reforms at the aggregate level. Moreover, our main independent variable is the interaction between job protection reforms and industry-specific factors (natural layoff rates and/or elasticities of substitution); this makes it even less plausible that causality runs from the industry-level labor share to these composite variables.

To further strengthen the causal interpretation of our results, we check the robustness of our results to several additional controls whose omission could bias our estimates—including past and expected values of GDP growth and other drivers of the labor share for the country-level analysis, and interactions between reforms in other areas and industry-specific natural layoff rates or

elasticities of substitution for the country-industry-level analysis. The effects of technological progress in equipment goods as well as those of international trade are controlled for in all specifications, given their importance as highlighted in the recent literature.

Our key finding is that job protection deregulation reduces labor shares. In the country-level analysis, a major reform of EPL is found to reduce the aggregate labor share by 0.6 to 0.8 percentage points on average over the medium term. In the country-industry-level analysis, the effect of that same reform is about 1 percentage point higher in high layoff-rate industries (defined as those in 75th percentile of the cross-industry distribution of layoff rates in the United States) compared with their low layoff-rate counterparts (25th percentile).[1] The differential medium-term effect between industries with low and high elasticity of substitution between capital and labor (again defined as those in the 25th and 75th percentiles of the cross-industry distribution of elasticities) is similar.

Using our country-level estimates, we perform an illustrative back-of-the-envelope calculation of the impact of all past legislative changes to EPL—both liberalizing and tightening reforms—on the labor share in advanced economies. This exercise suggests a non-trivial impact—job protection reforms may have lowered the labor share in the average advanced economy by about 0.2 percentage point over the period 1990-2008. This compares to an overall average decline of about 1.7 percentage points over this same period. This contribution (a little over one-tenth of the overall decline) reflects primarily the deregulation wave of the 1990s and 2000s, which is also the period over which labor shares declined the most in advanced economies. This estimate only captures the

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[1] Following Bassanini *et al.* (2009), we use industry layoff rates computed from U.S. data to proxy for "natural" layoff rates as in the U.S. job contract termination is almost absent. Hence, this country is the closest to a frictionless economy. For more details, we refer the reader to Section III.

impact of job protection deregulation and does not include any concomitant effects from declining worker bargaining power on account of other factors—such as the trend decline in unionism, for example.

Our paper relates to the extensive empirical literature on the drivers of labor shares which, somewhat surprisingly, has touched very little on the role of labor market regulation. Some papers study the impact of other drivers of labor shares, notably international trade and offshoring, via their effect on workers' bargaining power (see e.g. Kramarz, 2016, and the recent review by Hummels *et al.,* 2016). Instead, our focus is on the direct role of labor market institutions. Blanchard (1997) and Blanchard and Giavazzi (2003) provide theoretical support for a link between labor market deregulation, weaker bargaining power and lower labor shares, and argue that such link is consistent with the decline observed across European countries during the 1990s. They do not provide any formal evidence, however.

The few empirical studies that attempt to quantify the impact of labor market institutions on the labor share have typically failed to find any significant effect. Using cross-country industry-level data, Bentolila and Saint-Paul (2003) explore a range of labor share drivers, including the frequency of labor conflicts, which they take as a proxy for workers' bargaining power. They find this variable to be insignificant, in a simple OLS regression without fixed effects. Elsby *et al.* (2013) exploit variation in the rate of unionization across US industries but do not find a significant association with the labor share. Checchi and Garcia-Penalosa (2008) explore the impact on labor shares of several indicators of labor market institutions in a cross-country time-series set-up covering 16 OECD countries over the 1960-2000 period, but they do not consider EPL. Instead, Deakin *et al.* (2014) analyze the impact of EPL in an error correction framework for six OECD countries over 1970-2010 and do not find any statistically significant effect.

Our sharper identification strategy—using a three-dimensional set-up with a rich set of fixed effects and two identification assumptions à la Rajan-Zingales (1998) drawn from theory—and reliance on a new dataset of major job protection reforms is what radically distinguishes our analysis from these earlier contributions.

Our paper also relates to the extensive empirical literature on the macroeconomic effects of job protection legislation on economic outcomes, which has primarily focused on productivity and employment. While not fully settled, the bulk of the evidence suggests that stringent regulation lowers productivity by distorting job turnover, and may also lower employment (for a comprehensive review, see e.g. OECD, 2013; for recent evidence on aggregate employment effects, see e.g. Duval, Furceri and Jalles, 2017). However, except for the few studies mentioned earlier, this literature has not explored the impact of job protection on labor shares. Our paper fills this gap, thereby complementing recent IMF and other research that has documented the macroeconomic gains from these and other labor market reforms.

The remainder of this paper is organized as follows. In Section II we discuss a very stylized theoretical model and draw some useful predictions for the empirical analysis. Section III presents our new dataset of major employment legislation reforms as well as other data used in the empirical analysis and provides some stylized facts concerning the decline of labor shares and the role of EPL reforms. Section IV sets up the econometric framework. In Section V we present the main regression results and perform several robustness checks. Section VI concludes.

I. THEORETICAL FRAMEWORK

In this Section we illustrate the mechanisms through which changes in EPL may affect the labor share under the lenses of two standard wage bargaining models: the Right-to-Manage and the

Efficient Bargaining models (see e.g. Blanchard and Fischer, 1989). For ease of exposure, and following others, such as for example Blanchard and Giavazzi (2003), we assume that employment protection deregulation directly weakens workers' bargaining power. For the rest, our theoretical analysis largely follows Bentolila and Saint-Paul (2003).

A. Competitive labor market

As a start, let's consider the case of a fully competitive labor market where labor is paid its marginal product. We assume that real output Y is produced using a constant elasticity of substitution (CES) production function with constant returns to scale:

$$Y = F(K, AL) = (\alpha(K)^{\varepsilon} + (1 - \alpha)(AL)^{\varepsilon})^{1/\varepsilon}$$

where K, L and A denote capital, labor and labor-augmenting technical change, respectively, while the parameter ε defines the elasticity of substitution, σ, according to: $\sigma = 1/(1 - \varepsilon)$.[2]

The labor share of income is, by definition:

$$LS \equiv \frac{wL}{pY}$$

where w is the nominal wage, and p the price level.

Defining the labor-to-capital ratio in effective units as $l \equiv \frac{AL}{K}$, rewriting $F(K, AL) = Kf\left(\frac{AL}{K}\right)$, and using the fact that in competitive markets labor is paid its marginal product, such that $\frac{w}{p} = Af'(l)$, we can rewrite the labor share as:

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[2] The analysis in this section does not depend on any particular assumption regarding the form of technical change. In particular, the key findings would be unchanged if we assumed both labor- and capital-augmenting technological progress.

$$LS = l\frac{f\prime(l)}{f(l)} = \frac{(1-\alpha)(AL)^{\varepsilon}}{\alpha(K)^{\varepsilon}+(1-\alpha)(AL)^{\varepsilon}} \qquad (1)$$

For reasons that will become clear below, we want to express the labor share in terms of the capital-to-output ratio, k, which is $k = \frac{K}{(\alpha(K)^{\varepsilon}+(1-\alpha)(AL)^{\varepsilon})^{1/\varepsilon}}$. After simple manipulations, we can rewrite Equation (1) as:

$$LS = 1 - \alpha k^{\varepsilon} \qquad (2)$$

The key insight of Equation (2) is that when labor is paid its marginal product, any change in factor prices and/or quantities will affect the labor share only through its effects on the capital-to-output ratio k.

B. Bargaining under the Right-to-Manage model

To study the effects of EPL reforms on the labor share, we now introduce labor market frictions in the form of bargaining between employers and workers. We start with the Right-to-Manage model, in which employers and workers first bargain over the wage, with employers then setting employment taking the wage as given. When setting employment, employers are wage-takers, and therefore it remains optimal for them to set employment such that labor is paid its marginal product, that is $\frac{w}{p} = Af\prime(l)$. Hence, Equation (2) still holds.

What happens when easing EPL? Lower protection reduces workers' bargaining power, which in turn results in a lower wage. Employers respond by substituting labor for capital, and therefore the capital-to-output ratio decreases. This drives a change in the labor share, whose sign depends on whether capital and labor are complements ($\varepsilon < 0$) or substitutes ($\varepsilon > 0$). To see this formally, take the derivative of the labor share expression in Equation (2) with respect to workers' bargaining power θ:

$$\frac{\partial LS}{\partial \theta} = -\alpha \varepsilon k^{\varepsilon-1} \frac{\partial k}{\partial \theta} \implies \begin{cases} > 0 \ \ if \ \varepsilon < 0 \\ < 0 \ \ if \ \varepsilon > 0 \end{cases} \tag{3}$$

where the inequalities follow from the fact that k is positive and increasing in workers' bargaining power.

Equation (3) shows that EPL deregulation that reduces workers' bargaining power (lower θ) will lower the labor share if capital and labor are relative complements ($\varepsilon < 0$) but increase it if they are substitutes ($\varepsilon > 0$). In the former case, deregulation and the ensuing decline in bargained wages lead firms to substitute labor for capital too little for the labor share to rise, while the reverse holds in the latter case. More broadly, for a given deregulation-driven decline in bargained wages, the smaller the (absolute value of the) elasticity of substitution between capital and labor is, the larger the decline in the labor share will be. We will use this theoretical prediction regarding the role of the elasticity of substitution in our empirical analysis.

C. Efficient Bargaining

We now turn to the Efficient Bargaining model, whose key difference with the Right-to-Manage model is that bargaining takes places over both employment and wages. Under efficient bargaining, firms and workers set employment in an efficient manner by equalizing the marginal product of labor to its opportunity cost, which is the workers' reservation wage. Also, the wage itself is a weighted average of the average and marginal products of labor, with the weight on the former reflecting the bargaining power of workers vis-à-vis firms. Formally, under Nash bargaining:

$$\frac{w}{p} = \theta A \frac{f(l)}{l} + (1 - \theta) A f'(l) \tag{4}$$

In such an environment, labor is paid more than its marginal product and Equation (2) does not longer hold. Recalling the definition of l and k, it can be easily shown that the labor share can now be expressed as:

$$LS = 1 - \alpha(1 - \theta)k^\varepsilon \tag{5}$$

What is the effect of employment protection deregulation in this set-up? Deregulation reduces workers' bargaining power, θ. The wage decreases, whereas employment does not change since it is pinned down by the efficient bargaining condition that states that the marginal product of labor is equal to workers' reservation wage. Therefore, EPL liberalization *unambiguously* reduces the labor share. To see this formally, take the derivative of the labor share in Equation (5) with respect to workers' bargaining power:

$$\frac{\partial LS}{\partial \theta} = -\varepsilon\alpha(1 - \theta)k^{\varepsilon-1}\frac{\partial k}{\partial \theta} + \alpha k^\varepsilon = \alpha k^\varepsilon > 0 \tag{6}$$

where the second step follows from using $\frac{\partial k}{\partial \theta} = 0$, which in turn reflects the fact that changes in workers' bargaining leave unchanged the capital-to-output ratio, which is pinned down by the equality between the marginal product of labor and the reservation wage.

Hence, differently from the right-to-manage model, under efficient bargaining liberalizing EPL decreases the labor share regardless of the sign of the elasticity of substitution between capital and labor.

D. Summing up

We have analyzed the labor share impact of employment protection deregulation through its effect on workers' bargaining power under both the Right-to-Manage and the Efficient Bargaining models. Some of the predictions of these models are similar—for example, the implication that

deregulation unambiguously lowers the labor share if labor and capital are relative complements—while others vary—in particular, regarding whether deregulation *always* lowers the labor share. Insofar as, in practice, actual bargaining combines elements of both models, the key implication for our empirical analysis is that deregulation is more likely to lower the labor share, and more so, in countries and/or industries where capital and labor are less substitutable. In the next sections, we describe the dataset and the empirical set-up we use to test for this theoretical prediction.

II. DATASET

A. Employment protection legislation reforms

Major reforms of EPL are identified by examining documented legislative and regulatory actions reported in all available *OECD Economic Surveys* for 26 individual advanced economies from 1970 to 2013, as well as additional country-specific sources.[3] In this respect, the methodology is related to the "narrative approach" used by Romer and Romer (1989, 2004, 2010, and 2015) and Devries et al. (2011) to identify, respectively, monetary and fiscal shocks and periods of high financial distress.

In a first step, all legislative and regulatory actions related to EPL mentioned in any *OECD Economic Survey* for any of the 26 countries over the entire sample are identified. Over 100 such actions are analyzed overall. In a second step, for any of these actions to qualify as a major liberalizing or tightening reform one of the following three alternative criteria has to be met: (i) the *OECD Economic Survey* uses strong normative language to define the action, suggestive of an important measure (for example, "major reform"); (ii) the policy action is mentioned repeatedly

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[3] The 26 countries covered are: Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Korea, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Slovak Republic, Spain, Sweden, Switzerland, United Kingdom and United States.

across different editions of the *OECD Economic Survey* for the country considered, and/or in the

retrospective summaries of key past reforms that are featured in some editions, which is also

indicative of a major action; or (iii) the existing OECD EPL indicator of the regulatory stance is

in the 5th percentile of the distribution of the change in the indicator—or it would be if the OECD's

scoring system were applied, but no OECD EPL indicator score is available for the country and

year considered. When only the third condition is met, an extensive search through other available

domestic and national sources is performed to identify the precise policy action underpinning the

change in the indicator. Following this process, we end up with a variable that, for each country,

takes value 0 in non-reform years, 1 in liberalizing reform years, and -1 in tightening reform years.

Table A1 in the Appendix lists all reforms and tightening reforms that we identify.

An important advantage of this database of policy actions in the area of labor market

institutions compared with existing ones (such as the European commission *Labref*, the

Fondazione Rodolfo de Benedetti-IZA, and the ILO- *EPLex* database), is that it identifies major

legislative reforms as opposed to just a long list of actions that in some cases would be expected

to have little or no bearing on macroeconomic outcomes. Likewise, compared with an alternative

approach that would infer major reforms from large changes in existing EPL indicators produced

by the OECD, we are able to identify the exact timing of legislative actions, and also have a longer

time-series coverage—starting in 1970 rather than 1988. These features are particularly useful for

our empirical analysis that seeks to identify the dynamic effects of reforms.

The major strengths of this narrative database come with one limitation; because two large

EPL reforms can involve different specific actions (for example, a major simplification of the

procedures for individual and collective dismissals, respectively), only the average impact across

major historical reforms can be estimated. It should also be highlighted that the reform database

provides no information regarding the *stance* of current (or past) EPL, which however is not the purpose of this paper.

B. Other data

Country-time level data for labor shares are taken from the OECD Analytical Database. To derive industry-country labor shares, we use harmonized data on value added and labor compensation as contained in the EUKLEMS database (2012 Release, see O'Mahony and Timmer, 2009).[4]

For the country-time level analysis our dataset covers an unbalanced set of 26 advanced economies from 1970 to 2013. For the country-industry-time level analysis, coverage is constrained by the availability of EUKLEMS data. Hence, we have an unbalanced panel comprising 31 industries in 22 advanced economies from 1970 to 2010.[5] Whereas we present stylized facts for all these 31 industries, we constrain the empirical analysis to those industries that typically belong to the private sector since the EPL reforms we analyze generally do not apply to the public sector.[6]

To identify the effect of reforms at the industry level, we use data on U.S. layoff rates constructed by Bassanini *et al*. (2009), as well as on elasticities of substitution between capital and

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[4] The EUKLEMS database provides data on added value and labor compensation in 33 industries, classified according to the ISIC Rev. 4 classification. Next, we define the labor share as the percentage of labor compensation relative to added value. We drop 2 industries from the sample, namely activity of households as employers and activities of extraterritorial organizations and bodies, as for most countries labor compensation and/or added value data is not available. Further, we exclude observations for Ireland and Luxembourg for the years from 1970 to, respectively, 1990 and 1985 since both added value and labor compensation are flat for all industries through these periods and we believe this is due to some measurement error. Our results do not depend on these exclusions.

[5] The countries for which industry-level data are not available are Iceland, New Zealand, Norway and Switzerland.

[6] The industries that we exclude are (i) Public Administration, Defense and Social Security, (ii) Education, (iii) Health and Social Work. In line with Bassanini *et al.* (2009), we also exclude the Coke, Refined Petroleum and Nuclear Fuel industry due to issues in measuring added value. Our results do not depend on these exclusions.

labor as estimated by Baccianti (2013). Bassanini *et al*. (2009) compute layoff rates as the percentage ratio of laid-off workers over total wage and salary employment using industry-level data for the United States. Layoff rates are based on the U.S. given that labor market regulation is essentially non-existent there. Hence, the U.S. is the closest empirical example of a frictionless economy in which employers can freely adjust the workforce in response to operational needs.[7]

Baccianti (2013) estimates elasticities of substitution between capital and labor from a 2-level nested CES production function featuring also energy, as well as factor augmenting technical change. While many studies estimate elasticities of substitution between labor and capital assuming a common production function for all industries, that of Baccianti (2013) is particularly suited for our analysis as he estimates elasticities at the right level of disaggregation (2-digits industries) and uses a panel of countries that is very similar to ours (precisely the sample comprises 27 advanced economies over the period 1995-2008).[8] Table A2 in the Appendix shows elasticities of substitution and layoff rates, together with average value added shares (in the total economy) and average labor shares for the industries in our sample.

To carry out robustness checks on our results, we collect additional data. For trade union density, we use OECD data. For imports, exports, investment and output prices, we rely on the

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[7] Bassanini *et al.* (2009) construct U.S. layoff rates using data contained in the 2004 CPS Displaced Workers Supplement. U.S. Layoff rates data are available for 22 industries classified according to the ISIC Rev. 3 classification. The latest vintage of the EU KLEMS database follows instead the ISIC Rev. 4 classification. Hence, we match the U.S. layoff rates of Bassanini *et al.* (2009) from the ISIC Rev. 3 to the ISIC Rev. 4 classification using the many-to-one method used by O'Mahony and Timmer (2009) to backcast added value data. After matching, we have layoff data for 21 of the 31 industries in our sample.

[8] Similar to Bassanini *et al.* (2009), Baccianti (2013) estimates elasticity of substitution for industries according to the ISIC Rev. 3 classification. To match elasticities to the ISIC Rev. 4 classification, we again use the many-to-one method of O'Mahony and Timmer (2009). After matching, we have elasticities of substitution for 29 of the 31 industries in our sample.

Penn World Tables (version 9.0, see Feenstra *et al*., 2015). GDP growth data comes from the OECD *Economic Outlook*. Finally, to identify reforms of employment protection legislation for temporary workers we use the data produced by Duval *et al.* (2017).

C. Stylized facts

In this Section, we present stylized facts about the evolution of the labor share over the period 1970-2010 in the 22 countries of our sample for which industry-level data are available.[9] Four key facts emerge. First, the labor share has been on a declining trend since the mid-1970s, with the decline accelerating in the 1990s, a period that coincided with the bulk of job protection liberalizing reforms. Second, there exist significant heterogeneities both across countries and industries, with some countries even experiencing small increases. Third, about 60 percent of the decline in country-level labor shares can be accounted by within-industry changes. Finally, and related to the focus of our paper, the decline in the labor share has been typically larger in periods following EPL reforms, and even more specifically in industries with a higher "natural" layoff rate or a higher complementarity between capital and labor during these periods. The rest of the Section discusses these stylized facts in more detail.

   Figure 1 plots the coefficients of year fixed effects from two regressions featuring country-industry-time labor shares as the dependent variable and country-industry fixed effects, year fixed effects and a constant as regressors. In the first regression (blue line), all industries have equal weight. In the second regression (red line), industries are weighted by their relative size. All countries have equal weights in both regressions. Vertical lines are 1.645 standard errors. We

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[9] Since most of our stylized facts rely on data at the country-industry level, for consistency this section focuses on the 22-country sample for which such data are available. Country-level stylized facts for our full sample of 26 countries are available upon request.

observe that the labor share has been on a declining trend since 1975, with the magnitude of such decline somewhat accelerating in the 1990s. No significant differences arise from the two regressions assigning different weights to different industries. Two peculiar periods are the global recessions of the early 1990s and of 2009, during which the labor share increased due to a very small decline in labor compensation relative to value added. This is in line with the finding of Kehrig and Vincent (2017) that the labor share tends to modestly increase in recessions, as well as with the presence of sluggish wages as in the model of Rios-Rull and Santaeulalia-Llopis (2010). By including country-time fixed effects, we will ensure that this feature is controlled for in our econometric analysis.

We now explore the presence of heterogeneities in the decline of the labor share, both across countries and industries. In Figure 2, we plot estimated linear trends in country labor shares for the 22 countries in our sample. In 14 countries we estimate a negative and significant trend.[10] Next, we perform the symmetric exercise and estimate linear trends in industry labor shares. For ease of exposition, we aggregate the 31 industries of our sample in 14 broader sectors following the ISIC Rev. 4 classification, and then estimate time trends for each sector (Figure 3).[11] Of the 14 sectors considered, 10 display a negative and statistically significant coefficient, whereas only two have a significant positive coefficient. We find some differences in the magnitude of the estimated time

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[10] In Figure A1 in the Appendix we show linear trends within-industry labor shares by country. For only two countries (Portugal and Germany) does the sign of the estimated linear trend flip (and is significant) when moving from aggregate country to within-industry labor shares. Importantly, in 10 out of 22 countries we estimate a negative and significant trend, regardless of whether we consider within-industry or aggregate country shares. Instead, no country displays a significant positive linear trend in both cases. In Figure A2 in the Appendix we plot the median, 25th and 75th percentile of industry labor shares for each country in our sample.

[11] Figure A3 in the Appendix reports linear trends in (global) labor shares for each of the 14 sectors. Figure A4 shows the median, 25th and 75th percentiles of country-specific labor shares for each of these sectors. We also report labor shares and estimated linear trends by industry rather than by broad sector in Figures A5 to A7.

trends, with Hospitality being the most negative, but no sector emerges as an outlier. Overall, this exercise confirms that the trend decline in the labor share has been rather broad based, taking place both within countries and within industries, while at the same time displaying significant heterogeneity to be explained.[12]

Changes in industrial composition may be important drivers of aggregate country labor share trends. Since our analysis focuses mostly on explaining within-industry changes in the labor share, it is important to quantify how much of the overall time-series variation at the country level is explained by within rather than between variation—that is, by changes in labor shares within industries rather than changes due to industrial composition. To assess the importance of within- versus between-industry changes, we proceed by decomposing overall changes in the labor share according to the following formula (see e.g. Karabarbounis and Neiman 2014):

$$\Delta LS^j = \sum_i \overline{\omega}_i^j \Delta LS_i^j + \sum_i \overline{LS}_i^j \Delta \omega_i^j \qquad (7)$$

where Δx denotes the estimated linear trend in the variable x, $\bar{x}$ is the mean of variable x, LS refers to the labor share, ω is the share of added value, and the superscript j and subscript i denote respectively country and industry. The first and second terms of the right-hand side of Equation (7) represent the within- and between-industry components of changes in the aggregate country labor share respectively. In Figure 4, we show a scatterplot of the estimated aggregate trends in the labor share for each country in our sample (y-axis) against the within-industry component (x-axis). The linear regression explains about 60 percent of the country variation. This indicates that

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[12] Interestingly, we note that linear trends are more precisely estimated (lower standard errors) across different countries for specific sectors and industries, rather than across industries for specific countries. This provides further rationale for an econometric specification that, like ours, also considers industry-specific deterministic components.

within-industry changes are more important than changes in industrial composition in explaining movements at the country level, which highlights the importance of our industry-level analysis.

We now turn to the role of labor market deregulation. We first show that liberalizing reforms were predominantly implemented during the 1990s and the 2000s (Figure 5). In Figure 6we show the mean cumulative change in country labor shares in the years before and after any EPL reform in reforming countries (blue bars). The x-axis denotes the distance from the reform year (from 2 years before to 5 years after, with the reform year denoted by 0). The Figure also shows mean cumulative changes relative to all non-reform observations (maroon bars). We observe that before EPL reforms labor shares had typically been on a declining trend, whose slope was similar between reforming and status quo countries. This gives us some comfort about the exogeneity of our reform episodes to labor share trends at the country level. Secondly, and crucially, we notice that the extent of the decline considerably increased following labor market deregulation.

To check whether the decline in the labor share in the aftermath of EPL reforms displayed some heterogeneity across industries, we repeat the same analysis for within-industry labor shares by splitting the sample according to industry characteristics. First, we divide industries based on the distribution of the U.S. layoff rate. Figure 7 presents the mean cumulative change in the labor share from 2 years before to 5 years after EPL reforms (blue bars) and non-reform observations (maroon bars). Panel A (B) refers to industries in the lower (upper) quartile of the layoff rate. Panels A and B of Figure 8 show the same statistics, but for industries in the lower and upper quartiles of the distribution of the elasticities of substitution, respectively. This exercise reveals that the general pattern of a declining labor share following job protection deregulation is driven by industries with higher layoff rates and higher relative complementarity between capital and labor. This observation gives some comfort about the identification strategy that we adopt to

establish the causal effects of labor market deregulation on labor shares, which we explain more in detail in the next Section.

III. ECONOMETRIC FRAMEWORK

A. Country-level analysis

To estimate the dynamic response of labor shares to reforms that ease EPL (and reforms that tighten it), we follow the local projection method proposed by Jordà (2005) to estimate impulse-response functions (IRFs). This approach has been advocated by Auerbach and Gorodnichenko (2013) and Romer and Romer (forthcoming), among others, as a flexible alternative to vector autoregression (autoregressive distributed lag) specifications since it does not impose dynamic restrictions and it is better suited to estimate nonlinearities in the dynamic response. The baseline specification is:

$$y_{t+k,j} - y_{t-1,j} = \alpha_j + \gamma_t + \beta_k R_{j,t} + \theta X_{j,t} + \epsilon_{j,t} \tag{8}$$

in which y is the labor share of income; β_k denotes the response of the variable of interest in each year k after the reform; α_j are country fixed effects, included to take account of differences in countries' invariant characteristics; γ_t are time fixed effects, included to take account of global shocks; $R_{j,t}$ is our EPL reform variable, which takes value 0 in non-reform years, 1 in liberalizing reform years and -1 in tightening reform years; and $X_{j,t}$ is a set a of control variables including two lags of EPL reforms, lags of the labor share changes and recession dummies—to control for the fact that economic conditions may shape the likelihood of reform, for example according to the crisis-induced reforms hypothesis (Drazen and Easterly, 2001; Tommasi and Velasco, 1996), as well as variables that have been put forward as key drivers of labor shares in advanced economies

(Karabarbounis and Neiman, 2014; Elsby et al., 2013; IMF 2017), namely the relative price of investment goods and openness to trade (measured as the sum of the share of imports and exports over GDP).[13]

Equation (8) is estimated using OLS. IRFs are obtained by plotting the β_k coefficients for $k=$ 0,1,..4, with 90 percent confidence bands computed using the standard deviations associated with the estimated coefficients β_k—based on clustered robust standard errors.[14]

A potential limitation of our approach is that reforms are not "pure" shocks as they could be potentially anticipated, correlated with past changes in economic activity or implemented in response to prospects of future weak economic growth. To check the robustness of our results, we also estimate a specification that controls for past growth as well as for the expected values in *t-1* of future values of GDP growth rates over periods t to $t+k$—that is, the time horizon over which the impulse response functions are computed. These are taken from the fall issue of the OECD's *Economic Outlook* for year *t-1*.[15] Other sources of concern are the potential for omitted variable bias and reverse causality. We address these two issues by applying a differences-in-difference strategy on country-industry-time data.

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[13] The results are robust to different number of lags.

[14] Another advantage of the local projection method compared to vector autoregression (autoregressive distributed lag) specifications is that the computation of confidence bands does not require Monte Carlo simulations or asymptotic approximations. One limitation, however, is that confidence bands at longer horizons tend to be wider than those estimated in vector autoregression specifications.

[15] As noted above, the results are also robust to controlling for future reform and tightening reform episodes. Furthermore, they do not significantly differ between reforms and tightening reforms, which is why we do not report these separately here, and instead consider reforms and tightening reforms jointly throughout the whole analysis.

B. Industry-level analysis: baseline estimation and robustness check

We supplement the country-level estimates with the country-industry-level analysis. This enables us to further minimize endogeneity issues, and to explore the channels through which EPL reforms affect the labor share of income. The regression specification is estimated as follows:

$$y_{i,j,t+k} - y_{i,j,t-1} = \alpha_{j,t} + \gamma_{i,j} + \mu_{i,t} + \beta_k \vartheta_i R_{j,t} + \theta X_{i,j,t} + \epsilon_{i,j,t} \tag{9}$$

in which $y_{i,j,t+k}$ is the labor share of income in industry i of country j in period $t+k$; $\alpha_{j,t}$ are country-time fixed effects, which control for any variation that is common to all industries of a country's economy, such as country-wide macroeconomic shocks and reforms in other areas, including other types of labor market reforms; $\gamma_{i,j}$ are country-industry fixed effects, included to take account of cross-country differences in average changes in industry labor shares; $\mu_{i,t}$ are industry-time fixed effects to control for different labor share changes across industries. $R_{j,t}$ is our EPL reform variable; ϑ_i are industry-specific characteristics (the "natural" layoff rate, the parameter ε from our theoretical model, which implicitly defines the elasticity of substitution between capital and labor (EOS), and the interaction between these two). $X_{i,j,t}$ is a set of controls including two lags of the labor share change andof the EPL reform variable (in all specifications) and other variables meant to capture the other labor share drivers identified in the literature (only in the robust specifications), all interacted with industry-specific characteristics.

Our industry-country-time analysis is based on a differences-in-differences identification strategy in the spirit of Rajan and Zingales (1998) and on two identification assumptions. The first one suggests that stringent dismissal regulations are more binding, and therefore raise workers' bargaining power more, in industries that are characterized by a higher "natural" propensity to adjust their workforce—that is a higher "natural" layoff rate. The second one follows from our

theoretical framework and suggests that job protection deregulation and the associated decline in workers' bargaining power are likely to have a larger negative impact on the labor share in industries where capital and labor are less substitutable. In the baseline setup, we use a continuous measure of the parameter ε as an interaction term, given the uncertainty regarding the "right" bargaining model but also that surrounding EOS estimates, which makes it difficult to identify with a reasonable degree of confidence those industries with an EOS greater (smaller) than 1. However, in an extension, we also take the right-to-manage model seriously and formally test its theoretical prediction of a non-linear effect depending on whether the EOS is greater or smaller than 1.

Equation (9) is estimated for each $k = 0,..,4$. As for the country-level analysis, IRFs and the associated confidence bands are computed using the coefficients β_k, and the respective standard errors are clustered at the country-industry level. For the estimation, we rely on OLS since the inclusion of the rich set of fixed effects is likely to largely address the endogeneity concerns related to omitted variable bias. In addition, reverse causality is unlikely to be a concern in our set-up. First, the natural propensity to layoff in the U.S. is arguably orthogonal to industry-level labor share changes in other countries. A similar argument holds for the elasticity of substitution between capital and labor. Second, it is highly unlikely that industry-level labor share patterns can influence EPL reform. Movements in the labor share at the aggregate level may well do so, but this potential source of reverse causality is addressed through the inclusion of country-time fixed effects. In other words, claiming reverse causality would mean arguing that differences in labor share changes across industries lead to economy-wide EPL reforms; this, we argue, is implausible.

Nonetheless, one possible remaining issue in estimating Equation (9) with OLS is that other macroeconomic variables might affect industry-level labor share changes when interacted with

industries' natural layoff rates. As a robustness check, we estimate again Equation (9) this time also including proxies for the labor share drivers identified in the literature, namely the relative price of investment goods, the trade union density and the sum of imports and exports as a share of GDP, all interacted with either the layoff rate, the parameter ε defining the elasticity of substitution, or the combination of the two. Finally, we also check whether our results are robust to controlling for EPL reforms for temporary contracts, as these may correlate with reforms for regular contracts. Although we do not believe job protection for temporary workers to affect workers' bargaining power as typically under this type of contracts the conditions (including the wage) are set upfront and cannot be renegotiated while the contract is ongoing, we still control for EPL reforms to temporary contracts by including a set of control variables interacted with industry-specific characteristics.

C. Industry-level analysis: extension

As an extension, we take the right-to-manage model literally and formally test for its theoretical prediction that the effects of employment protection deregulation on the labor share are non-linear and depend on whether capital and labor are complements or substitutes (that is, $\varepsilon < 0$ or $\varepsilon > 0$). Specifically, we estimate the following specification:

$$y_{i,j,t+k} - y_{i,j,t-1} = \alpha_{j,t} + \gamma_{i,j} + \mu_{i,t} + \delta_k \vartheta_i d_i^c R_{j,t} + \rho_k \vartheta_i d_i^s R_{j,t} + \sigma_k d_i^c X_{i,j,t} + + \varphi_k d_i^s X_{i,j,t} +$$

$$\epsilon_{i,j,t} \tag{10}$$

where d_i^c and d_i^s are two dummy variables taking value 1, respectively, for industries where capital and labor are complements ($\varepsilon < 0$) and substitutes ($\varepsilon > 0$), and 0 otherwise. ϑ_i is the U.S. layoff rate, and the other variables are as above.

The identification assumption combines the prediction of the Right-to-Manage with the belief that EPL is more binding in industries that are characterized by a higher "natural" propensity to regularly adjust the workforce. As a further check, we also set ϑ_i to 1 and estimate the non-linear effect by simply splitting industries in two groups.

As before, Equation (10) is estimated for each $k = 0,...,4$. The IRFs and the associated confidence bands are computed using the estimated coefficients δ_k and ρ_k. The respective standard errors are clustered at the country-industry level. For the estimation, we again rely on OLS.

The next section starts by presenting the baseline results and the robustness checks from the country-level analysis. It then goes through the industry-level baseline analysis and robustness checks and concludes with the extension.

IV. RESULTS AND ROBUSTNESS CHECKS

A. Country-level analysis

Figure 9 shows the estimated dynamic response of the labor share to (the average major) liberalizing EPL reform over the five-year period following implementation, together with the 90% confidence interval around the point estimate. Major deregulation episodes have a statistically significant and persistent negative effect on the labor share. This effect becomes statistically significant at the 5 percent confidence level after two years, reaching 0.8 percentage points, before declining marginally to 0.6 percentage points and eventually leveling off at about 0.8 percentage

point again seven years after the reform (significant at the 1 percent confidence level).[16] This medium-term effect is also economically large. In particular, a back-of-the-envelope calculation of the labor share impact of all past legislative changes to EPL—both liberalizing and tightening reforms—suggests that job protection reforms may have lowered the labor share in the average advanced economy by about 0.2 percentage point over the period 1990-2008. This compares to an overall decline of the average advanced economy's labor share of about 1.7 percentage points over this same period.

Figure 10 shows the corresponding IRF from a robustness check specification including past as well as expected future values of GDP growth rates. The results are very similar to, and do not statistically differ from, our baseline, suggesting that these potential endogeneity issues are not empirically important in practice.

B. Country-industry level analysis: baseline results

Figure 11 presents the results obtained when estimating Equation (9). Panel A shows that over the medium term—that is, four years after the reform takes place—job protection deregulation tends to reduce the labor share in industries with a high layoff rate relative to those with a low-layoff-rate. This is as we expected since dismissal regulations are likely to be more burdensome in industries with a higher propensity to regularly adjust the workforce. Hence, changes in regulations are likely to have larger effects on wage levels in these industries.

The differential medium-term reduction in the labor share following an EPL reform between an industry with a relatively high natural layoff rate (at the 75th percentile of the cross-industry

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[16] We also separately estimated the effect of liberalizing and tightening EPL reforms. As expected, the magnitude of the estimated response is similar (although of opposite sign). This indicates that our results are not driven by tightening reform episodes.

distribution of layoff rates in the U.S) and one with a relatively low natural layoff rate (at the 25th percentile of the distribution) is about 1 percentage point. This differential effect is not only statistically significant but also economically meaningful. Under the illustrative and conservative assumption that EPL reforms did not have any impact on the labor share in industries with a natural layoff rate below the 25th percentile of the distribution, and assuming no change in industrial composition, the results would imply that on average EPL reforms reduced the labor share in a reforming country by about 1¾ percentage points. This is twice as large as our country-level estimate above.

The results also suggest that the effect of EPL reforms on the labor share tend to be higher (in absolute value) in industries with a lower elasticity of substitution between capital and labor (Panel B). The differential medium-term reduction in the labor share between an industry with a relatively low elasticity of substitution (at the 75th percentile of the ε's distribution) and one with a relatively high elasticity of substitution (at the 25th percentile of the ε's distribution) is about 0.7 percentage point. This confirms the intuition that when workers and employers bargain over the wage, the decrease in workers' bargaining power and wages caused by job protection deregulation triggers a smaller offsetting increase in employment in industries where capital and labor are less substitutable.

Finally, and broadly in line with theory, we also find that the interaction between the natural layoff rate and the elasticity of substitution between capital and labor significantly influences the effect of EPL reforms on the labor share across industries (Panel C). In other words, the effect tends to be larger in industries with a higher natural layoff rate *and* a lower elasticity of substitution. Quantitatively, the joint effect of moving from the 25th to the 75th percentile of both the layoff rate and the EOS' distribution is about 0.3 percentage point in the medium term.

C.   Country-industry level analysis: robustness checks

As discussed above, a possible concern in estimating Equation (9) is that the results could be biased due to the omission of other reforms or macroeconomic developments that may affect industry-level labor shares through the industry-specific natural layoff rate (or/and the elasticity of substitution) and may at the same time be correlated with EPL reforms.

A prime candidate is EPL reform for temporary contracts. To enhance the labor market prospects of disadvantaged groups such as youth, governments often choose to deregulate temporary contracts either as an alternative to, or—of potential concern in our context—in combination with EPL reform for regular contracts. This was particularly the case during the 1990s and the first half of the 2000s (see e.g. OECD, 2006). Although, for the reasons explained above, we do not believe that EPL applying to temporary contracts affects workers' bargaining power, we test whether our results are robust to the inclusion of EPL reforms to such contracts. We re-estimate Equation (9) adding the interaction effect between these reforms and the industry-specific layoff rate (or/and the elasticity of substitution). Data on major reforms of EPL for temporary contracts, are taken from Duval *et al.* (2017).

Another potential candidate is the change in union density, whose trend decline may have reduced workers' bargaining power (e.g. Pissarides 2000). However, the omission of this variable from our baseline specification could bias our estimates only insofar as they are correlated with EPL reforms. While this is not the case—the correlation between EPL reforms and changes in union density is about -0.01—we nonetheless check the robustness of our results by adding to Equation (9) an interaction term between the change in union density and the industry-specific natural layoff rate (or/and the elasticity of substitution).

Finally, while the effects of technological progress—proxied by the relative price of investment—and trade openness on labor shares are controlled for through country-time fixed effects, they could still be a source of omitted variable bias if (i) they are correlated with EPL reforms, and (ii) their impact varies with industry-specific characteristics. Therefore, we check the robustness of our results by adding in Equation (9) the interaction of these variables with industry-specific natural layoff rates (or/and the elasticities of substitution between capital and labor).

The results presented Figure 12 show that the effects of EPL reforms on industry labor shares when controlling for the additional factors described above are very close to, and not statistically different from, our baseline estimates.

D.   Country-industry level analysis: extension

Next, we present our results concerning the presence of non-linearities in the response of the labor share depending on whether capital and labor are complements or substitute (that is, whether $\varepsilon < 0$ or $\varepsilon > 0$). Our simple theoretical framework indeed predicts that this should be the case in a world in which workers and employers bargain over the wage but not over employment.

We show relevant estimates in Figures 13 and 14. Figure 13 reports results obtained interacting our reform variable with industry layoff rates. Therefore, the results should be interpreted as the differential effect of moving from the 25th to the 75th percentile of the layoff distribution, conditional on the elasticity of substitution being higher (Panel A) or lower than 1 (Panel B). We do not find significant differential effects for industries with substitutability between capital and labor. In contrast, the effect of EPL reforms through the layoff rate is negative and statistically significant in those industries where capital and labor are complements. Similar results are also

obtained when estimating Equation (10) by simply distinguishing between industries with complementarity and substitutability between capital and labor (Figure 14).

The absence of significant results for industries with substitutability between capital and labor may be because in practice, in the large sample of the countries we consider, bargaining combines elements of both the Right-to-Manage and the Efficient Bargaining models. Overall, however, these results confirm that the effect of job protection deregulation on the labor share is stronger in industries where capital and labor are complements.

V. CONCLUSION

This paper explored the impact of job protection deregulation on labor shares using both country-time-level and country-industry-time-level data and a new dataset of major reforms of regular contracts covering 26 advanced economies over the past four decades. We applied the local projection method to estimate the dynamic response of labor shares at both the country and country-industry levels. For the latter analysis, we used two alternative identifying assumptions à la Rajan-Zingales (1998) derived from theory—namely that job protection reforms should have larger effects in industries characterized by a high "natural" propensity to regularly adjust their workforce and a low elasticity of substitution between capital and labor. Unlike previous literature, we found a statistically and economically significant negative effect of weaker job protection on labor shares. In line with theory, this effect is concentrated in industries with a higher propensity to regularly adjust the workforce and a lower elasticity of substitution between capital and labor, and it is likely driven by a reduction in wage rents. To account for country-specific macroeconomic shocks and other aggregate drivers of labor shares, as well as for industry-specific developments, our country-industry-level analysis included country-time and industry-time fixed effects—and country-industry fixed effects as well. Our findings are also robust to a variety of alternative

specifications controlling for potential omitted variable bias and reverse causality as well as including different deterministic components.

Our results call for more research on the role of labor market deregulation, alongside those of technology and globalization, in the extensive literature on the drivers of the decline in labor shares. On the policy front, they also point to the need for assessing the effects of labor market reform plans on a wide range of macroeconomic outcomes—including productivity, employment and output, but also wages and labor shares—and for addressing trade-offs between efficiency and equity when designing such reforms.

REFERENCES

Acemoglu, Daron and Pascual Restrepo. 2016. "The Race Between Machine and Man: Implications of Technology for Growth, Factor Shares and Employment." NBER Working Paper, May, No. 22252.

Alvarez-Cuadrado, Francisco, Ngo Van Long and Markus Poschke. 2015. "Capital-Labor Substitution, Structural Change and the Labor Income Share." IZA Discussion Paper, No. 8941, March

Auerbach, Alan. J. and Yuri Gorodnichencko. 2013. "Measuring the Output Responses of Fiscal Policy." *American Economic Journal: Economic Policy*. Vol. 4, No. 2, May: 1-27.

Autor, David, David Dorn, Lawrence F. Katz, Christina Patterson and John Van Reenen. 2017a. "Concentrating on the Fall of the Labor Share." *American Economic Review: Papers & Proceedings*, Vol. 107, No. 5: 180-185

Autor, David, David Dorn, Lawrence F. Katz, Christina Patterson and John Van Reenen. 2017b. "The Fall of the Labor Share and the Rise of Superstar Firms." NBER Working Paper, No. 23396, May.

Baccianti, Claudio. 2013. "Estimation of Sectoral Elasticities of Substitution along the International Technology Frontier." ZEW Discussion Paper, No. 13-092.

Barkai, Simcha. 2017 "Declining Labor and Capital Shares." Working Paper.

Bassanini, Andrea, Luca Nunziata L and Danielle Venn. 2009**.** "Job protection legislation and productivity growth in OECD countries." *Economic Policy*, Vol. 24, April: 349-402.

Bentolila, Samuel and Gilles Saint-Paul. 2003. "Explaining Movements in the Labor Share." *The B.E. Journal of Macroeconomics*, Vol. 3, Issue 3, July: 1-33.

Blanchard, Olivier. 1997. "The Medium Run." *Brookings Paper on Economic Activity*, Vol. 2: 89-158.

Blanchard, Olivier and Stanley Fischer. 1989. "Lectures on Macroeconomics" *The MIT Press*, Book.

Blanchard, Olivier and Francesco Giavazzi. 2003. "Macroeconomic Effects of Regulaton and Deregulation in Goods and Labor Markets." *Quarterly Journal of Economics*, Vol. 118, Issue 3, August: 879-907.

Boehm, Cristoph E., Aaron Flaaen and Nitya Pandalai-Nayar. 2017. "Multinationals, Offshoring, and the Decline of U.S. Manufacturing." Center for Economic Studies Research Paper, No. 17-22, February.

Bridgman, Benjamin. 2017. "Is Labor's Loss Capital's Gain? Gross versus Net Labor Shares." *Macroeconomic Dynamics*. July.

Checchi, Daniele and Cecilia Garcia Penalosa "Labour Market Institutions and Income Inequality." *Economic Policy*, Vol. 56: 601-649.

Dao, Mai Chi, Mitali Das, Zsoka Koczan, Weicheng Lian. 2017. "Why is Labor Receiving a Smaller Share of Global Income? Theory and Empirical Evidence." IMF Working Paper, No. 17/169, July. Washington.

Devries, Pete, Jaime Guajardo, Daniel Leigh and Andrea Pescatori. 2011. "A New Action-based Dataset of Fiscal Consolidation." IMF Working Paper, No. 11/128, June. Washington.

Drazen, Allan, and William Easterly. 2001. "Do Crises Induce Reform? Simple Empirical Tests of Conventional Wisdom." *Economics and Politics,* 13 (2), 129–157.

Duval, Romain, Davide Furceri and Joao Jalles. 2017. "Job Protection Deregulation in Good and Bad Times." *IMF Working Paper*, Forthcoming.

Duval, Romain, Davide Furceri, Joao Jalles and Huy Nguyen. 2017. "A New *Narrative* Database of Product and Labor Market Reforms in Advanced Economies." *IMF Working Paper*, Forthcoming.

Eden, Maya and Paul Gaggl. 2015 "On the Welfare Implications of Automation." World Bank Policy Research Working Paper, No. 7487, November.

Elsby, Michael W. L., Bart Hobijn and Aysegul Sahin. 2013. "The Decline of the U.S. Labor Share." *Brookings Papers on Economic Activity*, Fall: 1-63.

Feenstra, Robert C., Robert Inklaar and Marcel P. Timmer (2015), "The Next Generation of the Penn World Table." *American Economic Review*, Vol. 105, No. 10: 3150-3182

Furceri, Davide, Prakash Loungani and Jontahn D. Ostry. "The Aggregate and Distributional Effects of Financial Globalization: Evidence from Macro and Sectoral Data." Paper presented at the Eighteenth Jacques Polak Annual Research Conference: http://www.imf.org/en/News/Seminars/Conferences/2017/09/18/2017-eighteenth-annual-research-conference

Hummels, David, Jakob Munch and Chong Xiang. 2016. "Offshoring and Labor Markets." *IZA Discussion Paper* No. 9741, February.

International Monetary Fund (IMF). 2017. "Understanding the Downward Trend in Labor Income Shares." Chapter 3. *World Economic Outlook April 2017*: 121-172. Washington.

Jordà, Òscar. 2005. "Estimation and Inference of Impulse Responses by Local Projections." *American Economic Review*. Vol. 95. No. 1: 161–82.

Jordà, Òscar and Alan M. Taylor. 2016. "The Time for Austerity: Estimating the Average Treatment Effect of Fiscal Policy." *The Economic Journal*, Vol. 126, Issue 590, February: 219-255.

Kaldor, Nicholas. 1957. "A Model of Economic Growth." *The Economic Journal*, Vol. 67. No. 268, December: 591-624.

Kaldor, Nicholas. 1957. "Capital Accumulation and Economic Growth." In *The Theory of Capital*, ed. F. A. Lutz and D. C. Hague, 177-222. New York.

Karabarbounis, Loukas and Brent Neiman. 2014. "The Global Decline of the Labor Share." *The Quarterly Journal of Economics*, Vol. 129, Issue 1: 61-103.

Kehrig, Matthias and Nicolas Vincent. 2017. "Growing Productivity without Growing Wages: The Micro-Level Anatomy of the Aggregate Labor Share Decline." CESifo Working Paper, No. 6554. Munich.

Koh, Dongya, Raul Santaeulalia-Llopis and Yu Zheng. 2016. "Labor Share Decline and Intellectual Property Products Capital." Working Paper.

Kramarz, Francis. 2016. "Offshoring, Wages and Employment: Evidence from Data Matching Imports, Firms and Workers." Chapter 9 in Fontagne, Lionel and Ann Harrison (eds.), *The Factory-Free Economy: Outsourcing, Servitization, and the Future of Industry*, Oxford University Press, Oxford, United Kingdom.

Layard, Richard, Stephen Nickell and Richard Jackman. 1991. "Unemployment. Macroeconomic Performance and the Labour Market." *Oxford University Press*. Oxford.

O'Mahony, Mary and Marcel P. Timmer. 2009. "Output, Input and Productivity Measures at the Industry Level: the EU KLEMS Database." *The Economic Journal*, Vol. 119, Issue 538, June: 374-403.

Organisation for Economic Cooperation and Development (OECD). 2013. "Protecting Jobs, Enhancing Flexibility: A New Look at Employment Protection Legislation." Chapter 2, *OECD Employment Outlook 2013,* Paris.

Organisation for Economic Cooperation and Development (OECD). 2012. "Understanding the Downward Trend in Labor Income Shares." Chapter 3, *OECD Employment Outlook 2012,* Paris.

Rajan, Raghuram G. and Luigi Zingales. 1998. "Financial Dependence and Growth." *American Economic Review*, Vol. 88, No. 3, June: 559-586.

Rios-Rull, Jose-Victor and Raul Santaeulalia-Llopis. 2010. "Redistributive shocks and productivity shocks." *Journal of Monetary Economics*. Vol. 57: 931-948.

Romer, Christina D., and David Romer. Forthcoming "New Evidence on the Impact of Financial Crises in Advanced Countries." *American Economic Review*.

Romer, Christina D., and David Romer. 2010. "The Macroeconomic Effects of Tax Changes: Estimates Based on a New Measure of Fiscal Shocks." *American Economic Review*, Vol. 100, No.3, June: 763– 801.

Romer, Christina D., and David Romer. 2004. "A New Measure of Monetary Shocks: Derivation and Implications." *American Economic Review*. Vol. 94, No. 4, September: 1055–1084

Romer, Christina D., and David Romer. 1989. "Does Monetary Policy Matter? A New Test in the Spirit of Friedman and Schwartz." *NBER Macroeconomics Annual*, 4: 121–170.

Rognlie, Matthew**.** 2015. "Decipering the Fall and Rise in the Net Capital Share: Accumulation or Scarcity." *Brookings Papers on Economic Activity*, Spring: 1-69.

Tommasi, Mariano, and Andres Velasco. 1996. "Where Are We in the Political Economy of Reform?" *Journal of Economic Policy Reform*, Vol. 1, Issue 2: 187-238
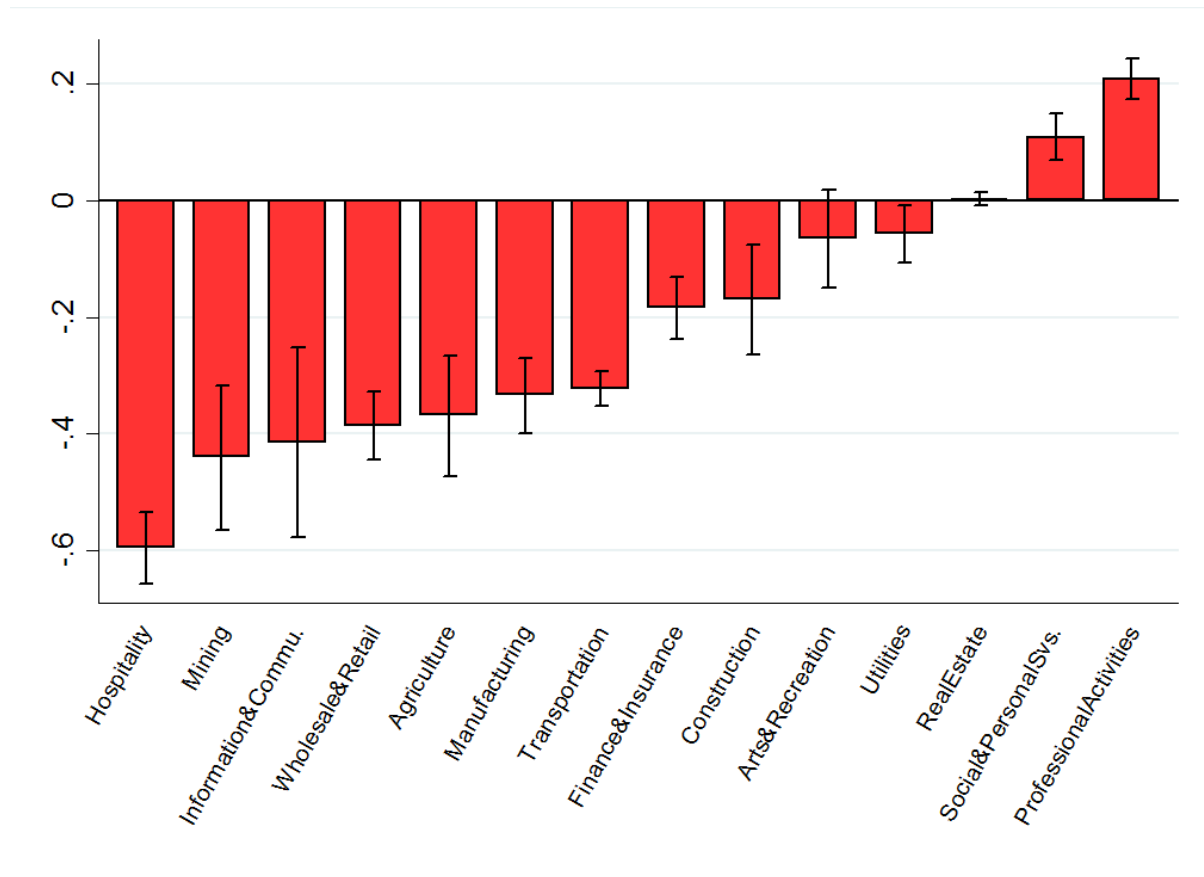
FIGURES

Figure 1. The global decline in the labor share of income
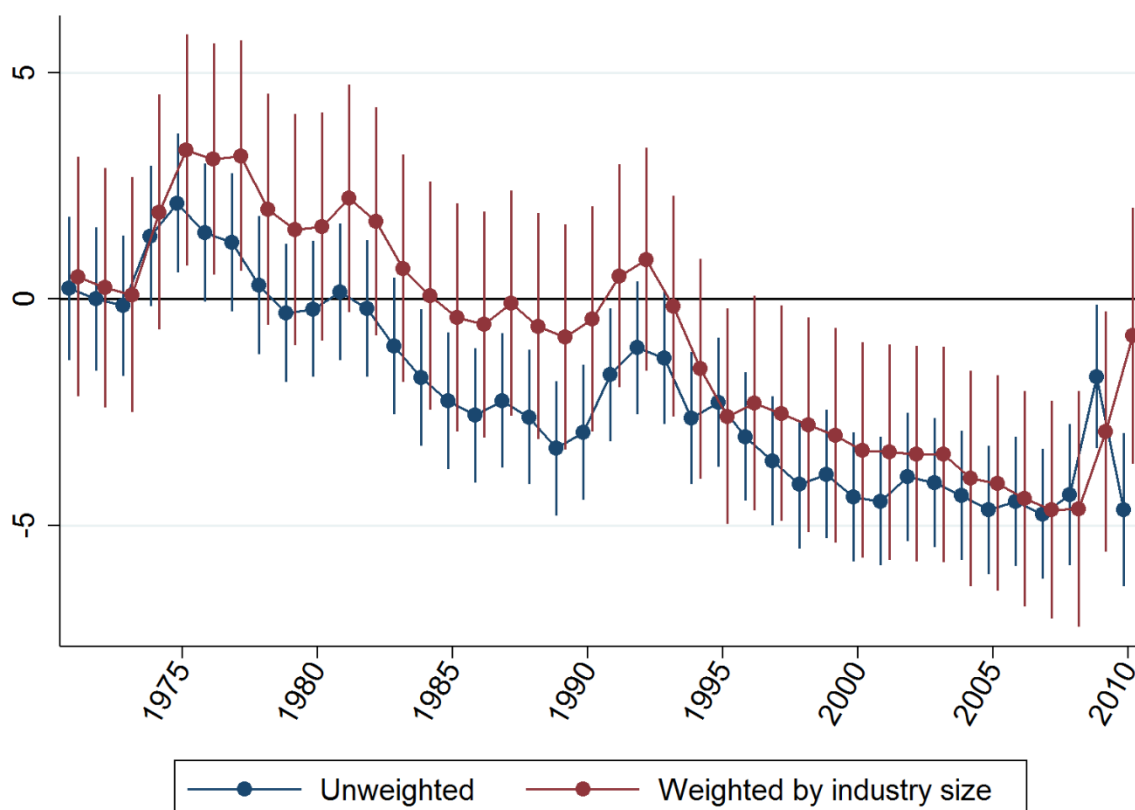
Notes: The Figure shows the coefficients of the year fixed effect from the following regression: $LS_{jit} = \alpha + \rho_t + \gamma_{ji} + \varepsilon_{jit}$, where the subscripts j, i and t denote, respectively, country, industry and year. LS is the labor share, α is a constant term, ρ are year fixed effects, γ are country-industry fixed effects and ε is the error term. The (blue) red line show estimates from a regression in which industries are (un-)weighted by their relative share. Vertical lines show 1.645 standard errors. Estimates can be interpreted as the average labor share changes in percentage points relative to 1970, the base year.

Figure 2. Time trends in country labor shares, 1970-2010
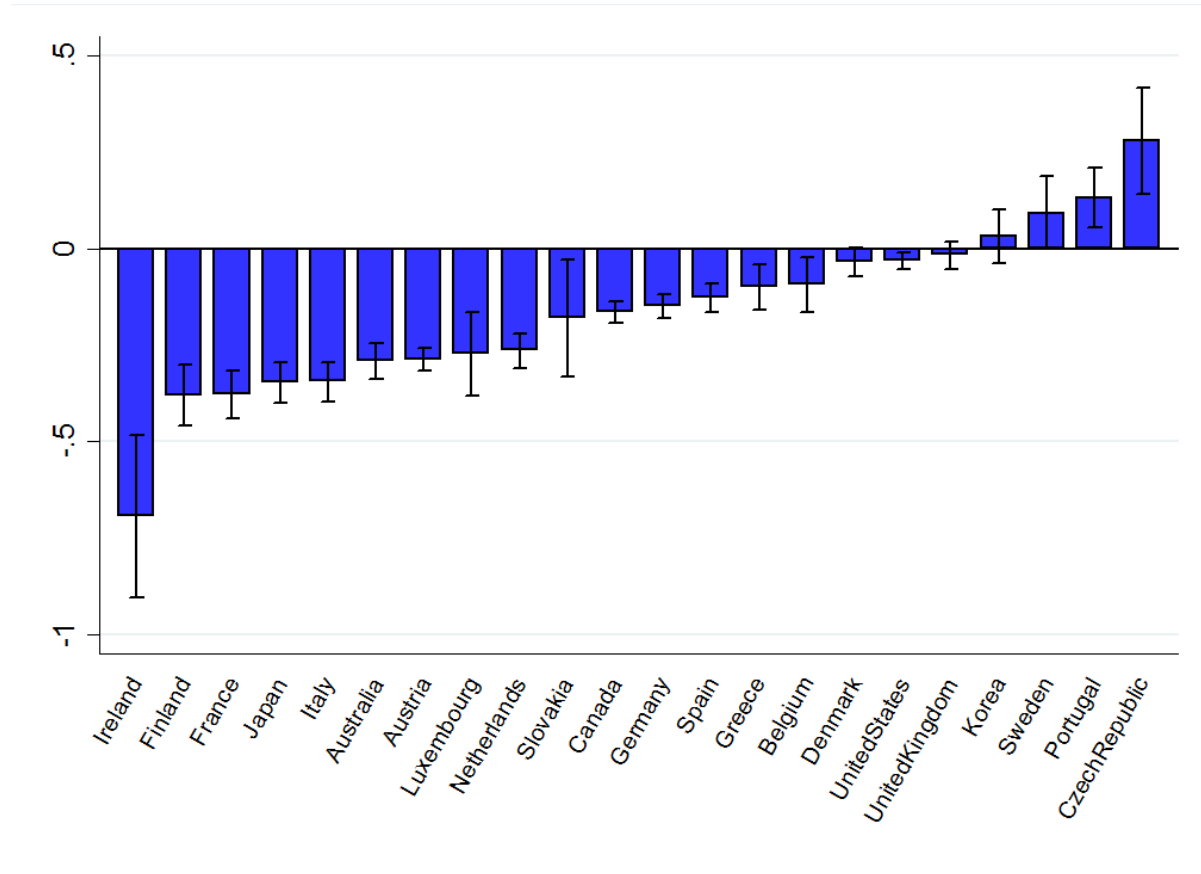
Notes: The Figure shows estimated linear trends in industry labor shares (y-axis) for each country. Trends are estimated from the following regressions: $LS_t^j = a^j + \tau_t^j + \varepsilon_t^j$, where the subscript t and the superscript j denote respectively year and country. LS is the labor share, α is a constant term, τ is the linear trend, and ε is the error term. Capped spikes denote 90% confidence intervals. Estimates should be interpreted as the average yearly change in country labor shares over the period considered.

**Figure 3.** Time trends in sector labor shares, 1970-2010

Notes: The Figure shows estimated linear trends in aggregate labor shares (y-axis) for each sector. Trends are estimated from the following regressions: $LS_t^s = \alpha^s + \tau_t^s + \varepsilon_t^s$, where the subscript t and the superscript s denote respectively year and sector. *LS* is the labor share, α is a constant term, τ is the linear trend, and ε is the error term. Capped spikes denote 90% confidence intervals. Estimates should be interpreted as the average yearly change in sector labor shares over the period considered.

Figure 4. Within vs. between industry decomposition of changes in labor shares
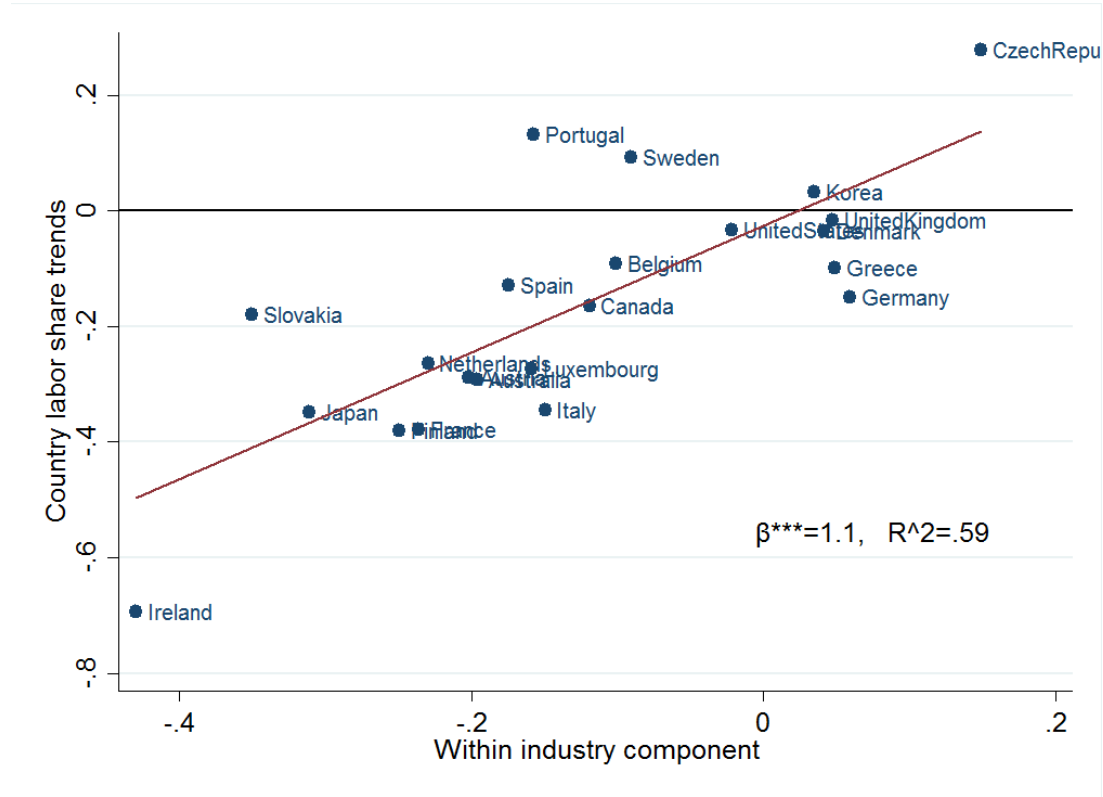

Notes: The figure plots country aggregate labor share trends (y-axis) over the within industry component in labor share trends (x-axis). Country trends are estimated from the following regression: $LS_t^j = \alpha^j + \rho_t^j + \varepsilon_t^j$, where the subscript t and the superscript j denote, respectively, year and country. LS is the labor share, α is a constant term, ρ are year fixed effects, and ε is the error term. Within industry components are estimated according to the following expression: $y^j = \sum_i \bar{\omega}_i^j \Delta LS_i^j$, where the superscript j and subscript i denote respectively country j and industry i, ΔLS denotes the estimated linear trend in the labor share, $\bar{\omega}$ refer to the mean of the share of added value.

**Figure 5**. Distribution of employment protection reforms over time
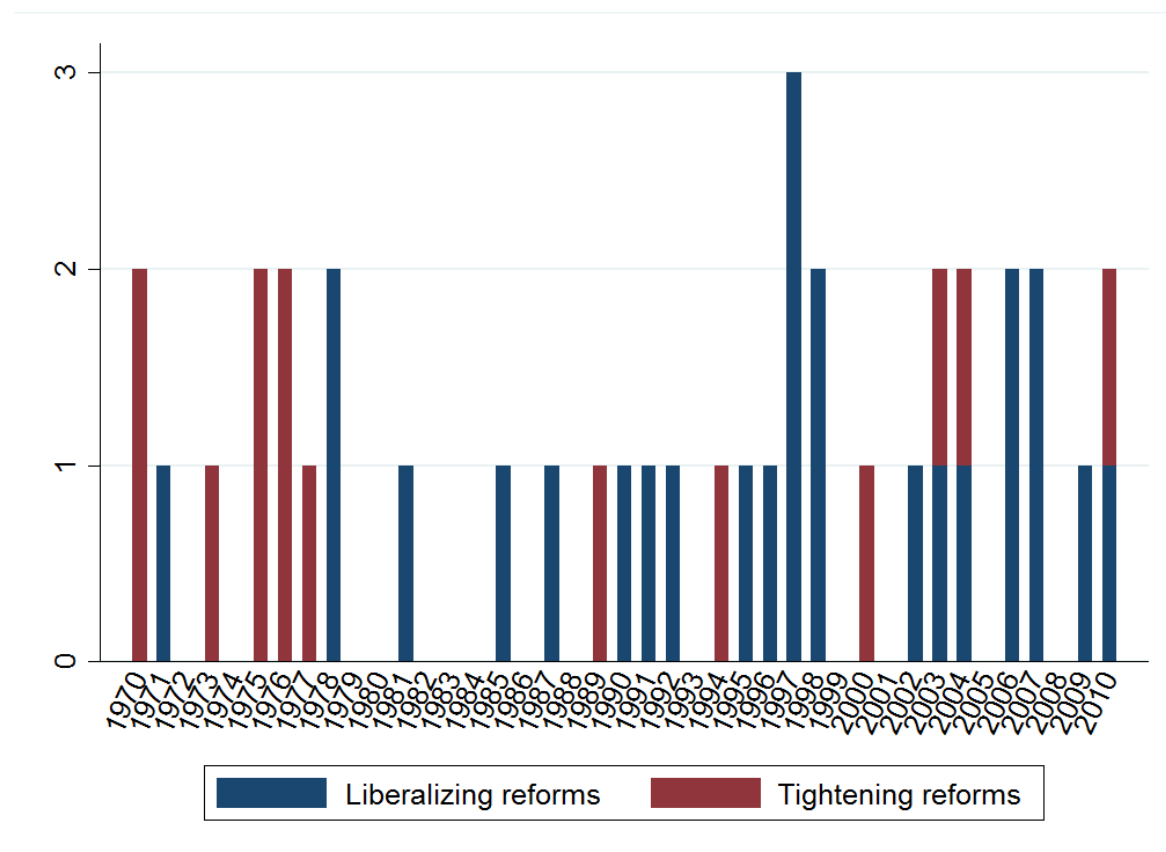
Notes: The Figure reports the total number (y-axis) of reforms to employment protection legislation implemented across all countries in the sample by year (x-axis).

Figure 6. Cumulative changes in country labor shares around reform years
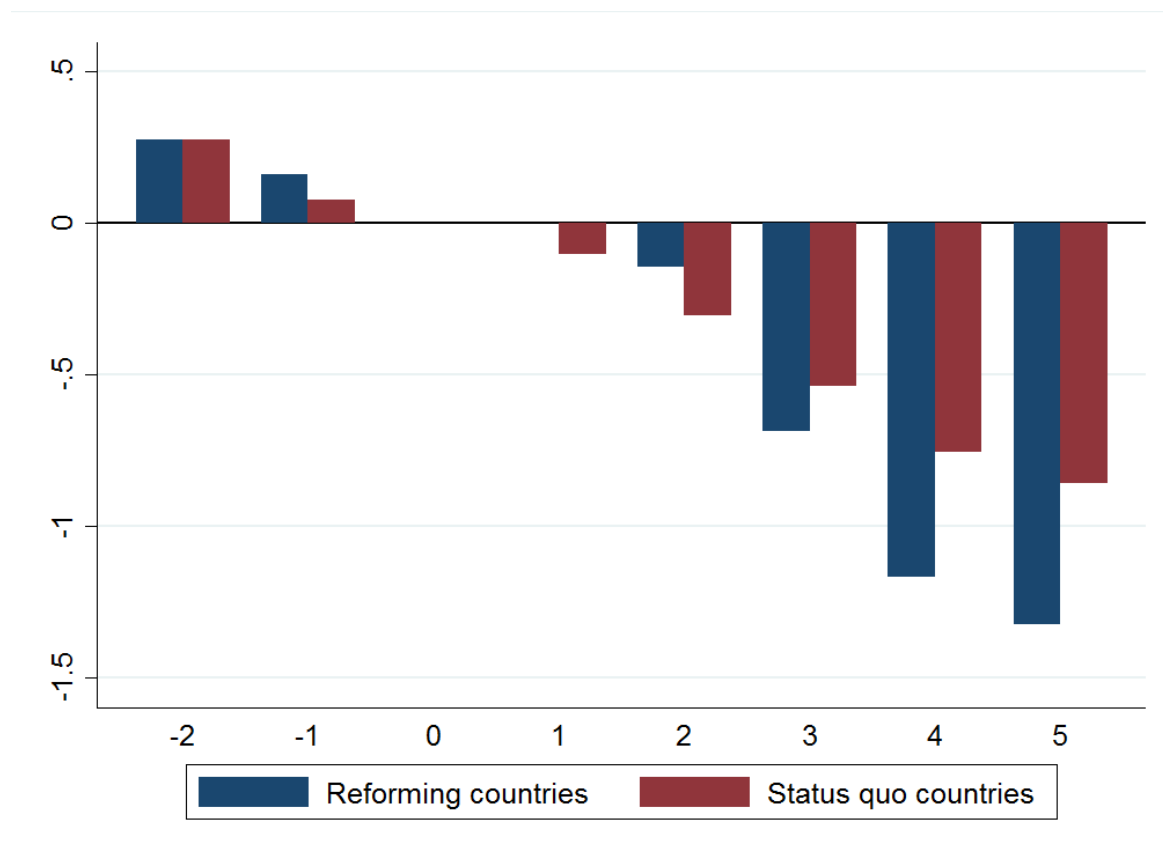
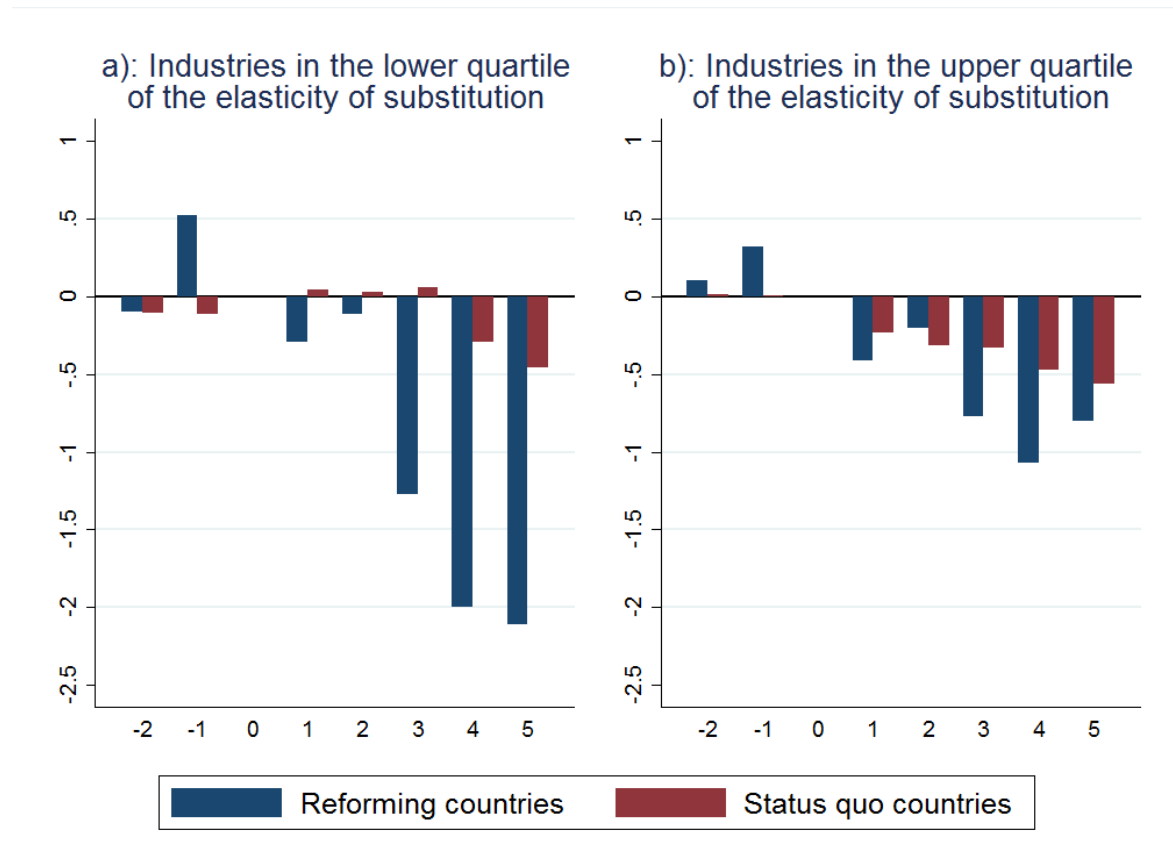*Notes*: The Figure compares the mean cumulative change in country labor shares relative to reform years in (i) reforming countries (blue bars), and (ii) status quo countries (maroon bars). The y-axis measures the size of the mean cumulative change (in percentage points). The x-axis represents the number of years before (negative numbers) and after (positive numbers) the base year (denoted by 0).

Figure 7. Cumulative changes in country-industry labor shares around reform years
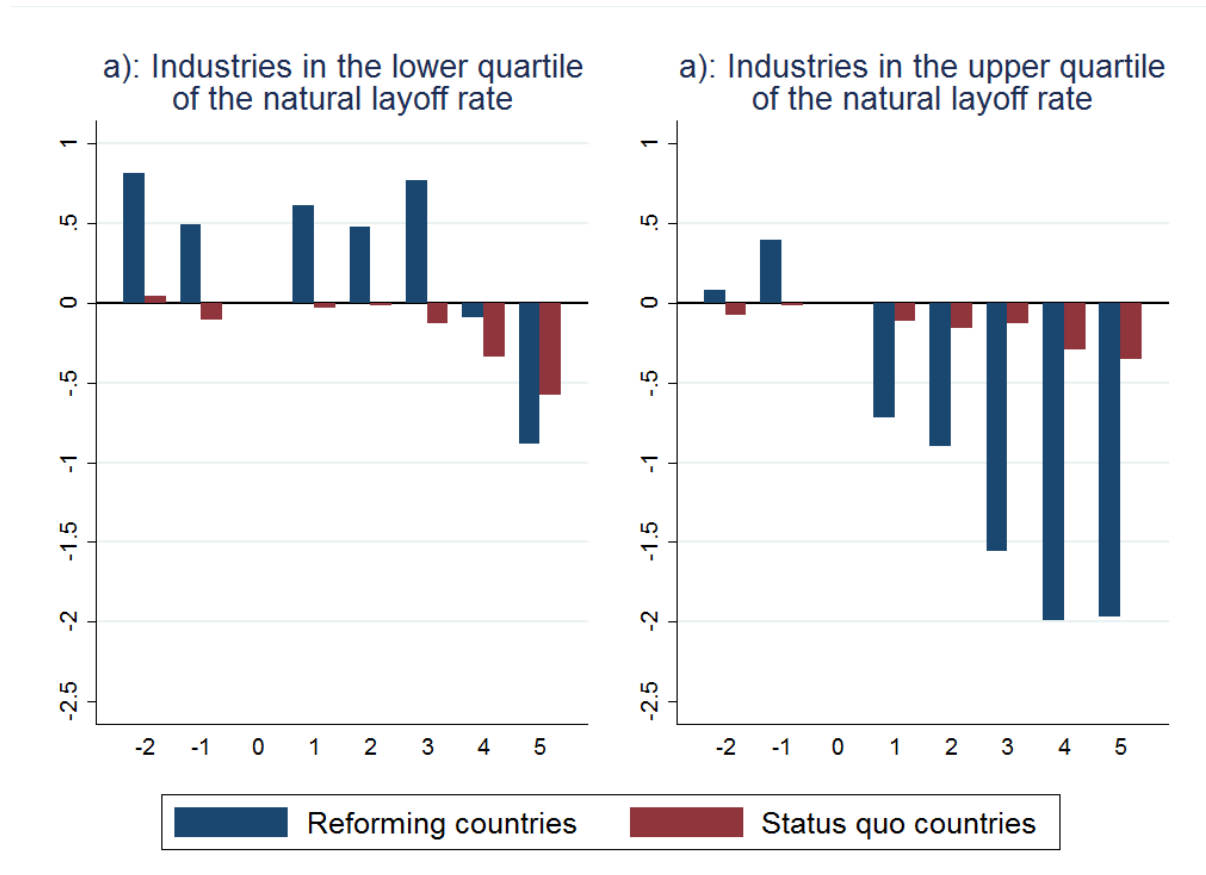
Notes: The Figure compares the mean cumulative change in country-industry labor shares relative to years of EPL reforms in (i) reforming countries (blue bars), and (ii) status quo countries (maroon bars), and for industries in the lower (Panel a) and upper (Panel b) quartiles of the layoff rate. The y-axis measures the size of the labor share change (in percentage points). The x-axis represents the number of years before (negative numbers) and after (positive numbers) the base year (denoted by 0).

Figure 8. Cumulative changes in country-industry labor shares around reform years


Notes: The Figure compares the mean cumulative change in country-industry labor shares relative to years of EPL reforms in (i) reforming countries (blue bars), and (ii) status quo countries (maroon bars), and for industries in the lower (Panel a) and upper (Panel b) quartiles of the elasticity of substitution. The y-axis measures the size of the labor share change (in percentage points). The x-axis represents the number of years before (negative numbers) and after (positive numbers) the base year (denoted by 0).

Figure 9. Country-level analysis – baseline results
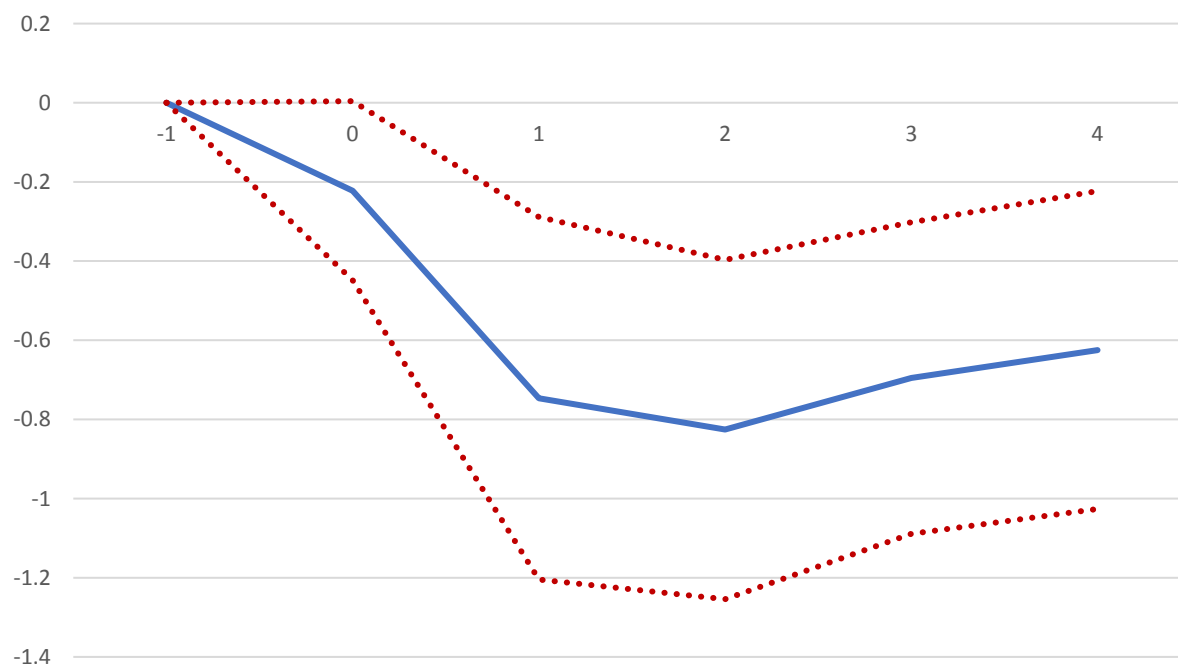
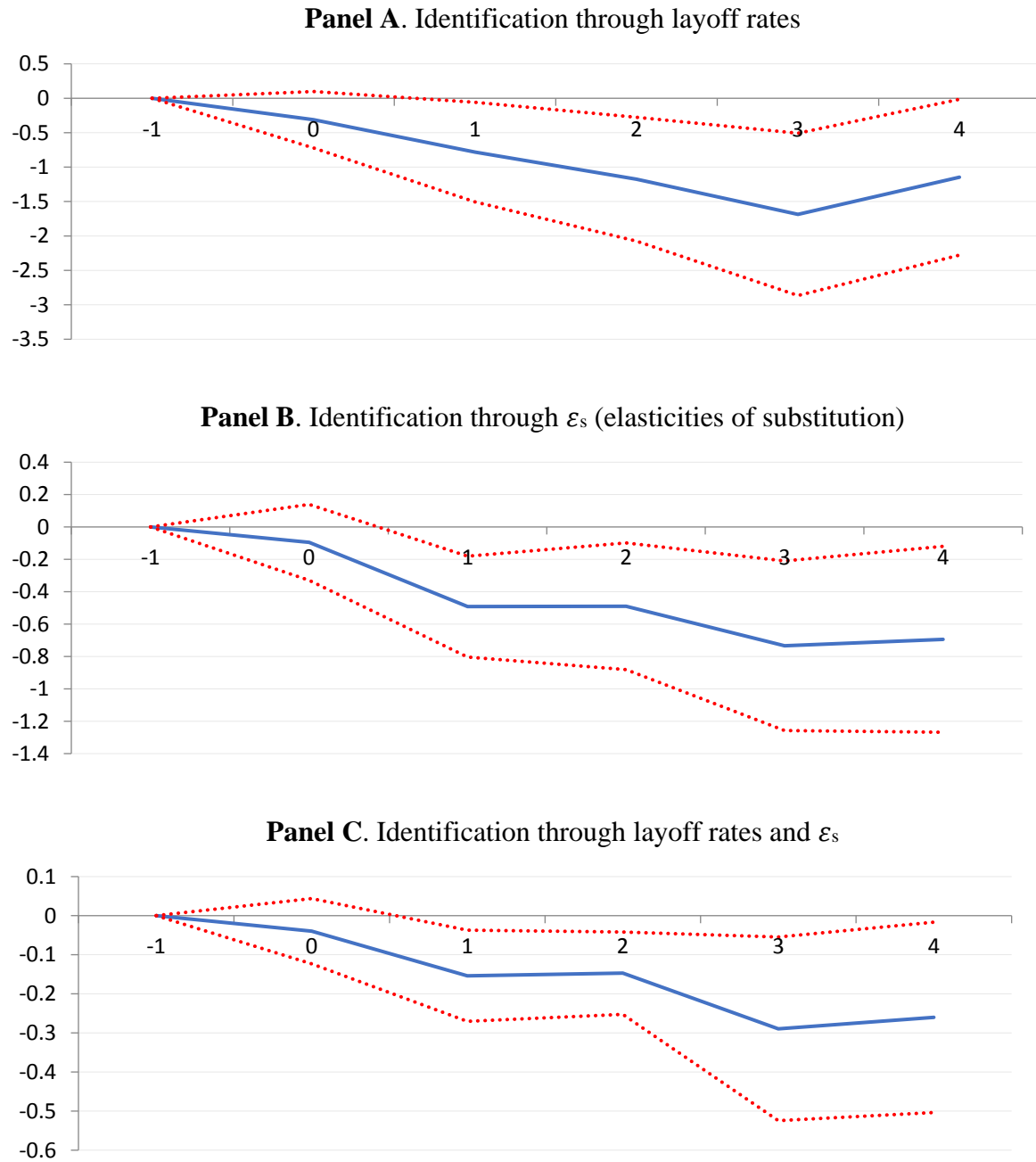Note: estimates based on Equation (8). Solid line denotes response of labor share to EPL reforms. Dotted lines indicate 90 percent confidence interval based on clustered standard errors. The X-axis reports the horizon, with 0 indicating the reform year. The Y-axis reports the magnitude of the estimated coefficients (in percentage points).

Figure 10. Country-industry level analysis – robustness checks

Panel A. Controlling for past growth and growth expectations
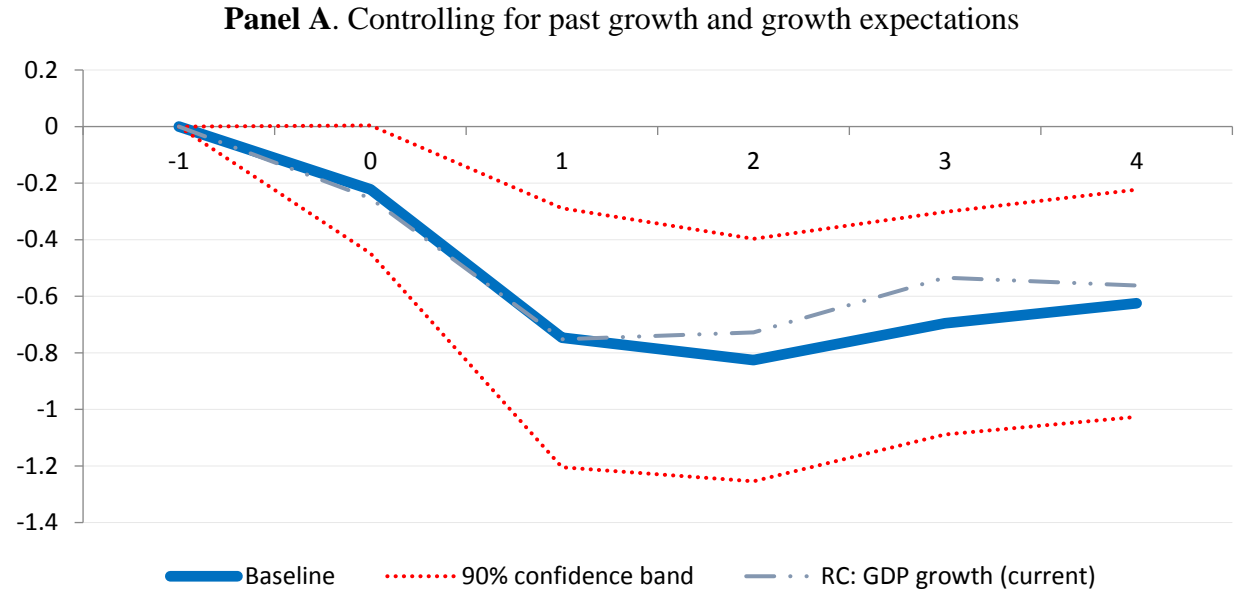
Note: estimates based on Equation (8). Dotted lines indicate 90 percent confidence interval based on clustered standard errors from the baseline regression. The blue solid line reports estimates from the baseline regression. The dotted-dashed blue line reports estimates from the robustness check specification. The X-axis reports the horizon, with 0 indicating the reform year. The Y-axis reports the magnitude of the estimated coefficients (in percentage points).

Figure 11. Country-industry level analysis – baseline results

Panel A. Identification through layoff rates

Panel B. Identification through ε_s (elasticities of substitution)

Panel C. Identification through layoff rates and ε_s

Note: estimates based on Equation (9). Solid lines denote the estimated average differential labor share effect of EPL reforms between industries in the 75th percentile and 25th percentile of the layoff rate distribution (Panel A), of the elasticity of substitution (Panel B) and the interaction between the two (Panel C). Dotted lines indicate 90 percent confidence interval based on standard errors clustered at country-industry level. The Y-axis reports the magnitude of the estimated coefficients (in percentage points).

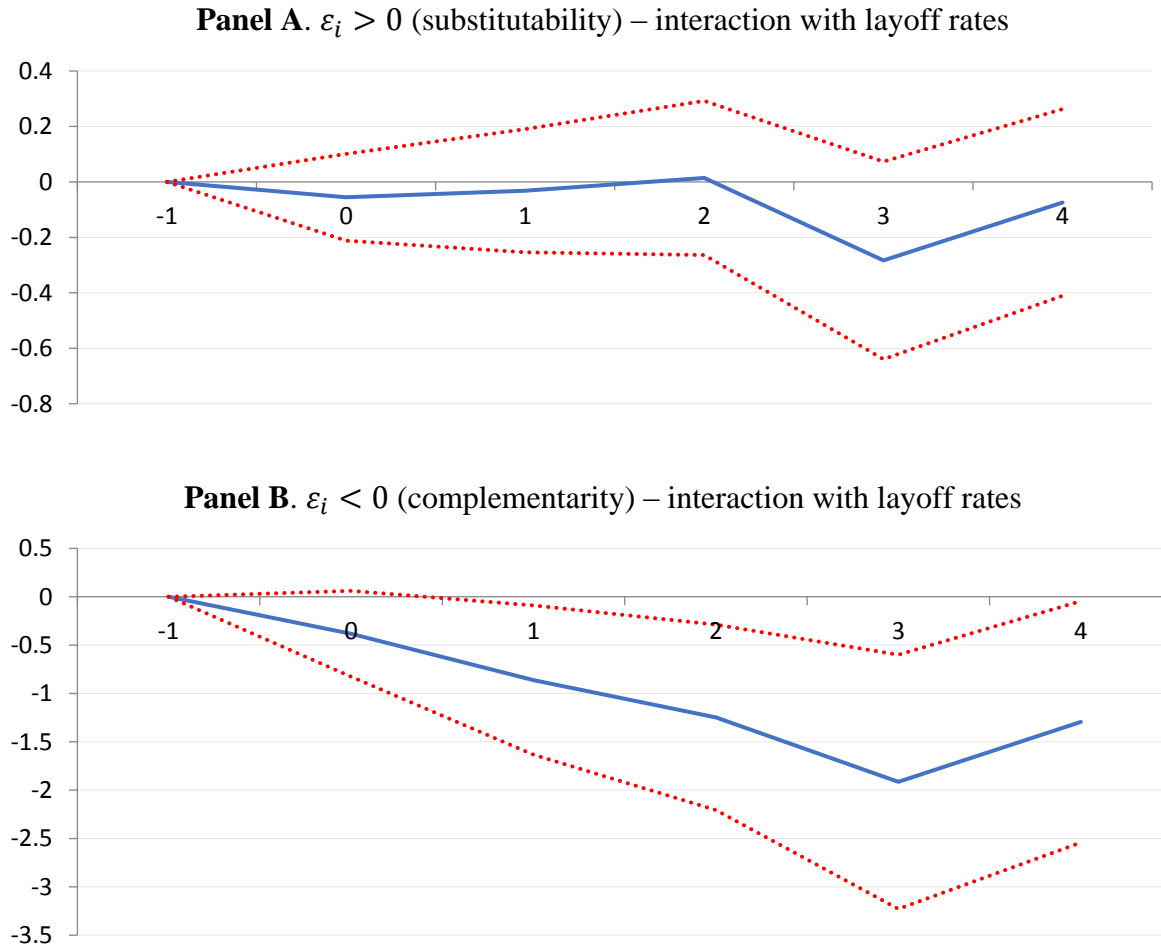**Figure 12**. Country-industry level analysis – robustness checks

Panel A. Identification through layoff rates

Panel B. Identification through ε_s (elasticities of substitution)

Panel C. Identification through layoff rates and ε_s

Legend:
- Baseline
- 90% confidence band
- RC: temporary contracts
- RC: trade openness
- RC: relative investment price
- RC: union density
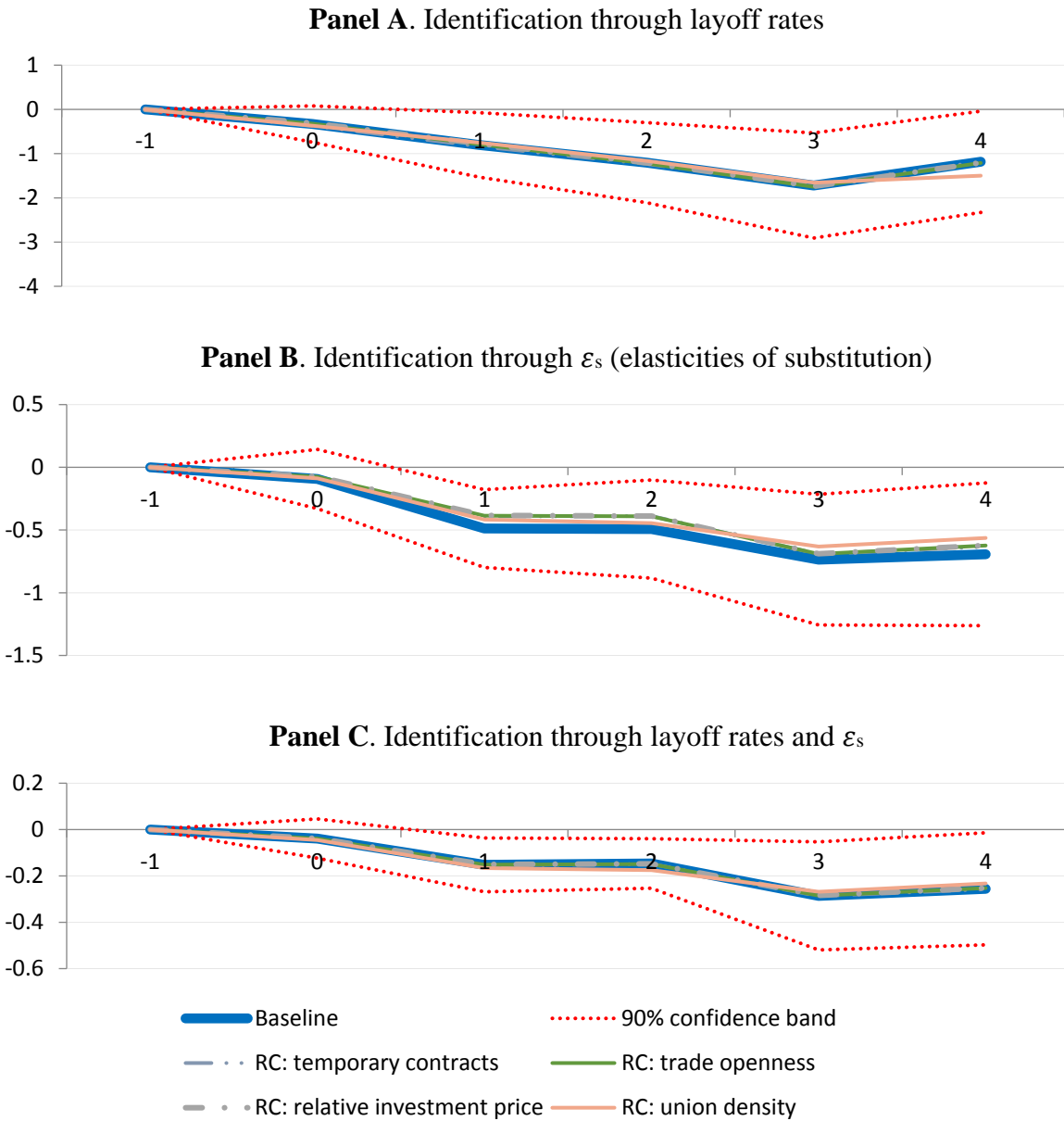
Note: estimates based on Equation (9). Blue solid lines denote the average differential labor share effect of EPL reforms between industries in the 75th percentile and 25th percentile of the layoff rate distribution (Panel A), of the elasticity of substitution (Panel B) and the interaction between the two (Panel C) estimated from the baseline specification. Dotted lines indicate 90 percent confidence interval based on standard errors clustered at country-industry level from the baseline specification. Other lines report the estimated differential effects controlling for other potential labor share drivers. The Y-axis reports the magnitude of the estimated coefficients (in percentage points).

Figure 13. Country-industry level analysis – extension (1)

Panel A. $\varepsilon_i > 0$ (substitutability) – interaction with layoff rates

Panel B. $\varepsilon_i < 0$ (complementarity) – interaction with layoff rates

Note: estimates based on Equation (10). Blue solid lines denote the average labor share differential effect to EPL reforms of moving from the 25th to the 75th percentile of the layoff rate distribution, for industries with elasticity of substitution higher than 1 ($\varepsilon > 0$, Panel A) and for those with elasticity lower than 1 ($\varepsilon < 0$, Panel B). Dotted lines indicate 90 percent confidence interval based on clustered standard errors. The X-axis reports the horizon, with 0 indicating the reform year. The Y-axis reports the magnitude of the estimated coefficients (in percentage points).

Figure 14. Country-industry level analysis – extension (2)

Panel A. $\varepsilon_i > 0$ (substitutability)

Panel B. $\varepsilon_i < 0$ (complementarity)
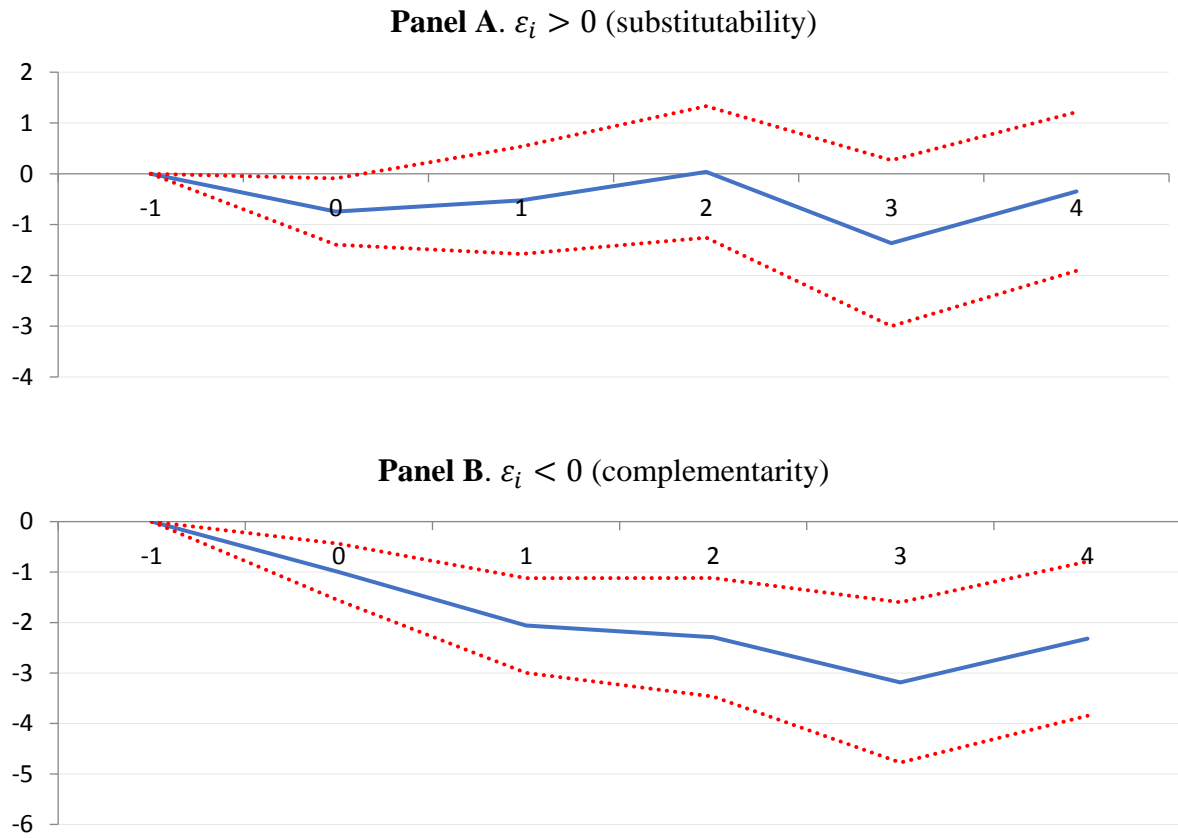
Note: estimates based on Equation (10). Blue solid lines denote the estimated average response of the labor share to EPL reforms for industries with elasticity of substitution higher than 1 ($\varepsilon > 0$, Panel A) and for those with elasticity lower than 1 ($\varepsilon < 0$, Panel B). Dotted lines indicate 90 percent confidence interval based on clustered standard errors. The X-axis reports the horizon, with 0 indicating the reform year. The Y-axis reports the magnitude of the estimated coefficients (in percentage points).
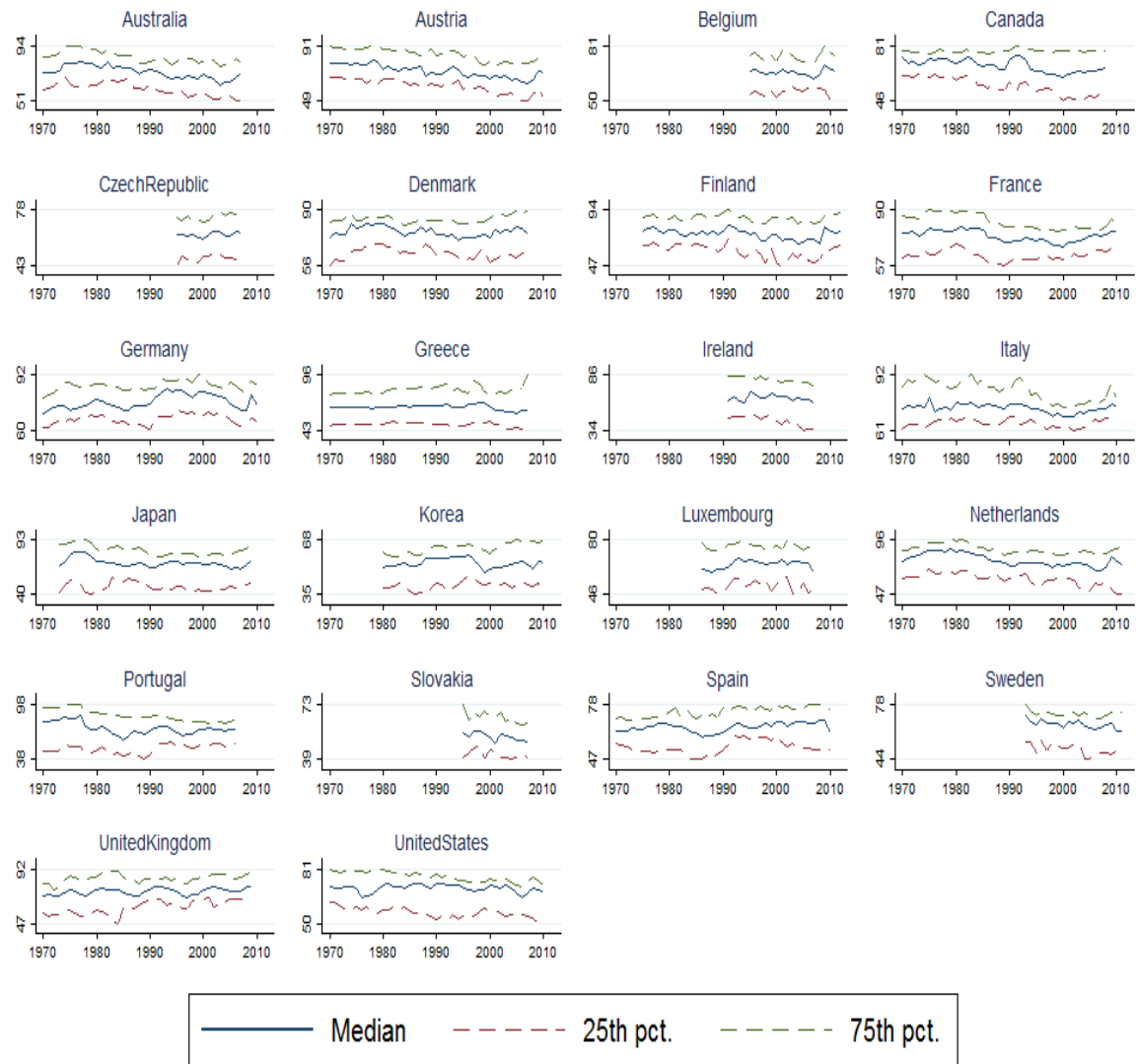
APPENDIX

Figure A1. Linear trends in country-industry labor shares, by country, 1970-2010
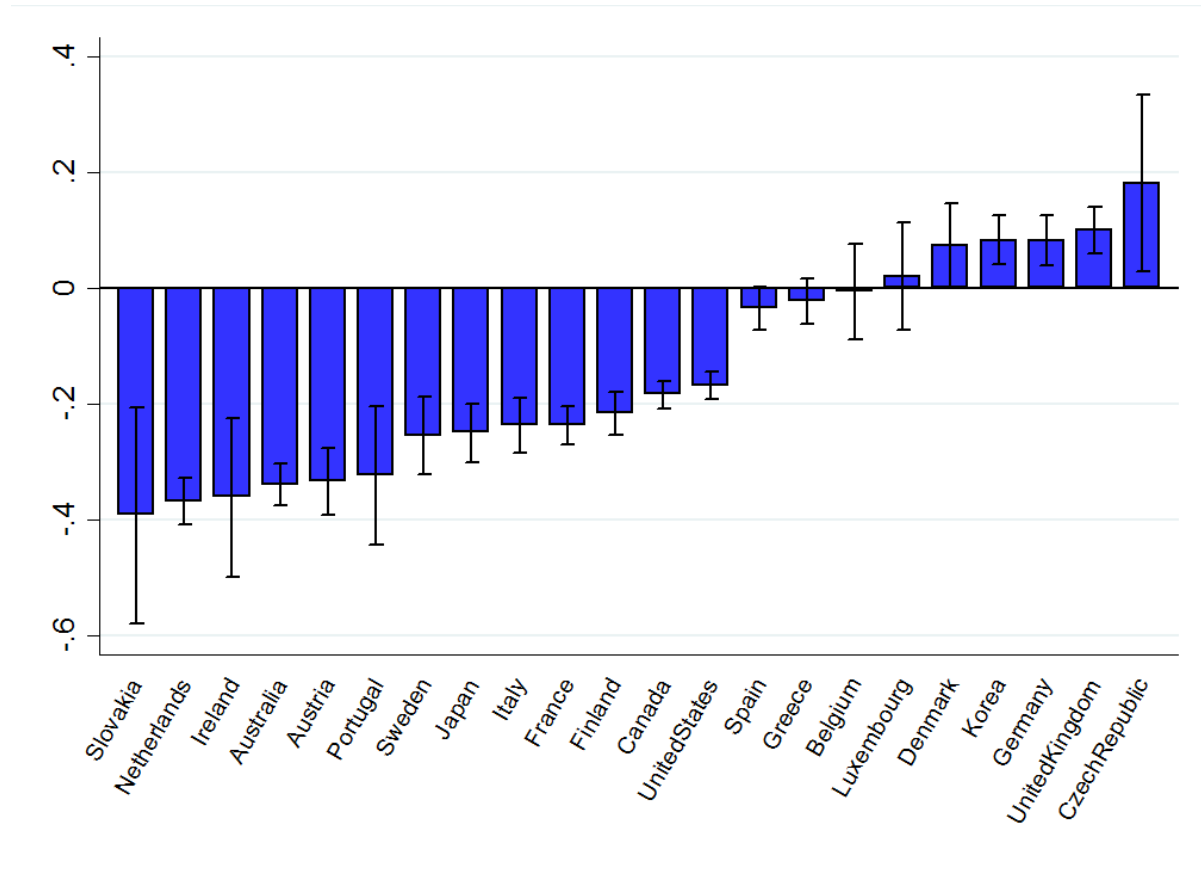
Notes: The Figure shows estimated linear trends in industry labor shares (y-axis) for each country. Trends are estimated from the following regressions: $LS_{it}^{j} = \alpha^{j} + \gamma_{i}^{j} + \tau_{t}^{j} + \varepsilon_{it}^{j}$, where the subscripts i and t denote, respectively, industry and year, while the superscript j denotes country. *LS* is the labor share, α is a constant term, γ are industry fixed effects, τ is the linear trend, and ε is the error term. Capped spikes denote 90% confidence intervals. Estimates should be interpreted as the average yearly change in country-industry labor shares over the period considered.

Figure A2. Country-industry labor shares, by country

Notes: The Figure shows the median (solid blue line), 25th percentile (dashed red line) and 75th percentile (dashed green line) of industry labor shares (x-axis) over time (y-axis), for each country in the sample, from 1970 to 2010.
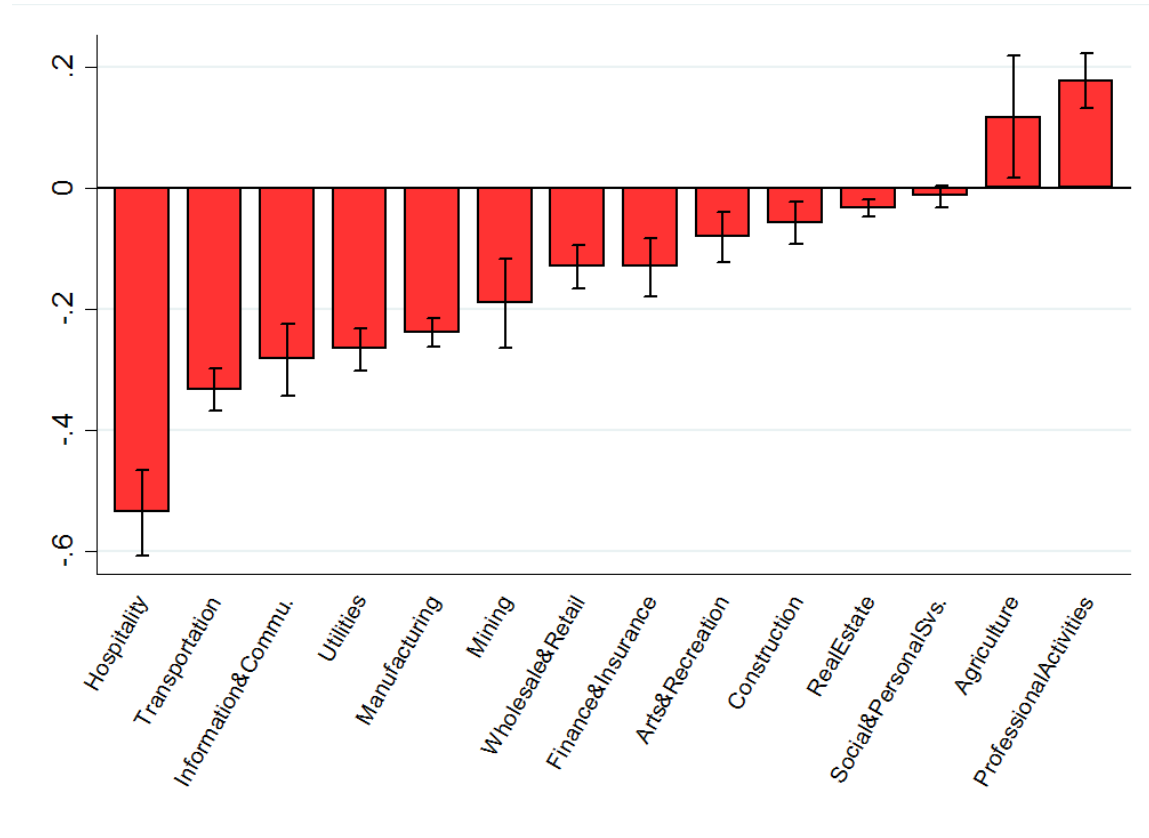
Figure A3. Linear trends in country-sector labor shares, by broad sectors, 1970-2010
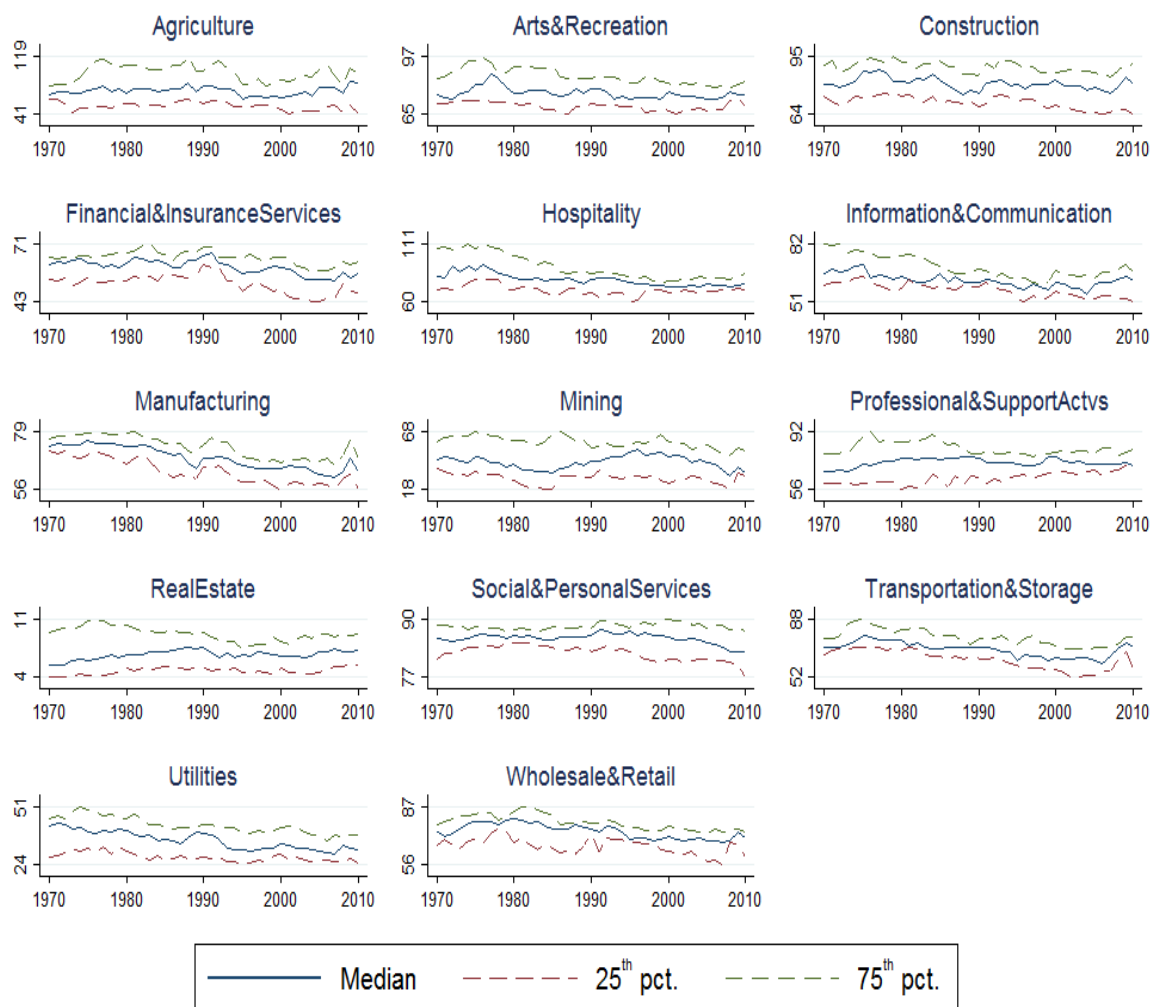

Notes: The Figure shows estimated linear trends in country-specific labor shares (y-axis) for each sector. Trends are estimated from the following regressions: $LS_{jt}^s = \alpha^s + \gamma_j^s + \tau_t^s + \varepsilon_{jt}^s$, where the subscripts j and t denote, respectively, country and year, while the superscript s denotes sector. LS is the labor share, α is a constant term, γ are country fixed effects, τ is the linear trend, and ε is the error term. Capped spikes denote 90% confidence intervals. Estimates should be interpreted as the average yearly change in country labor shares over the period considered.

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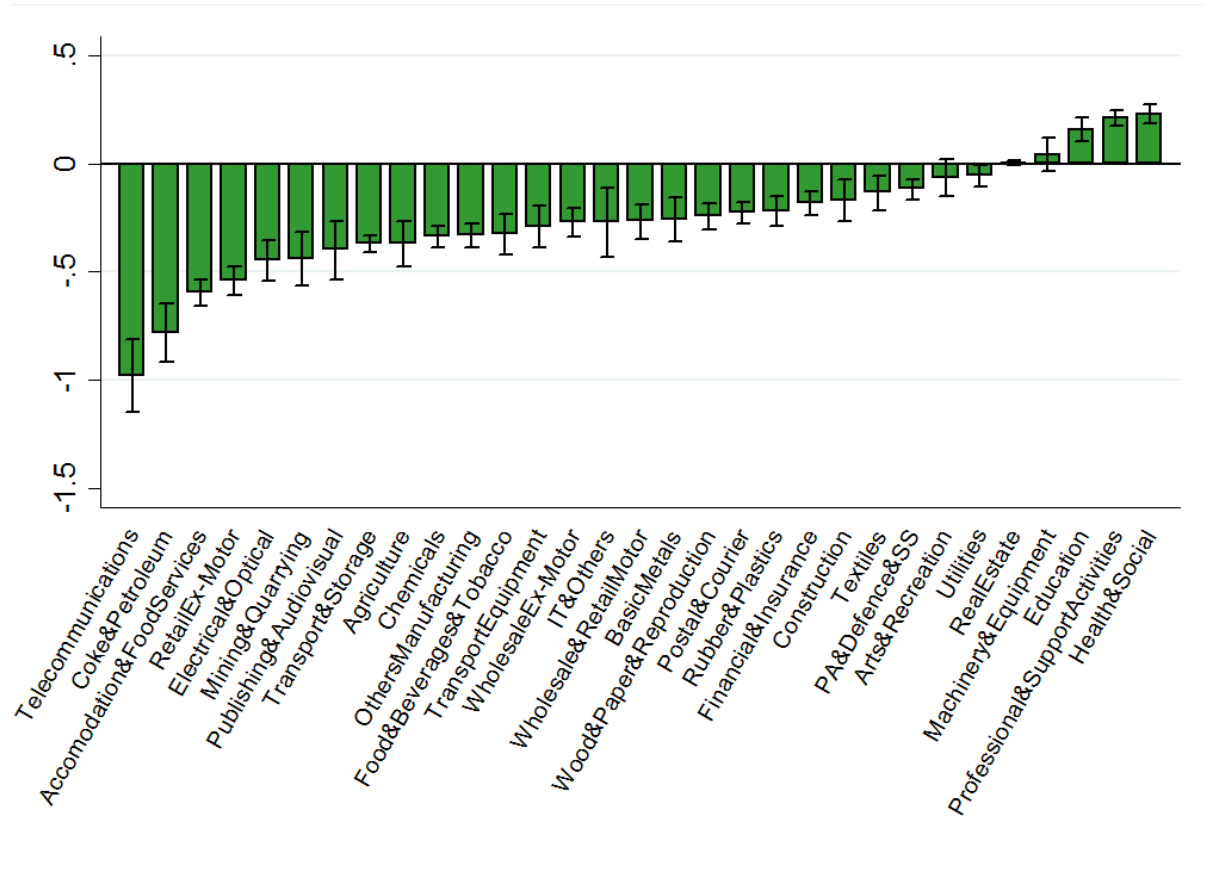**Figure A4.** Within-country labor shares, by broad sector

Notes: The Figure shows the median (solid blue line), 25th percentile (dashed red line) and 75th percentile (dashed green line) of country labor shares (x-axis) over time (y-axis), for each sector in the sample, from 1970 to 2010.

Figure A5. Linear trends in industry labor shares, 1970-2010

Notes: The Figure shows estimated linear trends in aggregate labor shares (y-axis) for each industry. Trends are estimated from the following regressions: $LS_t^i = \alpha^i + \tau_t^i + \varepsilon_t^i$, where the subscript t and the superscript *i* denote, respectively, year and industry. LS is the labor share, α is a constant term, τ is the linear trend, and ε is the error term. Capped spikes denote 90% confidence intervals. Estimates should be interpreted as the average yearly change in industry labor shares over the period considered.

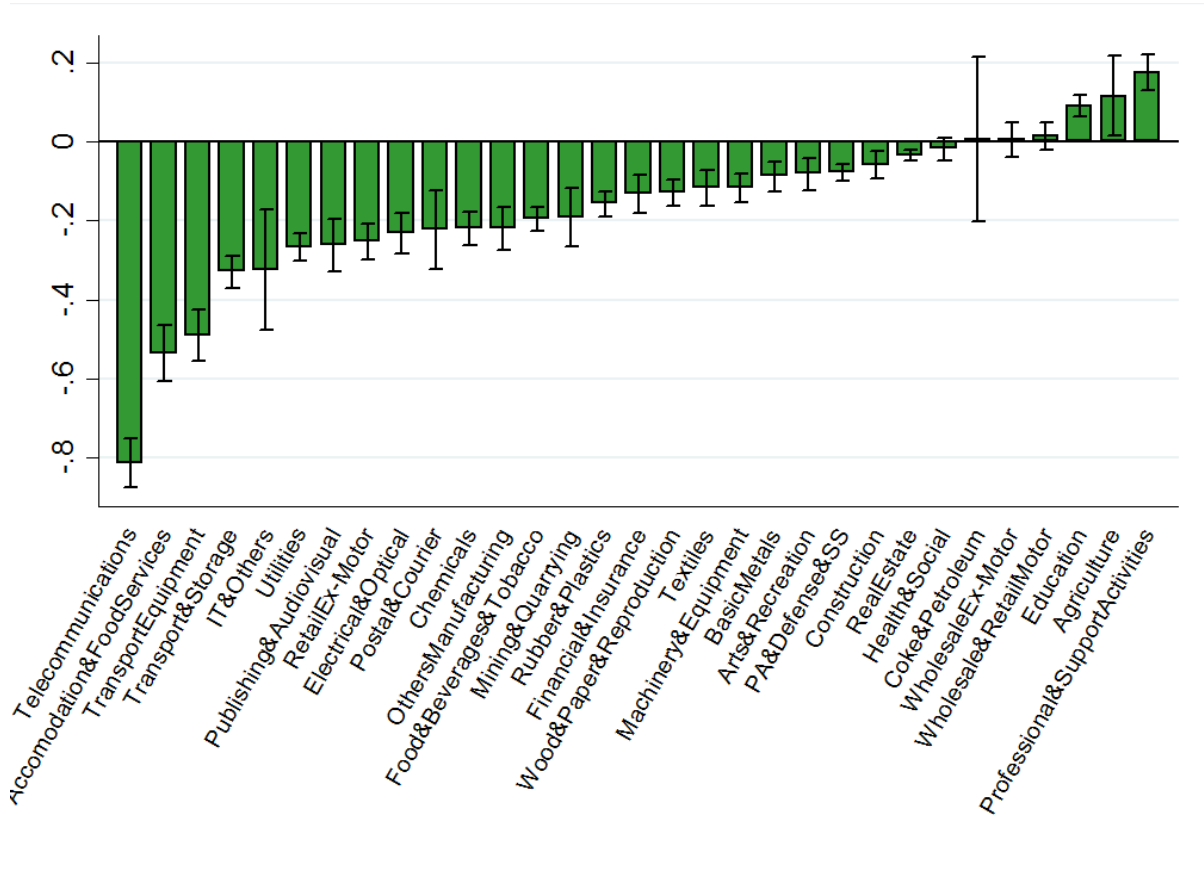**Figure A6.** Linear trends in country-industry labor shares, by industry, 1970-2010

Notes: The Figure shows estimated linear trends in country-specific labor shares (y-axis) for each sector. Trends are estimated from the following regressions: $LS_{jt}^i = \alpha^i + \gamma_i^i + \tau_t^i + \varepsilon_{jt}^i$, where the subscripts j and t denote, respectively, country and year, the superscript i denote industry. LS is the labor share, α is a constant term, γ are country fixed effects, τ is the linear trend, and ε is the error term. Capped spikes denote 90% confidence intervals. Estimates should be interpreted as the average yearly change in country labor shares over the period considered.

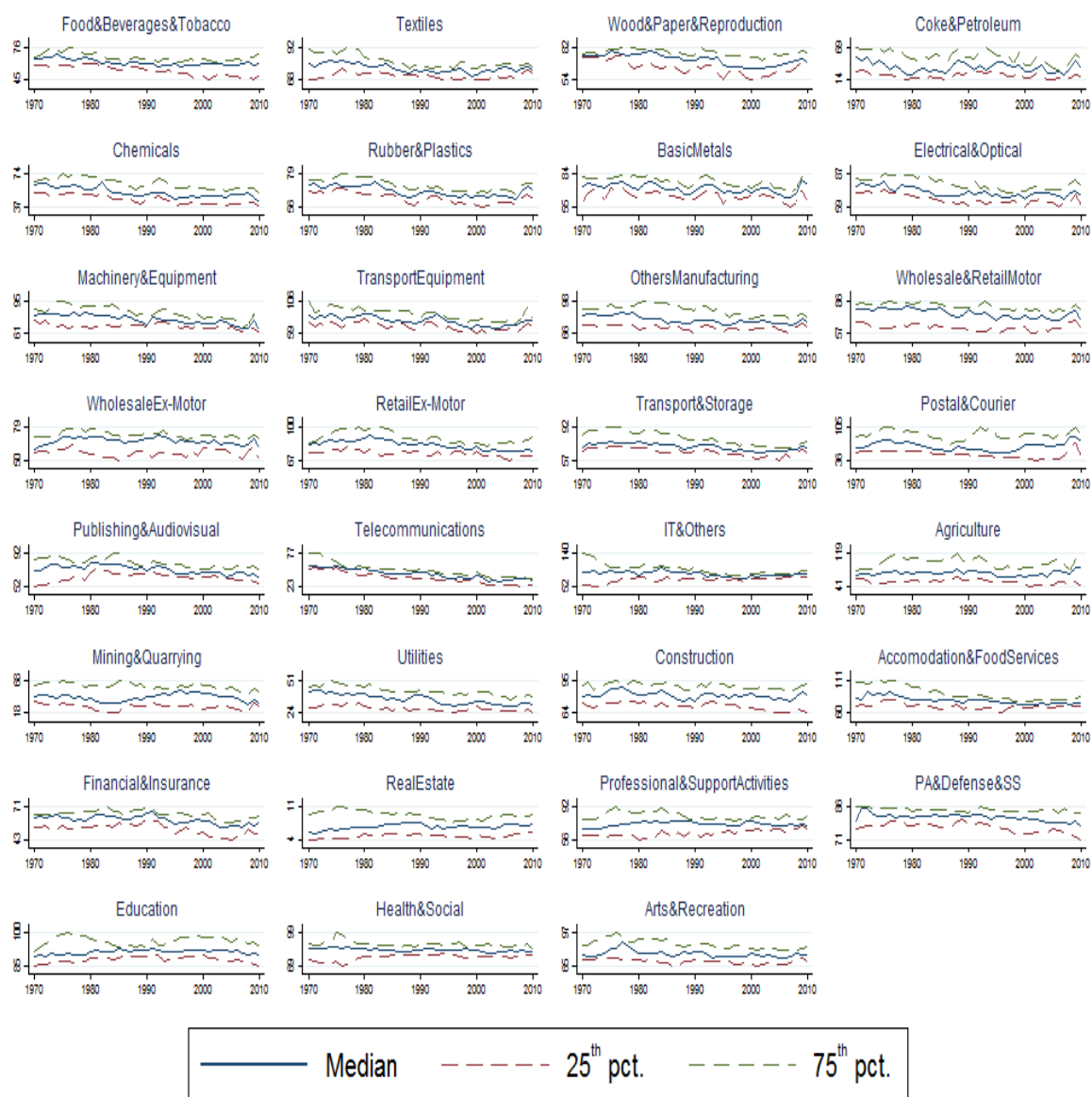**Figure A7.** Industry-country labor shares, by industry

Notes: The Figure shows the median (solid blue line), 25th percentile (dashed red line) and 75th percentile (dashed green line) of industry labor shares (x-axis) over time (y-axis), for each industry in the sample, from 1970 to 2010.

Table A1. Reforms events

Country	Impleme ntation/ Scored Year	Area	Content	Normative language	Mention in other reports	Large change in OECD indicator	Score
United Kingdom	2000	severance pay	Quadrupling maximum compensation for unfair dismissals from October 1999 (pg. 116, 2000)			yes for 2000	-1
Austria	2003	severance pay	… the system underwent thorough reform. In the new system, which became effective in January 2003, the management of severance pay is attributed to retirement accounts, which are legally independent from the employers and funded by employers via a monthly untaxed payment of some 1.5 per cent of gross wages. Accumulated entitlements rest in the employee's account until retirement, unless the work contract has been terminated by the employer, which makes cash payments admissible under certain conditions… (pg. 66, 2003)			yes for 2003	1
Belgium	1970	notice for individual dismissal	In November 1970, the notice period, which had been lengthened from 21 to 30 days early in 1969, was increased to three months. The possibility of a further extension to five months was left open and the five months' period was applied in most cases. (pg. 27, 1971)			no data but would qualify if scoring applied	-1
Belgium	1971	notice for individual dismissal	In April 1971, the period of prior notice was reduced to two months (pg. 27, 1971)			no data but would qualify if scoring applied	1
Belgium	1985	severance pay	…various measures to increase labour market flexibility: authorisation for ailing businesses to pay severance allowances in monthly instalments, when obliged to terminate indefinite-term contracts; incentives for the development of fixed-term contracts in order to promote youth employment and temporary work; lengthening of probation periods from 3 and 6 months to 6 and 12 months (pg. 47, 1985)	A major effort has also been made to promote part time work, temporary work and fixed-term contracts… (pg. 31, 1986) A major effort has also been made to increase labour flexibility… (pg. 32, 1986)		no	1
France	1987	procedural inconvenie nce	Checks on the genuineness of redundancies in firms with fewer than 10 employees to be discontinued (and from 1st January 1987, official authorisation for layoffs no longer necessary). (pg. 76, 1987)	…one area - employment - where a deliberately active economic policy is being pursued, with 1985 marking a major shift in the choice of instruments... the most important measure, at least from a psychological point of view, was the discontinuation of the requirement for official authorisation to lay off workers (with full effect from January 1987)... (pg. 37, 1987)	pg. 33 or 44, 1989; pg. 59, 1990	yes for 1987	1
France	2003	collective dismissal	…government introduced the Social Modernisation Law in 2002, significantly tightening the constraints on dismissal of more than 10 employees…in 2003 the new government suspended some of these provisions before introducing another law in 2004 which, while moderating some aspects of EPL, increased the obligation on employers to try to find alternative jobs for employees under threat of collective	…the Social Modernisation Law in 2002, significantly tightening the constraints on dismissal of more than 10 employees… These provisions prevent firms from undertaking practically any		yes for 2003	-1

			dismissal… The law permits "economic" dismissal only if it is necessary to preserve the competitiveness of the firm. Financial rationalisation by the management is not sufficient justification…in 2002 the Social Modernisation Law added a provision requiring that the financial position of the group to which the firm belongs should be taken into account, which means that an economic dismissal is not legally justified if the group is healthy. (pg. 105, 2005)	reorganisation to increase productivity that might ensure the survival or faster growth of the firm in the future… (pg. 105-106, 2005).			
France	2009	procedural inconvenience	Layoff law has been simplified by introducing the possibility of mutually agreed termination (rupture conventionnelle) of the CDI. (pg. 52, 2009)			yes for 2009	1
Germany	1994	notice for individual dismissal	Notice period for blue-collar workers extended to four weeks, thereby aligning it with that of white-collar workers [see e.g. OECD Employment Outlook 2004 pg. 119]			yes for 1994	-1
Germany	1997	procedural inconvenience	Legislation easing employment protection provisions…came into force in October 1996… The employment ceiling for enterprises above which employment protection is applicable was raised from five to ten employees per firm. The number of enterprises which are not subject to the general job protection law was thereby increased by some 15 percent. These companies employ some 30 per cent of all employees... With respect to large scale redundancies, the general requirement to consider social criteria in selecting employees to be made redundant was relaxed, with greater emphasis given to economic factors... (pg. 132, 1997)	… the measures reduce the costs and uncertainty of taking on new workers, thereby increasing the possibility for the unemployed and new entrants into the labour market to make the transition into permanent employment… (pg. 132, 1997)		no	1
Germany	2004	procedural inconvenience	The Protection against Dismissal Act (PaDA) states that a dismissal is "socially unjust" and, hence, invalid if there is no suitable reason (§ 1). A dismissal is socially justified only (1) in cases of personal misconduct, (2) lack of individual capabilities or (3) due to business needs and compelling operational reasons. Moreover, in the third case the PaDA requires that firms select workers or employees to be dismissed in accordance with social criteria such as age, tenure, alimony duties or individual disabilities. Until 2003, the regulations of the PaDA generally applied to all firms with more than a minimum number of five permanent employees. Since 2004, the four criteria of age, tenure, maintenance payments, and individual disability are listed explicitly in § 1(3) of the PaDA [see http://www.zew.de/en/publikationen/dfgflex/paperGoerke.pdf]			yes for 2004	-1
Italy	1970	procedural inconvenience	The Act of 1970 referred to as the "workers' statute". Mechanism for reinstatement after a dismissal has been declared unlawful…laid down by Article 18 [see https://www.eurofound.europa.eu/efemiredictionary/workers-statute]			No data but would qualify if scoring applied	-1
Italy	1991	procedural inconvenience	…the job allocation scheme was abolished in June 1991 (pg. 54, 1991)	A number of important measures…been taken in recent years to enhance the flexibility of the labour market, most prominent among them the abolition of the job	pg. 19, 1994 pg. 11, 1995 pg. 134, 1999	no	1

				allocation scheme in July 1991 (pg. 19, 1994)			
Italy	2013	procedural inconvenience	Comprehensive labour market reform (with explicit provision for monitoring of its effects) including: relaxation of employment protection rules, reduced incentives to hire on non-permanent contacts…. potentially increase in flexibility on the firing side... (pg. 42, 2013) …reform relaxed employment protection rules on permanent contracts, notably limiting the possibility of reinstatement following unfair dismissal. (pg. 27, 2015)		pg. 27, 2015	yes for 2013	1
Nether-lands	1976	collective dismissal	Compulsory 3-month advance notification to employment exchange and trade unions required for the intended dismissal of 20 or more employees (pg. 47, 1977). [Collective Redundancy Notification Act established rules applying to collective dismissals]			no data but would qualify if scoring applied	-1
Nether-lands	1996	procedural inconvenience	The Government decides to shorten dismissal procedures. According to the new rules, an employer can dismiss his employee at the same time or even before asking permission from the director of the Public Employment Service. (pg. 122, 1996)			yes in 1995	1
Norway	1977	procedural inconvenience	The main legislation concerning employment protection is the law on worker protection and the working environment which dates back to 1977. The law regulates a number of issues ranging from the terms of termination of employment, working hours, overtime and unfair dismissals.... (pg. 164, 2004)		pg. 164, 2004	no data	-1
Sweden	1975	notice for individual dismissal	…introduction of the employment security act in July 1974, stipulating that employers are to give 6 months' warning in advance of layoffs… (pg. 21, 1976) The Act on Security of Employment, which took effect i n 1974, stipulates that an employer must have acceptable reasons for laying off workers. Notice of dismissal, which may extend up to six months depending on age, can be contested in court and an employee is generally entitled to retain his employment pending a decision. Furthermore, employers must give the Employment Board 2 to 6 months notice of production cutbacks, depending on the number of employees affected... (pg. 36-37, 1980)		pg. 36-37, 1980	no data but would qualify if scoring applied	-1
Sweden	1997	notice for individual dismissal	The revised Employment Protection legislation enters into force, embodying modifications in i) the criteria determining the length of notice periods; ii) enterprises' rehiring obligation vis-`a-vis laid-off workers; iii) a wider scope for fixed-term contracts; and iv) a strengthened position for part-time workers and workers on replacement contracts. … the government tabled a set of proposals which were adopted by Parliament in late 1996, to enter into force during 1997. Of particular importance are: i) the length of notice periods is to be determined on the basis of tenure and not of age, implying that the costs of hiring older workers will fall relative to other groups; ii) enterprises' rehiring obligation vis-`a-vis laid-off workers will		pg. 105, 1999	yes in 1997 and 1999	1

Country	Year		Description				
			expire after nine instead of twelve months; iii) twelve-month fixed-term contracts with no restrictions applied to the nature of the work carried out has been introduced, with all enterprises regardless of size being allowed to employ up to five persons on such contracts and new establishments being allowed to extend them to eighteen months... (pg. 81-82, 1998)				
Japan	2007	procedural inconvenience	Labor Contract Act of 2007 [see e.g. http://apirnet.ilo.org/resources/the-labor-contract-act-of-2007-and-other-legislative-developments/at_download/file1].			yes in 2007	1
Finland	1989	notice for individual dismissal	Protection of workers is improved. Periods of notice will be extended from 1989. Dismissal for economic reasons will be possible only if work has decreased significantly and permanently and if employees cannot be transferred or trained for new tasks. (pg. 120, 1989)			no data but would qualify if scoring applied	-1
Finland	1997	notice for individual dismissal	In March 1996, several acts were submitted to the parliament regarding labour market reform aimed at stimulating new hiring... Employers' period of notice has been shortened to one month (from two months) and that for employees to fourteen days (from one month)... (pg. 78, 1996)\n\nNotice periods for employers and employees have been halved, to one month and two weeks, respectively (Pg. 63, 1997).		pg. 63, 1997	yes in 1997	1
Greece	2011	notice for individual dismissal, severance pay, collective dismissal.	The following measures were introduced in 2010 (Laws 3863/2010 and 3899/2010) to facilitate job reallocation:\n● Reduction in notice period. The notice period prior to dismissal of white collar workers has been reduced substantially. For an employee working 28 years or more, for example, notification is reduced to 6 from 24 months. The new provisions lower total severance costs for white collar workers with long tenure. Employers now have a clear incentive to provide notice of dismissal for workers with long tenure, in which case their severance payments are halved.\n● New rules for the settlement of severance payments…make it possible for severance payment, when it exceeds 2 months' pay, to be paid in installments.\n● Redefinition of collective dismissal rules. The new law increases the threshold above which dismissals are characterised as collective to 6 employees for enterprises with 20-150 employees and 5% or 30 employees for those with more than 150 employees. This compares with thresholds of 4 employees per month for enterprises with 20-200 employees and 2-3% or 30 employees for enterprises with more than 200 employees under the 2000 law.\n● Extension of probationary period. It was extended from 2 months to 1 year. (pg. 123, 2011)			yes in 2011	1
Greece	2012	severance pay	The length of prior notice of dismissal has been shortened to a maximum of four months, compared to 24 months for white-collar workers previously. The severance pay for white-collar workers has been reduced and subjected to a ceiling of 12 months' salary. (pg. 50, 2013)			yes for 2012	1

Ireland	1973	notice for individual dismissal	Minimum Notice and Terms of Employment Act, 1973, introduces and defines minimum notice period for dismissal [see e.g. http://www.irishstatutebook.ie/eli/1973/act/4/section/4/enacted/en/html#sec4]			no data but would qualify if scoring applied	-1
Ireland	1977	procedural inconvenience, notice for individual dismissal	During the 1970s, extensive legislation was enacted in Ireland to protect employees' rights and conditions of employment. The most important of these are the Protection of Employment Act (1977), the Unfair Dismissals Act (1977) and the Employment Equality Act (1977). (pg. 89, 1987) [see http://www.irishstatutebook.ie/eli/1977/act/7/enacted/en/html http://www.irishstatutebook.ie/eli/1977/act/10/enacted/en/html http://www.irishstatutebook.ie/eli/1998/act/21/enacted/en/html]			no data	-1
Ireland	2006	notice for individual dismissal	Revision of the 1973 Minimum Notice and Terms of Employment Act (which had introduced and defined minimum notice period for dismissal [see e.g. http://www.irishstatutebook.ie/eli/1973/act/4/section/4/enacted/en/html#sec4]			yes in 2006	1
Ireland	2012	severance pay	Before 2012, the Government paid a rebate to employers for redundancy payouts to employees. Up until 1 January 2012 this rebate amounted to 60%; between 1 January 2012 and 1 January 2013, the Government rebate was 15%; from 2013 onwards the Government rebate was abolished [see e.g. https://www.eurofound.europa.eu/observatories/emcc/erm/legislation/ireland-severance-payredundancy-compensation]			yes in 2012	-1
Portugal	1975	collective dismissal	Collective dismissal procedures become subject to regulation. (pg. 43, 1976)	Where employment is concerned, a law was passed in December 1974 which considerably limited the possibility of collective dismissals (pg. 35, 1976)	pg. 12, 1979 pg. 67, 1989	no data but would qualify if scoring applied	-1
Portugal	1976	procedural inconvenience	…to combat the rise in unemployment caused by the domestic and international recession and by the return of expatriates from the former colonies, the authorities enacted legislation virtually prohibiting all dismissals (pg. 9, 1976)		pg. 12, 1979 pg. 67, 1989	no data but would qualify if scoring applied	-1
Portugal	1978	procedural inconvenience	August 29: Authorisation for firms to suspend work contracts on account of economic difficulties. (pg. 40, 1977)			no data but would qualify if scoring applied	1
Portugal	1990	procedural inconvenience	the possibility of dismissal for failure to fulfill job requirements (pg. 19, 1992)		pg. 94, 1996	yes in 1990	1
Portugal	1992	procedural inconvenience	Changes in both layoff legislation and legal framework governing collective labour contracts aim at making labour markets more flexible. (pg. 92, 1993)			yes in 1992	1
Portugal	2004	procedural inconvenience	The new Labour Code (Código do Trabalho), which came into force in December 2003, replaces individual and collective labour legislation with a			yes in 2004	1

			unified text, deemed to be clearer and easier to apply…employers now have the right to oppose the reinstatement of workers in dismissal cases under certain conditions, such as in cases where it would harm or disrupt business activity. (pg. 78-79, 2004) In the case of regular contracts, the 2003 changes eased somewhat the procedures for collective dismissal: the deadlines for initiating negotiations and taking the final decision were shortened; the priority given to trade union representatives and members of workers councils was eliminated. (pg. 128, 2008)				
Portugal	2010	procedural inconvenience, notice for individual dismissal, severance pay	The introduction of the new labour code in 2009, by reducing EPL for regular contracts, is an important step in the direction of reducing labour market dualism (pg. 42, 2010)	…an important step in the direction of reducing labour market dualism (pg. 42, 2010)	pg. 33, 2012	yes in 2010	1
Spain	1978	procedural inconvenience	A Decree-Law of 4th March, 1977 made the regulations governing dismissals…considerably more flexible (pg. 13, 1977) …legislation on layoffs, which is currently very restrictive, will be made more flexible, and employers will be allowed to lay off up to 5 per cent of their workforce… (pg. 34, 1978)		pg. 34, 1978 pg. 27, 1982	no data	1
Spain	1981	procedural inconvenience, collective dismissals	The new Workers Statute…changed legal framework provides in particular for liberalisation of dismissals… (pg. 27, 1981)	Two important laws were enacted in 1980. The new Workers Statute... (27, 1981) … it was not until the promulgation of the Workers' Statute in 1980 that a comprehensive reform of labour law took place. (pg. 27, 1982)	pg. 27, 1982	no data	1
Spain	mid-1994/1995	procedural inconvenience, collective dismissals	The draft law simplifies layoff procedures. Dismissal of a small number of workers (treated as if they were individual dismissals) would no longer require prior consultation with workers' representatives and administrative authorization. (pg. 81, 1994) …the Government has presented a draft law modifying existing labour legislation significantly…Layoffs of permanent employees will be made much easier, notably by abolishing in many cases the requirement of administrative authorization. (pg. 88-89, 1994)	… far-reaching labor market reforms aimed at lifting barriers to job creation. A decree was passed at the end of 1993 and a draft has been presented to Parliament and is expected to become law by the middle of 1994. (pg. 80, 1994) This draft law breaks with the corporatist philosophy of past legislation and is expected to increase labour market flexibility considerably. (pg. 88-89, 1994)		yes for 1995	1
Spain	1998	severance pay	Employers and trade unions agree on a labour market reform which would encourage the creation of indefinite-term jobs. Inter alia, it calls for the introduction of a new type of indefinite-term contract with reduced redundancy costs for certain groups of workers, a new definition of the grounds for economic redundancies and	…The social partners have taken an important step… (pg. 76, 1998)	pg. 57, 2000 pg. 66-68, 165, 2001 pg. 101, 2010	no	1

			proposals for improving the collective bargaining process. (pg. 179, 1998)				1
Spain	2002	procedural inconvenie nce, severance pay	New measures taken in early 2001 have broadened the 1997 reform… (pg. 65-66, 2001) In March 2001 the government approved a deepening of the 1997 labour market reform. The measures adopted include: – An extension of the new permanent contract introduced in the 1997 labour market reform beyond May 2001. – The permanent contract with reduced firing costs will continue to apply to specific groups (workers aged 18-29, workers with a temporary contract, workers aged over 45, workers that have been unemployed for more than one year, women in some professions), and has been extended to young workers (now defined as those aged between 16 and 30), long-term unemployed (for more than 6 months), unemployed women in sectors where they are underrepresented (most of them) and disabled workers… (pg. 66, 2003)		pg. 66, 2003	no	1
Spain	2011	severance pay	The labour market reform, approved in September 2010…aims to reduce the upper range of dismissal costs for permanent contracts and to smooth the difference in dismissal costs between temporary and permanent contracts: ● First, the law aims to make it easier for firms to have dismissals accepted by the courts as justified. If this reform is effective, it will reduce severance payment of firms substantially, from the current practice of 45 days' wages to 20 days' wages. ● Second, it broadens the base for which the permanent contract with reduced severance payment of 33 days' wages can be applied and guarantees that this reduced severance pay also applies now in cases where firms would prefer to declare the dismissal upfront as "unjustified" (to avoid litigation). ● Third, the introduction of a capital-funded component, similar to the one introduced in the framework of the Austrian severance pay reform, further reduces the onetime costs of dismissal. (pg. 103, 2010)	The recent reform represents significant progress… The recent reform adopted by Parliament in September 2010 should lead to significant progress… (pg. 101, 2010)		yes for 2011	1
Spain	2013	procedural inconvenie nce, severance pay, collective dismissals	The 2012 labour market reform aims to reduce further the duality in the Spanish labour market, with a reform of employment protection legislation…: ● The law redefines the economic reasons for dismissal, further clarifying the conditions under which a dismissal for objective reasons could be justified. In this case, the employer pays 20 days' wages of severance pay per year of seniority. ● If a dismissal is judged unjustified, the maximum severance pay is reduced to 33 days' wages per year of seniority up to a maximum of 24 months, compared with 45 days and a maximum of 42 months on the regular permanent contract before. This applies to all new contracts and for future years of service on existing contracts. ● The law eliminates the need for administrative authorisation of collective dismissal, in	…these reforms are a substantial step in the right direction… A potentially important part of the reform is clarifying what justified dismissal means... (pg. 34, 2012)	pg. 40, 92, 2014	yes for 2013	1

			line with current regulations in most European countries. ● While it removes the option of express dismissal, according to which firms could declare the dismissal upfront as being "unjustified" and pay 45 days' wages per year of seniority to avoid litigation, firms no longer are obliged to pay interim wages during the period the case is adjudicated. ● The law introduces a new type of permanent contract for companies with fewer than 50 employees. Hiring on this new contract is subject to an extended trial period of one year, compared with a previous maximum of six months, and various tax credits. (pg. 98, 2012)				1
Australia	2006	procedural inconvenience	The Workplace Relations Amendment (Work Choices) Act 2005 took effect in the first quarter of 2006 and sought to reinforce employers' prerogatives at the expense of employees (pg. 81, 2012)			yes for 2007	1
Australia	2010	procedural inconvenience, notice for individual dismissal	Work Choices removed unfair dismissal protections for employees of firms with fewer than 100 employees. The Fair Work Act restored these protections subject to minimum qualifying periods of one-year service for workers in firms with fewer than 15 employees and six months' service for workers in firms with 15 or more employees. In addition, a number of protections previously available under Work Choices were streamlined and broadened in the FW Act to protect workers against discrimination and adverse actions because they have a workplace right. (pg. 83-84, 2012)			yes for 2010	-1
New Zealand	2001	procedural inconvenience	The new Employment Relations Act…modifies provisions under the ECA in several significant ways… The ERA proposes to avoid undue litigation by making mediation a mandatory first step. If there is no resolution, the parties can then turn to the Employment Relations Authority, a new investigative body. If the parties do not agree with its ruling, or if the Authority so decides, grievances and disputes are then turned over to an Employment Court. It can redirect the matter back to mediation, to the Authority or make a final judgement. (pg. 78-79, 2000)		pg. 83, 2002 pg. 98, 2005 pg. 117, 2013	yes for 2001	-1
New Zealand	2012		The Employment Relations Act 2000 was amended to extend trial period provisions (for up to 90 days) from firms with fewer than 20 employees to all firms on 1 April 2011… (pg. 56, 2011)			yes for 2012	1
Korea	1998	procedural inconvenience, notice for individual dismissal, collective dismissals	The March 1997 labour law reform eased restrictions on layoffs by expressly allowing dismissals for ''urgent managerial reasons'', while specifying certain requirements that must be fulfilled beforehand by management… the Tripartite Commission agreed that it should be implemented in February 1998 to help firms restructure in the wake of the crisis... (pg. 166, 1998)		pg. 142, 2005 pg. 127, 2008 pg. 129, 2012	yes for 1998	1
Czech Republic	2007	procedural inconvenience	A new labour code was passed by the lower chamber of the parliament in early 2006. The			yes for 2007	1

			code, if implemented, will allow a wider scope of employment contracts because it takes an "anglo-saxon" rather than "Napoleonic" legal form… (pg. 36, 2006) [NB: Amended Labor Code Act (No.262) eventually became law, see e.g. http://www.mpsv.cz/files/clanky/3221/Labour_C ode_2012.pdf]			
Czech Republic	2012	notice period, severance pay	2012 revision of labor code with effect from January 1st 2012 [see e.g. https://ec.europa.eu/europeaid/employment-labor-and-social-protection-social-reforms-czech-republic_en …it has…introduced wider possibilities for employers to terminate the employment…The maximum duration of the probationary period extended to 6 months for executive employees…]		yes for 2012	1
Slovak Republic	2004	notice period, severance pay	Major amendments to the Labour Code were adopted in June 2003 and became effective as of 1 July 2003…More flexibility is introduced as regards an employer's right to terminate an employee's contract. When terminating an employment contract the employer is obliged to specify the reasons for termination. These are more extensive than previously allowed… In all cases the statutory notice period is reduced to two months regardless of the reason for termination. An employee working for the same employer for more than five years shall be given 3-months notice… (pg. 121-122, 2004)		yes for 2003-2004	1
Slovak Republic	2012	notice period, severance pay	Amendments to the "new" 2003 labor code that eases legislation on regular contracts (shortening of length of notice period). [For details, see e.g.http://www.ilo.org/dyn/eplex/docs/50/labour-code-full-wording-january-2012.pdf]		yes for 2012	1

Table A2. Mean values of relevant industry characteristics

	Share in value added	Labor share	Elasticity of substitution	Natural layoff rate	Industry code
Food, Beverages & Tobacco	2.77	59.39	0.88	2.83	10t12
Textiles	1.64	76.74	0.97	6.58	13t15
Wood, Paper & Reproduction	2.20	69.55	0.88	5.45	16t18
Coke & Refined Petroleum	0.46	41.39	-1.60	5.59	19
Chemicals	2.06	53.00	0.91	3.09	20t21
Rubber & Plastics	1.89	65.47	1.01	4.86	22t23
Basic Metals	3.04	69.42	1.15	5.64	24t25
Electrical & Optical	2.20	70.72	0.86	8.12	26t27
Machinery & Equipment	1.67	76.13	0.95	5.42	28
Transport Equipment	1.75	78.29	0.84	4.53	29t30
Others Manufacturing	1.23	80.40	0.44	5.95	31t33
Wholesale & Retail, Motor vehicles	1.59	69.36	0.93	3.01	45
Wholesale ex. Motor Vehicles	5.62	63.99	1.10	3.95	46
Retail ex. Motor Vehicles	4.86	79.13	0.86	3.24	47
Transport & Storage	4.77	71.54	1.13	4.33	49t52
Postal & Courier	1.53	72.31	0.81	6.72	53
Publishing & Audiovisual	1.09	70.60	/	/	58t60
Telecommunications	1.57	43.80	0.81	6.72	61
IT & Others	1.11	84.97	/	/	62t63
Agriculture	4.22	77.81	0.64	/	A
Mining & Quarrying	1.47	43.51	0.67	/	B
Utilities	2.72	35.66	1.00	1.84	DtE
Construction	6.97	78.29	0.97	5.69	F
Accommodation & Food Services	2.71	78.53	0.98	3.35	I
Financial & Insurance	5.72	58.51	1.03	2.63	K
Real Estate	8.77	6.93	0.75	/	L
Professional & Support Activities	6.59	71.74	1.06	/	MtN
PA, Defense & SS	6.41	80.37	0.94	/	O
Education	4.83	91.72	0.97	/	P
Health & Social	5.68	83.58	1.01	/	Q
Arts & Recreation	2.74	78.25	1.00	/	RtS
Average	3.38	67.16	0.83	4.74	/

Notes: share in value added and labor share are averages across countries and years, computed from the EU KLEMS database. Elasticity of substitution are first difference estimated elasticities between labor and capital in a 2-level nested production function, from Baccianti (2013). Natural layoff rates are US layoff rates as computed from the 2004 CPS Displaced Workers Supplement by Bassanini *et al.* (2009)