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over the past two decades:
The role of public policies

**Mathilde Pak,
Cyrille Schwellnus**

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LABOUR SHARE DEVELOPMENTS OVER THE PAST TWO DECADES: THE ROLE OF PUBLIC POLICIES

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By Mathilde Pak and Cyrille Schwellnus

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ABSTRACT/RÉSUMÉ**Labour share developments over the past two decades: The role of public policies**

Labour share developments over the past two decades have differed widely across OECD countries, with about half of them experiencing significant declines. This paper analyses the role of public policies in shaping labour share developments across countries. The results suggest that pro-competition product market reforms raise the labour share by reducing producer rents. Labour market reforms that strengthen the bargaining position of workers, such as tightening employment protection or raising minimum wages, may raise wages in the short term but risk triggering the substitution of capital for labour in the medium term. On average, across countries, such reforms are estimated to reduce the labour share. By contrast, promoting the re-employment of workers who lose their jobs through active labour market policies unambiguously raises the labour share.

JEL Classification codes: D33, J38, J58.

Keywords: labour share, public policies, difference-in-differences estimation

Évolution de la part du travail dans le revenu des facteurs au cours des vingt dernières années : influence des politiques publiques

Au cours des vingt dernières années, la part du travail dans le revenu des facteurs a évolué de façon très différenciée selon les pays de l'OCDE, avec une baisse importante dans environ la moitié d'entre eux. Ce papier analyse le rôle des politiques publiques pour expliquer l'évolution de la part du travail dans les différents pays. D'après les résultats, les réformes favorisant la concurrence sur le marché des produits augmentent la part du travail en réduisant la rente des producteurs. Les réformes du marché du travail qui renforcent la position de négociation des travailleurs, comme renforcer la protection de l'emploi ou augmenter le salaire minimum, peuvent augmenter les salaires à court terme, mais risquent de provoquer la substitution du travail par le capital à moyen terme. Selon les estimations, de telles réformes réduisent la part du travail en moyenne dans les pays. En revanche, promouvoir la réembauche de travailleurs ayant perdu leur emploi, grâce à des politiques actives du marché du travail, augmente sans ambiguïté la part du travail dans le revenu des facteurs.

Classification JEL: D33, J38, J58.

Mots-clés: part du travail, politiques publiques, estimation en doubles différence

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Labour share developments over the past two decades: The role of public policies

By Mathilde Pak and Cyrille Schwellnus¹

1. Introduction

1. Several OECD countries have been grappling not only with slow productivity growth but have also experienced a slowdown in real average wage growth relative to productivity growth, i.e. a decline in the labour share. The evidence indicates that global developments in technology and trade have pushed real average wages down relative to productivity (Schwellnus et al., 2018^[1]), but large cross-country differences in labour share developments suggest an important role for domestic policies and institutions.

2. Public policies can affect the labour share by changing the level and the distribution of producer rents as well as the price of capital relative to labour. Pro-competition product market reforms, for instance, are likely to reduce the level of producer rents while pro-worker labour market regulations and collective bargaining arrangements may shift the distribution of rents toward labour, thereby raising the labour share. Raising corporate taxes or reducing labour taxes may raise the labour share by reducing the price of labour relative to capital. Most public policies affect the labour share simultaneously through several channels. For instance, stricter employment protection rules may raise the labour share by increasing workers bargaining position, but may also put downward pressure on the labour share by raising labour costs relative to capital costs.

3. The contribution of this paper to the existing body of research is twofold. Firstly, the empirical analysis is based on industry-level data, which allows a more credible identification of the policy drivers of labour share developments than existing studies based on country-level data (IMF, 2017^[2]; Stockhammer, 2017^[3]). In particular, the empirical approach taken in this paper allows controlling for unobserved country- and industry-specific trends that may bias estimates of policy effects in country-level studies. Secondly, the paper accounts for the impact of technological change and globalisation while systematically analysing a broad range of potential policy determinants in a unified empirical framework rather than focusing on a single policy as most of the existing literature (Azmat, Manning and van Reenen, 2012^[4]; Bassanini and Manfredi, 2012^[5]; Ciminelli, Duval and Furceri, 2018^[6]).

4. The main findings are as follows:

- For the OECD as a whole, the labour share has declined over the past two decades, but there have been large differences across countries. About half of the covered countries experienced significant declines whereas the others experienced constant

¹ Mathilde Pak and Cyrille Schwellnus are members of the Economics Department of the OECD. The authors would like to thank Luiz de Mello, Giuseppe Nicoletti, Jon Pareliussen, Dorothée Rouzet and Douglas Sutherland (from the Economics Department), Andrea Bassanini, Stéphane Carcillo and Andrea Salvatori (from the Directorate for Employment, Labour and Social Affairs), and Chiara Criscuolo (from the Directorate for Science, Technology and Innovation). The support of Sarah Michelson (also from the Economics Department) in putting together the document is gratefully acknowledged.

or increasing labour shares, suggesting that domestic policies and institutions may play an important role in shaping labour share developments across countries.

- Pro-competition product market reforms raise the labour share by reducing producer rents that tend to accrue to capital owners.
- A tightening of employment protection or an increase in minimum wages exerts downward pressure on the labour share, suggesting that in the medium term the substitution of capital for labour in response to higher labour costs outweighs the upward effect through higher wages.
- Higher spending on active labour market policies raises the labour share by preserving labour market attachment and skills of workers who lose their jobs.
- The coverage and degree of centralisation of collective bargaining have no significant effect on the labour share, which could reflect the fact that higher shares of rents accruing to workers are offset by the substitution of capital for labour in response to higher labour costs.
- Changes in corporate taxes and labour taxes are found to have statistically insignificant effects on labour shares.

5. The remainder of the paper is structured as follows. Section 2 provides a brief review of the literature on the policy drivers of labour shares. Section 3 describes the empirical setup and Section 4 describes the industry-level data used in the empirical analysis. Section 5 provides empirical results and discusses possible policy implications. Section 6 concludes.

2. The role of public policies and institution: Literature review

6. One channel through which public policies can affect the labour share is through the substitution of capital for labour (capital-labour substitution). Public policies that raise labour costs or reduce the cost of capital may reduce the labour share by raising capital intensity. Even if factor prices are determined competitively, the labour share declines with capital intensity if the elasticity of substitution between capital and labour is above unity.² By contrast, if the elasticity of substitution is around unity public policies that impact the relative price of capital have no effect on the labour share.³

7. Public policies that directly impact the price of capital relative to labour include corporate taxes, labour taxes (such as social security contributions) and minimum wages. Collective bargaining institutions may raise labour costs and thus reduce the relative price

² If factor prices are determined competitively, real wages are equal to *marginal* labour productivity, but this does not imply equality between real wages and average *labour* productivity. Real wages can decouple from *average* labour productivity even with factor prices that are determined competitively if the elasticity of substitution between capital and labour is non-unitary.

³ Although Karabarbounis and Neiman (2014^[37]) obtain an elasticity of substitution in the range of 1.2-1.5 using cross-country and cross-industry variation in labour shares and relative investment prices, most estimates suggest an elasticity of substitution below one (Chirinko, 2008^[34]). The high elasticity of substitution implied by recent OECD studies could partly reflect the recent sample period as the elasticity of substitution between ICT capital that emerged in the 1990s and labour is significantly higher than for other capital goods and is well above unity (Tevlin and Whelan, 2003^[35]; Bakhshi, Oulton and Thompson, 2003^[36]).

of capital by setting wage floors. However, a number of empirical studies suggest that collective bargaining institutions primarily affect wage dispersion rather than average wages (Dahl, le Maire and Munch, 2013^[7]; Leonardi, Pellizzari and Tabasso, 2015^[8]), which would imply no effect on capital-labour substitution. Pro-competition product market reforms may induce capital-labour substitution by reducing regulatory barriers to investment. To the extent that employment protection regulations affect overall labour costs, for instance by raising dismissal costs, they may induce capital-labour substitution whereas active labour market policies may limit capital-labour substitution by preserving workers' labour market attachment and skills. The empirical evidence on the impact of public policies on the labour share through capital-labour substitution is scarce. Using country-level data, (IMF, 2017^[2]) finds no significant impact of corporate taxes on labour shares.

8. A second channel through which public policies can affect the labour share is through the level of product market rents. When competition is imperfect, value added does not only include the marginal products of the factors of production but also product market rents. The creation of new products and services or regulations that limit competition in product markets allows firms to charge a mark-up over marginal costs. To illustrate the effects of an increase in product market rents on the labour share, it is useful to decompose value added into (i) labour compensation, (ii) required capital compensation and (iii) profits in excess of required capital compensation, i.e. product market rents. Assuming that product market rents primarily accrue to capital owners, an increase in product market rents reduces the labour share.

9. Empirical evidence suggests that increases in product market rents have contributed to declines in labour shares, but this may only partly be related to restrictive product market regulations. Recent findings suggest that the decline in the labour share in the United States overwhelmingly reflects an increase in rents rather than an increase in required capital compensation (Barkai, 2016^[9]; De Loecker and Eeckhout, 2017^[10]). Furman and Orszag (2015^[11]) show that increased market concentration in the United States coincided with the emergence of supernormal returns on capital, further supporting the hypothesis that increasing product market rents have played a key role in the decline of the labour share. Autor et al. (2017^[12]) show that declines in labour shares in the United States were particularly large in industries that experienced the largest increases in market concentration.⁴ Increased market concentration may partly reflect an increase in restrictive product market regulations such as licencing requirements for professionals or a less stringent enforcement of anti-trust policy (Furman, Orszag and Stiglitz, 2015^[11]). But it may partly also reflect technology-driven “winner-takes-most” dynamics that allow a small number of firms to gain a large share of the market (Autor et al., 2017^[12]).

10. A third channel through which public policies can affect the labour share is through the sharing of product market rents. In an imperfect competition labour market, workers and capital owners bargain over the distribution of rents formally or informally (Solow, 2015^[13]). Pro-competition product market reform may not only reduce product market rents but also affect the bargaining position of workers. Labour market institutions such as minimum wages or collective bargaining institutions directly influence the distribution of rents between workers and capital owners (Blanchard and Giavazzi, 2003^[14]). In a cross-country panel, (IMF, 2017^[2]) finds no independent effect of changes in union density on

⁴ Berkowitz, Ma and Nishioka (2017^[38]) find some evidence in Chinese micro-data that an increase in market power generates a decline in the labour share.

the labour share once technological change and globalisation are taken into account. By contrast, using a cross-state panel in the United States, Machin (2016^[15]) finds that stagnating real median wage growth is related to declining union coverage.

11. Most public policies affect the labour share simultaneously through several channels. Privatisation of network industries, for instance, typically raises product market competition and thereby reduces the level of rents but may tilt their distribution toward capital if private owners have weaker preferences for employment. Azmat, Manning and van Reenen (2012^[4]) and Bassanini and Manfredi (2012^[5]) find that the downward effect of weaker preferences for employment dominates the effect of lower rents so that, on balance, privatisation reduces the labour share. An increase in minimum wages may induce capital-labour substitution but may also improve the bargaining position of workers. Strict employment protection may strengthen workers' bargaining position, thereby allowing them to appropriate a higher share of product market rents but also inducing capital-labour substitution. Ciminelli, Duval and Furceri (2018^[6]) find that, on balance, deregulating employment protection reduces the labour share. The theoretical effects of public policies on the labour share through the above channels are summarised in Table 1.

Table 1. Theoretical effects of public policies on the labour share

Policies	Effects on the labour share through:		
	Capital-labour substitution	Product market rents	Rent sharing
Competition-friendly product market reform			
Loosening of employment protection			
Decrease in the minimum wage			
Decentralisation of collective bargaining			
Decline in collective bargaining coverage			
Corporate tax increase			
Labour tax reduction			
Increase in active labour market spending			

Note: The theoretical effects of public policies via capital-labour substitution assume an elasticity of substitution above unity. Bold arrows indicate high levels of certainty whereas dashed arrows indicate low levels of certainty.

3. The empirical model

12. The empirical analysis is conducted at the industry-level. Adopting an industry-level approach to the modelling of labour shares is both conceptually and econometrically appealing. From a conceptual standpoint, the fact that changes in aggregate labour shares overwhelmingly reflect developments within industries rather than cross-industry reallocation justifies modelling industry-level labour shares to explain aggregate

developments.⁵ From an econometric standpoint, the industry-level approach has the advantage that country- and industry-specific trends can be controlled for through an appropriate fixed effects structure.

13. The econometric model is estimated over the period 1995-2011 and focuses on medium-term changes in labour shares. For this purpose, the data is split into three periods of approximately 5 years (1995-2000, 2000-05 and 2005-11). The analysis of medium-term changes rather than long-term changes over the entire period permits a more precise estimation of the effects of structural and policy drivers of labour shares while allowing labour shares sufficient time to adjust given that the elasticity of substitution between labour and capital is likely to be higher in the medium term than in the short term.

3.1. The difference-in-differences specification

14. The analysis of the impact of product and labour market policies on labour share developments follows the difference-in-differences approach pioneered by Rajan and Zingales (1998_[16]).⁶ This approach uses within-country labour share differences across industries to econometrically identify the effects of public policy reforms. More specifically, it assumes that the response of labour shares to a given policy reform is greater in industries that are more exposed to this policy reform. This introduces an exogenous source of cross-industry variation in the policy shock which helps identifying the policy effect on labour shares. The advantage of using cross-industry data to identify the effect of public policies is that it allows to control for unobserved country-specific trends, which could bias the results in a simple cross-country setup. The disadvantage is that it does not allow to explain cross-country heterogeneity in labour share developments, as cross-country differences in public policy and institutional developments are captured by the country-period fixed effects.

15. The empirical specification takes the following generic form:

$$\Delta LS_{ijt} = \beta_1 (Exp_j^k \times \Delta Pol_{it}^k) + \beta_2 \Delta P_{ijt}^{Inv} + \beta_3 \Delta T_{ijt} + \beta_4 X_{ijt} + \alpha_{it} + \alpha_{jt} + \varepsilon_{ijt} \quad (1)$$

where subscripts i, j and t denote, respectively, countries, industries and periods; ΔLS_{ijt} denotes the medium-term (5- or 6-year) change in the labour share; Exp_j^k denotes the industry exposure variable relevant for public policy k ; ΔPol_{it}^k denotes the medium-term change in policy k ; ΔP_{ijt}^{Inv} denotes medium-term change in the relative investment price; ΔT_{ijt} denotes medium-term change in participation in global value chains; X_{ijt} denotes

⁵ At the level of industry disaggregation used in this paper, labour share developments within industries explain around 80% of aggregate labour share developments (Schwellnus et al., 2018_[11]). Given that reallocation across industries explains only a small fraction of aggregate labour share developments, weighting industries with shares in aggregate value added in the regression analysis allows making direct statements on aggregate effects.

⁶ In their seminal paper, Rajan and Zingales (1998_[39]) used the difference-in-differences approach with cross-country industry-level data in order to assess the impact of financial development on economic growth. They assumed that the response of industry-level value added growth to financial development is larger in industries that are more dependent on external finance, inferring from the positive estimated coefficient on the interaction term between external financial dependence and financial development that financial development raises economic growth.

control variables that vary at country-industry-period level, including the initial routine task intensity RTI_{ijt}^0 ; α_{it} and α_{jt} denote country-by-period and industry-by-period fixed effects. Given that the model is estimated in differences, the fixed effects pick up country-period and industry-period specific trends.⁷

16. The impact of public policies on labour shares is inferred from the interaction term between industry characteristics and public policy changes ($Exp_j^k \times \Delta Pol_{it}^k$). But the specification of equation (1) does not permit the identification of the average effect of public policies on the labour share across industries, which is captured by the country-by-period fixed effects. However, the difference-in-differences approach allows detecting the existence of an effect. For instance, a larger decline of the labour share in response to an increase in the minimum wage in an industry with a high share of low-wage workers than in an industry with a low share suggests that an increase in the minimum wage has a negative effect on the labour share.

3.2. Industry exposure to policy reforms

17. The next step is to choose exposure variables that are relevant for each public policy under consideration, but that are not affected by changes in policy. Choosing exposure variables that vary only across industries and are defined for a benchmark country and a benchmark period ensures that the estimated coefficients reflect the effects of changes in policies rather than changes in the exposure variable.⁸

18. Pro-competition product market reforms can plausibly be assumed to have a larger impact on the labour share in industries characterised by high rates of firm turnover. Economy-wide product market reforms such as reductions in the administrative burden on start-ups can be expected to primarily affect industries in which competition is structurally feasible. In industries in which there are natural barriers to competition, such as natural monopolies, most economy-wide product market reforms will have little impact on productivity and wages and thus the labour share. In the below empirical analysis, the structural feasibility of competition is proxied by the firm turnover rate.

19. Reforms of employment protection legislation can plausibly be assumed to have larger effects on the labour share in industries with high worker reallocation rates. Reducing the strictness of employment protection legislation reduces labour costs by reducing layoff costs, particularly so in industries that require high flexibility in layoff decisions, implying particularly large capital-labour substitutability in these industries.

20. Changes in active labour market spending can be assumed to have a larger impact on the labour share in industries with high shares of low-skilled workers. Such changes are likely to be concentrated in industries with high shares of low-skilled workers since low-skilled workers are overrepresented in OECD unemployment (Escudero, 2018^[17]; Oesch, 2010^[18]).

21. Changes in the minimum wage and in collective bargaining institutions can plausibly be assumed to have larger effects in industries with high shares of low-wage

⁷ The inclusion of relative investment price and participation in global value chains is motivated by the theoretical model in Schwellnus et al. (2018^[1]) linking the cost of capital, offshoring and the labour share. Based on this model, a decline in the relative investment price reduces the labour share, while a decline in the cost of offshoring has an ambiguous effect.

⁸ See Annex B for further details on the exposure variables.

workers. In these industries, the minimum wage is likely to be binding for a higher proportion of workers so that an increase will raise the average wage in the industry by more than in other industries. Whether this raises or reduces the labour share is an empirical question. In the short term, the increase in wages tends to raise the labour share if the employment response is modest (Card and Krueger, 1994^[19]; Card and Krueger, 2000^[20]; Neumark, Salas and Wascher, 2014^[21]), but in the medium term, which is the focus of the present paper, the increase in wages triggers capital-labour substitution (Lordan and Neumark, 2017^[22]). If the elasticity of substitution between capital and labour is above unity, this may raise labour productivity by more than the initial increase in wages so that the labour share declines. Similarly, collective bargaining institutions typically set wage floors at the national, industry, occupation or firm levels so that an increase in coverage or centralisation typically benefits low-wage workers more than other workers.⁹

22. Changes in corporate and labour taxes directly change the cost of capital relative to labour. The reduction in the cost of capital implied by a reduction in the corporate tax rate can be expected to induce capital-labour substitution and a decline in the labour share. The implied reduction in the relative cost of capital and the associated capital-labour substitution should be larger in industries in which profitability is high. Similarly, the increase in the relative cost of labour implied by an increase in taxes weighing directly on labour – i.e. an increase in the tax wedge – should lead to capital-labour substitution. The implied increase in the relative cost of labour should be larger in labour intensive industries.

4. Data and descriptive analysis

4.1. Data

23. The empirical analysis is conducted on 20 OECD countries over the period 1995–2011 for which the dependent and all explanatory variables can be constructed.¹⁰ The primary, coke and refined petroleum manufacturing, housing and non-market industries are excluded from the analysis since labour shares in these industries are driven by changes in commodity and asset prices or by imputation choices (Schwellnus, Kappeler and Pionnier, 2017^[23]).

24. The industry-level labour shares are constructed from the OECD Annual National Accounts Database complemented with additional data from the archives of the OECD STAN database and the EU-KLEMS database. Labour compensation is the sum of compensation of salaried workers and the imputed compensation of self-employed workers. The imputation is based on the average compensation of salaried workers in the

⁹ If centralisation of collective bargaining has a negative impact on the wages of high-wage workers, as suggested by a number of empirical studies (Dahl, le Maire and Munch, 2013^[5]; Leonardi, Pellizzari and Tabasso, 2015^[6]), the estimated coefficient on the interaction between the share of low-wage workers and collective bargaining decentralisation measures a differential rather than an aggregate effect of collective bargaining decentralisation.

¹⁰ The countries included in the econometric analysis are: Australia, Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Ireland, Italy, Japan, Korea, the Netherlands, Norway, Slovak Republic, Spain, Sweden, the United Kingdom and the United States. Even though industry-level labour shares could be constructed up to 2016 for most countries, some explanatory variables were not available after 2011 at the time of the empirical analysis.

corresponding industry.¹¹ Labour compensation of salaried and self-employed workers is then divided by value added at factor costs to obtain industry-level labour shares. Value added at factor costs is defined as value added at basic prices less taxes net of subsidies on production. Using value added at factor costs in the denominator ensures that labour and capital shares of value added sum to one.

25. Industry-level relative investment price indices are constructed from the OECD Annual National Accounts database with additional data from the EU-KLEMS database and the archives of the OECD STAN database. Price deflators for gross fixed capital formation are divided by value added price deflators in the corresponding industry. The same reference year (2000) is used for all indices.¹²

26. In line with previous studies, industry-level participation in global value chains is constructed as the sum of backward and forward linkages in vertical specialisation of production. Backward linkages measure the offshoring of intermediate inputs used in exports and are defined as foreign value added embodied in exports. Forward linkages measure trading partners' offshoring of intermediate inputs and are defined as domestic value added used as intermediate inputs in trading partners' exports.¹³ For the sample of high-income countries included in this paper, increases in backward and forward linkages are likely to have similar effects on labour shares: offshoring raises specialisation on the most capital-intensive stages of production while trading partners' offshoring raises demand for capital-intensive intermediate goods. The data are sourced from the OECD TiVA database, the OECD Annual Accounts database and EU-KLEMS database.

27. The industry-level routine intensity index is based on the occupation-level routine intensity index of Marcolin, Miroudot and Squicciarini (2016_[24]). The occupation-level routine intensity index provides a measure of the routine content of occupations, based on

¹¹ Depending on data availability, the imputation is based on hourly labour compensation or on per-capita labour compensation of salaried workers. In the case of Belgium, Estonia and Ireland, hourly compensation and hence labour share are available from respectively 1999, 2000 and 1998. This measure is based on the assumption that within industries average wages of salaried workers and self-employed workers are the same. If within industries average wages of self-employed workers are below those of salaried workers, this measure overestimates the labour share (Elsby, Hobijn and Sahin (2013_[3]); DNB (2016_[41]; 2017_[42])). However, basing labour compensation of self-employed workers on their total income ("mixed income" in the national accounts) as suggested by DNB (2016_[41]) risks overestimating the labour share in countries in which a large share of total income of self-employed workers consists of capital income.

¹² Extreme outliers in ICT manufacturing for some countries likely reflect measurement error and are dealt with by using the relative investment price in ICT manufacturing for the United States as an instrumental variable for the relative investment price in ICT manufacturing for all countries. Dropping ICT manufacturing from the regressions neither qualitatively nor quantitatively affects the results reported below. Observations below the first percentile or above the 99th percentile of the distribution of changes in nominal investment prices are dropped.

¹³ Backward and forward linkages are normalised by industry-level value added to account for the overall trade openness of the industry. To avoid spurious correlations with the denominator of the labour share, 5-year changes in global value chain participation are defined as follows: $\Delta GVC P_{ijt} = \Delta \ln \left(\frac{FWP_{ijt} + BWP_{ijt}}{EXGR_{ijt}} \right) \times \frac{EXGR_{ijt_0}}{VA_{ijt_0}}$, where FWP_{ijt} and BWP_{ijt} are forward and backward linkages in country i , industry j and year t ; $EXGR_{ijt_0}$ and VA_{ijt_0} are respectively gross exports and value added; and t_0 is the initial year of each five-period in the empirical analysis.

data from PIAAC. The routine intensity index measures the degree of independence and freedom in planning and organising the tasks to be performed on the job. The occupation-level index is translated into an industry-level index by constructing the weighted average of the occupation-based index by industry, with the occupational weights by industry are obtained from the European Labour Force Survey (1995-2015).¹⁴

28. The policy indicators as well as the exposure variables for the implementation of the difference-in-differences estimator are drawn from a variety of academic and institutional data sources. The industry-level exposure variables are mostly from academic data sources, with the orthogonality of the industry-level exposure variables to public policy settings that is required for the validity of the difference-in-differences estimator being achieved by using industry characteristics in a benchmark country and a benchmark year. The policy indicators are from standard institutional data sources. More details on indicator construction and data sources for the industry-level exposure variables and policy indicators are provided in the Annex B.

4.2. *Descriptive analysis*

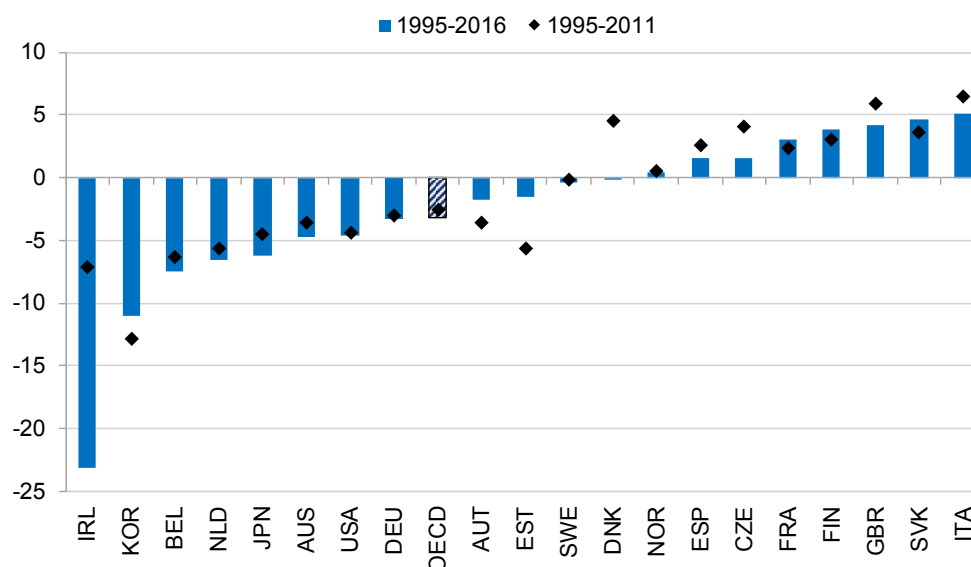
29. While the aggregate OECD labour share has declined over the past two decades, there have been large differences across countries (Figure 1). OECD countries with significant declines in labour shares include Japan and the United States, but in a number of other OECD countries, including France, Italy and the United Kingdom, labour shares have remained broadly constant or have increased.

30. Cross-country differences in labour share developments may partly reflect cross-country differences in workers' skills and differences in firm-level dynamics (Schwellnus et al., 2018^[1]). But there have also been large cross-country differences in public policy and institutional developments, especially regarding reforms of product market regulation, corporate taxes, active labour market spending and the centralisation of collective bargaining, which may have contributed to diverging labour share developments across countries (Figure 2).

¹⁴ For Australia, Japan, Korea and the United States, the simple average of the occupational weights across all European countries is used.

Figure 1. Large cross-country heterogeneity in labour share developments

Percentage point changes, excluding the primary, housing and non-market industries

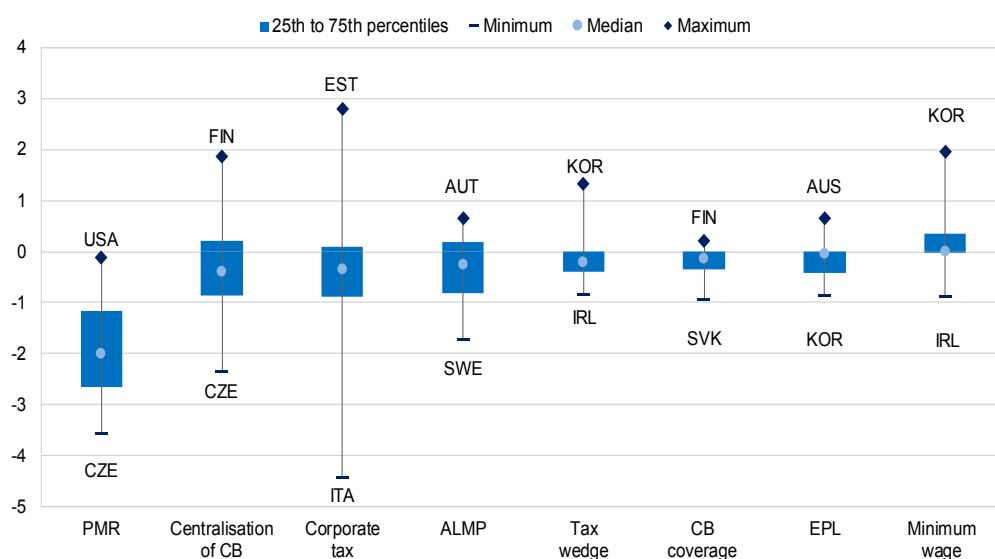


Note: The OECD average is the employment-weighted average of changes in labour shares over the 20 countries covered by the analysis. Start year is two-year average of 1994-1995 for all countries except for Austria, Belgium, Czech Republic, Estonia, Germany, Ireland, Italy, Netherlands, Slovak Republic, Spain and United Kingdom (1995-1996). End year is average of 2010-11 for the short period and average of 2015-16 for the long period except for Japan and Korea (2014-15).

Source: OECD National Accounts Database.

Figure 2. Changes in public policies and institutions, 1995-2016

Normalised by the cross-country standard deviation in the initial year



Note: 1998-2013 for PMR. 1995-2013 for EPL. PMR stands for product market regulation; ALMP for active labour market policies; CB for collective bargaining; and EPL for employment protection legislation. The sample includes the 20 OECD countries covered by this paper.

Source: See Annex B.

5. Empirical results

5.1. Baseline

31. The estimated effects of public policies and institutions are presented in Table 2. The main results can be summarised as follows:¹⁵

- In line with predictions from the theoretical framework developed in Schwellnus et al. (2018^[1]), a decline in the relative investment price and an increase in participation in global value chains reduce the labour share.
- Pro-competition product market reforms raise the labour share (Column 2).¹⁶ The impact of pro-competition product market reforms on the labour share is a priori ambiguous: while reductions in product market rents tend to raise the labour share, reductions in regulatory barriers to investment tend to induce capital-labour substitution. The empirical results suggest that the upward effect on the labour share of pro-competition product market reforms through a reduction in markups appears to outweigh the downward effect through capital-labour substitution. Assuming that the effect of pro-competition product market reforms is negligible in the least exposed industry, the average country-level effect can be approximated as the value-added weighted average in the remaining industries.¹⁷ According to this approximation, lowering the indicator of product market regulation by one standard deviation of the cross-country distribution in 2013 (which corresponds to lowering it from the level in Germany to the level in the United Kingdom) would increase the labour share by around 0.8 percentage point.
- Reducing employment protection for regular workers raises the labour share (Column 3). Employment protection legislation can affect the labour share by influencing the cost of labour relative to capital and by changing workers' bargaining position. Empirically, reducing employment protection appears to affect the labour share primarily through the reduction in the relative price of labour and the consequent substitution of labour for capital rather than the weakening of workers' bargaining position. This is consistent with results in Cetté, Lopez and Mairesse (2016^[25]) suggesting that in OECD economies the strengthening of employment protection results in capital-labour substitution.¹⁸ Using the previous

¹⁵ Results are robust to the exclusion of the benchmark country from the sample, i.e. United Kingdom for regressions including the share of low-wage workers as the industry exposure variable and United States for the other regressions.

¹⁶ Since the indicator of product market regulation is available only for the years 1998, 2003, 2008, 2013, the specifications including this indicator are estimated over the following five-year periods: 1998-2003, 2003-2008 and 2008-2013.

¹⁷ The average country-level effects in this section are computed as follows:

$\beta_1 \sum_j \omega_j (Exp_j^k - Exp_{min}^k) \Delta Pol_t^k$, where subscripts j and k denote, respectively, industries and policies; β_1 is the estimated coefficient on $(Exp_j^k \times \Delta Pol_{it}^k)$ in equation (1); ω_j denotes the cross-country average value added share of industry j over the period 1995-2011; Exp_{min}^k denotes the exposure value of the least exposed industry; ΔPol_t^k denotes the change in policy k .

¹⁸ Ciminelli, Duval and Furceri (2018^[4]) find that loosening employment protection for regular workers reduces the labour share, but their results are not directly comparable with the ones in this paper. First, their indicator of employment protection is based on a “narrative approach” which

approximation suggests that lowering the indicator of employment protection by one standard deviation of the cross-country distribution in 2013 (which corresponds to lowering it from the level in Austria to the level in Australia) would increase the labour share by around 4 percentage points.

- An increase in active labour market spending raises the labour share (Column 4).¹⁹ The results suggest that these policies can be effective in offsetting technology- or globalisation-related capital-labour substitution by preserving workers' labour market attachment and skills. Using the same approximation as above suggests that increasing active labour market spending by one standard deviation of the cross-country distribution in 2016 (which corresponds to raising it from the level in the United States to the level in the Netherlands) would increase the labour share by around 5 percentage points.
- The coverage and centralisation of collective bargaining are not significantly related to labour share developments (Columns 5 and 6). This suggests that capital-labour substitution and changes in rent-sharing in response to changes in collective bargaining coverage and decentralisation broadly offset each other.
- On average, across countries, increases in minimum wages reduce the labour share (Columns 7). Increases in minimum wages may strengthen workers' bargaining position, but over the 5-6 year horizon considered in this paper the upward effect on the labour share through higher wages appears to be more than offset by capital-labour substitution. Using the aforementioned approximation suggests that increasing the minimum wage (relative to the median wage) by one standard deviation of the cross-country distribution in 2016 (which corresponds raising it from the level in Australia to the level in France) would lower the labour share by around 1 percentage point.
- By contrast, the tax wedge (the share of income taxes and social security contributions in total labour costs) and corporate taxes, which both influence the relative price of capital to labour, do not affect the labour share. To some extent, this may reflect measurement error in the exposure variables used for the difference-in-differences identification. For instance, industry-level relative profitability in the benchmark country may be a noisy measure of relative profitability in other countries and may thereby bias the coefficient on the interaction with corporate taxes downwards. The insignificance of the tax wedge may also reflect the fact that in the medium run social security contributions are partly shifted to workers (Bozio, Breda and Grenet, 2017_[26]), which would imply that reducing the tax wedge raises wages net of social security taxes with only little effect on the overall cost of labour.

classifies over 100 legislative and regulatory actions related to employment protection into one of the three following categories: non-reform years, liberalisation reform years and tightening reform years. Second, their estimations do not systematically control for changes in investment prices or trade openness. Third, their empirical analysis is conducted on a slightly broader country and period sample.

¹⁹ The measure of active labour market spending in this paper includes spending on training and employment subsidies. Public spending on public employment services is found to have a statistically insignificant effect on the labour share.

- The results are robust to simultaneously including the policy reform indicators that are interacted with the same exposure variable. The estimated effects of changes in the minimum wage, collective bargaining coverage and its degree of centralisation are identified using the same assumption (larger response of the labour share in low-wage industries). Estimating the effect of policy reforms that are interacted with the same industry-level exposure variable separately rather than simultaneously may therefore lead to omitted variable bias. However, including them simultaneously does not alter the conclusion that higher minimum wages reduce the labour share, with the estimated coefficients remaining fairly stable (Column 10).

Table 2. The effect of public policies on the labour share
Selected OECD countries, 1995-2011

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Dependent variable	Change in business labour share excluding primary, coke and housing industries									
Change in relative investment price	0.23*** (0.06)	0.08* (0.04)	0.24*** (0.06)	0.23*** (0.07)	0.25*** (0.05)	0.24*** (0.06)	0.23*** (0.06)	0.25*** (0.05)	0.27*** (0.05)	0.23*** (0.06)
Change in GVC participation	-0.12** (0.05)	-0.06 (0.05)	-0.12** (0.04)	-0.10** (0.05)	-0.08** (0.03)	-0.12** (0.04)	-0.11** (0.04)	-0.08** (0.04)	-0.11** (0.05)	-0.11** (0.04)
Flexibility and activation										
Change in PMR x Firm turnover		-0.31** (0.13)								
Change in EPL x Worker reallocation			-0.24* (0.13)							
Change in ALMP x Low-skilled workers				1.10* (0.61)						
Collective bargaining										
Change in CB coverage x Low-wage workers					-0.05 (0.04)					-0.08 (0.05)
Change in CB decentralisation x Low-wage workers						-0.23 (0.18)				-0.08 (0.05)
Relative labour cost										
Change in minimum wage x Low-wage workers							-0.08** (0.03)			-0.09** (0.04)
Change in tax wedge x Labour intensity								0.07 (0.07)		
Change in corporate tax x Relative profitability									-0.27 (0.27)	
High routine intensity	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Country x period fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry x period fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Observations	922	900	864	832	861	872	872	861	723	872
Number of countries	20	20	20	20	20	20	20	20	20	20
Number of industries	19	19	18	18	18	18	18	18	16	18
Adjusted R ²	0.32	0.21	0.33	0.32	0.36	0.33	0.34	0.36	0.40	0.34

Note: GVC stands for global value chains; PMR for product market regulation; EPL for employment protection legislation; ALMP for active labour market policies; and CB for collective bargaining. Public policies and institutions denote 5-year differences. Standard errors are clustered at the country level. Weighted OLS, with the share of industry-level value added in total value as weights. *, **, *** denote statistical significance at the 10%, 5% and 1% levels. Column (6) includes an interaction term between low-wage workers and a dummy taking value 1 when a statutory minimum wage is introduced during the sample period.

Source: See Annex B.

5.2. Sensitivity analysis

32. The main concern with the difference-in-differences approach adopted above is that the effects of different policies are analysed one by one. For instance, reforms of employment protection and product market regulation are correlated and may both have larger effects in industries with large firm turnover, which makes it difficult to attribute the estimated effects to one policy or the other. To address this issue, the baseline specification is augmented with the interaction between the preferred exposure variable and another policy.²⁰ This sensitivity analysis is conducted for public policies with statistically significant effects on labour share developments in the baseline specification, i.e. product market regulation, employment protection, spending on active labour market programs and minimum wage.

33. The results on the effects of product market regulation, employment protection, minimum wages and active labour market policies are broadly robust to augmenting the baseline model with the interaction between the preferred exposure variable and another policy (Table 3). For instance, the coefficient on the interaction of firm turnover with changes in product market regulation remains statistically significant and around -0.3 when interactions of firm turnover with changes in other policies are included in the regression model (Column 1). In the case of employment protection and active labour market spending, the estimated coefficient from the baseline model remains fairly stable but loses statistical significance in some specifications.

Table 3. Sensitivity to adding confounding factors

Selected OECD countries, 1995-2011

	(1)	(2)	(3)	(4)
Controlling for:	Change in PMR x EXPO: Firm turnover	Change in EPL x EXPO: Worker reallocation	Change in ALMP x EXPO: Low-skilled workers	Change in minimum wage x EXPO: Low-wage workers
Change in PMR x EXPO	-0.31** (0.13)	-0.25* (0.12)	1.01* (0.52)	-0.08** (0.03)
Change in EPL x EXPO	-0.20* (0.11)	-0.24* (0.13)	1.09* (0.61)	-0.08** (0.04)
Change in ALMP x EXPO	-0.25* (0.12)	-0.22 (0.13)	1.10* (0.61)	-0.08** (0.03)
Change in CB coverage x EXPO	-0.31** (0.13)	-0.24 (0.14)	0.71 (0.51)	-0.09*** (0.03)
Change in CB decentralisation x EXPO	-0.30** (0.13)	-0.26 (0.15)	1.12 (0.65)	-0.08* (0.04)
Change in minimum wage x EXPO	-0.21 (0.15)	-0.18 (0.11)	1.03* (0.51)	-0.08** (0.03)
Change in tax wedge x EXPO	-0.31** (0.12)	-0.23* (0.12)	0.80 (0.49)	-0.08** (0.03)
Change in corporate tax x EXPO	-0.32** (0.12)	-0.28* (0.15)	1.10* (0.53)	-0.06 (0.04)

Note: PMR stands for product market regulation; EPL for employment protection legislation; ALMP for active labour market policies; CB for collective bargaining; and EXPO for exposure variable. The table reports the estimated coefficients on the interaction term in the column heading, with each row reporting the estimate when controlling for the interaction term in the row heading. Coefficients in bold font show the baseline estimates in Table 2 above. Public policies and institutions denote 5-year differences. Standard errors are clustered at the country level. Weighted OLS, with the share of industry-level value added in total value as weights. *, **, *** denote statistical significance at the 10%, 5% and 1% levels.

Source: See Table A.1 to Table A.4 in Annex A.

²⁰ Simultaneously including all interaction terms raises issues of multicollinearity.

6. Conclusion

34. The results in this paper suggest that pro-competition product market policies that limit product market rents do not only raise productivity but also support a broader sharing of productivity gains. *Prima facie* the fact that, over the past two decades, average product market regulation has become more competition friendly in OECD countries appears inconsistent with the decline in the average OECD labour share. However, technological change and globalisation may have more than offset the wider sharing of productivity gains from pro-competition product market reforms, including by reinforcing “winner-take-most” dynamics that may have reduced labour shares in the technologically most advanced firms (Schwellnus et al., 2018^[1]).

35. Promoting re-employment of workers who lose their jobs through active labour market policies can support the sharing of productivity gains. A large body of evidence indicates that technological change, globalisation and financial development raise productivity. However, the empirical results in this paper suggest that these productivity gains are not necessarily transmitted to workers, as capital-labour substitution reduces the labour share. Sharing technology- and globalisation-driven productivity gains requires policies that promote the re-deployment of workers displaced by these developments to better jobs, including well-designed active labour market policies (OECD, 2018^[27]).

36. Labour market policies that strengthen workers' bargaining position through increased minimum wages and stricter employment protection may raise wages but can have unintended side effects on the sharing of productivity gains. On the one hand, the strengthening of workers' bargaining position may raise wages, which tends to raise the labour share. On the other hand, in the medium term, the increase in wages may lead to capital labour substitution. If capital and labour are easily substitutable, the increase in labour productivity afforded by the increase in capital intensity may be larger than the initial increase in wages so that the labour share declines. The empirical results suggest that, on average across countries, in the medium term, the second effect dominates, with the labour share declining in response to increases in minimum wages and tightening of employment protection. However, a lower labour share does not imply that workers are necessarily worse off: wages may increase, disemployment effects may be small (Card and Krueger, 1994^[19]; Card and Krueger, 2000^[20]), and the decline in the labour share may entirely be explained by higher value added as capital intensity increases.

References

- Autor, D. et al. (2017), “Concentrating on the Fall of the Labor Share”, *NBER Working Paper*, No. 23108, National Bureau of Economic Research, Cambridge, MA, <http://dx.doi.org/10.3386/w23108>. [12]
- Azmat, G., A. Manning and J. van Reenen (2012), “Privatization and the Decline of Labour's Share: International Evidence from Network Industries”, *Economica*, Vol. 79/315, pp. 470-492, <http://dx.doi.org/10.1111/j.1468-0335.2011.00906.x>. [4]
- Bakhshi, H., N. Oulton and J. Thompson (2003), “Modelling investment when relative prices are trending: theory and evidence for the United Kingdom”, *Bank of England working papers*, No. 189. [37]
- Barkai, S. (2016), “Declining Labor and Capital Shares”, *New Working Paper Series*, No. 2, Stigler Center for the Study of the Economy and the State, University of Chicago Booth School of Business, <https://research.chicagobooth.edu/-/media/research/stigler/pdfs/workingpapers/257.pdf?la=en&hash=C465705E04AE217819398574706CAA372C2F6BDF>. [9]
- Bartelsman, E., J. Haltiwanger and S. Scarpetta (2009), “Measuring and Analyzing Cross-country Differences in Firm Dynamics”, in Dunne, T., J. Jensen and M. Roberts (eds.), *Producer Dynamics: New Evidence from Micro Data*, University of Chicago Press, <http://www.nber.org/chapters/c0480>. [28]
- Bassanini, A. and A. Garnero (2013), “Dismissal protection and worker flows in OECD countries: Evidence from cross-country/cross-industry data”, *Labour Economics*, Vol. 21, pp. 25-41, <http://dx.doi.org/10.1016/J.LABECO.2012.12.003>. [33]
- Bassanini, A. et al. (2010), “Institutional Determinants of Worker Flows: A Cross-Country/Cross-Industry Approach”, *OECD Social, Employment and Migration Working Papers*, No. 107, OECD Publishing, Paris, <http://dx.doi.org/10.1787/5kmbqvstc09x-en>. [31]
- Bassanini, A. and T. Manfredi (2012), “Capital's Grabbing Hand? A Cross-Country/Cross-Industry Analysis of the Decline of the Labour Share”, *OECD Social, Employment and Migration Working Papers*, No. 133, OECD Publishing, Paris, <http://dx.doi.org/10.1787/5k95zqsf4bxt-en>. [5]
- Berkowitz, D., H. Ma and S. Nishioka (2017), “Markups and Declining Labor Shares: Evidence from China”, https://static1.squarespace.com/static/56eefd22859fd004540849e0/t/59dce958e5dd5b36ffe5c247/1507649882369/LS_Aug21_2017_BMN.pdf. [39]
- Blanchard, O. and F. Giavazzi (2003), “Macroeconomic Effects of Regulation and Deregulation in Goods and Labor Markets”, *The Quarterly Journal of Economics*, Vol. 118/3, pp. 879-907, <http://dx.doi.org/10.1162/00335530360698450>. [14]

- Bozio, A., T. Breda and J. Grenet (2017), “Incidence of Social Security Contributions: Evidence from France”, http://www.parisschoolofeconomics.com/grenet-julien/WP/Bozio_Breda_Grenet_2017b.pdf. [26]
- Bravo-Biosca, A., C. Criscuolo and C. Menon (2013), “What Drives the Dynamics of Business Growth?”, *OECD Science, Technology and Industry Policy Papers*, No. 1, OECD Publishing, Paris, <http://dx.doi.org/10.1787/5k486qtttq46-en>. [29]
- Card, D. and A. Krueger (2000), “Minimum Wages and Employment: A Case Study of the Fast-Food Industry in New Jersey and Pennsylvania: Reply”, *American Economic Review*, Vol. 90/5, pp. 1397-1420, <http://dx.doi.org/10.1257/aer.90.5.1397>. [20]
- Card, D. and A. Krueger (1994), “Minimum Wages and Employment: A Case Study of the Fast-Food Industry in New Jersey and Pennsylvania”, *The American Economic Review*, Vol. 84/4, pp. 772-793, <http://www.jstor.org/stable/2118030>. [19]
- Cette, G., J. Lopez and J. Mairesse (2016), “Labour Market Regulations and Capital Intensity”, *NBER Working Paper*, No. 22603, <http://www.nber.org/papers/w22603>. [25]
- Chirinko, R. (2008), “ σ : The long and short of it”, *Journal of Macroeconomics*, Vol. 30/2, pp. 671-686, <http://dx.doi.org/10.1016/j.jmacro.2007.10.010>. [35]
- Ciminelli, G., R. Duval and D. Furceri (2018), “Employment Protection Deregulation and Labor Shares in Advanced Economies”, *IMF Working Papers*, No. 18/186, <https://www.imf.org/en/Publications/WP/Issues/2018/08/16/Employment-Protection-Deregulation-and-Labor-Shares-in-Advanced-Economies-46074>. [6]
- Dahl, C., D. le Maire and J. Munch (2013), “Wage Dispersion and Decentralization of Wage Bargaining”, *Journal of Labor Economics*, Vol. 31/3, pp. 501-533, <http://dx.doi.org/10.1086/669339>. [7]
- De Loecker, J. and J. Eeckhout (2017), “The Rise of Market Power and the Macroeconomic Implications”, *NBER Working Paper*, No. 23687, National Bureau of Economic Research, Cambridge, MA, <http://dx.doi.org/10.3386/w23687>. [10]
- DNB (2017), *DNBulletin: Alternative definition accentuates international decline in the labour income share*, <https://www.dnb.nl/en/news/news-and-archive/dnbulletin-2017/dnb360688.jsp>. [41]
- DNB (2016), *DNBulletin: Alternative labour income share currently relatively low*, <https://www.dnb.nl/en/news/news-and-archive/dnbulletin-2016/dnb340720.jsp>. [40]
- Elsby, M., B. Hobijn and A. Sahin (2013), “The Decline of the U.S. Labor Share”, *Brookings Papers on Economic Activity*, No. 2013-27, <https://www.brookings.edu/bpea-articles/the-decline-of-the-u-s-labor-share/>. [34]
- Escudero, V. (2018), “Are active labour market policies effective in activating and integrating low-skilled individuals? An international comparison”, *IZA Journal of Labor Policy*, Vol. 7/1, p. 4, <http://dx.doi.org/10.1186/s40173-018-0097-5>. [17]

- Furman, J., P. Orszag and J. Stiglitz (2015), *A Firm-Level Perspective on the Role of Rents in the Rise in Inequality*, <http://gabriel-zucman.eu/files/teaching/FurmanOrszag15.pdf>. [11]
- IMF (2017), “Chapter 3 : Understanding the Downward Trend in Labor Income Shares”, in *World Economic Outlook, April 2017: Gaining Momentum?*, <http://www.imf.org/en/Publications/WEO/Issues/2017/04/04/world-economic-outlook-april-2017>. [2]
- Karabarbounis, L. and B. Neiman (2014), “The Global Decline of the Labor Share”, *The Quarterly Journal of Economics*, Vol. 129/1, pp. 61-103, <http://dx.doi.org/10.1093/qje/qjt032>. [38]
- Leonardi, M., M. Pellizzari and D. Tabasso (2015), “Wage compression within the firm”, *CEPR Discussion Paper Series*, No. 10770, https://cepr.org/active/publications/discussion_papers/dp.php?dpno=10770#. [8]
- Lordan, G. and D. Neumark (2017), “People Versus Machines: The Impact of Minimum Wages on Automatable Jobs”, *NBER Working Paper*, No. 23667, <http://dx.doi.org/10.3386/w23667>. [22]
- Machin, S. (2016), “Rising Wage Inequality, Real Wage Stagnation and Unions”, in Cappellari, L. and K. Polachek, Solomon W. Tatsiramos (eds.), *nequality: Causes and Consequences (Research in Labor Economics, Volume 43)*, Emerald Group Publishing Limited, <http://dx.doi.org/10.1108/S0147-912120160000043017>. [15]
- Marcolin, L., S. Miroudot and M. Squicciarini (2016), “The Routine Content Of Occupations: New Cross-Country Measures Based On PIAAC”, *OECD Trade Policy Papers*, No. 188, OECD Publishing, Paris, <http://dx.doi.org/10.1787/5jm0mq86fljg-en>. [24]
- Neumark, D., J. Salas and W. Wascher (2014), “Revisiting the Minimum Wage-Employment Debate: Throwing Out the Baby with the Bathwater?”, *Industrial & Labor Relations Review*, Vol. 67/Supplement, pp. 608-648, <http://dx.doi.org/10.1177/00197939140670S307>. [21]
- OECD (2018), “Chapter 4. Back to work: Lessons from nine country case studies of policies to assist displaced workers”, in *OECD Employment Outlook 2018*, OECD Publishing, Paris, http://dx.doi.org/10.1787/empl_outlook-2018-8-en. [27]
- OECD (2006), “Part III - Historical Trends, 1979-2004”, in *Taxing Wages 2004*, OECD Publishing, Paris, http://dx.doi.org/10.1787/tax_wages-2004-5-en. [32]
- Oesch, D. (2010), “What explains high unemployment among low-skilled workers? Evidence from 21 OECD countries”, *European Journal of Industrial Relations*, Vol. 16/1, pp. 39-55, <http://dx.doi.org/10.1177/0959680109355307>. [18]
- Rajan, R. and L. Zingales (1998), “Financial Dependence and Growth”, *The American Economic Review*, Vol. 88, pp. 559-586, <http://dx.doi.org/10.2307/116849>. [16]
- Schwellnus, C. and J. Arnold (2008), “Do Corporate Taxes Reduce Productivity and Investment at the Firm Level?: Cross-Country Evidence from the Amadeus Dataset”, *OECD Economics Department Working Papers*, No. 641, OECD Publishing, Paris, <http://dx.doi.org/10.1787/236246774048>. [30]

- Schwellnus, C., A. Kappeler and P. Pionnier (2017), “The Decoupling of Median Wages from Productivity in OECD Countries”, *International Productivity Monitor*, Vol. 32, http://www.csls.ca/ipm/32/Schwellnus_Kappeler_Pionnier.pdf. [23]
- Schwellnus, C. et al. (2018), “Labour share developments over the past two decades: The role of technological progress, globalisation and “winner-takes-most” dynamics”, *OECD Economics Department Working Papers*, No. 1503, OECD Publishing, Paris, <http://dx.doi.org/10.1787/3eb9f9ed-en>. [1]
- Solow, R. (2015), “The Future of Work: Why Wages Aren't Keeping Up”, *Pacific Standard*, <https://psmag.com/economics/the-future-of-work-why-wages-arent-keeping-up>. [13]
- Stockhammer, E. (2017), “Determinants of the Wage Share: A Panel Analysis of Advanced and Developing Economies”, *British Journal of Industrial Relations*, Vol. 55/1, pp. 3-33, <http://dx.doi.org/10.1111/bjir.12165>. [3]
- Tevlin, S. and K. Whelan (2003), “Explaining the Investment Boom of the 1990s”, *Journal of Money, Credit and Banking*, Vol. 35/1, <http://www.jstor.org/stable/3649843>. [36]

Annex A. Sensitivity to inclusion of several policy variables

1. This annex provides the full regression results underlying Table 3.

Table A.1. Additional policy covariates to the specification for PMR

Selected OECD countries, 1995-2011								
Dependent variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Change in business labour share excluding primary, coke and housing industries								
Change in relative investment price	0.08*	0.24***	0.23***	0.25***	0.24***	0.23***	0.25***	0.27***
	(0.04)	(0.06)	(0.07)	(0.05)	(0.06)	(0.06)	(0.05)	(0.05)
Change in GVC participation	-0.06	-0.12**	-0.10**	-0.08**	-0.12**	-0.11**	-0.08**	-0.11**
	(0.05)	(0.04)	(0.05)	(0.03)	(0.04)	(0.04)	(0.04)	(0.05)
Change in PMR x Firm turnover	-0.31**	-0.20*	-0.25*	-0.31**	-0.30**	-0.21	-0.31**	-0.32**
	(0.13)	(0.11)	(0.12)	(0.13)	(0.13)	(0.15)	(0.12)	(0.12)
Change in EPL x Firm turnover		-0.63***						
		(0.15)						
Change in ALMP x Firm turnover			0.11					
			(0.10)					
Change in CB coverage x Firm turnover				-0.00				
				(0.01)				
Change in CB decentralisation x Firm turnover					-0.02			
					(0.04)			
Change in minimum wage x Firm turnover						0.01		
						(0.01)		
Change in tax wedge x Firm turnover							0.00	
							(0.02)	
Change in corporate tax x Firm turnover								0.00
								(0.00)
High routine intensity	YES	YES	YES	YES	YES	YES	YES	YES
Country x period fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Industry x period fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Observations	900	900	900	900	900	900	900	900
Number of countries	20	20	20	20	20	20	20	20
Number of industries	19	19	19	19	19	19	19	19
Adjusted R ²	0.21	0.22	0.21	0.21	0.21	0.21	0.21	0.21

Note: Public policies and institutions denote 5-year differences. Standard errors are clustered at the country level. Weighted OLS, with the share of industry-level value added in total value as weights. *, **, *** denote statistical significance at the 10%, 5% and 1% levels. Column (6) includes an interaction term between low-wage workers and a dummy taking value 1 when a statutory minimum wage is introduced during the sample period. In order to use identical samples in columns (2) to (8), missing values for changes in the associated policies are set to 0 and absorbed in an interaction term between firm turnover and a dummy that takes value 1 if the change in the associated policy is missing.

Source: See Annex B.

Table A.2. Additional policy covariates to the specification for EPL

Selected OECD countries, 1995-2011

Dependent variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Change in business labour share excluding primary, coke and housing industries								
Change in relative investment price	0.24*** (0.06)	0.24*** (0.06)	0.24*** (0.06)	0.24*** (0.06)	0.24*** (0.06)	0.24*** (0.06)	0.24*** (0.06)	0.24*** (0.06)
Change in GVC participation	-0.12** (0.04)	-0.12** (0.04)	-0.11** (0.04)	-0.11** (0.04)	-0.11*** (0.04)	-0.11** (0.04)	-0.12** (0.04)	-0.12** (0.04)
Change in EPL x Worker reallocation	-0.24* (0.13)	-0.25* (0.12)	-0.22 (0.13)	-0.24 (0.14)	-0.26 (0.15)	-0.18 (0.11)	-0.23* (0.12)	-0.28* (0.15)
Change in PMR x Worker reallocation		-0.20 (0.12)						
Change in ALMP x Worker reallocation			0.19 (0.16)					
Change in CB coverage x Worker reallocation				-0.01* (0.01)				
Change in CB decentralisation x Worker reallocation					0.02 (0.04)			
Change in minimum wage x Worker reallocation						-0.02* (0.01)		
Change in tax wedge x Worker reallocation							0.00 (0.01)	
Change in corporate tax x Worker reallocation								0.01 (0.00)
High routine intensity	YES	YES	YES	YES	YES	YES	YES	YES
Country x period fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Industry x period fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Observations	864	864	864	864	864	864	864	864
Number of countries	20	20	20	20	20	20	20	20
Number of industries	18	18	18	18	18	18	18	18
Adjusted R ²	0.33	0.33	0.33	0.33	0.33	0.35	0.33	0.33

Note: Public policies and institutions denote 5-year differences. Standard errors are clustered at the country level. Weighted OLS, with the share of industry-level value added in total value as weights. *, **, *** denote statistical significance at the 10%, 5% and 1% levels. Column (6) includes an interaction term between low-wage workers and a dummy taking value 1 when a statutory minimum wage is introduced during the sample period. In order to use identical samples in columns (2) to (8), missing values for changes in the associated policies are set to 0 and absorbed in an interaction term between worker reallocation and a dummy that takes value 1 if the change in the associated policy is missing.

Source: See Annex B.

Table A.3. Additional policy covariates to the specification for ALMP

Selected OECD countries, 1995-2011

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable	Change in business labour share excluding primary, coke and housing industries							
Change in relative investment price	0.23*** (0.07)	0.23*** (0.07)	0.23*** (0.07)	0.23*** (0.06)	0.23*** (0.07)	0.25*** (0.08)	0.24*** (0.06)	0.23*** (0.07)
Change in GVC participation	-0.10** (0.05)	-0.10** (0.05)	-0.10** (0.05)	-0.10* (0.05)	-0.10* (0.05)	-0.08 (0.05)	-0.10* (0.05)	-0.11** (0.05)
Change in ALMP x Low-skilled workers	1.10* (0.61)	1.01* (0.52)	1.09* (0.61)	0.71 (0.51)	1.12 (0.65)	1.03* (0.51)	0.80 (0.49)	1.10* (0.53)
Change in PMR x Low-skilled workers		0.60 (0.65)						
Change in EPL x Low-skilled workers			-0.01 (0.39)					
Change in CB coverage x Low-skilled workers				-0.02 (0.02)				
Change in CB decentralisation x Low-skilled workers					0.08 (0.22)			
Change in minimum wage x Low-skilled workers						-0.08* (0.04)		
Change in tax wedge x Low-skilled workers							-0.02 (0.02)	
Change in corporate tax x Low-skilled workers								0.03 (0.03)
High routine intensity	YES	YES	YES	YES	YES	YES	YES	YES
Country x period fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Industry x period fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Observations	832	832	832	832	832	832	832	832
Number of countries	20	20	20	20	20	20	20	20
Number of industries	18	18	18	18	18	18	18	18
Adjusted R ²	0.32	0.33	0.32	0.34	0.33	0.35	0.34	0.34

Note: Public policies and institutions denote 5-year differences. Standard errors are clustered at the country level. Weighted OLS, with the share of industry-level value added in total value as weights. *, **, *** denote statistical significance at the 10%, 5% and 1% levels. Column (6) includes an interaction term between low-wage workers and a dummy taking value 1 when a statutory minimum wage is introduced during the sample period. In order to use identical samples in columns (2) to (8), missing values for changes in the associated policies are set to 0 and absorbed in an interaction term between low-skilled workers and a dummy that takes value 1 if the change in the associated policy is missing.

Source: See Annex B.

Table A.4. Additional policy covariates to the specification for minimum wage

Selected OECD countries, 1995-2011								
Dependent variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Change in business labour share excluding primary, coke and housing industries	0.23***	0.23***	0.23***	0.23***	0.23***	0.23***	0.23***	0.23***
Change in relative investment price	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)	(0.06)
Change in GVC participation	-0.11**	-0.11**	-0.11**	-0.11**	-0.10**	-0.11**	-0.11**	-0.11**
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Change in minimum wage x Low-wage workers	-0.08**	-0.08**	-0.08**	-0.08**	-0.09***	-0.08*	-0.08**	-0.06
	(0.03)	(0.03)	(0.04)	(0.03)	(0.03)	(0.04)	(0.03)	(0.04)
Change in PMR x Low-wage workers		-1.87**						
		(0.85)						
Change in EPL x Low-wage workers			-0.82					
			(0.59)					
Change in ALMP x Low-wage workers				1.39				
				(1.16)				
Change in CB coverage x Low-wage workers					-0.06			
					(0.04)			
Change in CB decentralisation x Low-wage workers						-0.16		
						(0.16)		
Change in tax wedge x Low-wage workers							0.05	
							(0.06)	
Change in corporate tax x Low-wage workers								0.02
								(0.03)
High routine intensity	YES	YES	YES	YES	YES	YES	YES	YES
Country x period fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Industry x period fixed effects	YES	YES	YES	YES	YES	YES	YES	YES
Observations	872	872	872	872	872	872	872	872
Number of countries	20	20	20	20	20	20	20	20
Number of industries	18	18	18	18	18	18	18	18
Adjusted R ²	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34

Note: Public policies and institutions denote 5-year differences. Standard errors are clustered at the country level. Weighted OLS, with the share of industry-level value added in total value as weights. *, **, *** denote statistical significance at the 10%, 5% and 1% levels. All columns include an interaction term between low-wage workers and a dummy taking value 1 when a statutory minimum wage is introduced during the sample period. In order to use identical samples in columns (2) to (8), missing values for changes in the associated policies are set to 0 and absorbed in an interaction term between low-wage workers and a dummy that takes value 1 if the change in the associated policy is missing.

Source: See Annex B.

Annex B. Glossary

Active labour market policies

Active labour market policies include public expenditure on training; employment incentives; sheltered and supported employment and rehabilitation; direct job creation; and start-up incentives. Source: OECD Labour Market Programmes Database.

Collective bargaining coverage

Collective bargaining coverage is the ratio of employees covered by collective (wage) bargaining agreements to the number of all wage and salary earners in employment with right to bargaining. Missing annual observations are obtained through linear interpolation. Source: ICTWSS database.

Collective bargaining decentralisation

Collective bargaining decentralisation is measured by an indicator ranging from 1 (wages set by a centralised bargaining process) to 7 (wages set at each individual company). Source: Fraser Institute Economic Freedom of the World Database.

Corporate tax

The corporate tax is defined as the effective marginal corporate tax rate. Source: Oxford Centre for Business Taxation.

Employment protection

Employment protection is measured by the OECD indicator of employment protection legislation for regular contracts. The indicator ranges from 0 (least restrictions) to 6 (most restrictions) and captures protection against individual dismissals measured, among others, through redundancy procedures, mandated pre-notification periods, severance payments and the definition of unfair dismissals. Source: OECD Employment Protection Database.

Firm turnover

Firm turnover is defined as the sum of industry-level entry and exit rates for the United States over the period 1987-1997. The entry rate is defined as the ratio of new firms to the total number of active firms in a given year. The exit rate is defined as the ratio of firms exiting the market in a given year to the total number of active firms in the previous year. Source: Bartelsman, Haltiwanger and Scarpetta (2009^[28]).

Labour intensity

Industry-level labour intensity is defined as the ratio of labour expenditure to capital expenditure for the United States in 2002. Source: Bravo-Biosca, Criscuolo and Menon (2013^[29]).

Labour share

The labour share is defined as the industry-level ratio of total nominal labour compensation over nominal gross value added. Labour compensation is the sum of compensation of salaried workers and the imputed compensation of self-employed workers. The imputation is based on the average hourly or per-capita compensation of salaried workers in the corresponding industry. Value added is expressed at factor costs and does not include net taxes less subsidies on production. Using value added at factor costs in the denominator of

the labour share ensures that labour and capital shares of value added sum to one. Source: Schwellnus et al. (2018_[1]).

Minimum wage ratio

The minimum wage ratio is defined as the ratio of the minimum wage to the median wage of full-time employees. Changes in the minimum wage are set to 0 in countries with no statutory minimum wage. All specifications that include changes in the minimum wage additionally include a dummy variable that takes value 1 when a statutory minimum wage was introduced (United Kingdom in 1999, Ireland in 2000) or data become available during the estimation period (Estonia in 1999). Source: OECD Earnings Database.

Participation in global value chains

Participation in global value chains is defined as the sum of domestic value added embodied in foreign exports and foreign value added embodied in domestic exports (forward plus backward linkages). It is expressed in percent of gross nominal value added. Source: Schwellnus et al. (2018_[1]).

Product market regulation

Product market regulation measures the economy-wide regulatory and market environments. The indicator ranges from 0 (least restrictive) to 6 (most restrictive) and covers the years 1998, 2003, 2008 and 2013. In the regression including this indicator, the five-year periods are defined as follows: 1998-2003, 2003-2008 and 2008-2013. Source: OECD Public Sector, Taxation and Market Regulation Database

Relative investment price

Industry-level relative investment price indices are defined as industry-level price deflators for gross fixed capital formation divided by industry-level value added price deflators. The same reference year (2000) is used for all indices. Source: Schwellnus et al. (2018_[1]).

Relative profitability

Industry-level relative profitability is defined as the ratio of profits to gross value added normalised by the ratio in the median industry for the United States in 1997. Source: Schwellnus and Arnold (2008_[30]).

Routine intensity

Industry-level routine intensity is computed as the employment-weighted sum of high-routine occupations in an industry, with an occupation defined as being high routine if its routine content is above the cross-country 75th percentile. The dummy for high routine intensity is set to 1 when the share of high routine employment in an industry is above the cross-country median. Source: Marcolin, Miroudot and Squicciarini (2016_[24]) and European Labour Force Survey (1995-2015).

Share of low-skilled workers

The share of low-skilled workers at the industry level is defined as the average of share of adults with low literacy skills (under level 2), low numeracy skills (under level 2) and low problem solving skills (under level 3). It is computed as the average over the 20 countries of the sample for the reference year 2012. Data for problem solving exclude France, Italy and Spain since they did not participate in the assessment of problem solving in technology-rich environments. For these countries, the simple average across all countries is used. Source: OECD PIAAC.

Share of low-wage workers

The industry-level share of low-wage workers is defined as the share of wage and salary employees working at least 30 hours per week with gross monthly wages less than two thirds of the median wage of all workers. It is computed for the United Kingdom over the period 1994-1999, i.e. before the introduction of the statutory minimum wage. Source: Bassanini et al. (2010^[31]).

Tax wedge

The average tax wedge is defined as the sum of income tax and employee and employer contributions divided by the total labour cost, for a single person at 100% of average earnings and no child. Source: OECD Taxing Wages Database and OECD (2006^[32]).

Worker reallocation

Worker reallocation is defined as the sum of hiring and separation rates for the United States over the period 2000-2007. The hiring rate is defined as the ratio of workers with less than one year of tenure to the average industry employment in $t-1$ and t . The separation rate is the difference between the hiring rate and rate of change in employment. Source: Bassanini and Garnero (2013^[33]).