Greenwich papers in political economy

The political economy of income distribution: industry level evidence from 14 OECD countries

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Abstract
This article presents an econometric estimation of the determinants of the wage share, using sectoral data for 14 OECD countries for the period 1970- 2014. We present estimations for the wage share of high- and low-skilled workers and within manufacturing and service industries. We augment sectoral data with input-output tables and union density data to obtain detailed estimations of the effect of technological change, globalisation and bargaining power on the wage share.
We find a significant negative effect of globalisation and we discover offshoring to emerging markets to be a robust driver of this process. Technological change had an impact which differs by skill group, but theoretical issues and lack of robustness of the results cast doubt on the hypothesis of skill-biased technological change as a key factor in the overall decline in the wage share. Furthermore, we find a robust effect of institutional factors such as union density and minimum wages on the wage share, lending strong support to the political economy approach to functional income distribution.

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1. Introduction

There has been a significant decline in the share of wages in GDP in both developed and developing countries since the 1980s. This was accompanied by another trend towards greater inequality in personal income distribution, particularly by increases in income shares of the top 1% of the distribution (Atkinson, et al., 2011). These developments indicate a clear reversal of the trends towards relatively egalitarian income distribution during the post-war era. This article presents an econometric analysis of the determinants of the wage share (labour compensation as a ratio to value added) using sectoral data for selected OECD countries.

Previous research has highlighted the impact of technological change, financialisation, globalisation, changes in government policy, and labour market institutions to explain the decline in the wage share (IMF, 2017; EC, 2007; Stockhammer, 2016). Since many of those factors are either determined on a sectoral level or have developed differently across sectors, a sector level analysis has advantages over previous research that uses country-level data. Furthermore, it allows to focus on the decline of the within sector wage share, which was the main driver of the trend of increasing inequality in functional income distribution (IMF, 2017; Karabarbounis & Neiman, 2014).

We compile a comprehensive sector-level dataset for 14 OECD countries (Australia, Austria, Belgium, France, Finland, Germany, Ireland, Italy, Japan, the Netherlands, Spain, Sweden, the UK, the US) for the period of 1970- 2014[1], which allows us to trace the developments of the wage share across high- and low-skilled sectors, between high-, medium-, and low-skilled workers and within manufacturing and service industries. A thorough analysis of the service sectors which are gaining increasing importance is a novelty of this study. The use of additional data sources such as input-output tables and collective bargaining data, which were not fully exploited in the previous research, allows us to obtain detailed estimations of the effect of globalisation, in particular offshoring, and bargaining power on the wage share. Finally, we use a dynamic panel data estimation technique that takes the endogeneity of our core variables into account, and present new insights into the potential bias in the previous research that focuses on technological change as the main driver of the decline in the wage share.

[1] The time period is determined by data availability at a detailed sectoral level.

Our results indicate that the decline in the wage share can be attributed to globalisation and a decline in bargaining power of labour, however, we find that these factors impact skill groups differently. While we also find evidence for a negative impact of technological change, the effect seems to be less significant since the mid-1990s. In contrast, factors accounting for globalisation and bargaining power exhibit a robust impact. Our findings suggest that mainstream models assuming optimising behaviour of firms with full knowledge of their cost and demand functions perform poorly in explaining the trends in the recent decades. These results imply that the increase in income inequality is not an inevitable outcome of technological change but can be altered by collective bargaining institutions and fiscal policies.

The rest of the article is organised as follows. Section 2 provides a review of the theoretical and empirical literature with an aim to pin down the effects of technology, globalisation, and changes in the bargaining power of labour on functional income distribution. Section 3 presents our estimation methodology and specifications. Section 4 introduces our data and stylised facts. Section 5 presents the estimation results and section 6 concludes.

2. Determinants of the wage share: different theories and empirical evidence

The neoclassical approach to the determinants of income distribution, which also forms the basis for the New Keynesian analysis, starts from a production function with capital and labour. In a fully competitive market with optimising firms, factors will be remunerated according to their marginal product. Under these assumptions the labour share can be expressed as a function of the capital-output ratio and capital augmenting technological change. However, if unions bargain over employment as well as wages (i.e. there are imperfections in the labour market), an increase in their bargaining power will increase the wage share for a given capital-output ratio (Bentolila & Saint-Paul, 2003). [2,3]

Recent literature emphasises how technological progress in the last decades was driven by Information and Communication Technology (ICT), that allowed to replace

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[2] The case of imperfections in the product market (e.g. oligopolistic competition) is equivalent, resulting in a negative relation between the degree of concentration and the wage share (Karabarbounis and Neiman 2014).

[3] However, if firms set employment *after* the wage has been decided, bargaining power of workers will not alter the relationship between the wage share and the capital-output ratio. Put differently, while unions might succeed in increasing the real wage, this will induce a substitution of labour by capital and therefore increase the capital-output ratio. This will increase the wage share if the elasticity of substitution between capital and labour is less than one.

workers by machines for tasks that are easily automatized (Goos, et al., 2014) and contributed to a decline in the price of capital relative to labour which led to an increase in the capital-output ratio (Karabarbounis & Neiman, 2014). The neoclassical framework, expects a negative (positive) effect of technological progress or an increase in the capital-output ratio on the wage share if capital acts as a gross substitute (complement) for labour (i.e. if the elasticity of substitution between capital and labour is larger (smaller) than one). It is usually assumed that capital is a substitute for unskilled labour, whereas it complements skilled workers.

The effect of globalisation on income distribution, has also been widely researched, with an increasing focus on offshoring within sectors (Feenstra, et al., 1997; Grossman & Rossi-Hansberg, 2008). Firms in capital abundant countries offshore labour intensive tasks in order to benefit from the lower wages in labour abundant countries (IMF, 2017). This emphasises the need to distinguish between different destinations of offshoring. While this process increases profits, it depends on the elasticity of substitution whether it will translate into an increase of the profit share. Similarly, Feenstra (2007) suggests that wages of high skilled workers will increase while those of low-skilled workers will decline in labour- as well as capital-abundant countries. The impact on the wage share in such a scenario is ambiguous and depends on the relative size of the effects. Focusing on the financial side of globalisation, IMF (2017) argues that larger financial inflows may lower the relative cost of capital with ambiguous effects on the wage share. Importantly for our empirical analysis, the effects of globalisation discussed above are enacted through a change in the price of capital and labour, and should therefore be reflected in the capital-output ratio. Consequently, if globalisation has an impact on the wage share *for a given* capital-output ratio, this effect reflects a change in relative bargaining power of capital vis-à-vis labour. For example, deregulation of trade barriers might increase the mobility of capital by reducing relocation costs and thereby increase the credibility of the firing threat for workers (e.g. Harrison, 2002; Jayadev, 2007). Since increasing trade openness usually benefits the more mobile factor, we expect a negative effect of globalisation on the wage share.

Furthermore, globalisation can put domestic workers in direct competition with foreign workers through an increase in migration. The impact of labour migration on the wage share is theoretically ambiguous. Previous research has shown that migration is positively linked to productivity (Huber, et al., 2010), with the ambiguous effects discussed above. The effects also depend on whether migrants substitute or complement natives. Moreover, if unions and other institutions protecting labour rights are weak, leading to a segmented labour market, lower wages paid to migrants may have a negative impact on the wage share.

The theories in the tradition of political economy[4] have a different approach to the determinants of functional income distribution as they reject the assumption of well-behaved aggregate production functions and marginalist pricing (Lavoie, 2014). Indeed, empirical studies suggest that firms apply a version of cost-plus pricing (Melmiès, 2010). This implies that competition is not perfect and firms have some degree of market power. The most commonly used version is mark-up pricing, where a mark-up is charged on average variable costs such as wages (Kalecki, 1954). The mark-up, in turn, determines the wage share. This approach is consistent with certain insights that emerge from the neoclassical framework. For example, if firms have a certain profit rate target an increase in the capital stock will be associated with a higher mark-up to increase profits and keep the profit rate constant (Lavoie, 2014:162-163). This creates a negative relation between the capital-output ratio and the wage share, irrespective of substitution between capital and labour.

There is a large literature on the determinants of the mark-up in the Political Economy tradition. Kalecki (1954) claims that workers bargaining power and social norms will determine the mark-up. Distributional conflict about income shares will work via increases in prices. In a situation where unions manage to increase nominal wages, firms could increase prices equivalently, thus keeping the wage share constant. In order to avoid this inflationary spiral capital and labour will settle for a mark-up that is deemed acceptable by both parties.

In the political economy framework, technological change, e.g. an increase in labour productivity, will reduce the wage share if wages do not keep up with productivity. This stands in stark contrast to the neoclassical framework where the effects of changes in productivity will depend on the elasticity of substitution. Several contributions have examined how changes in labour productivity are endogenous with respect to the wage share or the real wage (Cassetti, 2003; Bhaduri, 2006; Storm & Naastepad, 2012; Hein, 2014). Finally, in so far as technological change facilitates replacement of workers by machines, this increases the credibility of the firing threat and thereby reduces labour's bargaining power. Therefore, the Political Economy approach also considers a social effect of technological change (Marglin, 1974), but does not necessarily imply a skill bias.

[4] In the following, we refer to the Marxist, Institutionalist and post-Keynesian/Kaleckian analysis as the Political Economy approach because we believe that the core hypotheses of these different schools of thought can be reconciled in the framework presented below.

The effect of globalisation on the wage share is often analysed in the context of fall-back options of capital and labour in the Political Economy literature. In addition to the negative effect of trade liberalisation that was discussed above, recent contributions consider the effect of capital mobility. The deregulation of financial flows has increased the fall-back options of capital which can now be invested in real as well as financial assets internationally (Jayadev, 2007; Stockhammer, 2016).[5]

Consequently, although the New Keynesian and the Political Economy approach to income distribution start from different assumptions, both arrive at a bargaining framework to analyse the distribution of income. Then what is the difference? Theoretically, the assumption of marginalist pricing in the face of imperfect competition on the product market requires that the price elasticity of demand is larger than one (otherwise marginal revenue would be negative and could never equal marginal costs). However, empirical estimates of price elasticities indicate a value much below one (Blinder, et al., 1999). Another difference is that in the Political Economy approach factors such as globalisation cannot be neatly distinguished into their effect on relative prices on the one hand, and bargaining power on the other hand. For example, offshoring could decrease the wage share through an increase in the firing threat that disciplines workers, or because segments of production with a relatively higher wage share are outsourced abroad. While this can appear as a caveat, the Political Economy framework allows to explain the negative effect of globalisation, the capital-output ratio or technological change on the wage share without relying on a certain value of the elasticity of substitution, or the assumption of optimising firms with full knowledge of their continuous and differentiable production and demand functions.[6]

Several empirical papers have confirmed an impact of direct measures of bargaining power, such as strike activity, collective bargaining arrangements and minimum wages on the wage

[5] There are other trends that form part of the phenomenon of financialisation and can negatively affect the wage share, such as increasing household debt or financial payments of non-financial corporations. However, most variables are not available at the sector level and are therefore excluded from the discussion. We found them insignificant in our empirical analysis (results available upon request). See Kohler, Guschanski and Stockhammer (2017) for a detailed analysis of the effect of financialisation on the wage share using aggregate country data.

[6] Recent papers based on firm level data emphasise that the decline of the wage share is driven by a small number of superstar firms (Autor, et al. 2017). Consequently, increased concentration allowed successful firms to reduce their wage share, while the wage share stagnated in the majority of companies. While testing this hypothesis requires the use of firm level data, we can nevertheless account for the factors that enabled superstar firms to reduce the wage share, insofar as they are not particularly related to their size (e.g. network effects or increasing returns to scale).

share (Kristal, 2010; Argitis & Pitelis, 2001; Bentolila & Saint-Paul, 2003; EC, 2007; ILO, 2011). Union density is the most commonly used variable with the best data availability and the most robust positive effect on the wage share in country level estimations (Stockhammer, 2009; Stockhammer, 2016; ILO, 2011). Nevertheless, the actual effect of unions may be underestimated in empirical studies since collective bargaining coverage greatly exceeds union membership in some countries (Visser, 2006). Conversely, Jaumotte and Buitron (2015) have argued that high collective bargaining coverage relative to union density, as in Spain and France, can increase unemployment when wage demands of unions become excessive. However, while evidence for a significant negative effect of union strength on unemployment is weak (OECD, 2006), in analyses of the wage share such a mechanism should be reflected in the capital-output ratio. IMF (2007; 2017), and EC (2007) find no significant effect of union density in most specifications. Welfare state retrenchment is found to be an important determinant of the fall in the wage share (Harrison, 2002; Jayadev, 2007; Onaran, 2009; Stockhammer, 2016). However, the measure used is often aggregate government spending, which does not reflect changes in government composition. Kristal (2010) uses government civilian spending, which nevertheless does not capture the details of spending that is particularly important for the social wage and bargaining power of labour such as in-kind benefits and cash transfers.

Lastly, there is some empirical research on the effects of changes in the wage share on personal inequality (Daudey & Garcia-Penalosa, 2007; Wolff & Zacharias, 2013) but not on the effects of the latter on the wage share. The increase in personal inequality affects the command over resources and power relations (Stiglitz, 2012). Increasing economic and political power in the hands of a small elite allows them what Stiglitz (2012) calls 'regulatory capture' – i.e. to limit redistribution as well as to shape the rules in areas ranging from corporate governance to product and labour market regulation in their interest. Consequently, we would expect a negative effect of personal distribution on the wage share.

Previous research controls for the effect of technological change by the inclusion of the capital-output ratio (or, equivalently, the capital-labour ratio, or relative prices of capital and labour) – capturing the effect of a decline in the relative price of capital – and a measure of capital-augmenting technological change. The two proxies used for capital augmenting technological change are the ICT capital stock and total factor productivity (TFP). Both come with their caveats: ICT capital is part of the general capital stock and therefore captures substitution processes that are not necessarily driven by technological change. TFP is a generic measure that is derived as a residual of a production function model where factors are remunerated according to their marginal product (Timmer, et al., 2007). This seems tautological in a study whose aim is to analyse the determinants of the labour share. Finally, TFP will be biased to the extent that it captures labour- as well as capital augmenting technological change (Bassanini & Manfredi, 2012).

While previous neoclassical/new Keynesian research on OECD countries emphasises technological change as the major explanatory variable for the decline in the wage share, the lack of robustness of the effect appears to be ignored in the evaluation of the results. Theoretically, a negative effect of technological change requires an elasticity of substitution larger than one, which should be reflected in a negative effect of capital intensity and TFP on the wage share. IMF (2007) finds a U-shaped relationship between the ICT intensity and the wage share and no robust effect of the capital-labour ratio, while in EC (2007) ICT capital is statistically insignificant in estimations for the total labour share. Furthermore, Stockhammer (2016) argues that a close examination of the reported findings reveals serious robustness issues regarding the effects of technology. Harrison (2002) finds an elasticity of substitution smaller than one. Doan and Wan (2017) find contradicting results for advanced economies: an elasticity of substitution larger than one based on TFP and an elasticity smaller than one based on the capital-labour ratio. Stockhammer (2009; 2016) does not find a statistically significant coefficient for ICT or the capital-labour ratio that would be robust across different specifications.

Bentolila and Saint-Paul (2003) and Bassanini and Manfredi (2012), are closer to our own approach in that their analysis is based on sectoral data and controls for potential endogeneity between technological change and the wage share. They obtain significant negative effects of the capital-output ratio as well as TFP, implying an elasticity of substitution larger than one. Hutchinson and Persyn (2012) confirm the finding with respect to technology but they do not account for endogeneity. Karabarbounis and Neiman (2014) consistently obtain an elasticity of substitution larger than one. IMF (2017) fail to find a significant effect of the relative price of investment on the wage share for tradable sectors, while there is some evidence for a negative effect in non-tradable sectors with a high initial exposure to routinisation. Elsby, et al. (2013) find no statically significant effect of the relative price of capital on the wage share.

As summarised in Table 1, out of the 13 studies surveyed above, seven found an elasticity of substitution between capital and labour that is smaller or equal to one, implying no significant negative effect of technological change on the wage share.

<Table 1>

Articles presenting the most robust evidence for an elasticity of substitution larger than one use sector level data and follow the model proposed by Bentolila and Saint-Paul (2003), i.e. Hutchinson and Persyn (2012) and Bassanini and Manfredi (2012). This model is derived from a constant elasticity of substitution production function.[7] We argue that the robustness of their results might be driven by the fact that the specification is similar to an accounting identity. Indeed, Felipe and McCombie (2013) have argued that estimations of production functions run the danger of being simple reproductions of accounting identities. To see how this can be applied to models of the wage share (WS), we consider its definition $WS = 1 - r.\left(\frac{K}{Y}\right)$, where (r) is the profit rate, (K) is capital stock and (Y) is output, and take the total derivative with respect to time:

$$\dot{WS} = -(1 - WS).\frac{d}{dt}\ln(r) - (1 - WS).\left[\frac{d}{dt}\ln(K) - \frac{d}{dt}\ln(Y)\right] \quad (1)$$

The estimation equation used by Bassanini and Manfredi (2012),[7] is a discrete time approximation of equation (1), the only difference being that capital-augmenting technological change is replaced by the profit rate. However, the proxy for capital augmenting technological change is TFP, which is itself derived from a production function approach. Indeed, TFP growth can equally be expressed as a weighted average of changes in wages and profits (Felipe & McCombie, 2013). Consequently, TFP should be strongly correlated with the profit rate, which increases the similarity of Bassanini and Manfredi's (2012) estimation equation to an accounting identity. Similar considerations apply to the measurement of capital. Capital stock is measured either as an aggregation of depreciated investments on an initial capital stock value or within a user cost approach. In the EU KLEMS database the former is referred to as capital stock, while the latter is capital services. Most authors prefer to use capital services in their analysis (EC, 2007; Bassanini & Manfredi, 2012). However, the user costs approach is '[…] based on the assumption that marginal costs

[7] For example, the baseline specification of Bassanini and Manfredi (2012) takes the following form:
$\Delta WS_t = \theta.\Delta\ln(TFP_t) + \theta.\Delta\ln\left(\frac{K}{Y}\right)_t + \varepsilon_t$
where t is the time index, *TFP* is total factor productivity, $\left(\frac{K}{Y}\right)$ is the capital to value added ratio and ε is the error term.

reflect marginal productivity' (Koszerek, et al., 2007). Consequently, the robust findings of papers using such a specification may partly be driven by an accounting identity.

Research based on both mainstream and Political Economy approaches find substantial negative effects of globalisation on the wage share, measured by trade openness (imports plus exports as a ratio to GDP), foreign direct investment (FDI) or offshoring, in line with the hypothesis that trade liberalisation increases the fall-back options of capital (Harrison, 2002; EC, 2007; IMF, 2007; Jayadev, 2007; Dünhaupt, 2016; Stockhammer, 2016). Research using sector level data finds negative effects of offshoring in high wage countries, while there are mixed results for FDI (Onaran, 2011; Onaran, 2012; Bassanini & Manfredi, 2012; Lin & Tomaskovic-Devey, 2013). IMF (2017) employ trade intensity as well as forward and backward trade linkages, a measure related to offshoring, and confirm a negative impact on the wage share in sectors producing tradable goods. IMF (2017) does not find a significant effect of financial globalisation in the sector level estimations, although there is evidence for a negative effect in their country-level estimations for advanced economies, while the effect turns positive for emerging markets. Interestingly, IMF (2007), EC (2007) and Bassanini and Manfredi (2012) interpret their findings as consistent with the traditional trade theory. However, as discussed above, it is hard to reconcile this interpretation with the assumption of optimising firms and the fact that the capital-output ratio and capital augmenting technological change is controlled for in their models. The findings in the Political Economy literature (Jayadev, 2007; Harrison, 2002; Onaran, 2009; Stockhammer, 2016) indicate that globalisation has a negative effect on the wage share in the developing as well as developed countries which is in-line with an interpretation based on bargaining power.

Empirically, the majority of studies use aggregate country level panel data, which does not allow to differentiate the results across skill groups and industries. Within the mainstream literature, which holds technological change as the main factor explaining falling wage shares, Bassanini and Manfredi (2012), Karabarbounis and Neiman (2014) and the IMF (2017) use sectoral as well as country panel data; however they barely control for variables which would reflect the bargaining power of labour and labour market institutions, welfare state retrenchment or financialisation. Furthermore, they do not distinguish their offshoring measure by country of origin. Lin and Tomaskovic-Devey (2013), Onaran (2011; 2012) and Guschanski and Onaran (2016) are closest to our analysis, but while these studies focus on single countries, we perform our analysis for a panel of selected OECD countries and are therefore able to account for issues related to endogeneity.

3. Empirical model and methodology

Our aim is to decompose the effect of different determinants of the wage share; therefore, we seek a generic model that is compatible with different theoretical approaches to income distribution. Our baseline specification combines explanatory variables originating from the neoclassical model discussed in Section 2, but is adapted to allow for effects of institutional factors determining bargaining power and globalisation:

$$WS_{c,i,t} = \alpha_{WS} WS_{c,i,t-1} + \alpha_T \ln(TFP)_{c,i,t} + \alpha_{KI} \ln(CAPITAL\ INTENSITY)_{c,i,t} + \alpha_G GROWTH_{c,i,t} + \alpha_{barg} BARGAINING_{c,i,t-1} + \alpha_{glob} GLOBALISATION_{c,i,t-1} + \varepsilon_{c,i,t} \quad (2)$$

where *WS* is the adjusted wage share in sector *i* of country *c*, which is measured as labour compensation as a ratio to value added adjusted for the labour income of the self-employed, imputed based on the assumption that their hourly labour income is equal to the average hourly labour income of the sector.[8] Furthermore, we estimate separate specifications for the share of the labour compensation in sectoral value added for high-, medium- and low-skilled workers defined by their level of education.[9]

TFP denotes the logarithm of total factor productivity and is used as a proxy for capital augmenting technological change (Bentolila & Saint-Paul, 2003; Bassanini & Manfredi, 2012). Consequently, we expect a negative effect on the wage share if the elasticity of substitution between capital and labour is larger than one.

CAPITAL INTENSITY, our main measure of the extent to which labour is substituted by capital, is composed of two variables measured as the logarithm of ICT and non-ICT

[8] Where data from EU KLEMS is not available or where the wage share is constant for several years in a row (indicating lack of data in the national accounts) we extrapolate through splicing. More specifically, we link the wage share from KLEMS with the growth rate of the wage share obtained from the World Input-Output Database (WIOD) and the OECD Structural Analysis database (OECD STAN). Since self-employed are not included in the measure of labour compensation in OECD STAN we impute their wages by applying the same technique as in EU KLEMS. We exclude observations where the number of self-employed suddenly falls to zero, assuming that it must be related to a measurement problem. The three series have correlations of 0.91 and above. We exclude outliers in the wage share by excluding cases where the percentage change in the wage share exceeds 30% in one year. These outliers mostly appear in the UK and Sweden. However, our results are largely robust to the inclusion of outliers.

[9] Low, medium and high skilled refers to workers with primary, secondary and tertiary education, respectively. Their respective wage shares add up to the sectoral wage share. See Table A2 in the appendix for more details on the skill classification.

capital services as a ratio to value added in our baseline specification.[10] Again, we expect a negative effect on the wage share if capital is a gross substitute for labour.

Furthermore, we include *GROWTH*, measured as the logarithmic change in value added, to account for the counter-cyclicality of the wage share (Kalecki, 1954).

We capture the effect of *GLOBALISATION* by narrow offshoring, measured as intra-industry intermediate imports, based on the World Input-Output Database (WIOD), in our baseline specification. Additionally, we differentiate intermediate imports by origin from three country groups defined as 'high-wage' countries (countries as in our panel plus Canada and Denmark)[11], 'Eastern Europe' (EU10 and Russia), and 'rest of the world' (RoW). In alternative specifications discussed below, we also estimate the impact of inward and outward FDI and migration.

$BARGAINING$ is a vector of variables related to industrial relations and labour market institutions including union density at the sector level, country-level minimum wages as a ratio to sectoral average labour compensation per employee, and social government spending at the country level. Data for union density is based on Visser (2015) and only available at an aggregated level of sectoral classification and not available for each year. Therefore, we linearly interpolate the series between available years and extrapolate using the growth rate of data available for the next higher level of aggregation. For example, we extrapolate data for individual manufacturing sectors using the growth rate of the total manufacturing union density or country-level union density when the latter series was not available. Nevertheless, we think our indicative results are important as this paper is the first attempt to analyse the impact of union density on sectoral wage share for a large group of countries. Theoretically, an increase in any of the bargaining measures is expected to have a positive impact on the wage share, given that potential negative effects of an increase in wages on employment should be captured by the capital-output ratio. We also include the female share in hours of employment at the sectoral level, which is expected to have a negative impact on the wage share given the persistence of gender wage gaps, which may reflect lower collective voice of women. Notwithstanding the issues associated with this model as discussed in Section 2, we chose equation (2) as our baseline specification because

[10] Despite theoretical issues raised in section 2, capital 'services' are available for more countries than the capital 'stock' measure and the use of this variable makes our analysis directly comparable to other papers. However, we provide robustness test with capital stock measured as 'stock'.

[11] Australia, Austria, Belgium, Canada, Denmark, France, Finland, Germany, Ireland, Italy, Japan, the Netherlands, Spain, Sweden, the UK, the US.

it facilitates comparability of our analysis with previous studies. Variable definitions and data sources are listed in table A7 in the appendix.

Next we discuss our estimation methodology. Given that technological change is likely to be a function of past or current values of the wage share, we have to take potential endogeneity into account (Acemoglu, 2003; Cassetti, 2003; Bhaduri, 2006; Hein, 2014). Similarly, workplaces where workers have higher bargaining power, as reflected in a higher wage share, might effectively resist offshoring, thereby leading to a negative effect of a higher wage share on offshoring (Barthelemy & Geyer, 2001). The bias arising when ignoring this endogeneity in estimations using the within estimator will be opposite to the direction of the reverse causality (Wooldridge, 2002). We argue that this might be the reason for the finding of high and significant negative effects of technological change on the wage share in previous papers, which do not properly account for endogeneity, e.g. EC (2007) and IMF (2007; 2017). The effect of globalisation might be understated for the same reason. Accounting for simultaneity and reverse causality in a dynamic model requires the use of instrumental variables. We use the General Method of Moments (GMM) estimator introduced by Arellano and Bond (1991) because it provides readily available 'internal' instruments based on lagged values of the explanatory variables.[12]

To arrive at our baseline specification we adopt an estimation strategy that starts with the most general specification and the most robust estimator (one-step difference GMM) and work our way toward the most parsimonious model with the most efficient estimator (two-step difference GMM with standard errors adjusted for heteroscedasticity and Windmeijer (2005) small sample error correction), following Kiviet, et al. (2015). We start with the estimation of a fairly unrestricted Autoregressive Distributed Lag (ARDL) model including the contemporaneous and lagged value of all explanatory variables and the first and second lag of the dependent variable. All estimations include year dummies to account for unobserved shocks and mitigate cross-sectional dependence. We treat all variables as endogenous. Subsequently, we perform a 'testing down' procedure by dropping variables with the lowest t-statistic, until we are left with at least one measure per variable. Thereafter, we test whether some of our variables can be treated as predetermined or exogenous by

[12] As any other estimator, the GMM estimator is based on the assumption that we have no omitted time-varying variable that is correlated with the wage share and any of our covariates. For this reason, it is important to account for a lagged dependent variable as well as to start the estimations based on a fairly general model that allows for several lags of the explanatory variables. Additionally, given that we cannot account for all possible determinants of bargaining power at the same time, the use of the GMM estimator mitigates potential endogeneity of our explanatory variable as long as the correlation between these omitted factors and our explanatory variables is only contemporaneous.

including one-by-one more recent lags of the variable as an additional instrument and testing for its validity by applying the incremental Sargan test. This procedure indicates exogeneity of union density, while the other variables are treated as endogenous. Thereafter, we reduce the number of instruments to see whether our results change. This results in four instruments per variable for estimations going back to the 1970s and three instruments per variable otherwise (starting from the second lag for the endogenous variables). Only then do we move to the two-step approach to estimate the weighting matrix for the instruments used in our model.[13] Furthermore, we provide estimations using the within-estimator for selected specifications for comparison.

4. Data and stylised facts

We compile a comprehensive database for 14 high-wage OECD economies drawing on seven publicly available international databases for sectoral data which we augment by country level data. Due to the impact of the Great Recession on industrial relations and wage determination as well as a break in the dataset, we estimate our specifications for two separate time periods of 1970 – 2007 and 2008 – 2014.[14] For example, unions might be focused on maintaining employment during a recession and even coordinate wage cuts. Furthermore, TFP usually shows massive declines in a recession which have little to do with 'negative technology shocks' but are simply an effect of the lack of aggregate demand. Estimation period for specifications with offshoring start in 1995 due to data availability.

While the observed decline in the aggregate country-level labour share is a well-documented fact, there is only limited analysis at the sectoral level. We find that the trend observed in the aggregate country level wage share is mirrored at the sectoral level, albeit

[13] Lastly, we include additional moment conditions that can be applied to the model estimated in level instead of differences. Most studies that apply the system GMM estimator do not report the value of the Incremental Sargan test for the estimations in level, claiming the validity of the instruments based on the value of the overall Hansen test. This seems unfortunate, given the strong assumption (referred to as the stationarity condition) underlying the validity for the instruments in level.

[14] While previous releases of the EU KLEMS database could be made compatible by the use of concordance tables, this is not possible with the December 2016 release due to changes in variable definitions. The data split also allows us to use our variables at the most disaggregated industry level. We exclude the following sectors from the estimations: Agriculture, Hunting, Forestry and Fishing, Mining and Quarrying and Coke and Refined Petroleum sectors as well as mostly publicly owned sectors (Public Administration and Defence; Compulsory Social Security; Education; Human Health and Social Work Activities). This is because the wage setting behaviour in these industries may not be determined by the same forces as other sectors. For example, publicly owned not-for-profit companies will typically have a wage share of 100%, while value added in Agriculture and Mining will fluctuate enormously with changes in commodity prices. Furthermore, we exclude the real estate sector whose value added largely constitutes imputed rents (Timmer, et al., 2007). Table A1 in the appendix contains a detailed sector overview.

with differences between manufacturing and services sectors as well as high (HS) and low skilled (LS) sector groups as can be seen in Figure 1 below for selected countries.

<Figure 1>

The wage share in France exhibits a strong skill bias. However, although there is a clear decline in the wage share of low skilled service and manufacturing sectors, high skilled services have lost out in comparison to their own position in the 1980s as well. In fact, the only sector group characterised by a slightly increasing wage share is high skilled manufacturing.

In Germany, the wage share appears to be quite stable until the early 2000s, which marks the implementation of the Hartz reforms – one of the most drastic labour market policy packages to be implemented in Germany. Thereafter all sector groups except high skilled services exhibit a strong decline in the wage share. The wage share in the high skilled manufacturing industries declined by more than 19 percentage-points between 1993 and 2008, the strongest reduction in all sector groups.

The UK presents a diverse picture. While low skilled services experienced a steady reduction in the wage share since the mid-1990s until 2007, low skilled manufacturing sectors have increased their wage share in the same period, although they still lost out compared to the early 1980s. In the high skilled sectors the wage share appears to be highly volatile, but the wage share in high-skilled service sectors in 2014 is still 6 percentage-points lower than its value of 74 percent in the mid-1980s, and the wage share in high skilled manufacturing in 2014 is 10 percentage-points lower than its peak in 1981 at 72 percent.

The USA and Sweden experienced a steady decline in high and low skilled manufacturing as well as low skilled service wage shares, while high skilled service wage shares appear to be relatively stable – a sector dominated by high wages in the financial sector.

In Italy, all sector groups experienced a steady decline since the early 1980s, a trend which has been slightly reversed in the early 2000s. Nevertheless, the aggregate wage share has stagnated, pointing towards a decline of the wage share in public sectors.

In Spain wage shares follow a U-shaped pattern until the mid-1990s, after which the manufacturing sectors start declining, while high-skilled services remain constant until the Great Recession. One exception is low skilled service industries which experienced a decline through the whole period by 26 percentage-points between 1970 and 2010.

Summing up, despite the diversity of wage share dynamics across countries and sectors, there are only very few sectors which seem to be exempt from the declining trend. 74 percent of all sectors experienced a decline in the wage share between 1980 and 2007, and 64percent experienced a decline that is larger than 3%-points. The wage share declined most strongly and consistently across countries in service sectors like Post and Telecommunications, Electricity, Gas and Water Supply, and Retail Trade, as well as manufacturing sectors like Basic Metals and Fabricated Metal and Paper, Printing and Publishing. Most of these sectors (except Retail Trade and Basic Metals) are classified as high-skilled, the opposite from what we would expect according to the hypothesis of skill-biased technological change. Furthermore, Post and Telecommunications as well as Utilities experienced large-scale privatisations in many countries (Bassanini & Manfredi, 2012). This confirms previous findings that attribute the decline of the country-level wage share to a decline of the wage share within sectors (IMF, 2017; Karabarbounis & Neiman, 2014).

When looking at the wage share of high-, medium- and low-skilled workers (as defined by their level of education) in value added of the sector, we can see a stronger skill bias.

<Figure 2>

The share of high skilled workers' wage bill in total value added increased in some countries; however, the picture is dominated by declining wage shares of both medium and low skilled workers. Importantly, a decline in the wage ratio of workers as defined by their level of education captures losing out with respect to capital, workers of another skill group, as well as a change in the educational composition of the workforce. Therefore, we control for changes in the supply of skilled workers in our empirical analysis. Additionally, given that our data for this series is limited to the period between 1995 and 2009, we are unable to compare with the pre-1980s. Nevertheless, using this data to distinguish different effects across skill-groups in addition to estimations for sector groups is imperative, because data by skill group does not require the restrictive assumption that the wage share in the low-skilled sectors reflects predominantly the share of low-skilled workers in those sectors.

Variables accounting for globalisation show similar patterns across all countries. Offshoring increased in all countries in both high and low skilled manufacturing sectors. While offshoring to Eastern Europe and the rest of the world increased most significantly, the majority of offshoring is still among the 'high-wage' countries. The years of the Great

Recession and shortly afterwards are the only exception to the otherwise increasing trend, which resumed in 2010 in all countries. The highest growth rates were experienced in the 1990s in Sweden and Germany, driven by high skilled manufacturing sectors which generally have a higher share of intermediate imports than low skilled manufacturing sectors.

<Figure 3 >

We observe a steady increase in the share of ICT capital across all sectors and countries. Union density declined in all sector groups in France, Germany, the UK, the USA and Austria, while the decline is more moderate, albeit still visible, in Italy and Sweden. Union density followed an inverted U-shape pattern in Spain between 1980 and 2010, however not exceeding the comparatively low level of 20 percent at the aggregate level. In most countries union density began to decrease in the 1980s, with the exception of Austria, France and the USA where it has been declining since the 1970s. Union density is highest in manufacturing sectors and lowest in low skilled service sectors. However, the latter group is also characterised by the smallest reduction in union density. Union density measured at the country level declined most strongly in Austria where we observe a reduction by 34 percentage-points between 1970 and 2014, followed by the UK and Germany where the reduction constitutes 24 and 20 percentage-points respectively.

5. Estimation Results

Table 2 reports estimation results for our baseline model (equation 2) and several robustness tests.[15] Specification (1) in Table 2 is estimated for the time period 1973-2007,[16] excluding offshoring. All variables have the expected signs. We can test our hypothesis that this specification runs the danger of capturing an accounting identity, as would be suggested by equation (1), by comparing the coefficient in front of TFP and capital intensity with the average profit share in our sample. At the same time, we must keep in mind that we are instrumenting the variables with their past values, which might reduce the similarity of our

[15] We have also estimated a specification with only TFP and capital intensity, thereby effectively reproducing results from Bassanini and Manfredi (2012) for the period from 1970 to 2007. The long-run coefficients of TFP and ICT capital intensity have the expected values and are significant, while non-ICT capital is statistically insignificant. However, there are potential issues with the validity of instruments in this specification, as suggested by low values of the Hansen test.

[16] Estimations start in 1973 (1997) rather than 1970 (1995) due to the inclusion of lagged values and the necessity to use instruments.

estimation to an accounting identity. Indeed, reducing the number of instruments step-by-step (and thereby approaching the accounting identity) appears to reduce the coefficients for non-ICT capital and TFP until they approach a value around 0.3 which is very similar to the average profit share of 0.31 in the sample.

<Table 2>

Given that several of our variables of interest, specifically offshoring, are available only from 1995 onwards, we split our sample, estimating two separate regressions for the periods 1973-1996 and 1997-2007. Our results in specification (2) for the period 1997-1996 are robust compared to specification (1). However, results for the period 1997-2007 in specification (3) paint a very different picture: all variables turn insignificant, with the exception of growth.[17] Including aggregate offshoring in specification (4) does not change much, and offshoring itself is statistically insignificant. However, this result conceals the different impact of offshoring by origin as can be seen in specification (5). Offshoring to emerging markets, growth and union density are statistically significant with the expected sign.

After 1997 variables accounting for technological change appear to have only minor relevance as indicated by the statistical insignificance of the coefficients; in contrast union density remains statistically significant. There are several potential reasons that might explain this lack of robustness. From a neoclassical perspective, the elasticity of substitution between capital and labour might change due to automatization of routine tasks or an increasing level of education among the workforce, pushing the two factors of production more in the direction of complements than substitutes. Another reason might be an increase in uncertainty, which hinders firms to accurately maximise their profits. From a political economy perspective, financialisation, through its impact on firms' objectives, might have decoupled wage negotiations and employment decisions from real production processes and made them more dependent on share price performance. Most certainly, as indicated by the high significance of offshoring, globalisation, demand conditions abroad and foreign competition have played a strong role. We find a negative coefficient of offshoring to the rest of the world, which mainly consist of emerging and developing countries. Given that negative effects of globalisation resulting from changes in factor demand should be captured

[17] Excluding growth and union density and performing a general to specific approach shows insignificant coefficients for all but the lagged dependent variable and a worrisome low value of the Hansen test (see Table A3, specification (3) in the appendix).

by the capital-output ratio, this result is in line with our predictions based on the impact of globalisation on bargaining power. Finally, union density appears to have a robust positive impact on the wage share.

Next, we extend our analysis to the post-2007 period in specifications (6-7). Interestingly, while growth stays significant with the expected sign, we cannot confirm a robust effect of any of the other variables. Indeed, only non-ICT capital intensity appears to be significant and robust in specification (7), and offshoring to high wage countries has a significant and positive effect, which is different from the pre-crisis period. Allowing for different lag structures of the variables or including interaction terms yields similar results with growth, and less often, non-ICT capital, being the only significant variables. Furthermore, union density is not statistically significant anymore. This provides clear indication for the hypothesis that the Great Recession strongly disturbed underlying economic relationships.

Table (3) reports estimations by different sector- and skill groups as well as further robustness tests.

<Table 3>

Specifications (1-3) in Table 3 report our baseline for high-, medium- and low-skilled workers' labour compensation in sectoral value added. We also include the share of the labour force that has attained the level of education defined by the skill group as an explanatory variable in order to account for shifts in labour supply. The results regarding the effects of technological change are in contrast to the expectations from a neoclassical perspective. First, we find statistically significant negative effects of TFP and capital intensity only for medium skilled workers. Interestingly, estimations for manufacturing and service sectors separately (specifications 4 and 7 in Table 3), reveal that these results are mainly driven by service sectors, especially those classified as high-skilled (specification 11, Table A4 in the appendix), although there is also evidence for an effect in low-skilled manufacturing sectors (specification 4, Table A4). While the impact in service sectors might seem surprising at a first glance, some of these sectors had a high potential for automatization in the mid-1990s (IMF, 2017). Low-skilled workers, supposedly those with the highest substitutability by capital, are least affected by TFP, which, while being insignificant, even has a positive sign in specification 3 (in Table 3). This result is confirmed in estimations for service sectors classified as high-skilled and manufacturing sectors classified as low-skilled (see specification (5) and (12) in Table A4 in the appendix). It is indeed medium-skilled workers in high-skilled service sectors that drive the negative impact of TFP on the wage share (see Table A4 specification 8 and 11).

While the negative impact of technological change on medium skilled workers can be explained by the process of automatization of routine tasks, the lack of a significant effect on low-skilled workers is puzzling. These results are less surprising from a Political Economy perspective, where substitutability is assumed to be small and distribution largely depends on bargaining power. Our findings suggest that medium-skilled workers, whose labour productivity might have increased even faster than those of low-skilled workers, have not benefitted as much as capital from the technological advancements. Furthermore, if we do not control for endogeneity there is some evidence of a negative effect of TFP on the total wage share and of non-ICT capital on the low skilled workers (see specifications (1-2) in Table A3 in the appendix, where the within-estimator instead of the GMM estimator is used. This bias resulting from reverse causality might be another explanation for the supposedly strong evidence for an effect of technological change, especially on low-skilled workers, obtained in previous studies (EC, 2007; IMF, 2007).

While the negative effect of offshoring to the RoW is significant only for high-skilled workers, it is always negative, suggesting that offshoring harmed workers of all skill groups. While the effect on low-skilled workers is consistent with the assumption that segments employing low-skilled labour will suffer most strongly from offshoring practices, the coefficient is borderline insignificant. The negative effect on high-skilled workers is a novel finding. Furthermore, there appears to be a negative impact of offshoring to high-wage countries on high-skilled worker's wage share combined with a positive effect of offshoring to Eastern Europe. We interpret this as the effect of Multinational Corporations that are increasingly operating in several of the high-wage countries simultaneously, thereby increasing their profits while not sharing with labour. Disaggregation by sector type reveals that the negative effect is mainly driven by manufacturing sectors, and by high- and low-skilled workers alike, although the coefficient for low-skilled workers is statistically insignificant (Table A4 in the appendix). To shed further light on the effect of offshoring to Eastern Europe, which has been found to have a negative effect in previous research, we apply an interaction term for Austria, Germany, France and Finland, who have strong offshore ties with this region (Onaran, 2012). We confirm a negative impact of offshoring to Eastern Europe on the wage share in manufacturing sectors for these countries, which is driven by medium-skilled workers in specification (5-6), whereas the coefficient for other countries is insignificant.[18] We also added imports of final and capital goods as well as exports in the baseline specification, and estimated additional specifications with foreign direct investment (outward and inwards, based on the OECD STAN database) instead of offshoring as an alternative measure of globalisation, but we did not obtain any significant effects.

The positive effect of union density appears to be driven by low skilled workers in manufacturing sectors (specification 3-5 in Table 3). Furthermore, it appears to have a negative impact on the wage share of high-skilled workers (specification 1, Table 3). This is consistent with the finding of Jaumotte and Buitron (2015), who find that union density reduces wage dispersion – for example by limiting excessive wages of managers.

We estimate our long-sample baseline specification for the period of 1973-2007 with an alternative dependent variable, the wage share of the bottom 99% of the workers, which is obtained by subtracting the share of the wage income of the top 1% of the wage earners (specification 8, Table 3). Thereby, we seek to subtract the wage share of managers, whose income share is arguable not influenced by the same determinants as the rest of the workers. Since wage income of the top 1% is only available at the country level, we assume that an equal percentage share of each sectors' wage share accrues to top income earners. The country pool includes only Australia, France, Italy, Spain, and the USA due to data availability (Alvaredo, et al., 2015). We confirm the results of specification (1) Table 2 as can be seen in specification (8) Table 3.[19]

Finally, we test the robustness of our results to the use of capital stock, rather than capital services in specification (9) Table 3. As mentioned previously we are concerned about the use of capital services in our model because of its measurement. The use of capital stock slightly reduces our sample due to data availability, so that we start in 1980 (rather than 1970) and Belgium and Ireland are excluded. Results indicate that TFP, non-ICT capital, growth and union density are robust to the different measure of capital. However, ICT capital

[18] We have also experimented with alternative specifications where offshoring to Southern European countries was, first, calculated as a separate category, and second, included into offshoring to Eastern Europe and the Russian Federation. However, this did not change the sign of offshoring to other high-wage OECD countries.

[19] To test whether the results of our baseline specification (specification 5, Table 2) are driven by insignificant variables, we continue with the general to specific procedure until only significant variables are left. The result is an estimation equation where only growth and union density are left, which confirms the robustness of our measure of direct bargaining power, while it casts some doubt on the robustness of offshoring. We also experimented with the system GMM estimator. We obtain a very low Hansen test which is driven by the instruments from the level equation, as can be deducted from the incremental Sargan test on this group of instruments. This speaks against the validity of the 'stationarity assumption' and thereby renders this estimation method unreliable. Put differently, it confirms our choice of difference GMM as the main estimation method. Results are reported in specification (8) and (9) of Table A3 in the appendix.

has a positive and significant coefficient in contradiction to the neoclassical hypothesis. This casts further doubt on the reliability of the explanatory power of technological change for the decline in the wage share.

We proceed by testing the impact of additional factors that were discussed in Section 2. Table 4 reports the results.

<Table 4>

Specification (1) in Table 4 applies an interaction term for union density (union density_int) which takes the value 1 for countries where wage bargaining takes place at the industry or national level: Austria, Belgium, Finland, Germany, Ireland, Italy, Japan, the Netherlands, Spain, and Sweden (i.e. excluding France, UK, USA and Australia; see Visser, 2015). The strong positive coefficient on the interacted variable suggest that high union density is more effective in increasing the wage share in countries with more coordinated bargaining regimes. Indeed, the effect for countries with mainly firm level bargaining is insignificant.

Specification (2) in Table 4 includes the female share in employment as an additional explanatory variable for the period of 1970-2007. We find a negative effect on the wage share, which is driven by low-skilled workers in manufacturing industries. Estimations for the period of 1997-2007 are robust with respect to the effect of female share in employment but render offshoring insignificant. [20]

Specification (3) in Table 4 controls for the share of in-kind social government spending and cash transfers in total government spending. Applying interaction terms, we find that this measure is specifically important for countries with a relatively low level of collective bargaining coverage, classified as having an average collective bargaining coverage below 50%, such as Japan, Ireland, the UK and the US. While the effect is insignificant for other countries, this result should be seen as indicative given that the variable is measured at the country level. However, it suggests that in countries where successful wage negotiations are not shared with the wider labour force because of a low level of collective coverage, increasing the fall-back options of labour by increasing social government spending might be a viable strategy to raise the wage share.

Specification (4) includes national minimum wages as a ratio to sectoral average wages for a pool of nine countries that had introduced minimum wages by 2007 (Australia,

[20] Estimations for other skill-groups did not yield statistically significant results. Results are reported in Table A5 in the appendix.

Belgium, France, Ireland, Japan, the Netherlands, Spain, the UK and the US). Evidence suggests a strong positive impact of higher minimum wages on the wage share. This result is also confirmed for the longer period of 1970- 2007. It is worth noting that minimum wages appear to be relevant for workers of all skill groups and across service and manufacturing sectors alike. Interestingly, union density turns insignificant, while still maintaining its positive coefficient.

Specification (5) to (8) tests the effect of migration, defined as the share of foreign-born employees in total labour force and measured at the country level, on the wage share. Theory suggests that the effect should be strongest for low-skilled workers who will suffer the most from wage competition by foreign employees. However, while the coefficient is negative, we obtain no statistically significant effect for either the total wage share or workers of different skill levels. This suggests that migration does not exercise a negative effect on the wage share, once globalisation and bargaining power is controlled for. Indeed, offshoring to low wage countries remains statistically significant with a negative sign in specification (5), indicating that capital mobility, rather than labour mobility has a negative impact on the wage share. Interestingly, offshoring to Eastern Europe appears to have a positive impact in this specification. However, the results should be taken as indicative, as the migration variable is not at the sector level. Further research using household labour force survey data is required for more conclusive evidence.

Specification (9) controls for excess bargaining coverage, i.e. bargaining coverage as a ratio to union density at the sector level. We find a positive significant effect of this variable. The other variables, including union density, remain significant as well, suggesting an additional positive impact of bargaining coverage relative to union density on the wage share. This finding is in contrast to Jaumotte and Buitron (2015) as discussed above. However, excess bargaining coverage turns insignificant in the period 1973-2007 (see Table A5 in the appendix). Similarly, estimations with bargaining coverage alone (i.e. not as a ratio to union density) did not yield significant results, possibly because this variable is only available at the country level.

Finally, specification (10) includes the Gini coefficient after taxes and transfers. The negative coefficient provides evidence to the hypothesis that personal income inequality, may lead to political capture and create an institutional environment conducive to policy changes at the expense of labour's bargaining power and income.

We have tested a set of other hypotheses outlined in Section 2 which are reported in Tables A5- A6 in the appendix. This include different measures of financialisation, such as financial income and payments, and financial flows other than FDI flows. While we do confirm a negative effect of non-FDI flows on the wage share in specification (9) in Table A5, in line with Stockhammer (2016), the Hansen-test is not passed so this result can only be regarded as indicative. Other variables did not have a robust impact on the wage share in our specifications, which can be related to the fact that they are measured at the country level. We also did not find statistically significant effects of employment protection legislation, based on estimations with the Labour Regulation Index Dataset (Adams, et al., 2016), which provides data on labour laws using a novel 'leximetric' method (specification 1 in Table A6).

Finally, we report the economic significance of our estimations based on specification (5) Table 2, by multiplying the average change (across all sectors included in the estimation) of our explanatory variables by their respective coefficients. We include statistically significant as well as insignificant variables, as we consider this calculation as an addition to the statistical hypothesis test. Results are presented in Table 5.

<Table 5>

Offshoring to emerging markets emerges as the single most important variable, accounting for 44% of the decline in the wage share between 1997 and 2007. However, given the positive impact of offshoring to Eastern Europe in this specification, the overall impact of offshoring in total is 26%.[21] TFP had a considerable impact, accounting for up to 43% of the decline in the wage share, while union density accounts for 23%. Summing up, our results suggest that, if one is willing to accept TFP as an adequate measure of technological change, all three factors (technological change, globalisation and institutional changes) had a strong impact on the wage share. However, changes in bargaining power driven by union density and offshoring together had a larger impact on the wage share from 1997 to 2007 than technological change.

6. Conclusion

Our findings lend strong support to the Political Economy approach to functional income distribution. We confirm a significant negative effect of globalisation; the increase in fall-back options of capital in the form of offshoring, rather than migration, is the most important driver of this process. Technological change, as measured by total factor productivity and

[21] Nevertheless, we need to keep in mind that offshoring to Eastern Europe has proven to have a strong negative effect on continental European countries (specification 5, Table 3).

capital intensity, has a negative effect on medium skilled workers. While this finding is in line with the process of automatization of routine tasks, it cannot serve to explain the strong decline in low-skilled workers wage shares. Furthermore, our findings, as well as findings of existing studies with respect to technological change, might be overstated due to a strong similarity of our estimation equation to an accounting identity and the assumptions about income distribution that are inherent in the measure of TFP and capital services. Finally, the model applied in many mainstream studies shows clear issues of robustness across different time periods. Our finding should be interpreted as an indication that overly technical approaches to income distribution are too simplistic, and that institutional and social factors should be given more attention. Research in Political Economy has long emphasised that technology must be interpreted as a factor influencing bargaining positions rather than a mechanical process determining distribution outcomes. Our findings suggest that workers have not benefitted as much as capital from the technological advancements in the production process due to the decline in workers' bargaining power. This decline is related to a strong deterioration in union density and minimum wages, welfare state retrenchment, and the overall rise in inequality according to our findings. The increase in female employment in the absence of strong collective representation of women and enforcement of equal pay legislation also contributes to the fall in the wage share.

Other institutional factors and processes such as financialisation have received some attention in the recent literature on the wage share (Stockhammer, 2016). Unfortunately, we were not able to obtain measures at a sectoral level, and country level measures of financialisation were not significant in explaining sectoral trends. However, firm level data might be a viable alternative and a promising direction for further research on the impact of financialisation.

Our findings have important policy implications. Rising inequality is not an inevitable outcome of technological change. Tackling income inequality requires a restructuring of the institutional framework in which bargaining takes place and a level playing field where the bargaining power of labour is more in balance with that of capital. The impact of globalisation is likely to be significantly moderated and/or offset by stronger bargaining power of labour via an improvement in union legislation, increasing minimum wages, improving and enforcing equal pay legislation, increasing the social wage via public goods and social security and international labour standards embedded in a broader strategy of global cooperation for high road labour market policies and macroeconomic policy coordination. Furthermore, our results suggest that a simple attempt to reduce income inequality through skill-upgrading will not work as medium-skilled workers have experienced the strongest negative impact of technological change among all workers, although low-skilled workers experienced the strongest decline in the wage share.

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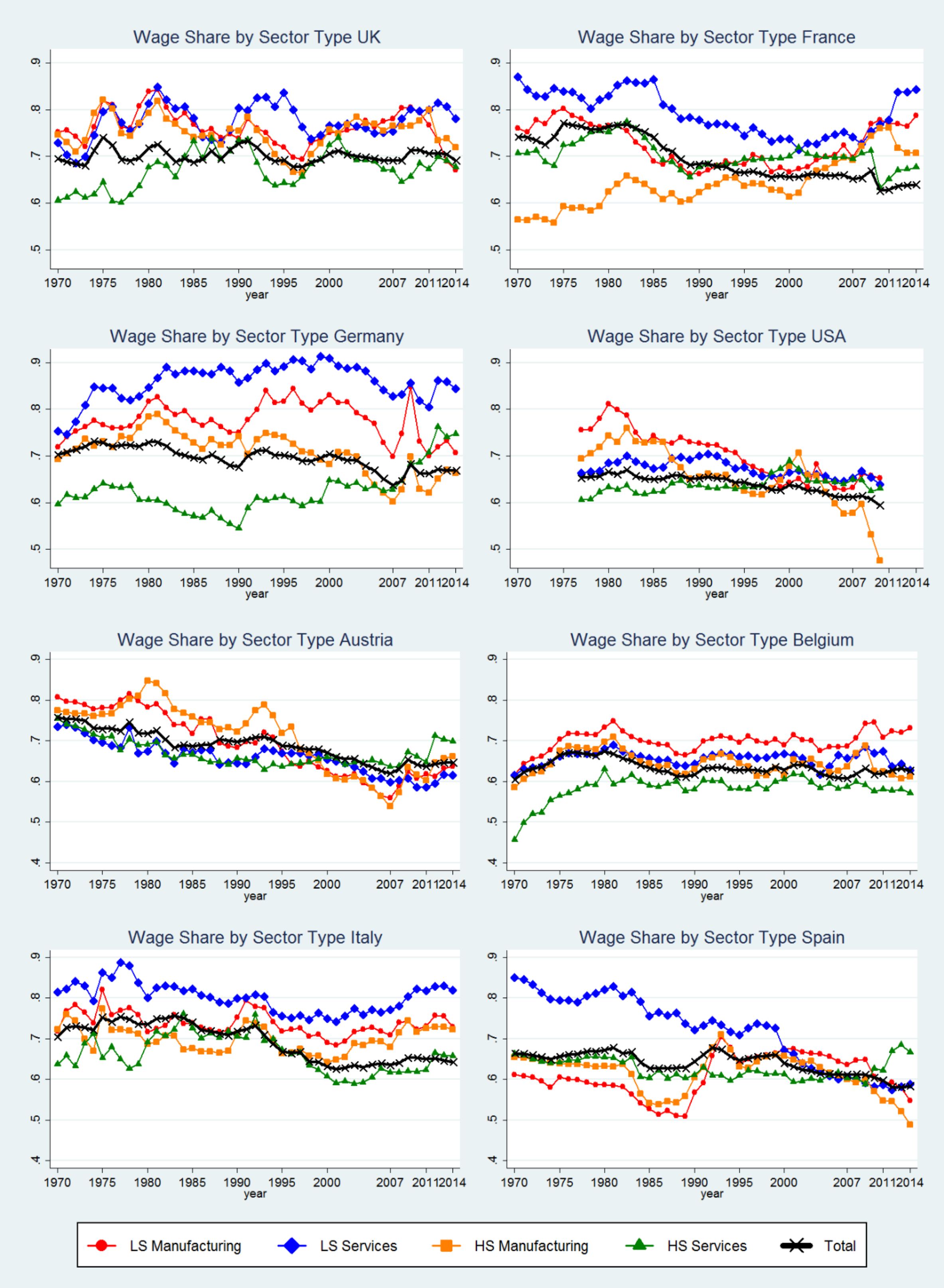
Figures and tables

Figure 1: Wage share in selected countries, 1970-2014



Source: Own calculations based on EU KLEMS. The line for the total wage share includes all sectors. Sector level lines exclude Agriculture, Hunting, Forestry and Fishing; and Mining and Quarrying; Coke and Refined Petroleum; Public Administration and Defence; Compulsory Social Security; Education; Human Health and Social Work Activities and Real Estate. HS and LS stands for high and low skilled sectors respectively.

Figure 2: Wage share by skill group as defined by workers' education, 1995-2009

Source: Own calculations based on EU KLEMS and WIOD.

Figure 3: Total offshoring in selected OECD countries

Source: Own calculations based on WIOD. Figures exclude the following sectors: Agriculture, Hunting, Forestry and Fishing; and Mining and Quarrying; Coke and Refined Petroleum; Public Administration and Defence; Compulsory Social Security; Education; Human Health and Social Work Activities and Real Estate.

Table 1: Implied elasticity of substitution in selected papers

Paper	Implied elasticity
Country level	
Doan and Wan (2017)	e<1 (K/L) e>1 (TFP)
EC 2007	e<1 (K/L); e>1 (ICT) LS: e>1 MS: e<1 HS: e<1
Elsby, et al. (2012)	e=1
Harrison (2002)	e<1
Hutchinson and Persyn (2012)	e>1
ILO (2011)	e<1
IMF (2007)	e>1 (K/L) Non-linear for ICT
Stockhammer 2009	e=1
Stockhammer 2016	e<=1
Sector level	
IMF (2017)	e>=1
Bassanini & Manfredi (2012)	e>1
Bentolila and Saint-Paul (2003)	e>1
Karabarbounis & Neiman 2014	e>1

Notes: HS, MS, LS indicate results for the wage share of high-, medium-, and low-skilled workers. If conflicting results are found the variables are indicated in in brackets. e=elasticity of substitution between capital and labour; (K/L) = capital-output ratio; TFP = total factor productivity; ICT = ICT capital intensity

Table 2. Baseline specification and robustness of results over time

	1	2	3	4	5	6	7
growth	-0.205***	-0.222***	-0.331**	-0.178	-0.267**	-0.306***	-0.286***
	(0.001)	(0.001)	(0.046)	(0.119)	(0.042)	(0.000)	(0.000)
TFP	-0.242***	-0.234***	-0.072	-0.055	-0.062	-0.070	-0.035
	(0.001)	(0.001)	(0.469)	(0.218)	(0.175)	(0.393)	(0.765)
ICT	-0.041***	-0.042**			-0.001	0.013	-0.009
	(0.008)	(0.018)			(0.883)	(0.458)	(0.788)
ICT_(t-1)	0.021*	0.021*	0.007	0.001			
	(0.100)	(0.099)	(0.755)	(0.843)			
nonICT	-0.202***	-0.170***	-0.005	-0.049	-0.053	-0.099	-0.171*
	(0.004)	(0.008)	(0.965)	(0.149)	(0.120)	(0.133)	(0.061)
offshoring_OECD_(t-1)					-0.364		1.179*
					(0.404)		(0.051)
offshoring East_(t-1)					1.811		1.409
					(0.339)		(0.636)
offshoring RoW_(t-1)					-1.725**		-1.267
					(0.039)		(0.334)
offshoring total_(t-1)				0.448			
				(0.408)			
union density_(t-1)	0.141***	0.146***	0.060	0.082**	0.084*	-0.052	-0.201
	(0.000)	(0.003)	(0.162)	(0.048)	(0.063)	(0.791)	(0.210)
wage share_(t-1)	0.640***	0.703***	0.646***	0.709***	0.747***	0.476***	0.580***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)
wage share_(t-2)	-0.057***	-0.072**					
	(0.007)	(0.013)					
Hansen_pval	0.200	0.423	0.201	0.441	0.154	0.790	0.808
AR1_pval	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AR2_pval	0.760	0.976	0.326	0.855	0.952	0.228	0.266
Instruments	56	45	27	30	36	26	30
Sectors	300	276	300	300	300	162	153
F-test	33.882	34.565	16.296	11.763	12.196	23.253	17.114
Observations	7835	4552	3837	3284	3284	1134	1071
F-test year dummies	0.007	0.010	0.892	0.881	0.222	0.036	0.004
Period	73-07	73-96	97-07	97-07	97-07	08-14	08-14

Notes: The dependent variable is the sectoral adjusted wage share. Estimation method is ‘difference GMM’ (Arellano and Bond 1991) with Windmeijer small sample error correction and one instrument column per variable (collapse option). HS, MS and LS stands for high, medium and low skilled workers. P-values below the estimation coefficients in parenthesis. ***, **, * denote statistical significant at the 1%, 5% and 10% level, respectively. Hansen_pval stands for the p-value of the Hansen test of overidentifying restrictions for all instruments. AR1 and AR2_pval is the p-value of the Arellano-Bond test for autocorrelation of first and second order in the residuals. Instruments denote the number of instruments used. Sectors, F-test and Observations is the number of cross sections, the p-value of the F-test and the number of observations. F-test year dummies is the p-value of the Wald test on the joint significance of all year dummies.

Table 3: Robustness tests and sector disaggregation

	1	2	3	4	5	6	7	8	9
skill group	HS	MS	LS	All	All	MS	All	All	All
sector type	All	All	All	MANU	MANU	MANU	SERV	All	All
growth	-0.030	-0.088	-0.079	-0.322*	-0.390**	-0.285**	-0.235*	-0.210***	-0.173***
	(0.521)	(0.173)	(0.240)	(0.076)	(0.018)	(0.041)	(0.067)	(0.004)	(0.001)
TFP	0.009	-0.068**	0.006	-0.072			-0.095*	-0.251***	-0.241***
	(0.676)	(0.033)	(0.714)	(0.248)			(0.066)	(0.001)	(0.000)
TFP_(t-1)					-0.044	-0.021			
					(0.394)	(0.582)			
ICT	-0.001	-0.004	0.005	-0.072*	-0.073**		0.000	-0.090***	0.037***
	(0.802)	(0.422)	(0.213)	(0.081)	(0.047)		(0.996)	(0.002)	(0.000)
ICT_(t-1)				0.057*	0.062**	0.001		0.061**	
				(0.076)	(0.039)	(0.883)		(0.013)	
nonICT	0.015	-0.047**	-0.011	-0.086	-0.067	-0.011	-0.042	-0.110***	-0.261***
	(0.319)	(0.023)	(0.445)	(0.121)	(0.211)	(0.746)	(0.254)	(0.001)	(0.000)
offshoring OECD_(t-1)	-0.650**	-0.458	0.242	0.143	0.616	0.410	-0.334		
	(0.024)	(0.139)	(0.482)	(0.721)	(0.177)	(0.215)	(0.876)		
offshoring East_(t-1)	2.004**	-0.043	0.744	-4.175	-0.682	0.637	28.270		
	(0.023)	(0.974)	(0.467)	(0.118)	(0.841)	(0.749)	(0.237)		
offshoring East_int(t-1)					-5.443*	-4.117**			
					(0.056)	(0.030)			
offshoring RoW_(t-1)	-1.330**	-0.342	-0.833	-0.403	-0.405	0.769	-0.130		
	(0.019)	(0.649)	(0.162)	(0.749)	(0.745)	(0.491)	(0.925)		
union density_(t-1)	-0.069***	0.018	0.105***	0.143*	0.133*	0.056	0.080		0.168***
	(0.002)	(0.448)	(0.000)	(0.060)	(0.086)	(0.215)	(0.241)		(0.008)
union density								0.110*	
								(0.068)	
education_HS,MS,LS	0.094	-0.103***	-0.055***			-0.081			
	(0.234)	(0.000)	(0.005)			(0.112)			
wage share_(t-1)	0.526***	0.762***	0.676***	0.506***	0.488***	0.519***	0.671***		0.565***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)		(0.000)
wage share_(t-2)			0.119***						-0.068***
			(0.000)						(0.000)
wage share99_(t-1)								0.537***	
								(0.000)	
Hansen_pval	0.320	0.133	0.076	0.310	0.498	0.156	0.353	0.086	0.239
AR1_pval	0.000	0.000	0.000	0.002	0.001	0.000	0.000	0.002	0.000
AR2_pval	0.868	0.948	0.319	0.384	0.411	0.563	0.676	0.204	0.848
Instruments	37	37	36	36	39	40	36	42	46
Sectors	300	300	295	166	166	166	134	107	246
F-test	60.651	26.089	208.409	10.522	11.318	16.091	9.975	24.920	24.859
Observations	3284	3284	293	1816	1816	1816	1468	2650	7213
F-test year dummies	0.066	0.048	0.458	0.101	0.283	0.587	0.760	0.003	0.390
Period	97-07	97-07	98-07	97-07	97-07	97-07	97-07	97-07	83-07

Notes: The dependent variable is the sectoral adjusted wage share, except for specification (8) where the wage share of the 99% is used. ‘wage share_(t-1)’ reflects the lagged dependent variable, i.e. the wage share of high-, medium-, low-skilled or all workers depending on the skill-group. Estimation method is ‘difference GMM’ (Arellano and Bond 1991) with Windmeijer small sample error correction and one instrument column per variable (collapse option). HS, MS and LS stands for high, medium and low skilled workers. P-values below the estimation coefficients in parenthesis. ***, **, * denote statistical significant at the 1%, 5% and 10% level, respectively. Hansen_pval stands for the p-value of the Hansen test of overidentifying restrictions for all instruments. AR1 and AR2_pval is the p-value of the Arellano-Bond test for autocorrelation of first and second order in the residuals. Instruments denote the number of instruments used. Sectors, F-test and Observations is the number of cross sections, the p-value of the F-test and the number of observations. F-test year dummies is the p-value of the Wald test on the joint significance of all year dummies.

Table 4: Other explanatory factors for the wage share

	1 Union	2 Gender	3 Gov't	4 min wage	5 migration	6 migration	7 migration	8 migration	9 excess CB	10 Gini
Skill-group	All	All	All	All	All	HS	MS	LS	All	All
growth	-0.242*	-0.186***	-0.212	-0.287***	-0.264	-0.015	-0.099	-0.104*	-0.372***	-0.346***
	(0.060)	(0.000)	(0.130)	(0.000)	(0.134)	(0.771)	(0.297)	(0.098)	(0.002)	(0.003)
TFP	-0.064	-0.329***	-0.047	-0.034	-0.053	0.014	-0.078**	-0.011	-0.035	-0.059
	(0.159)	(0.006)	(0.318)	(0.559)	(0.254)	(0.610)	(0.039)	(0.561)	(0.401)	(0.187)
ICT	-0.006	-0.028	-0.000	-0.007	-0.002	0.002	-0.014	0.008*	-0.007	-0.002
	(0.456)	(0.378)	(0.962)	(0.532)	(0.800)	(0.738)	(0.138)	(0.073)	(0.348)	(0.727)
ICT_(t-1)		0.005								
		(0.813)								
nonICT	-0.045	-0.269***	-0.041	-0.045	-0.023	0.018	-0.047*	-0.024	-0.013	-0.051
	(0.186)	(0.009)	(0.239)	(0.286)	(0.518)	(0.383)	(0.084)	(0.128)	(0.677)	(0.133)
offshoring OECD_(t-1)	-0.298		-0.425	0.093	-0.557	-0.824	-0.744	0.806**	-0.426	-0.401
	(0.501)		(0.349)	(0.875)	(0.584)	(0.130)	(0.370)	(0.029)	(0.458)	(0.380)
offshoring East_(t-1)	2.932		2.951	4.606	5.008**	0.600	2.834	-0.700	3.848**	0.348
	(0.133)		(0.194)	(0.109)	(0.014)	(0.721)	(0.156)	(0.351)	(0.026)	(0.871)
offshoring RoW_(t-1)	-1.882**		-2.391**	-2.050*	-2.943**	-0.543	-1.990	0.286	-2.156***	-0.983
	(0.030)		(0.032)	(0.087)	(0.038)	(0.604)	(0.117)	(0.504)	(0.010)	(0.283)
union density_(t-1)	-0.049	0.134***	0.058	0.057	0.083	-0.066*	0.070*	0.070	0.102**	0.087**
	(0.504)	(0.000)	(0.221)	(0.294)	(0.205)	(0.068)	(0.083)	(0.152)	(0.028)	(0.049)
union density int_(t-1)	0.192**									
	(0.020)									
fem. share_(t-1)		-0.409*								
		(0.085)								
Govt expen_(t-1)			-0.089							
			(0.262)							
Govt expen_int_(t-1)			0.206*							
			(0.079)							
min wage_(t-1)				0.277***						
				(0.000)						
migration_(t-1)					-0.659	-0.167	-0.079	-0.204		
					(0.152)	(0.602)	(0.784)	(0.273)		
excess CB_(t-1)									0.003*	
									(0.072)	
net gini_(t-1)										-0.004**
										(0.027)
education_HS, MS, LS						0.445***	-0.134***	-0.044*		
						(0.002)	(0.001)	(0.083)		
wage share_(t-1)	0.721***	0.553***	0.767***	0.686***	0.747***	0.611***	0.695***	0.645***	0.737***	0.707***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)
wage share_(t-2)		-0.041*						0.118***		
		(0.098)						(0.000)		
Hansen_pval	0.192	0.121	0.215	0.471	0.052	0.337	0.001	0.001	0.325	0.099
AR1_pval	0.000	0.000	0.000	0.001	0.000	0.001	0.000	0.000	0.000	0.000

AR2_pval	0.982	0.515	0.989	0.346	0.935	0.913	0.740	0.411	0.467	0.984
Instruments	37	54	38	37	39	31	40	48	45	39
Sectors	300	242	300	191	259	259	259	254	300	300
F-test	12.326	21.651	10.455	5.113	15.016	48.854	23.172	141.260	13.472	13.509
Observations	3284	6075	3284	1880	2833	2833	2833	2524	3189	3284
F-test year dummies	0.154	0.016	0.340	0.454	0.068	0.589		0.111	0.133	0.141
Period	97-07	73-07	97-07	97-07	97-07	97-07	97-07	97-07	97-07	97-07

Notes: ‘wage share_(t-1)’ reflects the lagged dependent variable, i.e. the wage share of high-, medium-, low-skilled or all workers depending on the skill-group. Specification (9) uses a different measure of the capital stock as discussed in the text. The dependent variable is the sectoral adjusted wage share. Estimation method is ‘difference GMM’ (Arellano and Bond 1991) with Windmeijer small sample error correction and one instrument column per variable (collapse option). HS, MS and LS stands for high, medium and low skilled workers. P-values below the estimation coefficients in parenthesis. ***, **, * denote statistical significant at the 1%, 5% and 10% level, respectively. Hansen_pval stands for the p-value of the Hansen test of overidentifying restrictions for all instruments. AR1 and AR2_pval is the p-value of the Arellano-Bond test for autocorrelation of first and second order in the residuals. Instruments denote the number of instruments used. Sectors, F-test and Observations is the number of cross sections, the p-value of the F-test and the number of observations. F-test year dummies is the p-value of the Wald test on the joint significance of all year dummies.

Table 5: Economic significance

Variables	Percentage of explained change in the wage share, based on Specification (5), Table 2
growth	1.99%
TFP	42.71%
ICT	3.69%
nonICT	-4.78%
offshore OECD	-0.52%
offshore East	-17.08%
offshore RoW	44.01%
offshore total	26.41%
UD	22.88%
Sum	92.89%

Notes: a negative value indicates that the variable contributed to an increase of the wage share over the sample period

Appendix

Table A1 – Sectoral classification and skill taxonomy

Description	ISIC3 code for estimations 1970-2007	ISIC4 code for estimations 2008-2014	Skill classification (IMF, 2007)
Manufacturing			
Food products, beverages and tobacco	15-16	10-12	low
Textiles, wearing apparel, leather and related products	17-19	13-15	low
Wood and Products of Wood and Cork	20		low
Pulp, Paper, Printing and Publishing	21-22		high
Wood and paper products; printing and reproduction of recorded media		16-18	high
Chemicals and chemical products	24	20-21	high
Rubber and Plastics	25		high
Other Non-Metallic Mineral	26		high
Rubber and plastics products, and other non-metallic mineral products		22-23	high
Basic metals and fabricated metal products, except machinery and equipment	27-28	24-25	low
Machinery and equipment n.e.c.	29	28	high
Electrical and optical equipment	30-33	26-27	high
Transport equipment	34-35	29-30	low
Manufacturing, n.e.c; Recycling	36-37	31-33	low
Services			
Electricity, Gas and Water Supply	E	D-E	high
Construction	F	F	low
Wholesale and Retail Trade; Repair Of Motor Vehicles and Motorcycles		G	low
Sale, Maintenance and Repair of Motor Vehicles and Motorcycles; Retail Sale of Fuel	50		low
Wholesale Trade and Commission Trade, Except of Motor Vehicles and Motorcycles	51		low
Retail Trade, Except of Motor Vehicles and Motorcycles; Repair of Household Goods	52		low
Hotels and Restaurants	H	I	low
Transport and storage	60-63	49-52	high
Post and Telecommunications	64		high
Postal and courier activities		53	high
Telecommunications		61	high
Publishing, audiovisual and broadcasting activities		58-60	high
IT and other information services		62-63	high
Financial Intermediation	J	K	high
Renting of Machinery and Equipment and Other Business Activities	71-74	M-N	high

Table A2: Skill disaggregation in the WIOD Socio-Economic Accounts

Skill classification	Description
Low	Up to lower secondary or second stage of basic education
Medium	Up to Post-secondary non-tertiary education
High	First and Second stage of tertiary education

Source: Erumban, et al., (2016)

Table A3: Baseline Appendix

	1	2	3	4	5	6	7	8	9
skill group	All	LS							
growth	-0.270***	-0.067***		-0.050	-0.167	-0.215*	-0.209	-0.193	-0.285*
	(0.000)	(0.000)		(0.708)	(0.214)	(0.087)	(0.103)	(0.105)	(0.057)
TFP	-0.032***	-0.005		-0.053	-0.082	-0.085	-0.040	-0.045	
	(0.000)	(0.246)		(0.265)	(0.209)	(0.218)	(0.453)	(0.140)	
TFP_(t-1)			-0.005						
			(0.962)						
ICT	0.003	0.001	-0.003					0.006	
	(0.195)	(0.388)	(0.789)					(0.318)	
ICT_(t-1)				-0.002	0.003	0.004	0.002		
				(0.753)	(0.700)	(0.612)	(0.716)		
nonICT	-0.002	-0.007**	-0.033	-0.053	-0.022	-0.018	-0.042	-0.007	
	(0.787)	(0.017)	(0.538)	(0.149)	(0.543)	(0.631)	(0.231)	(0.481)	
offshoring OECD					-1.293*				
					(0.078)				
offshoring OECD_(t-1)	-0.108*	0.041						-0.389**	
	(0.056)	(0.145)						(0.010)	
offshoring East						-0.792			
						(0.730)			
offshoring East(t-1)	0.369	-0.083						2.036*	
	(0.237)	(0.594)						(0.054)	
offshoring RoW							1.695		
							(0.157)		
offshoring RoW_(t-1)	0.050	0.010					-2.902*	0.097	
	(0.742)	(0.895)					(0.051)	(0.730)	
offshoring total				-1.503*					
				(0.070)					
offshoring total_(t-1)				1.186*					
				(0.079)					
union density_(t-1)	0.044**	-0.012		0.113**	0.091**	0.079**	0.062	0.007	0.069*
	(0.035)	(0.234)		(0.014)	(0.018)	(0.044)	(0.139)	(0.807)	(0.099)
wage share_(t-1)	0.730***	0.673***	0.665***	0.713***	0.653***	0.618***	0.742***	0.931***	0.622***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
wage share_(t-2)			-0.060**						
			(0.028)						
constant	0.328***	0.056***						0.250**	
	(0.000)	(0.000)						(0.023)	
Hansen_pval			0.155	0.795	0.169	0.045	0.327	0.003	0.193
AR1_pval			0.000	0.000	0.000	0.000	0.000	0.000	0.000
AR2_pval			0.678	0.537	0.495	0.666	0.856	0.922	0.236
Instruments			22	30	30	30	30	58	18
Sectors	300	295	300	300	300	300	300	300	300
F-test	261.959	577.128	17.823	12.861	13.788	11.616	9.160	178.173	22.849
Observations	3584	3524	3879	3284	3561	3561	3284	3584	3848
F-test year dummies	0.584	0.000	0.567	0.390	0.435	0.378	0.573	0.710	0.371
Period	97-07	97-07	97-07	97-07	97-07	97-07	97-07	97-07	97-07

Notes: The dependent variable is the sectoral adjusted wage share. ‘wage share_(t-1)’ reflects the lagged dependent variable, i.e. the wage share of high-, medium-, low-skilled or all workers depending on the skill-group. We use the within estimator in specification (1) and (2), and the system GMM estimator in specification (8), otherwise estimation method is ‘difference GMM’ (Arellano and Bond 1991) with Windmeijer small sample error correction and one instrument column per variable (collapse option). HS, MS and LS stands for high, medium and low skilled workers. P-values below the estimation coefficients in parenthesis. ***, **, * denote statistical significant at the 1%, 5% and 10% level, respectively. Hansen_pval stands for the p-value of the Hansen test of overidentifying restrictions for all instruments. AR1 and AR2_pval is the p-value of the Arellano-Bond test for autocorrelation of first and second order in the residuals. Instruments denote the number of instruments used. Sectors, F-test and Observations is the number of cross sections, the p-value of the F-test and the number of observations. F-test year dummies is the p-value of the Wald test on the joint significance of all year dummies.

Table A4: Further sector differentiation

	1	2	3	4	5	6	7	8	9	10	11	12
skill group	HS	MS	LS	All	LS	All	HS	MS	LS	All	All	LS
sector type	Manu	Manu	Manu	Manu LS	Manu LS	Manu HS	Serv	Serv	Serv	Serv LS	Serv HS	Serv HS
growth	-0.044	-0.236*	-0.143*	-0.214	-0.081	-0.257	0.029	-0.027	-0.050	-0.252**	-0.081	-0.083
	(0.484)	(0.064)	(0.066)	(0.120)	(0.272)	(0.273)	(0.628)	(0.693)	(0.434)	(0.024)	(0.564)	(0.187)
TFP	0.024	-0.052	0.010	-0.192**	0.015	-0.026	0.020	-0.077*	0.016	-0.058	-0.192**	0.012
	(0.473)	(0.311)	(0.769)	(0.017)	(0.696)	(0.771)	(0.500)	(0.060)	(0.567)	(0.207)	(0.020)	(0.787)
ICT			0.009	-0.103***			0.004		0.006			0.011
			(0.287)	(0.010)			(0.473)		(0.277)			(0.151)
ICT_(t-1)	0.001	-0.003		0.083**	0.013	-0.013		0.001		0.005	-0.010	
	(0.877)	(0.663)		(0.010)	(0.133)	(0.576)		(0.872)		(0.726)	(0.475)	
nonICT	0.014	-0.035	-0.018	-0.130**	-0.013	-0.064	0.029	-0.046*	0.007	0.007	-0.118*	0.005
	(0.599)	(0.347)	(0.617)	(0.033)	(0.714)	(0.455)	(0.213)	(0.098)	(0.758)	(0.807)	(0.097)	(0.871)
offshoring OECD_(t-1)	-0.715***	-0.023	0.043	0.187	-0.206	0.389	1.065	0.991	0.215	1.405	0.767	-0.116
	(0.008)	(0.932)	(0.867)	(0.685)	(0.478)	(0.424)	(0.166)	(0.305)	(0.741)	(0.767)	(0.370)	(0.807)
offshoring East_(t-1)	0.943	-1.709	0.017	-2.852	0.313	-2.755	2.403	-9.786	-1.219	9.192*	2.158	3.230
	(0.265)	(0.303)	(0.989)	(0.462)	(0.794)	(0.533)	(0.867)	(0.446)	(0.876)	(0.060)	(0.906)	(0.556)
offshoring RoW_(t-1)	-1.739***	0.665	-0.776	-0.123	-0.894	-2.502*	-0.132	0.814	-0.012	0.067	0.387	-0.088
	(0.007)	(0.508)	(0.228)	(0.951)	(0.292)	(0.094)	(0.750)	(0.294)	(0.973)	(0.987)	(0.576)	(0.770)
union density_(t-1)	-0.110***	0.061	0.159***	0.136	0.201***	0.123	-0.049	0.023	0.042	-0.160	0.013	0.034
	(0.004)	(0.180)	(0.001)	(0.140)	(0.001)	(0.277)	(0.168)	(0.594)	(0.300)	(0.192)	(0.886)	(0.467)
education_HS	0.027						0.143					
	(0.820)						(0.137)					
education_MS		-0.116***						-0.126***				
		(0.008)						(0.003)				
education_LS			-0.053*		-0.050				-0.065***			
			(0.068)		(0.179)				(0.006)			
wage share_(t-1)				0.459***		0.441**				0.808***	0.590***	
				(0.000)		(0.036)				(0.000)	(0.002)	
wage share_HS_(t-1)	0.408**						0.309					
	(0.021)						(0.169)					
wage share_MS_(t-1)		0.569***						0.866***				
		(0.000)						(0.000)				
wage share_LS_(t-1)			0.707***		0.737***				0.675***			0.811***
			(0.000)		(0.000)				(0.000)			(0.000)
wage share_LS_(t-2)			0.136***		0.129**				0.127***			
			(0.001)		(0.013)				(0.000)			
Hansen_pval	0.529	0.142	0.215	0.806	0.490	0.384	0.397	0.079	0.476	0.295	0.263	0.329
AR1_pval	0.003	0.000	0.000	0.000	0.000	0.141	0.031	0.000	0.000	0.000	0.016	0.000

AR2_pval	0.994	0.607	0.158	0.568	0.213	0.488	0.520	0.754	0.737	0.186	0.136	0.941
Instruments	37	37	36	36	36	36	37	37	36	36	36	36
Sectors	166	166	166	98	98	68	134	134	129	67	67	62
F-test	44.031	16.636	123.797	14.236	99.300	8.676	26.968	27.406	85.004	23.677	10.028	57.075
Observations	1816	1816	1650	1072	974	744	1468	1468	1284	734	734	679
F-test year dummies	0.013	0.163	0.974	0.074	0.902	0.388	0.593	0.385	0.114	0.507	0.450	0.155
Period	97-07	97-07	97-07	97-07	97-07	97-07	97-07	97-07	97-07	97-07	97-07	97-07

Notes: The dependent variable is the sectoral adjusted wage share. 'wage share_(t-1)' reflects the lagged dependent variable, i.e. the wage share of high-, medium-, low-skilled or all workers depending on the skill-group. Estimation method is 'difference GMM' (Arellano and Bond 1991) with Windmeijer small sample error correction and one instrument column per variable (collapse option). HS, MS and LS stands for high, medium and low skilled workers. P-values below the estimation coefficients in parenthesis. ***, **, * denote statistical significant at the 1%, 5% and 10% level, respectively. Hansen_pval stands for the p-value of the Hansen test of overidentifying restrictions for all instruments. AR1 and AR2_pval is the p-value of the Arellano-Bond test for autocorrelation of first and second order in the residuals. Instruments denote the number of instruments used. Sectors, F-test and Observations is the number of cross sections, the p-value of the F-test and the number of observations. F-test year dummies is the p-value of the Wald test on the joint significance of all year dummies.

Table A5: Additional variables

	1 fem. share	2 female share	3 female share	4 female share	5 govt	6 min wage	7 min wage	8 excess CB	9 non-FDI	10 FDI
skill group	All	HS	MS	LS	All	All	All	All	All	All
growth	-0.408***	-0.080	-0.179***	-0.122**	-0.199***	-0.288***	-0.198**	-0.187***	-0.144***	-0.300***
	(0.000)	(0.107)	(0.002)	(0.032)	(0.000)	(0.000)	(0.023)	(0.000)	(0.005)	(0.000)
TFP	-0.085	-0.009	-0.053	-0.008	-0.107**	-0.035	-0.202**	-0.293***	-0.201***	-0.114
	(0.140)	(0.880)	(0.179)	(0.747)	(0.020)	(0.548)	(0.011)	(0.000)	(0.002)	(0.128)
ICT	-0.007	-0.006	-0.006	0.007		-0.007	-0.036***	-0.025***	-0.024**	-0.027**
	(0.404)	(0.299)	(0.365)	(0.250)		(0.489)	(0.002)	(0.000)	(0.016)	(0.027)
ICT_(t-1)					0.004					
					(0.284)					
nonICT	-0.034	-0.003	-0.032	-0.021	-0.114***	-0.043	-0.167***	-0.274***	-0.210***	-0.030
	(0.387)	(0.939)	(0.275)	(0.342)	(0.004)	(0.299)	(0.004)	(0.000)	(0.004)	(0.553)
offshoring OECD_(t-1)	-0.545	-0.903*	-0.402	0.927*		0.142				
	(0.346)	(0.051)	(0.501)	(0.052)		(0.800)				
offshoring East_(t-1)	1.615	1.870	1.464	0.392		4.757*				
	(0.493)	(0.226)	(0.173)	(0.756)		(0.089)				
offshoring RoW_(t-1)	-1.888	-1.720	-1.602**	0.431		-1.898*				
	(0.177)	(0.149)	(0.047)	(0.710)		(0.095)				
union density_(t-1)	0.037	-0.048	0.013	0.044	0.076*		0.063	0.172***	0.107***	0.101
	(0.500)	(0.148)	(0.686)	(0.366)	(0.054)		(0.248)	(0.000)	(0.007)	(0.179)
fem. share_(t-1)	-0.571**									
	(0.016)									
fem. share HS_(t-1)		0.001								
		(0.229)								
fem. share MS_(t-1)			-0.003							
			(0.208)							
fem. share LS_(t-1)				-0.324***						
				(0.002)						
Govt expen_(t-1)					-0.153**					
					(0.023)					
Govt expen_int_(t-1)					0.256***					
					(0.004)					
min wage						0.275***	0.246***			
						(0.000)	(0.000)			
excess CB_(t-1)								-0.000		
								(0.685)		
non-FDI flows_(t-1)									-0.071***	
									(0.009)	

outward FDI_(t-1)										0.003
										(0.757)
inward FDI_(t-1)										0.009
										(0.419)
education HS, MS, LS		0.128*	-0.068**	0.005						
		(0.065)	(0.023)	(0.864)						
wage share_(t-1)	0.663***	0.239	0.857***	0.629***	0.606***	0.677***	0.717***	0.532***	0.603***	0.484***
	(0.000)	(0.323)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
wage share_(t-2)				0.132***	-0.079***		-0.058**	-0.072***	-0.067***	
				(0.000)	(0.003)		(0.030)	(0.000)	(0.004)	
Hansen_pval	0.048	0.062	0.578	0.100	0.042	0.542	0.119	0.223	0.058	0.160
AR1_pval	0.000	0.156	0.000	0.000	0.000	0.001	0.002	0.000	0.000	0.004
AR2_pval	0.343	0.550	0.963	0.048	0.972	0.365	0.630	0.305	0.600	0.134
Instruments	48	40	40	39	52	36	47	57	54	50
Sectors	242	242	242	237	300	191	191	300	300	166
F-test	12.762	27.422	44.870	107.738	15.373	5.521	13.630	25.142	32.026	14.548
Observations	2419	2419	2419	2134	5228	1880	3878	7647	7645	2090
F-test year dummies	0.027	0.200	0.087	0.084	0.001	0.590	0.001	0.000	0.001	0.012
Period	97-07	97-07	97-07	98-07	73-07	97-07	73-07	73-07	73-07	72-07

Notes: The dependent variable is the sectoral adjusted wage share. 'wage share_(t-1)' reflects the lagged dependent variable, i.e. the wage share of high-, medium-, low-skilled or all workers depending on the skill-group. Estimation method is 'difference GMM' (Arellano and Bond 1991) with Windmeijer small sample error correction and one instrument column per variable (collapse option). HS, MS and LS stands for high, medium and low skilled workers. P-values below the estimation coefficients in parenthesis. ***, **, * denote statistical significant at the 1%, 5% and 10% level, respectively. Hansen_pval stands for the p-value of the Hansen test of overidentifying restrictions for all instruments. AR1 and AR2_pval is the p-value of the Arellano-Bond test for autocorrelation of first and second order in the residuals. Instruments denote the number of instruments used. Sectors, F-test and Observations is the number of cross sections, the p-value of the F-test and the number of observations. F-test year dummies is the p-value of the Wald test on the joint significance of all year dummies.

Table A6: Additional variables (continued)

	1 LMI	2 CB	3 CB	4 Gini	5 non-FDI	6 FNC-inter	7 FNC	8 HHD	9 IMP	10 IM-EX
growth	-0.204***	-0.177***	-0.352***	-0.193***	-0.242*	-0.320**	-0.148	-0.182***	-0.406***	-0.324**
	(0.001)	(0.001)	(0.007)	(0.000)	(0.064)	(0.016)	(0.144)	(0.001)	(0.001)	(0.027)
TFP	-0.236***	-0.247***	-0.054	-0.201***	-0.045	-0.054	-0.201**	-0.294***	-0.092	-0.061
	(0.001)	(0.003)	(0.263)	(0.003)	(0.285)	(0.229)	(0.034)	(0.000)	(0.138)	(0.259)
ICT	-0.039***	-0.029**	-0.008	-0.011	-0.002	-0.001	-0.013	-0.034***	-0.004	-0.001
	(0.008)	(0.034)	(0.294)	(0.219)	(0.821)	(0.906)	(0.319)	(0.007)	(0.661)	(0.899)
ICT_(t-1)	0.019*									
	(0.099)									
nonICT	-0.198***	-0.201**	-0.029	-0.099*	-0.046	-0.049	-0.088	-0.278***	-0.056	-0.049
	(0.005)	(0.030)	(0.391)	(0.097)	(0.175)	(0.151)	(0.121)	(0.000)	(0.176)	(0.231)
offshoring OECD_(t-1)			-0.716		-0.476	-0.547			0.399	0.905
			(0.226)		(0.306)	(0.208)			(0.548)	(0.141)
offshoring East_(t-1)			3.636*		3.827	0.833			0.693	4.511
			(0.069)		(0.134)	(0.679)			(0.723)	(0.194)
offshoring RoW_(t-1)			-2.831***		-2.871**	-1.374			-0.695	-0.247
			(0.006)		(0.033)	(0.129)			(0.422)	(0.832)
union density_(t-1)	0.144***	0.171***	0.071	0.115***	0.043	0.075	0.095	0.201***	0.120**	0.133***
	(0.000)	(0.000)	(0.119)	(0.009)	(0.400)	(0.117)	(0.114)	(0.000)	(0.020)	(0.007)
LMI_(t-1)	-0.001									
	(0.824)									
collective bargaining_(t-1)		-0.000	-0.000							
		(0.608)	(0.306)							
net gini_(t-1)				-0.001						
				(0.467)						
non-FDI flows_(t-1)					-0.041					
					(0.193)					
financial intermediation_(t-1)						-0.389				
						(0.368)				
FINPAY_(t-1)							-0.035			
							(0.621)			
FININC_(t-1)							0.055			
							(0.429)			
HHD_(t-1)								0.000		
								(0.354)		
capital imports OECD_(t-1)									0.697	
									(0.603)	
capital imports East_(t-1)									0.212	
									(0.165)	

capital imports RoW_(t-1)									0.066	
									(0.681)	
capital imports all_(t-1)									1.071**	
									(0.028)	
cons. imports. OECD_(t-1)									0.042	
									(0.617)	
cons. imports East_(t-1)									-0.109	
									(0.684)	
cons. imports RoW_(t-1)										0.016
										(0.928)
cons. imports all_(t-1)										0.151
										(0.155)
exports OECD_(t-1)										-0.241
										(0.194)
exports East_(t-1)										-0.643
										(0.208)
exports RoW_(t-1)										-0.470*
										(0.052)
wage share_(t-1)	0.644***	0.588***	0.712***	0.640***	0.769***	0.744***	0.598***	0.535***	0.672***	0.723***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
wage share_(t-2)	-0.057***	-0.076***		-0.048*			-0.017	-0.094***		
	(0.006)	(0.001)		(0.050)			(0.544)	(0.000)		
Hansen_pval	0.182	0.055	0.453	0.020	0.417	0.057	0.119	0.012	0.172	0.589
AR1_pval	0.000	0.000	0.000	0.000	0.000	0.000	0.001	0.001	0.000	0.000
AR2_pval	0.760	0.785	0.469	0.777	0.986	0.954	0.437	0.162	0.859	0.487
Instruments	57	51	37	54	39	39	38	54	54	51
Sectors	300	300	300	300	300	300	256	300	300	300
F-test	35.036	33.774	13.314	28.478	10.365	11.365	18.334	22.322	11.679	9.264
Observations	7835	7429	3189	7479	3284	3284	3102	7018	3284	3284
F-test year dummies	0.008	0.016	0.102	0.056	0.130	0.305	0.058	0.001	0.439	0.252
Period	70-07	70-07	95-07	70-07	95-07	95-07	70-07	70-07	95-07	95-07

Notes: The dependent variable is the sectoral adjusted wage share. 'wage share_(t-1)' reflects the lagged dependent variable, i.e. the wage share of high-, medium-, low-skilled or all workers depending on the skill-group. Estimation method is 'difference GMM' (Arellano and Bond 1991) with Windmeijer small sample error correction and one instrument column per variable (collapse option). HS, MS and LS stands for high, medium and low skilled workers. P-values below the estimation coefficients in parenthesis. ***, **, * denote statistical significant at the 1%, 5% and 10% level, respectively. Hansen_pval stands for the p-value of the Hansen test of overidentifying restrictions for all instruments. AR1 and AR2_pval is the p-value of the Arellano-Bond test for autocorrelation of first and second order in the residuals. Instruments denote the number of instruments used. Sectors, F-test and Observations is the number of cross sections, the p-value of the F-test and the number of observations. F-test year dummies is the p-value of the Wald test on the joint significance of all year dummies.

Table A7: Descriptive statistics and sources

Variable definition	Observations	Mean	Standard Deviation	Minimum	Maximum	Source
$\text{wage share} = \frac{\text{labour compensation}}{\text{value added}}$	10191	0.698	0.163	0.072	1.467	EU KLEMS
$\text{wage share(high} - \text{skilled)} = \frac{\text{labour compensation(high} - \text{skilled)}}{\text{value added}}$	3895	0.160	0.088	0.014	0.539	EU KLEMS
$\text{wage share(medium} - \text{skilled)} = \frac{\text{labour compensation(medium} - \text{skilled)}}{\text{value added}}$	3895	0.331	0.117	0.033	0.754	EU KLEMS
$\text{wage share(low} - \text{skilled)} = \frac{\text{labour compensation(low} - \text{skilled)}}{\text{value added}}$	3830	0.180	0.108	0.003	0.596	EU KLEMS
$\text{ICT} = \frac{\text{ICT services}}{\text{real value added}}$	9811	0.008	0.025	$8.09*10^{-8}$	0.455	EU KLEMS
$\text{nonICT} = \frac{\text{non} - \text{ICT services}}{\text{real value added}}$	9811	0.019	0.039	$6.13*10^{-7}$	0.475	EU KLEMS
TFP = Total Factor Productivity	8852	88.954	24.572	3.595	278.861	EU KLEMS
$\text{growth} = \Delta\ln(\text{real value added})$	10335	0.026	0.064	-0.413	0.616	EU KLEMS
$\text{union density} = \frac{\text{union members}}{\text{total employees}}$	10142	0.419	0.255	0.011	1.321	ICTWSS 5.1
$\text{offshoring OECD} = \frac{\text{offshoring to OECD countries}}{\text{gross output}}$	4004	0.032	0.046	$3.11*10^{-6}$	0.308	WIOD
$\text{offshoring East} = \frac{\text{offshoring to Eastern Europe}}{\text{gross output}}$	4004	0.002	0.004	$3.73*10^{-8}$	0.034	WIOD
$\text{offshoring RoW} = \frac{\text{offshoring to the rest of the world}}{\text{gross output}}$	4004	0.008	0.013	$4.02*10^{-7}$	0.137	WIOD
$\text{female share} = \frac{\text{hours worked by women}}{\text{total hours worked}}$	6888	0.294	0.146	0.016	0.778	EU KLEMS
$\text{Govt} = \frac{\text{in} - \text{kind social government expenditure and cash transfers}}{\text{total government spending}}$	5918	0.546	0.058	0.406	0.642	OECD
$\text{min wage} = \frac{\text{minimum wages}}{\text{average labour compensation per person engaged}}$	5274	0.383	0.185	0.105	1.877	OECD & EU KLEMS
$\text{migration} = \frac{\text{foreign born labourforce}}{\text{total labour force}}$	5962	0.051	0.037	$3.18*10^{-4}$	0.168	OECD
$\text{excess bargaining coverage} = \frac{\text{collective bargaining coverage}}{\text{union density}}$	9548	3.095	4.413	0.368	48.556	ICTWSS 5.1
Gini (net)	10494	28.229	4.355	17.964	37.816	SWIID
Wage income of the top 1 percent of income earners	4048	0.529	0.113	0.306	0.815	World Wealth and Income Database

$\frac{\text{non} - \text{FDI flows}}{\text{GDP}}$	10780	1.907	2.549	0.133	24.679	External Wealth of Nations
$\frac{\text{FDI outflows}}{\text{gross output}}$	2463	0.020	0.116	-1.497	1.264	OECD STAN
$\frac{\text{FDI inflows}}{\text{gross output}}$	2534	0.017	0.100	-1.301	1.740	OECD STAN