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Determinants of the Wage Share: A Cross-country Comparison Using Sectoral Data¹



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INTRODUCTION

There has been a significant decline in the share of wages in GDP in both developed and developing countries since the 1980s. This paper analyses the determinants of the wage share (labour compensation as a ratio to value added) for the 1970–2011 period using sectoral data with country specific estimations for six OECD countries: France, Germany, Italy, Spain, Britain, and the United States.

There are two main hypotheses put forward to explain the decline in the wage share: the technological change hypothesis posits that the labour share declined due to capital augmenting technological change or an increase in the capital intensity of production. The bargaining power hypothesis attributes the decline in the labour share to a decline in the bargaining power of labour, induced by changes in government policy, labour market institutions or financialisation. We argue that the relevance of these factors differs across countries along three lines:

1. The relevance of labour market institutions depends on the bargaining regime. For example, union density is likely to be particularly relevant in countries with highly coordinated bargaining regimes, whereas bargaining coverage and social government expenditure is potentially more relevant in a decentralised bargaining environment.
2. The effect of globalisation on the wage share depends on whether market or cost seeking activities dominate, which is likely to differ by country and industry group.
3. The effect of technology might differ depending on the production structure in the economy, the type of goods the country specialises in, as well as across high- and low-skilled sectors.

Previous research either focuses on one individual country or uses panel data that pools countries, which does not offer a satisfactory account for country-specific differences. Our contribution consists in providing country-specific estimations using an industry-level dataset for the largest economies in

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the EU and the United States. Our sample allows to assess how the effect of labour market institutions on the wage share depends on the underlying bargaining regime. Furthermore, while industry level data on FDI or intermediate imports does not allow for a differentiation between market or cost seeking activities, we can analyse whether trade in a particular country is more of a market seeking or cost seeking nature by conducting country-specific estimations.²

Previous contributions mainly focus on either the technological change or the bargaining power hypothesis. The previous research focusing on the impact of bargaining power on the wage share uses mostly aggregate country level panel data, which does not differentiate the results across skill groups and industries (ILO 2011; Jayadev 2007; Kristal 2010; Onaran 2009; Stockhammer 2009 and 2017). Within the literature that argues the primacy of technological change, Bassanini and Manfredi (2014), Karabarbounis and Neiman (2014), and IMF (2017) use industry as well as country panel data; however they barely control for variables reflecting the bargaining power of labour and labour market institutions, welfare state retrenchment or financialisation.³ Guschanski and Onaran (2017a, 2017b and 2018) provide a comprehensive analysis of both hypotheses. However, they pool countries (Guschanski and Onaran 2017a and 2017b), or use firm-level data (Guschanski and Onaran 2018). Lin and Tomaskovic-Devey (2013), and Onaran (2011 and 2012) are closest to our analysis, but while these studies focus on a single country, the United States and Austria respectively, we perform our analysis for six OECD countries, control more thoroughly for measures of technological change and incorporate a broader range of explanatory variables.

Our findings provide new insights regarding the drivers of the falling wage share. We confirm previous research based on the analysis of country-level panel data attributing the decline in the wage share to a decline in bargaining power of labour driven by changes in labour market institutions, financialisation and globalisation. However, we find that these factors impact countries and skill groups within countries differently, thereby confirming the utmost relevance of country specific institutional setting in determining income distribution. Specifically, we find that union density is the most relevant measure of the bargaining power of labour in highly coordinated bargaining

² Furthermore, while country-level analysis always faces the question as to whether the decline in the wage share captures changes in the sectoral composition rather than a decline of the wage share within sectors, we are able to isolate the within sector development of the wage share, while abstracting from changes in the sectoral composition. Indeed, we find that the wage share declined within the large majority of industries in our sample, including within high- and low-skilled sectors. This confirms previous findings by Karabarbounis and Neiman (2014); and Rodriguez and Jayadev (2010), attributing the decline in the wage share mainly to within-industry changes.

³ IMF (2017) controls for union density, employment protection legislation and corporate taxation at the country level in some sector level estimations for different skill groups, while Bentolila and Saint-Paul (2003) control for the strike rate at the country level.

regimes (Germany, Italy, Spain), while collective bargaining coverage and social government spending is more important in countries where firm-level bargaining dominates (France, Britain, the United States). Financialisation reduced the bargaining power of labour mainly in Britain and the United States, and to some extent in Germany. Different measures of globalisation had an impact on the wage share in all countries. Although we also find some evidence for a negative impact of technological change in the United States, Italy and Spain, our results indicate that the decline in the wage share is not an inevitable outcome of technological progress. Rather, reversing the decline in the wage share requires institutional changes that bring the bargaining power of labour more in balance with that of capital.

The remainder of the paper is organised as follows. The second section provides a review of the literature on the determinants of functional income distribution, as well as some stylised facts on the countries in our sample. The third section outlines our empirical strategy, followed by the fourth section which presents the estimation results. The final section concludes.

WHAT DRIVES THE DECLINE IN THE WAGE SHARE?

The Technological Change Hypothesis

The technological change hypothesis posits that the labour share declined due to capital augmenting technological change or an increase in the capital-output ratio. Several studies argue that technological progress was capital augmenting since the 1980s (Bassanini and Manfredi 2014; European Commission 2007). This increases the amount of output that can be produced from a given unit of capital and can have a negative impact on the labour share. A related stream of literature argues that technological progress in the last four decades contributed to a decline in the price of capital relative to labour. If firms are optimising, this will lead to a substitution of capital for labour and an increase in the capital-output ratio, referred to as ‘capital intensity’ (Karabarbounis and Neiman 2014). However, the effect of these two variables on the labour share depends on the elasticity of substitution between capital and labour. More precisely, the necessary assumption for a negative effect of capital augmenting technological change and capital intensity on the labour share is that the elasticity of substitution between capital and labour is larger than one (Bentolila and Saint-Paul 2003). We obtain the cases shown in Table 1.

Table 1

Different Elasticities of Substitution between Capital and Labour and the Effect of Technological Change on the Labour Share

Elasticity of substitution	Effect of capital intensity and capital augmenting technological change on the wage share	Description
> 1	< 0	K and L are strong substitutes → technological change has a negative impact
$= 1$	$= 0$	Unitary elasticity (Cobb-Douglas production) → no impact of technological change
< 1	> 0	K and L are weak substitutes → technological change has a positive impact

Source: Authors' own compilation.

It is usually assumed that capital is a substitute for low-skilled labour, whereas it complements high-skilled labour – therefore we expect a negative effect in the former and a positive effect in the latter case.

The ratio of capital to value added, often differentiated by ICT and non-ICT capital, is usually applied as a measure of technological change in the literature. Most prominently, Karabarbounis and Neiman (2014) provide evidence for a negative effect of technological change on the wage share and increasing capital intensity worldwide, implying an elasticity of substitution above one. According to their estimations, about half of the global decline in the labour share can be explained by a reduction in the relative price of capital. Similarly, Bentolila and Saint-Paul (2003), and Bassanini and Manfredi (2014) obtain significant negative effects of capital intensity as well as total factor productivity (used as a proxy for capital augmenting technological change) in OECD countries, again implying 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. In contrast, analyses by Elsby *et al.* (2012), Harrison (2002), ILO (2011) and Stockhammer (2009 and 2017) find none or a positive effect of capital intensity, implying an elasticity of substitution that is below or equal to one. This is supported by studies whose primary focus lies on the estimation of the elasticity of substitution between capital and labour – the majority of these analyses consistently find values below one and closer to 0.4 (Chirinko 2008; Chirinko and Mallick 2014; Rowthorn 2014). The value of the elasticity of substitution between capital and labour is one of the most contested topics in economic research. However, there is relatively little research on the determinants of this parameter.⁴ Usually, the elasticity is assumed to be given by technology and only subject to change

⁴ IMF (2017) propose a model, where globalisation leads to offshoring of goods with a low elasticity of substitution from advanced to emerging economies, thereby increasing the share of tasks with low elasticity of substitution in emerging economies.

over the very long run. Since the determinants of the elasticity of substitution are largely unobservable as well as task-specific, it is not possible to formulate a hypothesis about the effect of capital intensity on the labour share in a particular country or industry *a priori*. In general, we expect a negative effect to be more likely in low-skill industries, whereas the effect should be positive in high-skilled industries, if these classifications accurately represent the skill-level of the representative task in the industry.⁵

We could also observe a negative relation between capital intensity and the wage share that has nothing to do with substitution of capital for labour. For example, if firms set prices to achieve a certain target profit rate 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).⁶

⁵ A specific hypothesis suggesting a negative impact of technological change on medium-skilled workers is put forward by the literature on job polarization. According to this research, technological progress in the last decades was driven by Information and Communication Technology (ICT), that allowed to replace workers by machines for tasks that are easily automatized, which were mainly performed by medium-skilled workers (Autor and Dorn 2013; Goos *et al.* 2014; IMF 2017). As we apply a binary sectoral classification, this implies that some sectors classified as high-skilled might also be negatively affected by technological change.

⁶ To be precise, it would be a negative relation between the wage share and the capital stock to normal output level, i.e. the output level firms expect to sell which may be below the full-capacity output level.

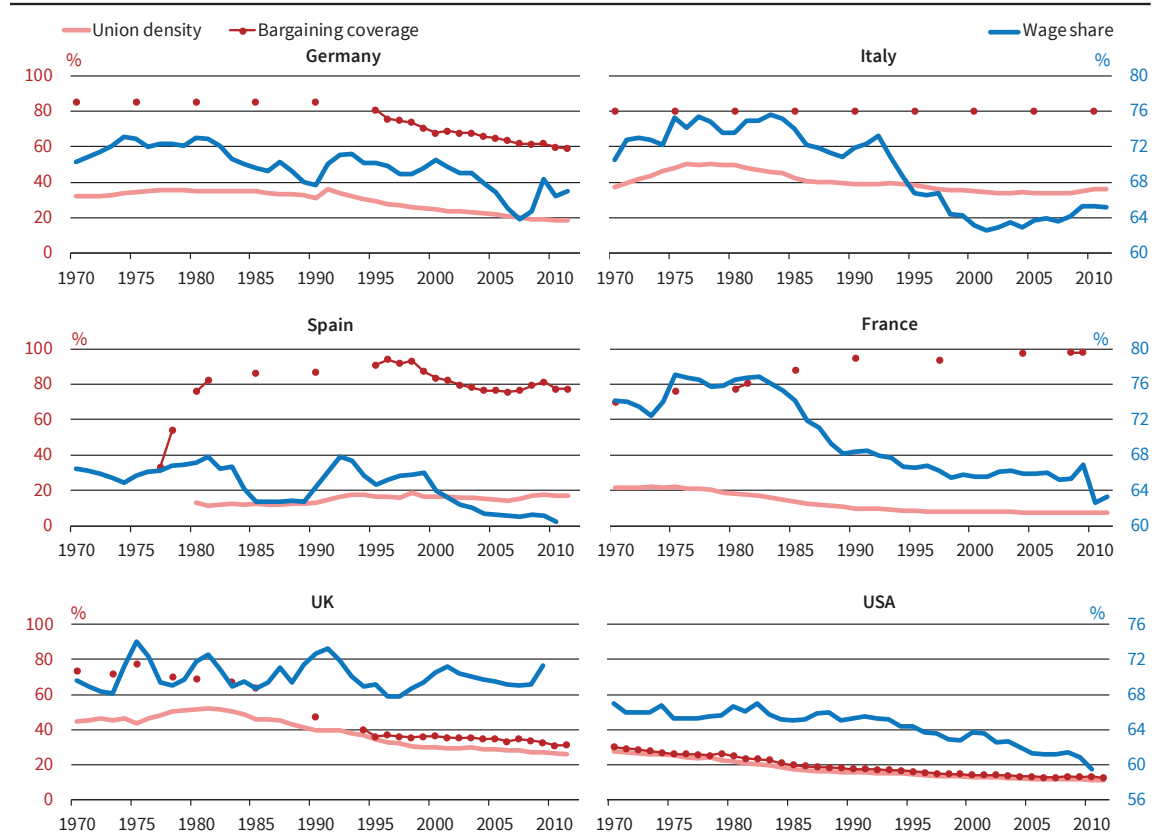
We observe a steady increase in the share of ICT capital to value added across all sectors and countries in our sample.⁷ There is a slight bias in favour of high skilled sectors in Britain and the United States, but the general positive and sometimes even exponential trend is common to all countries. In contrast, total capital intensity, while increasing in Germany, France, Italy and Spain, was largely stable in the United States and Britain.

The Bargaining Power Hypothesis

The bargaining power hypothesis attributes the decline in the wage share to a decline in the bargaining power of labour. If markets are not fully competitive, i.e. there is market power in the labour market and potentially the goods market, bargaining power between capital and labour determines factor income distribution (besides capital intensity and capital augmenting technological change). In models of bargaining power, capital and labour bargain for wages and potentially employment. Both parties have an interest in concluding the negotiations and the split of the value added depends on their respective fall-back options. The literature distinguishes three main factors determining bargaining power

⁷ Descriptive statistics are available upon request from the authors: see also Guschanski and Onaran (2016).

Figure 1
Changes in the Wage Share and Different Bargaining Regimes
1970–2011



Source: Visser (2015); EU KLEMS (Timmer *et al.* 2007).

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– labour market institutions, financialisation and globalisation.

a) Labour Market Institutions

The traditional focus of bargaining power models are labour market institutions (Blanchard and Giavazzi 2003). Measures of bargaining power related to labour market institutions can be categorised into direct and indirect factors. Direct factors strengthen workers' voice in negotiations, whereas indirect factors improve their fall-back options in case negotiations break down. An example of indirect factors is unemployment benefits. A similar effect can be expected from welfare services provided by the state which allow workers to rely on the fall-back option of a social wage to meet their basic needs in case of losing their job (Stockhammer 2017; Onaran 2009; Jayadev 2007; Harrison 2002). Direct measures of bargaining power include union density, strike activity, collective bargaining arrangements and minimum wages. Different measures of direct bargaining power might be relevant depending on the bargaining regime. We differentiate regimes by their level of union density, collective bargaining coverage and by the degree of bargaining coordination, i.e. whether bargaining takes place at the firm, industry or national level. Table 2 provides a summary of the degree of coordination for our sample, while Figure 1 demonstrates the development of union density, collective bargaining coverage and the wage share.

Highly coordinated regimes where bargaining takes place at the industry or national level are usually characterised by a high degree of bargaining coverage. In such a setting, union density might be the most relevant variable for the determination of functional income distribution, as it captures the potential pressure unions can exert on employers (Visser 2006). If unions achieve their goals, agreements are implemented at the industry level. Examples include

Italy and Germany, which experienced a decline in union density while maintaining a relatively high level of collective bargaining coverage and a high degree of coordination. Union density stagnated or even increased in Spain between 1980 and 2010, however not exceeding the comparatively low level of 20 percent, while collective bargaining coverage remained high.⁸ In contrast, in decentralised regimes unions might be less effective in pushing labours' interests, because wage increases at the firm level are not automatically transferred to the wider work force.⁹ Britain and the United States are prime examples of such institutional settings. In these cases, collective bargaining coverage might be more relevant, as it captures the effectiveness of unions in pushing for higher wages and defending employment on a wider scale (i.e. industry or country level). France is a special case characterised by a high degree of bargaining coverage, coupled with a low level of union density and a low degree of coordination. In this context, small unions can be very effective in improving the wage share due to the high level of collective bargaining coverage. However, due to the low degree of coordination, unions might not be able to take potential negative employment effects into account. Therefore, it is not clear which variable is best suited to capture changes in bargaining power in France *a priori*.

Comparing the dynamics of these labour market institutions across countries reveals that union density measured at the country level decline most strongly in Britain and Germany where the reduction constitutes 24 and 18 percentage-points respectively. The most drastic reductions in bargaining coverage can be observed in Britain, Germany and the United States

⁸ Since the increasing trend of union density in Spain can be attributed to a period of recovery after oppressed labour unions after Franco, we regard it as a special case.

⁹ Conversely, it has been argued that a high degree of coordination allows wage suppression with potentially negative effects on the labour share (OECD 2012).

Table 2
The Degree of Coordination in Bargaining

		Degree of coordination	Hypothesis: most relevant measure of direct bargaining power
Germany	3	1964–65; 1968–77; 1998–2001	Union density
	4	1960–63; 1966–67; 1978–97; 2002–11	
France	2	1961–2011	Union density or bargaining coverage
	2	1987–2001	
Spain	3	2008–11	Union density
	4	1980–86; 2002–08	
Italy	2	1960–76; 1985–1991	Union density
	3	1992–2011	
	4	1977–84	
UK	1	1980–2011	Bargaining coverage
	3	1961–74	
US	4	1975–79	Bargaining coverage
	1	1960–2011	

Notes: Degree of coordination: 1 – Fragmented wage bargaining, confined largely to individual firms or plants; 2 – Mixed industry and firm-level bargaining, weak government coordination through MW setting or wage indexation; 3 – Negotiation guidelines based on centralized bargaining; 4 – Wage norms based on centralized bargaining by peak associations with or without government involvement; 5 – Maximum or minimum wage rates/increases based on centralized bargaining.

Source: Visser (2015).

where it declined by 48, 27 and 18 percentage-points between the 1970 and the 2010s.

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 share (Kristal 2010; Argitis and Pitelis 2001; Bentolila and Saint-Paul 2003; European Commission 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 and 2017; ILO 2011). In contrast, IMF (2007 and 2017) and European Commission (2007) find no significant effect of union density in most specifications.

Among indirect measures of bargaining power, welfare state retrenchment is found to be an important determinant of the fall in the wage share (Harridon 2002; Jayadev 2007; Onaran 2009; Stockhammer 2017). However, the measure used is often aggregate government spending. 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.

Social government expenditure, defined as government spending on market goods and services provided to households such as health care, housing, recreational and cultural services, education and social protection, can be used as a proxy for the social wage of workers. We observe an increase in social government spending in our sample period in most countries. However, the trend might be related to the fact this measure excludes social transfers in cash (reflecting welfare benefits), which are not available prior to 1995.¹⁰ Interestingly, while social government spending increased or stagnated, its financing is more reliant on workers' income as can be observed by the increasing implicit tax rates for labour and consumption for all countries in our sample (Onaran and Bösch 2014).

b) Financialisation

This paper addresses financialisation as an important determinant of bargaining power, which gained momentum since the 1980s and received only limited attention in the literature on functional income distribution. Financialisation is not unambiguously defined but can be understood as the “increasing role of financial motives, financial markets, financial actors and financial institutions in the operation of the domestic and international economies” (Epstein 2005, 3). We outline three sub-channels *via* which financialisation can impact the wage share.

¹⁰ Social transfers were added to the previous measure for robustness tests, but unfortunately the latter series is available from 1995 only for most countries.

The first channel highlights that managers, motivated by shareholder value maximisation, adopted a corporate governance strategy that is hostile towards wage increases and prioritises dividend pay-outs and share buybacks (Lazonick 2014). Similarly, shareholder value orientation coincided with increasing financial payments, such as dividend payments to satisfy shareholders, or interest payments on debt (Hein 2015; Dünhaupt 2016). Rather than accepting profit cuts, managers shifted the burden of increased financial payments on consumers by increasing the mark-up on production costs, with negative impacts on the wage share. This argument has motivated four econometric studies that found a negative impact of dividend and interest payments on the wage share, although the effect of interest payments is less robust (Dünhaupt 2016; Guschanski and Onaran 2018; Hein and Schoder 2011; Kohler *et al.* 2018; Alvarez 2015).

The second channel highlights that fall-back options of capital increased due to the possibility to invest in financial assets rather than productive activities. This will lead to an increase in the relative bargaining power of capital. Lin and Tomaskovic-Devey (2013) and Alvarez (2015) investigate this hypothesis using US sector-level and French firm-level data respectively. Both find a negative effect of financial income on the wage share, while controlling for variables measuring technological change and globalisation. In contrast, Kohler *et al.* (2018) find no effect of financial income in a panel of 14 OECD countries. Several studies based on country-level data find a negative effect of financial globalisation on the labour share, which can be considered an alternative measure of this variable (Jayadev 2007; Stockhammer 2009 and 2017; ILO 2011).

The third channel emphasises household indebtedness. Household debt has been argued to reduce the wage share through increasing financial vulnerability that has an adverse effect on workers' willingness to engage in collective action (Anderloni *et al.* 2012; Kohler *et al.* 2018; Wood 2017). Wood (2017) finds a negative effect of mortgage debt in Britain and the United States for the period 1979–2012.

To test these three channels, we employ three measures of financialisation: financial payments (the sum of interest and dividend payments) and financial income of nonfinancial corporations as a ratio to total resources of nonfinancial corporations obtained from the OECD Non-financial Accounts by Sectors Database. Furthermore, we augment our analysis by a measure of household debt as a percentage of GDP from the Bank of International Settlements Total Credit Statistics. All measures show an overall increasing trend in the 2000s,¹¹ which is interrupted only by the Great

¹¹ Household debt has been increasing in our sample since the 1970s. For other variables availability data starts in the late 1990s or early 2000s.

Recession, after which most measures decline until 2011.

Globalisation

Globalisation plays a dual role – on the one hand it increases the bargaining power of capital due to increased mobility and ease of offshoring or relocation, on the other hand it can lead to changes in capital intensity or induce technological change. The increase in capital intensity will be driven by globalisation if firms in capital abundant countries offshore labour-intensive tasks to benefit from lower wages in labour abundant countries (IMF 2017; Elsby *et al.* 2013). This mechanism should be reflected in changes in capital intensity – consequently, it is not possible to identify whether the effect of capital intensity stems from technological change or globalisation. In contrast, trade induced capital-augmenting technological change as well as changes in bargaining power due to globalisation will change the wage share for a given level of capital intensity. Therefore, technology and bargaining power effect of globalisation cannot be separated in our empirical framework.

Two tendencies characterising advanced economies in the past decades were the increase in offshoring and FDI. We expect a negative effect of offshoring on the within-industry wage share for low skilled sectors in advanced economies, brought about either by downward pressure on wages to maintain competitiveness or through trade-induced labour-saving technological change (Grossman and Rossi-Hansberg 2006; Onaran 2011). The expected effect for high skilled sectors is more ambiguous, given that imports can also increase output and consequently labour demand and wages if they are complementary to domestic production or reduce costs. The effect is theoretically even more ambiguous if one considers imports of final goods that are not produced domestically (Onaran 2011).

We generally expect the effect of outward FDI to vary across manufacturing and services and potentially across skill groups. FDI is generally classified into two categories: vertical or cost-seeking FDI induces downward pressure on wages as it puts domestic workers in direct competition with foreign workers (Choi 2001). Additionally, cost-seeking FDI might have an impact on the factor composition since the type of jobs created abroad are potentially of a low skilled nature, whereas high-skilled jobs might be created domestically. This can lower wages of low-skilled domestic workers while increasing those of high-skilled workers. The effect of horizontal, or market-seeking FDI on the wage share is less clear. Most likely it will have a positive impact for high skilled workers because of an increase in labour demand at headquarters situated in the home country (Onaran 2012). Generally, we expect these effects to be less pronounced in services because of their non-tradable character. Whether market or

cost-seeking FDI dominates in a particular country or industry remains an empirical question. Herger and McCorriston (2014) rely on firm-level data to show that the share of vertical FDI is between 26–30 percent of all FDI in France, Germany, Britain and the United States. The lowest share of vertical FDI can be found in Britain and France (26 percent), while the highest share is in the United States (30 percent).¹² Depending on the industries affected, the impact of FDI on the wage share might therefore differ by country.

Several empirical studies find substantial negative effects of variables measuring trade intensity (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; European Commission 2007; IMF 2007; Jayadev 2007; Dünhaupt 2016; Stockhammer 2017). Research using sector level data finds negative effects of import penetration in high wage countries, while there are mixed results for FDI (Bassanini and Manfredi 2014; IMF 2017; Lin and Tomaskovic-Devey 2013; Onaran 2011 and 2012).

Variables accounting for globalisation show a similar pattern across all countries of our sample. Intermediate import penetration increased in all countries in both high and low skilled manufacturing sectors. The years of the crisis and shortly afterwards are the only exception to the otherwise increasing trend, which resumed at the latest in 2010 in all countries.¹³ The highest total growth rate was achieved in the 1990s in Germany, driven by high skilled manufacturing sectors, which in general have a higher level of intermediate imports than low skilled manufacturing sectors. A similar pattern can be observed for outward FDI. Outward FDI per employee increased more in high-skilled manufacturing and service sectors rather than their low-skilled counterparts in France, Germany and the United States, while the other countries experienced a rather balanced increase in outward FDI across sectors. The exceptions are low-skilled service sectors, which experience the least amount of outward FDI in all countries.

While offshoring and FDI capture the increasing mobility of capital, migration allows us to account for the mobility of labour. Previous findings suggest the effect of migration on the wage share to be negligible (IMF 2007). Theoretically, the effect depends on whether migrant labour both substitutes the domestic workers and pushes down wages or acts as a complement to labour being performed locally, rather than a direct competitor. Previous research has shown that migration is related to increased innovation, measured by the registration of patents, and is therefore potentially positively linked to productivity, with the subsequent effects discussed above (see Hunt and Gauthier-Loiselle 2010, for the United States;

¹² They do not report data for Spain and Italy.

¹³ These years are the reason why several countries have a negative growth rate for the last period.

and Rolfe *et al.* 2013, for Britain; in general results appear to be country specific). Turning to the effect on employment, migrants often bring in knowledge about markets and economies of their home countries and therefore open the possibility for expansion of the business activities *via* new export markets, which might have a positive impact on the wage share (Huber *et al.* 2010; Rolfe *et al.* 2013). Conversely, if unions and other institutions protecting labour rights are weak and migrants are paid lower wages than nationals, the impact on the wage share will be negative.

The share of migrant workers in the total labour force has been increasing in most countries with the noticeable exception of France where it declined. Nevertheless, the share of migrants is very small in all countries, exceeding ten percent only the United States, where the data is not comparable because it is measured as foreign-born rather than foreign labour force.

MODEL AND ESTIMATION METHOD

Our basic estimation equation has the following form:

$$(1) \quad WS_{i,t} = \alpha_i + \alpha_g GROWTH_{i,t} + \alpha_k KnonICT_{i,t} + \alpha_{kict} KICT_{i,t} + \alpha_{LMI} LMI_{i,t} + \alpha_{glob} GLOBAL_{i,t} + \alpha_{welfare} WELFARE_t + \alpha_{financial} FINANCIALISATION_t + \varepsilon_{i,t}$$

where i is the sector index and t is the time index. These estimations are conducted for each country separately. WS is the wage share in sector i from the EU KLEMS database (Timmer *et al.* 2007).¹⁴ Income of self-employed workers is imputed based on the assumption that their wage is equal to the average hourly wage of the sector. $GROWTH$ is the growth of the value added of the sector. It is included to control for the counter-cyclical dynamics of the wage share due to the existence of overhead costs. $KICT$ and $KnonICT$ are ICT (information and communication technology) and non-ICT capital services as a ratio to value added; these capture the effects of technological change. $GLOBAL$ stands for intermediate import penetration (capturing offshoring¹⁵), outward FDI intensity¹⁶ and the share of migrant workers in total employment. LMI captures different labour market institutions

¹⁴ Further information on data sources is available upon request from the authors.

¹⁵ However, our data for intermediate imports is based on the conversion of commodity indices to sector indices and thereby does not allow us to calculate how much of the imported product is actually used by each sector, which requires the use of Input-Output tables (Guschanski and Onaran 2017). However, if the use of imported goods stays relatively constant across sectors, intermediate import penetration is a relevant measure for the reallocation of production abroad.

¹⁶ We focus on outward FDI since it is clearly linked to developments in the wage share while the effect of inward FDI is more ambiguous, and less relevant for developed economies. Furthermore, estimations with inward FDI did not change our results for outward FDI and the coefficient was not robust. Furthermore, we test the robustness of our results with regard to globalisation with country-level variables like the KOF index supplied by Dreher (2006) and Dreher *et al.* (2008). These controls, which are important because the variable constitutes an exogenous measure of globalisation, strongly confirm our results with sector level variables. Results available upon request.

including union density (at the sector level) and adjusted collective bargaining coverage at the country level. $FINANCIALISATION$ includes interest and dividend payments and income as a ratio to total resources of nonfinancial corporations, as well as household debt as a ratio to GDP at the country level. $WELFARE$ is social government expenditure measured at the country level. α_i is a sector specific coefficient. We do not include period effects in our baseline estimation since several of our bargaining variables are only available at the country level and are thereby statistically similar to year dummies while carrying more meaningful information.

We apply two main estimation techniques. Our baseline estimation is performed using the within estimator, while we estimate the variance-covariance-matrix of the remainder error term using the approach developed by Driscoll and Kraay (1998). Therefore, standard errors are robust with respect to serial correlation within countries, cross-sectional correlation between countries as well as general heteroscedasticity. Our main robustness test is conducted using the first difference estimator. This has the additional advantage that potential non-stationarity concerns are taken care of given that all our variables are unambiguously stationary in first differences. Since there is reason for concerns regarding the endogeneity for our measures of globalisation, and because the effect of other variables will most likely be manifested with a time lag, all explanatory variables enter the equation with a lag. It would be preferable to employ a General Method of Moments (GMM) estimator to tackle the issue of endogeneity as well as the dynamic nature of distribution. However, due to the limited number of cross sections in our single country estimations this estimation method is not appropriate (Roodman 2009). Including our explanatory variables with a lag to mitigate biases arising from sequential exogeneity (predetermined variables) can be seen as a 'second best approach' given our dataset (Wooldridge 2002).

In addition to the pool of all sectors, separate regression analyses are performed for sector groups disaggregated as high skilled and low skilled sectors in manufacturing and services separately. This not only allows us to test the robustness of our results, but at the same time provides insights with regards to the variables that have potentially contrasting effects for manufacturing and services or across skill groups. However, since our cross sections are limited to a maximum of 21 sectors, specifications for individual skill groups can only provide indicative evidence.¹⁷ We exclude the Agriculture, Hunting, Forestry and Fishing, and Mining and Quarrying sectors as well as mostly publicly owned sectors (Public Administration and Defence; Compulsory Social Security; Education; Human Health and Social Work Activities) from the

¹⁷ The sectoral classification is based on the International Standard Industrial Classification of All Economic Activities (ISIC 3).

reported estimations, as in these sectors wage setting behaviour may constitute an outlier and may not be determined by the same forces as other sectors.

The estimation period differs due to data availability depending on the variables used in each specification and country. While the data for the wage share at a sectoral level is available for 1970–2011, the data for the FDI starts only in 1985 and detailed data on imports disaggregated as intermediate and final imports start in 1995. The estimation period for most countries for the specifications including intermediate import penetration is 1996–2010, while it is 1986–2010 for specifications including FDI. Furthermore, data for our measures of financialisation starts in 1995 for most countries with the exception of France where data is available from 1970.

ESTIMATION RESULTS

Table 3 presents a summary of our estimation results, while country-specific estimations are available upon request from the authors (see also Guschanski and Onaran 2016). The results reported in Table 3 provide a summary of over 40 different specifications for each variable, as we conduct separate specifications by skill-group, manufacturing and service industries, as well as two different estimations methods (within- and first-difference estimator). Therefore, they can only be seen as indicative.

Technology

We do not find a significant negative effect of ICT capital services on the wage share in France except for one specification when estimated using the within estimator only. The effect of ICT capital is even less robust for Germany where the variable is found to be positive or statistically insignificant in basically all specifications. The same applies to non-ICT capital

services that exhibit a robust positive effect for the manufacturing sector pool. Similarly, capital intensity appears to be insignificant for most of the specifications for Britain ICT capital intensity appears to have a negative impact on the wage share in the United States, Italy and Spain. However, using sectors defined as high or low-skilled we fail to find evidence for the hypothesis that technological change will decrease the wage share of low-skilled labour and increase the wage share of high-skilled labour. Furthermore, in the United States and Spain the coefficient for ICT is statistically not different from zero when we include variables accounting for the effect of financialisation and migration. On the other hand, we find a robust positive impact of non-ICT capital in the United States, Italy and Spain, implying an elasticity of substitution that is smaller than one, which is in contrast to the finding for ICT capital intensity.

Bargaining Power

Our results regarding measures of bargaining power differ significantly across countries. We find robust positive effects of union density in Germany, mainly driven by the manufacturing sector. This is not surprising given the long tradition of sector-level wage negotiations in Germany. Similarly, we obtain a positive impact of union density in Italy and Spain. In France there is no robust effect of union density, and in fact the variable seems to have a perverse negative effect in some of the specifications using the within estimator. However, when we replace union density by adjusted collective bargaining coverage, we obtain a robust positive effect. Similarly, we obtain an insignificant coefficient for union density in Britain and the United States, while bargaining coverage appears to have a positive effect especially for manufacturing sectors in Britain and manufacturing as well as service sectors in the United States.

Table 3

Summary of Estimation Results

	Germany	France	Spain	Italy	UK	US
Technology						
ICT	0	0	–*	–	0	–
non-ICT	+	0	+	+	0	+
Globalisation						
intermediate import penetration	–	–	+*	0	0	–
FDI	–*	0	–	0	0	0
Migration	–*	0	0	+*	+	0
Labour market institutions and social government expenditure						
Union density	+	0	+	+	0	0
Bargaining coverage	+	+	+	+	+	+
Government expenditure	0	+	0	+	+	+*
Financialisation						
Household debt	0	+	0	+*	–	–
Financial payments	0	+*	–*	0	–	–
Financial income	–	–*	0	0	+	–

Notes: Table 3 provides a summary of country-specific estimation results based on industry level data. '+' indicates a statistically significant positive impact of the variable in column 1 on the wage share. '-' indicates a statistically significant negative impact. '0' indicates no statistically significant effect. The signs provide a summary of over 40 different specifications for each variable, therefore they can only be seen as indicative. '*' indicates results that are robust only for a subset of the estimations, e.g. only for one particular estimation method or industry group.

Source: Guschanski and Onaran (2016); all estimation results are available upon request from the authors.

Social government spending has a statistically highly significant and robust positive coefficient for nearly all specifications in France and Italy, and is robust to the application of different estimation methodologies. The same holds for Britain although the results are not robust to estimations in first differences, and the United States where we find a positive impact if we reduce our sample to manufacturing sectors only, while we obtain a perverse negative sign for service sectors. For Germany and Spain, the effect is not robust to the application of different estimation methodologies and the coefficient is mostly statistically insignificant.¹⁸

We obtain mixed results regarding the effect of financialisation. In France household debt and financial payments have a perverse positive coefficient, while financial income has a negative effect. However, financial income and payments become insignificant for estimations in first differences. Similarly, we find a positive effect of household debt in Italy which is not robust to estimations in first differences. In Germany financial income appears to have the strongest negative effect on the wage share, while the negative coefficient of household debt is not robust. Similarly, we obtain a negative impact of financial payments in Spain, albeit only for estimations when applying the within estimator. However, in Britain, given the strong financial sector and the massive surge in household debt, financial payments and household debt both have a robust negative effect in all estimations using the within estimator, and the effect of financial payments is also robust when estimated in first differences. All financialisation variables have a negative impact on the wage share in the United States if the first difference estimator is applied.

Globalisation

We find support for a negative effect of globalisation measured by intermediate import penetration in France, Germany and the United States, while in Britain the coefficient is still negative but rarely significant. In the United States and France, the negative effect of intermediate import penetration is mostly driven by low-skilled manufacturing sectors, while in Germany the effect is equally found in low as well as high skilled manufacturing sectors. However, it is not robust to estimations in first differences in the United States and Germany. We find a positive impact of intermediate import penetration in some specifications in Spain using the first difference estimator, although this result is not robust to estimations using the first-difference estimator and other robustness tests.

¹⁸ We have also experimented with an alternative measure of government spending: total social government spending comprising the sum of in-kind and in-cash social transfers as a ratio to GDP. Our results are largely robust to this alternative measure but given that data for cash benefits is available only from 1995 onwards we prefer our current measure comprising in-kind transfers only.

In France we obtain an insignificant effect of outward FDI in the pool with all sectors when the first difference estimator is used, however the effect is positive for manufacturing sectors and negative for service sectors (albeit insignificant).¹⁹ Similarly, there is no robust effect of outward FDI in first differences in Britain. This is in line with research by Herger and McCorrison (2014) suggesting a low share of vertical FDI in Britain and France. For Germany the impact of FDI does not appear to be robust for the pool of all sectors. However, the effect is negative and highly significant and doubles in size when we restrict our sample to manufacturing sectors only (first difference estimator), while it stays insignificant, albeit with a positive sign, if only service sectors are considered. Interestingly, we find a positive impact of outward FDI in the United States using the within estimator, driven by high-skilled manufacturing and service sectors alike, while the effect is negative for low skilled service sectors. However, the coefficient turns insignificant if the first difference estimator is applied. Furthermore, we obtain a highly robust negative impact of outward FDI in Spain. The impact of outward FDI turns out to be mostly statistically insignificant or not robust in Italy, especially applying the first difference estimator.

Our country-level measure of migration has a positive effect in Britain, which points to the fact that migrant workers are overall complementary to domestic workers, while there is a negative effect in Germany. However, the negative effect in Germany is not robust in all specifications, and according to the estimations in first differences, the negative migration effect seems to be driven by low skilled manufacturing sectors. In France, the effect of migration is insignificant in the total pool but is significantly positive in services; further disaggregation indicates that the positive effect in services is driven by high skilled services, whereas there is a negative effect in the low skilled manufacturing sectors. Turning to the other countries we find a positive effect of migration in Italy, clearly driven by manufacturing sectors, while there is no statistically significant effect in the United States or Spain.

CONCLUSION

Our results provide evidence for the importance of country specific estimations. Our findings cast doubt on the technological change hypothesis as an explanation for the decline in the wage share common to all countries. While we found some evidence for a negative impact of ICT-capital intensity in the United States, Italy and Spain, the finding of a positive effect of non-ICT capital in these countries cast doubt on the prevalence of an elasticity of substitution larger than

¹⁹ Our measure of FDI is the variable for which we are most concerned about non-stationarity as our unit root test indicate integration of first order. Therefore, we mainly rely on the estimations in first differences for the analysis of outward FDI. For estimations using the within estimator we obtain a positive impact in France.

one, which is a necessary condition for the technological change hypothesis. These doubts are substantiated by our finding that the effect of ICT capital intensity does not differ across high- and low-skilled sectors. Other countries show no robust effect of technological change on the wage share. This suggests that the effect of technology might be determined by the institutional environment in which production takes place, rather than by the elasticity of substitution.

The relevance of the institutional environment is further emphasised by our findings with respect to different measures of bargaining power. We confirm our hypothesis that union density is an important indicator of the bargaining power of labour in highly coordinated regimes (Germany, Italy and Spain), while collective bargaining coverage is more important in countries where firm-level bargaining dominates (France, the United States and Britain). This hypothesis can also be translated into an argument about different forms of bargaining power. The industrial relations literature relates the degree of coordination and bargaining coverage to the ‘institutional power’ of unions, while union density and fall-back options relate to ‘organisational and structural power’ (Wright 2000; Silver 2003; Brinkmann and Nachtwey 2010; Bispinck *et al.* 2010). Our finding of an insignificant effect of union density in Britain, the United States and France implies that organisational power (union density) does not have an impact on the wage share unless it is backed up by institutional power as represented by a sufficient degree of coordination and bargaining coverage. With respect to other measures of bargaining power we find a positive impact of social government spending in France and Italy, and, less robust, for Britain and the United States, while there is no significant effect in Germany and Spain. This is in line with our finding that countries with a decentralised bargaining regime will benefit from policies at the national level, since gains that unions can achieve are often confined to a small work force.

Financialisation had the most pronounced effect in Britain and the United States, while there is also an effect in Germany. In Britain the most relevant channel appears to be shareholder value orientation that leads to wage suppression or increases in the mark up on production costs, as well as household indebtedness that reduces labour’s bargaining power. In Germany, and to some extent in France, increasing fall-back options of capital as captured by financial income appear to have a negative impact on the wage share. In the United States all three aspects of financialisation appear to be relevant. Estimations for other countries are inconclusive and require analysis using data on a more disaggregated level (Guschanski and Onaran 2018).

We find that globalisation had a strong impact on the wage share in all countries. The effect of globalisation on the wage share was least strong in

Britain, which might indicate that market seeking rather than cost seeking FDI dominates in this country. In Germany the effect is due to outward FDI as well as intermediate import penetration which reflects the impact of international outsourcing practices and suggest that cost-seeking trade activities dominate. Intermediate imports penetration, had a positive (but not robust) impact in Spain, while FDI had a robust negative impact. FDI played a smaller role in France and the United States, while import penetration had a negative effect on the wage share in these countries.

Overall, our findings suggest that the decline in the wage share is not an inevitable outcome of technological change and globalisation. The lack of robustness regarding the effects of technology implies that an attempt to reduce income inequality through skill-upgrading alone will not be sufficient. Reversing the decline in the wage share requires an institutional framework in which the bargaining power of labour is more in balance with that of capital. Our findings suggest that it might not be enough to increase union density to achieve such a ‘level playing field’. Rather it requires a policy mix aiming at increasing the institutional power of unions *via* higher bargaining coverage and, potentially, coordination, as well as increasing the structural power of labour by improving labour’s fall-back options. This is particularly relevant for countries where firm-level bargaining dominates (Britain, the United States and to some extent France). The effect of financialisation can be altered by creating incentives to decrease short termism and dividend payments, e.g. through higher taxation of dividend payments and capital gains, and by prohibiting share buybacks. Decoupling executives’ remuneration from share prices and including representatives of employees and the wider public on company boards would further support this process (Lazonick 2014).

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