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THE ROLE OF FINANCIAL CONSTRAINTS ON LABOUR SHARE DEVELOPMENTS: MACRO- AND MICRO-LEVEL EVIDENCE

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Abstract

Technological advancements have been affecting labour shares through a steep decline in the relative price of investment goods. This has lowered the cost of capital allowing firms to replace labour with capital. Nonetheless, financing obstacles could obstruct investment in both labour and capital. This paper assesses the role of financial constraints in hampering the effect of relative investment prices change on labour shares, using data for up to 26 OECD countries over the period 1995-2014. We find statistically significant, economically large and robust effects of financial constraints acting as a channel to hinder the effect of relative investment prices changes on labour shares. In particular, our results reveal that: *(i)* there has been a global decline in the labour share that coincides with declines in the relative price of investment goods and this decline has been heterogeneous across countries with different levels of financial constraints; (*ii)* industries highly dependent on external finance face a lower decline in the labour share following a drop in the relative investment price than industries that are less dependent on external finance, possibly because they are more constrained in accessing funds to finance investment; (*iii*) industry-level investment prices affect the labour share partly through changes within-firms rather than through composition effects, with smaller effects for firms that are more dependent on external finance and larger effects in less financially constrained and highly productive firms. These results are corroborated by an estimated aggregate elasticity of substitution between capital and labour greater than one, and higher for countries that are less financially constrained.

Keywords: Labour Income Share, Financial Constraints, External Financial Dependence, Relative investment price

JEL Classification: E25, E44, O33, J21

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1. Introduction and literature review

Over the last three decades, the labour's share of income, a measure showing how much of productivity gains accrue to workers, has been falling, despite being at odds with Kaldor's (1961) most influential stylized fact for macroeconomic modelling: the long run stability of aggregate factor shares. This fall has attracted the attention of economists, policymakers and the media. It is central to discussion of growing income inequality (De Serres and Schwellnus, 2018), of job polarization and the effects on workers' displacements (Elsby et. al., 2013) and of the rise in 'superstar firms' (Autor et. al., 2017). More generally, the evolution of the labour share plays a key role for the understanding of macroeconomic dynamics, the economy's production function and firm's technology choice (León-Ledesma and Satchi, 2018).

Several studies have documented a global decline in the aggregated labour share since the 1980s (e.g. Bentolia and Saint-Paul, 2003; OECD, 2012; Karabarbounis and Neiman, 2014; Elsby et. al., 2013, IMF, 2017, Schwellnus et. al. 2018). A large majority of the existing explanations focus on trade-offs between labour and capital. These have ranged from technological change, routinization of jobs, capital accumulation to changes in the relative price of capital.

This paper adds to the ongoing debate by assessing the still under-explored channel through which financial constraints hinder the substitution of capital for labour, in response to a decline in relative investment prices. In particular, measuring the real cost of capital requires taking into account not only the price of investment goods but also the financial frictions firms are facing, as the latter may reduce the ability of firms to take advantage of declines in investment prices in order to substitute capital for labour. The motivation is twofold. First, behind this average global decline in the aggregated labour share lies considerable cross-country and cross-industry heterogeneities. These heterogeneities appear to be related to cross-country and cross-industry differences in the respective level of financial constraints. Second, finance has been placed at the heart of the theories of persistent inequality (Demirgüç-Kunta and Levine, 2009). There exists a bulk of empirical evidence establishing that improved financial contracts, markets and

intermediaries lead to increased economic opportunities and decreased inequality.[1] Despite that, the role of financial constraints in exploring labour share changes has been left unexplored.[2] Given that the literature has focused on the prominent role of the steep decline in the relative price of investment goods for the observed fall in the labour share, it is crucial to account for the non-linearity in investment opportunities generated by financial obstacles. To our knowledge, no other study has previously explored the link between labour share changes and declines in the relative investment goods, taking into account differences in investment opportunities due to financing obstacles.

To fill this gap in the literature, we draw from both aggregated and disaggregated industry- and firm-level data, for a considerable number of OECD countries, over the last two decades. In particular, we follow the standard approach used in the literature to estimate the effect of technology driven declines in equipment prices and use the change in the relative price of investment goods (relative to consumption) to proxy firms' incentives for capital-labour substitution (Karabarbounis and Neiman, 2014; IMF, 2017; and Schwellnus et. al., 2018). The use of disaggregated data at the industry- and firm-level can provide meaningful mechanisms underlying aggregate labour share developments. In particular, firm-level analysis can shed light on the micro-level dynamics underpinning the estimated aggregated and industry-level effects. Moreover, we use leverage and external financial dependence measures to proxy for financial constraints to examine whether capital-labour substitution can be stronger for countries, sectors and firms that are less exposed to financial constraints.

Our results provide substantive evidence on the role of financial constraints for the development of the labour share at both the macro- and micro-levels. First, our results suggest that labour share has remained overall constant across highly

[1] See Demirgüç-Kunta and Levine (2009) for a review of the literature.

[2] One exception to this is Furceri et al. (2018) who, using aggregate and sector-level data, look at the effects of capital account liberalization policies on output and inequality. Results suggest that on average liberalisation reforms have led to small output increases and large inequality increases. Moreover, they suggest that episodes of capital account liberalization lead to falls in the labour share, especially for industries with a higher (i) level of external financial dependence, (ii) natural propensity to adjust their workforce in response to idiosyncratic shocks, and, (iii) elasticity of substitution between capital and labour (i.e., greater than one).

financially constrained countries, while the global decline in the labour share has been driven by countries that have low or no financial constraints. Second, the sectoral analysis suggests that industries highly dependent on external finance face a lower decline in the labour share following a drop in the relative investment price than industries that are less dependent on external finance. This is because industries that are more dependent on external finance are likely to be more constrained in accessing funds to finance investment, e.g. because of asymmetric information between borrowers and lenders, or because of limited financial flexibility or spare debt capacity. Third, the firm-level analysis demonstrates that since firms in the same industry face similar changes in relative investment prices, the industry-level response of labour shares should, at least partly, be driven by within-firm developments rather than reallocation effects. These results suggest that the effect of changes in relative investment prices partly operates through within-firm changes, with smaller effects for firms that are more dependent on external finance and larger effects in highly productive firms. These results are therefore consistent with the idea that technical change and innovations can often be obstructed or abandoned due to financing obstacles (Planes et al., 2002). We conclude by estimating the elasticity of substitution between labour and capital exploiting the cross-sectional variation of trends in labour share and relative investment price. The estimated elasticity supports our previous findings as we find a higher elasticity of substitution between labour and capital for low/non-financially constrained countries than for highly financially constrained countries, and that on aggregate this estimate is significantly higher than[1].

Our paper relates to the extensive empirical literature on the drivers of labor shares.[3] In particular, it mainly relates to the literature examining the structural

[3] Within these studies, some focus on the structural drivers and typically find the aggregate level labour share to be negatively associated with both technological change, proxied by relative investment price, and globalization, measured by trade integration and increased global value chain participation (e.g. Karabarbounis and Neiman, 2014; Piketty and Zucman, 2014; Bassanini and Manfredi, 2013; IMF, 2017; Schwellnus et. al., 2018). Other studies focus on the importance of public policies. For instance, the privatization of network industries and worker's bargaining power have been found to play a role for labour share developments (De Serres and Schwellnus, 2018; Azmat et al., 2012; OECD, 2012), while product market regulation and employment protection seem not playing an important role (IMF, 2017). Moreover, recent literature links labour share developments to changes in product market structure. In particular, evidence suggests that rising

drivers of labour share development. Capital-augmenting technological change or technology-driven declines in equipment prices may increase capital intensity and, in turn, reduce the labour share. This requires the assumptions that factor prices are determined competitively and that the elasticity of substitution between capital and labour is above unity.[4] This means that a decline in the relative cost of capital causes firms to substitute labour with capital to such a degree that the labour share declines. Using within-country time series variation in factor shares and prices, the estimates of the elasticity of substitution between capital and labour are generally found to be below one (Chirinko, 2008; León-Ledesma et. al. 2010, and Lawrence, 2015). By contrast, Karabarbounis and Neiman (2014) obtain an elasticity of substitution in the range of 1.2-1.5, using long-run cross-country and cross-industry variation in labour shares and relative investment prices. Their estimations suggest that 50% of the global decline of the labour share is driven by large declines in equipment prices across a significant number of advanced and emerging economies. A possible explanation for these discrepancies is that over time, capital may have become more easily substitutable for labour. Acemoglu and Restrepo (2018) suggest that the amount of tasks that machines can carry out has been substantially extended by new technology. This, in turn, could lead to the displacement of workers and to a fall in the labour share. For instance, evidence for the United Kingdom and the United States suggests that the elasticity of substitution between ICT capital and labour is significantly higher than for other capital goods and is well above one (Tevlin and Whelan, 2003; Bakhshi et. al. 2003). More recently, and in line with this finding, Autor and Salomons (2018) examine labour share developments in the United States and they suggest that technological progress has become more labour displacing over time, with the effects being particularly large in the 2000s. Along these lines, Krusell et al., (2000) account for the implied substitution of capital for routine labour tasks. Distinguishing between

concentration and higher mark-ups reduce the labour share through technology-, globalisation- or policy-induced "winner-take-most" dynamics (Autor et al., 2017; De Loecker and Eeckhout, 2017; Barkai, 2016). Finally, some studies have emphasized the importance of measurement issues (e.g. Gollin, 2002 and Bridgman, 2017).

[4] Grossman et al. (2017) develop a theoretical model in which a *decline* in the rate of technical change reduces the labour share irrespective of whether it is labour- or capital-augmenting.

low-skilled and high-skilled labour, they estimate, for the United States, the elasticity of substitution between capital and low-skilled labour to be around 1.7, while the one between capital and high-skilled labour is much lower, at around 0.7. This is consistent with cross-country evidence, in both IMF (2017) and Schwellnus et al., (2018), of particularly negative effects of declines in relative investment prices on labour shares in countries with high initial shares of routine jobs.

The other key structural driver put forward by the labour share development literature is globalisation. Acemoglu and Autor (2010) suggest that trade integration could have an impact on the labour share similar to increases in capital intensity. The offshoring of the most labour-intensive stages of production and/or increased import competition can indeed lead to the displacement of workers and, therefore, to an increase in capital intensity. In turn, this will determine the fall in the labour share assuming the elasticity of substitution between capital and labour is higher than one. Harrison (2005), Elsby et al.,(2013) and Schwellnus et al., (2018) provide evidence for this channel. However, the IMF (2017), in a cross-industry cross-country study, finds that increased participation in global value chains is negatively correlated with the labour share in emerging markets but has no effect in advanced economies.

Our paper also relates to the literature examining the effect of financial constraints on employment and investment. Doa and Liu (2017) develop a simple model showing how the link between financial constraints and firm's job creation is affected by the need of its working capital financing. Moreover, a number of studies have shown that, under imperfect capital markets, the firm's fixed investment and employment choices depend on the firm's financial position/debt level (for surveys see, Hubbard, 1998 and Bond and Van Reenen, 2006; Marchica and Mura, 2010). Spaliara (2009) suggests that a firm's investment and employment decisions have to be jointly analysed as long as firms use both inputs of production and there is some substitutability between them. Using firm-level data from the UK, it provides evidence that more financially constrained firms face a lower capital-to-labour ratio. In light of these considerations, financing obstacles could obstruct investment in both labour and capital, as a result, financial

constraints could account for, at least some of, the heterogeneity of the technology channel. Better access to finance may allow firms to hire more labour, but, at the same time, it can encourage firms to invest in more or better capital. Therefore, if firms have a production technology with capital and labour being substitutable, an increase in capital investment may reduce a firms' labour demand (Dao and Liu, 2017). However, firms with financial constraints may face difficulties expanding business investment due to a lack of resources. Financial constraints are found to play a key role for a firm's investment decisions (Carpenter and Guariglia, 2008 and Guariglia, 2008), and this could, in turn, have important consequences for the dynamics of the labour share.

The reminder of the paper is organised as follows. Section 2 presents the data and provides some stylized facts concerning the decline of labour shares and the role of financial constraints. Section 3 describes the empirical methodology. Section 4 presents and discusses the empirical results. Finally, Section 5 concludes.

2. Data and stylised facts

This Section describes the main data used in the empirical analysis. It starts by presenting the main data on labour share and its main drivers. It then proceeds illustrating the measures of financial constraints that are the focus of the analysis. The Section concludes by presenting some stylized facts about the evolution of labour share, the relative investment price and the global value chain participation over the past two decades – over the period 1995-2014 – in 29 countries for which data are available. The main facts that emerge are the following: first, the labour share has been on a declining trend over the examined period; second, there exist significant heterogeneities in labour share developments across countries; third, the decline in the labour share has been typically larger in countries with lower financial constraints.

2.1. Labour share and other data

Industry-country labour shares and relative investment prices data come from the OECD Annual National Accounts database complemented with additional data

from the archives of the OECD Stan database and the EU-KLEMS database. The labour share is defined as the ratio of total nominal labour compensation over nominal gross value added.[5,6] For the macro-level analysis, the country-level labour shares data are obtained by aggregating industry-level data.

Country- and industry-level relative investment price indices are constructed from the OECD Annual National Accounts database with additional data from the EU-KLEMS database and the archives of the OECD STAN database. Price deflators for gross fixed capital formation divided by value added price deflators. The same reference year (2000) is used for all indices.[7]

Finally, participation in global value chains is proxied by the sum of forward and backward linkages, in percent of value added. Backward linkages measure the offshoring of intermediate inputs used in exports and are defined as foreign value added embodied in exports. Forward linkages measure trading partners' offshoring of intermediate inputs and are defined as domestic value added used as intermediate inputs in trading partners' exports.[8] Global value chain participation data are sourced from the OECD TiVA database.

The firm-level analysis is based on the 2013 OECD-ORBIS database for the years 2001-2013, a unique cross-country longitudinal dataset of both listed and unlisted firms provided by Bureau van Dijk. The dataset features harmonized and rich information on firms' productive activities (e.g. value-added output, capital stock, employment) and financial situation based on balance sheets and income statements (e.g. debt, assets, tangible and intangible fixed assets, long-term debt).

[5] Labour compensation is the sum of compensation of salaried workers and the imputed compensation of self-employed workers. The imputation is based on the average hourly or per-capita compensation of salaried workers at industry-level. Nominal value added is expressed at factor costs, that is, net of taxes less subsidies on production. Using value added at factor costs in the denominator ensures that labour and capital shares of value added sum to one.

[6] The primary, coke and refined petroleum manufacturing, housing and non-market industries are excluded from the analysis since labour shares in these industries are driven by changes in commodity and asset prices or by imputation choices (Schwellnus et al. 2017).

[7] For the industry-level analysis, extreme outliers in ICT manufacturing for some countries likely reflect measurement error and are dealt with by using the relative investment price in ICT manufacturing for the United States as an instrumental variable for the relative investment price in ICT manufacturing for all countries. Dropping ICT manufacturing from the regressions neither qualitatively nor quantitatively affects the results reported below.

[8] Backward and forward linkages are normalised by aggregate value added to account for the overall trade openness of the country.

In order to limit the influence of erratic or implausible firm-behaviour, the dataset is cleaned by removing extreme outliers using the procedure described in Gal (2013).[9]

2.2. Measuring financial constraints at aggregate level

Measuring financial constraints in an economy requires capturing the effect of financial conditions on real activity. Therefore, finding comparable indicators of financial constraints at country-level is not trivial. Cross-country financial development indicators (e.g. BIS data) have a number of drawbacks, particularly reverse causality, and do not allow identifying the effective role of financial constraints. The most natural way to measure country-level financial constraints would be to calculate, by country, the share of highly indebted firms using comparable enterprise surveys. However, due to data limitation, we are not able to obtain such measure.

We therefore follow the literature to construct firm-level external financial dependence indicator to proxy for financial constraints. It is assumed that countries and industries that are more dependent on external finance are also more constrained in accessing funds to finance investment, e.g. because of asymmetric information between borrowers and lenders. External financial dependence was likely to be a particularly binding constraint on the financing of investment during the global financial crisis of 2008-09. In general, observed external finance dependence indicator captures both demand for funds – which is largely determined by industry characteristics, such as R&D intensity or capital intensity – and supply of funds, which is determined by the development of the financial system. However, observed external funding is likely to reflect mainly the technology-determined demand for funds in highly developed financial markets.

We use data from Thompson Reuters Worldscope to construct country-level indicators of financial constraints. Worldscope provides data on the balance sheets, cash flows, and income statement for all listed non-financial companies, for the 29

[9] See Gal (2013), Kalemli-Özcan et al. (2015) and Gal and Hijzen (2016) for a more detailed description of the dataset.

OECD economies included in the analysis.[10] The sample period is 1995-2014. Two indicators of financial constrains are constructed:

– *External finance dependence*: the country-level approximation of firm's dependence on external finance is constructed following the methodology first developed by Rajan and Zingales (1998). Specifically, external finance dependence is measured, excluding firms in the financial sector, as capital expenditure minus internal funds (cash flow from operations) divided by capital expenditure.[11]This indicator reveals the median company in the country for which the desired investment cannot be financed through internal cash flow. It gives a sense of the demand for external finance in the economy.

– *Debt ratio*: debt over total assets.[12] The debt ratio is an indicator of firm's (long-term) debt-paying ability. The rationale is that high leveraged firms might find it difficult and costly to raise more funds. This is because firms with higher debt-to-asset ratios will need higher profits to pay off their debt, therefore facing a higher probability of default.

For both proxies of financial constraints, we first calculate, for each firm, the average value of the indicators over the three decades (1990-1999; 2000-2009; 2010-2014), based on annual data.[13] Then, we define the country-level value of the indicators by calculating the median across all firms in each country by decade.[14] To

[10] Since Worldscope data covers publicly listed firms only, it could be argued that the constructed financial constraints indicators do not necessarily reflect the level of financial constraints of the whole economy. However, results obtained with these data can be considered as a lower bound of the real effect of financial constraints, given that small and medium-sized firms are generally more likely to be financially constrained (Banerjee, 2014). Moreover, listed firms account for a large share of output and employment in most developed countries.

[11] Throughout, financial firms (Standard Industrial Classification (SIC) 6000–6999) are excluded from the sample.

[12] We construct two measures of debt ratio, both a measure of long term debt to total assets and a measure of total debt (i.e. long term and short term debt) to total asset.

[13] We restrict to firms that contains at least 5 years of observations per decade.

[14] A different method to aggregate indicators at country-level has been checked to test the robustness of the results. Particularly, the starting from firm-level indicators, we have aggregated at the industry-level (at the Standard Industrial Classification [SIC] two-digit level), separately by country and decade by taking the median of all firms in each sector. The sector-level indicators are then aggregated using a common set(s) of industry weights. Specifically, we use industry's share of employment on total employment.

minimize the influence of outliers in subsequent analysis, we winsorize those measures at both the top and bottom 1%.[15]

2.3. Stylized facts

Figure 1 shows the trends in the aggregate labour share, relative investment price and global value chain for the 29 countries included in our sample. It emerges that aggregate labour share have declined by around 3 percentage points over the 1995-2014 period, which coincided with the fall in relative investment prices and the expansion of global value chains. This result is consistent with previous literature and supports the idea that relative investment price declines may have initiated capital-labour substitution (Karabarbounis and Neiman, 2014; IMF, 2017; and Schwellnus et al., 2018). Similarly, increased global value chain participation may have conducted to the offshoring of the most labour-intensive tasks (Elsby et al., 2013; and IMF, 2017).

[Figure 1]

However, this global decline conceals significant heterogeneities across countries (Figure 2). In particular, 13 out of the 29 countries display increased labour shares over the period 1995-2014. Those differences could be explained, to some extent, by large cross-country differences in relative investment price developments and changes in global value chain participation. Similarly, although most countries covered by the analysis have experienced declining relative investment prices and all countries have experienced increasing global value chain participation, these changes have not been uniform across countries.

[Figure 2]

To examine whether the decline in the labour share is related to financing obstacles, we report the average trend in labour share, relative investment price and global value chain for countries with high financial constraints and for countries with low financial constraints. Figure 3 shows that the overall labour share decline is driven by countries with low financial constraints (Panel B), rather

[15] Figure 3 is obtained using the external financial dependence as a proxy for financial constraints. The general picture is unaltered when instead using the debt ratio.

than by countries with high financial constraints (Panel A). This figure also displays a more pronounced fall in the relative investment price of low financially constrained countries, and a more pronounced increase in the global value chains prices of highly financially constrained countries. Part of the observed differences between those two groups of countries might therefore be coming from the different trends in relative investment prices and global value chains prices. Despite that, it also clearly provides support for further examination of the potential role of financial obstacles for the development of labour share.

[Figure 3]

3. Empirical framework

To examine the role played by financial constraints in reducing the impact of declines in relative investment prices on the labour share we perform a three-tier (country-, industry-, and firm-level) analysis on the empirical relationship between trends in labour shares and relative investment prices interacted with different financial constraints' measures. We also consider the role of global value chain participation as it could lead to the offshoring of the most labour-intensive stages of production.

We focus on medium-term changes in labour shares and relative investment prices, while using the financial constraints measure in the initial year to minimise possible endogeneity with changes in the labour share, as well as to ensure orthogonality with changes in the relative investment price. This medium-term changes approach allows: (1) capturing slow adjustments of labour shares to structural changes triggered by technological change and global integration; (2) reducing the likelihood of biases arising from cyclical or temporary components; (3) for a more realistic setup for the implied assumption that the elasticity of substitution between labour and capital is above one.[16]

[16] For more work using this strategy, see for instance: Harrison (2005); Elsby, et al. (2013); Karabarbounis and Neiman (2014); Acemoglu and Restrepo (2016); and IMF (2017); Schwellnus et. al. (2018).

3.1. Macro-level analysis:

We begin with a macro-level analysis of labour share developments and examine the role that country-level financial constraints play in hindering the effect of relative investment price declines on labour share changes. We follow the standard approach in the literature used to assess the contributions of the key drivers of labour shares (Karabarbounis and Neiman, 2014; Acemoglu and Restrepo, 2016; and IMF, 2017). To estimate the effect of technology, we follow Karabarbounis and Neiman (2014) by using the change in the relative price of investment goods (relative to consumption) to proxy firms' incentives for capital-labour substitution. Furthermore, an innovation of the paper is the recognition that substitution can be stronger for countries where firms are less exposed to financial constraints. Financial constraints can indeed reduce the ability of firms to take advantage of declines in relative investment prices in order to substitute capital for labour.

Motivated by the above considerations, we estimate the following empirical specifications:

$$\Delta LS_{ct} = \beta_1 Fin_{c0} + \beta_2 Fin_{c0} * \Delta IP_{ct}^{inv} + \beta_3 \Delta IP_{ct}^{inv} + \beta_4 \Delta T_{ct} + \beta_5 \Delta OG_{ct} + \alpha_t + \alpha_c + \varepsilon_{ct} \qquad (1)$$

where subscripts c and t denote countries and periods; $\Delta \mathrm{LS_{ct}}$ is medium-term change in the aggregate labour share, excluding primary, housing and public sectors; Fin_{c0} is a proxy for financial constraints measured by a country-level approximation of firm's dependence on external finance or debt to total assets; ΔIP_{ct}^{inv}, ΔT_{ct}, ΔOG_{ct} measure, respectively, the change in log relative investment price, the change in global value chain participation, and the change in the output gap.[17] All regressions also include period-, α_{t}, and country-specific, α_{c} , fixed effects. To maximise the use of the data, we rely on overlapping 8-year differences (e.g. 1995-2003, 1996-2004, etc) and we cluster the standard errors at

[17] The output gap is defined as the deviation of actual GDP from potential GDP in percent of potential GDP. Data are drawn from the OECD Economic Outlook database.

the county-level to ensure robust estimators (Andrews et al 2016 and Bloom et al,. 2015).[18]

This macro-level estimation strategy exploits cross-country and time variation for different measures of financial constraints. Although this strategy cannot establish a conclusive causal relationship, the robustness of the results presented in the next section suggests the existence of a systematic relationship between financial constraints, changes in relative investment prices and labour share developments. To ensure that the effects of financial constraints are not driven by changes in the level of financial development, we also include controls for financial development at the macro-level.[19] Following Demirgüç-Kunt and Levine (1996), we define financial development as the sum of financial intermediary development and stock market development. The former is the sum of the ratio of liquid liabilities to GDP and the credit going to the private sector over GDP. The latter is the sum of stock market capitalization over GDP, total value traded over GDP, and total value traded over market capitalization. The data are taken from the Global Financial Development Database of the World Bank.

3.2. Industry-level analysis:

Additional evidence on the role of financial constraints on labour share developments comes from industry-level data. This subsection complements the analysis of aggregate labour shares by analysing their changes across countries and industries. There are some comparative advantages associated with this disaggregate analysis. First, it allows for a more credible identification of the structural drivers of labour share developments. Second, using an appropriate fixed-effect structure, one can control for country- and industry-specific trends that are uncorrelated with the structural drivers of labour share development. Third, this layer of analysis will provide evidence on whether sectors that are more dependent on external finance have experienced smaller declines in labour share

[18] For robustness, we also run 7- and 9-year overlapping differences, and results remain unchanged.

[19] As a robustness check, we also run the regressions including the initial level of financial development rather than the change. Results are robust and remain quantitatively the same.

following a fall in the relative investment price than sectors that are less dependent on external finance. We therefore estimate the following empirical specification:

$$\Delta LS_{cjt} = \beta_1 FC_{cj0} + \beta_2\left(FC_{cj0} \times \Delta P_{cjt}^{Inv}\right) + \beta_3 \Delta P_{cjt}^{Inv} + \beta_4 \Delta T_{cjt} + \alpha_{ct} + \alpha_{jt} + \varepsilon_{cjt} \quad (2)$$

where subscripts *c*, *j* and *t* denote, respectively, countries, industries and periods; as for the macro-level analysis, ΔLS_{cjt} denotes the medium-term (8-year) changes in the labour share; FC_{cjt} denotes initial financial constraints at industry-level; ΔP_{cjt}^{Inv} denotes the medium-term change in the relative investment price; ΔT_{cjt} is the medium-term change in participation in global value chains; α_{ct} and α_{jt} denote country-by-period and sector-by-period fixed effects. The inclusion of these two types of fixed-effects provides two important advantages compared to the cross-country analysis: (i) country-by-period fixed effects allow controlling for any variation that is common to all sectors of a country's economy, as well as macroeconomic shocks; (ii) sector-by-period effects allow controlling for industry-specific factors.[20] However, a drawback of this fixed-effect structure is that it does not allow identifying business cycle effects since changes in the output gap are perfectly collinear with country-by-period fixed effects. Some of the results reported in the next section replace country-by-period and industry-by-period fixed effects with country-industry and period-fixed effects to include long differences in the output gap as control.

For this level of analysis, in order to test the hypothesis that financial constraints limit the impact of changes in the relative price of investment on the labour share, we exploit heterogeneity across industries in dependence on external finance. In this case, industry-level financial constraints are proxied by the measure of external financial dependence constructed by De Serres et al. (2006). In particular, they measure external financial dependence as industry-level capital expenditure minus internal funds (cash flow from operations) divided by capital expenditure in the United States over 1994-2003. The analysis then assumes that the same value of external financing dependence applies to the corresponding sector in all other economies, based on the argument that US firms are judged least

[20] The inclusion of country-period and industry-period fixed effects is likely to address endogeneity concerns related to omitted variable bias.

likely to suffer from financing constraints relative to firms in other countries due to a relatively high level of financial development in the US. Therefore, the US value of the index for a particular sector likely represents a minimum-value for the same-sector firms in other countries.

As for the macro level analysis, to maximise the use of the data, we focus on overlapping 8-year differences and we cluster standard errors at country-industry pair level to make this inoffensive (Andrews et al 2016 and Bloom et al., 2015).

3.3. Firm-level analysis:

Finally, we use firm-level data to shed light on the micro-level mechanisms underlying the estimated aggregate and industry-level effects. This angle enables us to understand the extent to which key drivers of labour share developments (i.e. relative investment prices and global value chain participation) affect aggregate and industry-level labour shares primarily through changes in labour shares within firms or trough changing firm composition. Since it is plausible to assume that firms in the same industry face similar changes in relative investment prices, then the industry-level response of labour shares should, at least partly, be driven by within-firm developments rather than reallocation effects. However, even within narrowly defined industries, there may be large differences in the extent to which firms are able to take advantage of relative investment price declines as firms with better access to external finance respond more strongly to changes in industry-level investment prices.

In order to assess whether within-firm labour shares respond to changes in industry-level relative investment prices, and whether the response of labour share to changes in industry-level relative investment prices depends on initial financial constraints, we estimate the following equation:

$$\Delta LS_{cjit} = \beta_1 FC_{cjt} + \beta_2\left(FC_{cji0} \times \Delta log P_{cjt}^{Inv}\right) + \beta_3 \Delta P_{cjt}^{Inv} + \beta_4 \Delta T_{cjt} + \gamma' X_{cji0} + \alpha_{cj} + \alpha_t + \varepsilon_{cjit} \quad (3)$$

where subscripts *c, j, i, t* denote, respectively, countries, industries, firms and time. ΔLS_{cjit} denotes the annualised long difference in the firm-level labour share, with long differences computed over the longest period a firm is observed and the sample is constrained to firms that are observed for at least 8 years over the period

2001-13. ΔP_{cjt}^{Inv} denotes the annualised long difference of the log relative investment price; ΔT_{cjt} is the annualised change in global value chain participation; X_{cji} is a set of firm-level controls that include: initial values of the firm's age, size (as measured by employment) and the initial labour share; α_{cj} denotes country-sector fixed effects and α_t are period-fixed effects that cover all permutations of possible start and end years over the period 2001-13.[21] We use leverage as proxy for access to external finance, the rationale being that highly leveraged firms may both be more dependent on external finance and find it more difficult and costly to raise external funds. This is calculated as the ratio of the sum of current liabilities and long-term debt to total assets.[22,23] The inclusion of country-sector fixed effects is particularly important as it implies that we compare the change in average labour share between more and less credit constrained firms within narrowly defined country-sector cells. This control is crucial because it is well established, for instance, that some sectors rely more heavily on external finance than others and tend to have higher leverage ratios as a result (Rajan and Zingales, 1998).

To analyse the extent to which firm-level labour shares respond to changes in industry-level relative investment prices and whether the response differs across firms with different initial financial constraints, we use firm-level data from OECD-ORBIS and industry-level relative investment price indices.

Throughout the three layers of the analysis presented above, in order to test the hypothesis that financial constraints limit the impact of changes in the relative price of investment on the labour share, we focus on the coefficient, β_2, the

[21] The above specification of the firm-level regressions implies that only one long difference per firm is considered, therefore, firm fixed effects cannot be included. Including the initial values of the dependent variable allows controlling for unobserved firm characteristics in the absence of firm fixed effects (Angrist and Pischke, 2009).

[22] Current Liabilities include loans, liabilities to credit institutions, trade payables and any other liabilities due within one year, as well as accruals and deferred income.

[23] The literature on firm-level financial constraints is yet to provide a clear-cut consensus on a financial measure estimate (Silva and Carreira, 2012). Despite that, the literature evidences a positive relationship between firms' leverage ratio and financial constraints. For instance, Ferrando and Mulier (2015) have found that firms with lower leverage ratios are less likely to be financially constrained. Giroud and Mueller (2017) provide evidence for U.S. firms on a positive relationship between pre-crisis leverage ratio and financial constraints during the Great Recession. Finally, Mocking et al. (2016) use the average debt-to-assets ratio in the period before the crisis as indicator for dependence on external finance.

interaction term between the measure of financial constraint and the change in the relative investment price. If $\beta_2 < 0$, then it implies that financial constraints are hindering the substitution of capital for labour in response to a decline in relative investment prices.

4. Results

The first sub-section of the results covers the macro-level specification analysing cross-country differences in labour share developments. The second sub-section covers the industry-level analysis. The third and last sub-section of this section exploits firm-level data to sheds light on the effect of financial constraints on labour share developments.

4.1. Macro-level

The macro-level empirical analysis is conducted on 19 OECD countries over the period 1995-2014.[24] Table 1 summarises the aggregate regression results obtained by estimating equation (1). Column 1 shows the baseline estimation results, columns 2 and 3 present the results further augmented with alternative measures of financial constraints, and columns 4 and 5 displays the results when controlling for changes in financial development. Regarding the role of technology, the baseline estimates imply that the estimated semi-elasticity of the labour share to the relative investment price good is approximately 0.21. This means that a decline of 10 percent in the relative price of investment goods leads to a 2.1 percentage point decline in the labour share. This is also consistent with the finding that the average elasticity of substitution is higher than 1. Participation into global value chain is estimated to have a negative effect on the labour share of income: the estimated elasticity of the labour share to GVC participation is around -0.05, suggesting that an increase of backward and forward linkages of 10 percentage points of value added reduces the labour share by 0.5 percentage points. However, this effect is not significant across all estimations. IMF (2017) explains that in advanced economies offshored tasks are relatively labour-intensive, and increased

[24] The countries included in the macro-level econometric analysis are: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Slovak Republic and Sweden, United Kingdom and the United States.

participation in global value chains leads to a fall in the labour share as the composition of production becomes more capital-intensive. Given that our sample is composed of advanced economies, our finding supports the notion that offshored tasks are labour-intensive (IMF, 2017).[25] Moreover, the baseline results are also consistent with the evidence that the labour share is counter-cyclical as the coefficient of changes in the output gap is negative and statistically significant. Finally, the results of Columns (2) to (5) confirm that the effect of changes in relative investment prices varies depending on the degree of country-level financial constraints. These suggest that a decline in relative investment price reduces the labour share by more in countries relatively less exposed to financial constraints. In particular, the results suggest that both high external financial dependence and high debt to total asset ratio dampen the transmission of declines in the relative investment price to aggregate labour share.[26] While the estimated semi-elasticity for countries with low financial constraints is ranging between 0.30 and 0.35, it is around 0.09 and 0.17 for countries with high financial constraints, with the difference being significant. [27, 28]

The observed average decline in the relative investment price across countries with high financial constraints, over the sample period, was 6%, while it was around 10% for countries with low financial constraints (see Figure 2). Thus, a simple back-of-the-envelope calculation based on our results, suggest that investment price declines reduced the labour share only by around 1.5 percentage points for high financially constrained countries. While the investment price declined lead to a labour share decline of 3.2 percentage points in countries with low financial constraints.

[Table 1]

[25] The idea here is that as wages are higher in advanced than in emerging economies, tasks that are labour-intensive could be offshored from the former to the latter.

[26] High debt to assets ratio refers to those countries whose initial level of debt to total assets is at the 75th percentile of the distribution or above.

[27] The overall effect of changes in relative investment prices on relatively more financially constrained countries is given by $\beta_2 + \beta_3$.

[28] Results do not change when using the continuous measure of financial constraints rather than the dummies.

4.2. Industry-level analysis

The sectoral analysis of aggregate labour share is conducted on 26 OECD countries over the period 1995-2014.[29] As for the macro-level analysis, according to the baseline specification, declines in the relative price of investment and increases in GVC participation have been associated with declines in labour shares (Table 2, Column 1). The estimated semi-elasticity of the labour share to the relative investment price is 0.12, slightly lower than for the macro-level analysis and the estimated semi-elasticity of labour share to GVC participation is -0.1. Replacing country-period fixed effect by including among the explanatory variables changes in output gap, to measure the effect of the business cycle, does not change the results on relative investment price and GVC participation. Additionally, the coefficient on output gap changes, being negative and significant, is consistent with the macro-level findings (Table 2, Column 2). When testing for heterogeneous effects of changes in the relative price of investment across industries that are more or less exposed to financial constraints, results are consistent with the aggregated analysis and with the view that financial constraints dampen the transmission of declines in relative investment prices to the labour share. The estimated semi-elasticity of the labour share to relative investment price is 0.24 for industries less dependent on external finance whereas it is around 0.05 for industries highly dependent on external finance (Table 2, column 3). These results suggest that industries that are more dependent on external finance are likely to be more constrained in accessing funds to finance investment, e.g. because of asymmetric information between borrowers and lenders. Consequently, firms that are highly dependent on external finance may not be able to take advantage of declines in the relative investment price to substitute capital for labour.[30]

[29] The countries included in the industry-level econometric analysis are: Australia, Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Korea, Luxembourg, Latvia, Netherlands, Norway, Portugal, Slovak Republic, Slovenia, Spain, Sweden, United Kingdom, and United States.

[30] These results are robust to the inclusion of country-period fixed effects and the removal of controls for changes in output gap. Estimates are not shown but available upon request.

4.3. Firm-level analysis

The firm-level analysis focuses on nine OECD countries for which long differences in labour shares can be computed for a sufficient number of firms and for which information on aggregate financial and credit conditions is available.[31] The analysis is constrained to the same industries as the industry-level analysis: the sample is restricted to the non-primary non-financial business sector; industries with a high share of self-employed and ICT using sectors which were found to have problematic relative investment prices have been excluded (NACE Rev.2 codes 10-82, excluding 01-09, 19, 26-27, and 68). Finally, country-industry-years for which there are less than 30 firms have been removed. The analysis is based on a harmonized consolidation level of accounts using unconsolidated and consolidated accounts.[32] In addition, we exclude very small firms (less than 3 employees), a common practice in studies using firm-level data, due to concerns regarding the reliability of the data as well as the consistency of variables over time.[33]

We rely on the cross-firm variation in initial leverage, to assess the impact of financial constraints. The results reported below are based on a financial constraint measure defined as the ratio of current liabilities and long-term debt to total assets. We also investigate another potential source of firm heterogeneity, initial productivity, in order to proxy for know-how required for technology adoption. High-productivity firms are defined as the top 5% of leading firms within an industry with the highest labour productivity across the countries covered by the analysis.

Table 3 summarises the main empirical results of the firm-level analysis and clearly shows that firm-level data capture the key dynamics of the economy-wide data. A decline in the relative investment price is estimated to reduce firm-level labour shares (Table 3, Column 1). The average estimated firm-level semi-elasticity is around 0.15, remarkably similar to the estimated industry-level semi-elasticity (of

[31] Namely, Belgium, Finland, France, Germany, Italy, Korea, Spain, Sweden and the United Kingdom.
[32] To ensure consistency and comparability of monetary variables across countries and over time, data have been cleaned using the standard methodology followed by Gal and Hijzen (2016).
[33] In order to ensure that results are not driven by firms with extreme values in long differences in labour shares, firms with long differences outside the [-40,+40] percentage point interval are removed from the analysis. The analysis is further constrained to country-industry cells with more than 30 firms in order to ensure that the industry-level variables are identified by a sufficient number of firms. The results are robust to alternative sample restrictions.

around 0.11) and the aggregate one (of around 0.18). However, the firm- and industry-level results are not directly comparable as high-productivity firms – for which the estimated semi-elasticity of labour shares to relative investment prices is higher (Column 4) – are over-represented in OECD-ORBIS. Additionally, the firm-level analysis is based on a more limited sample. As a result, the positive and statistically significant semi-elasticity in the firm-level analysis suggests that declines in the relative investment price affect aggregate labour shares at least partly through within-firm effects, however, the similarity in estimated semi-elasticities across the firm- and industry-level analyses cannot be interpreted as ruling out composition effects. By contrast, the estimated coefficient on global value chain participation is insignificant, suggesting that the macro and industry-level effects mainly operate through the composition effect, that is the reallocation of production from high-labour share to low-labour share firms.

High levels of leverage dampens the transmission of declines in the relative investment price on the labour share (Table 3, Columns 2-4). In firms that are more financially leveraged a decline in the relative investment price reduces the labour share significantly less than in less leveraged firms. The semi-elasticity of labour shares to the relative investment price for a firm with a leverage ratio of 100% is about one third lower than for a firm with zero leverage. These findings hold measuring financial constraints both with the initial level of firms' leverage and with a discrete variable measuring high initial leverage, that is a debt ratio above the sample mean (Table 3, column 3-4).[34,35]

[Table 3]

Moreover, results are robust to the inclusion of the dummy for high-productivity firm and leverage simultaneously; suggesting that results are not

[34] High leverage is a dummy variable that takes value 1 for firms with initial leverage higher than the sample's mean, and zero otherwise.

[35] We also create some alternative measures of financial constraints to prove the robustness of the results. In particular, we create two more measures of leverage to proxy for financial constraints: (i) a firm's *total liabilities to total assets* ratio, which is the same as our preferred leverage ratio but including also other liabilities (i.e., provisions); (ii) short term loans to total assets ratio; (iii) cash flow, measured as the EBITDA-to-capital ratio, as it is another common proxy for financial constraints used in the literature (Kalemli-Ozcan et al. 2015). Results remain quantitatively the same.

driven by the fact that more constrained firms may be less productive (Table 3, Column 3). Finally, these results are confirmed also by replacing the country-industry and year-fixed effects with a combined country-industry-year fixed effects, the estimated coefficient on the interaction terms is remarkably consistent with the main specification (Table 3, column 5).[36] Overall, the results based on firm-level analysis suggest that industry-level investment prices affect the labour share partly through changes within firms rather than composition effects, with firms with low financial leverage and high-productivity firms typically responding more strongly to changes in industry-level investment prices. By contrast, there is no evidence that changes in global value chain participation affect firm-level labour shares, suggesting that they operate mainly through composition effects. This latter effect is in line with the results in Böckerman and Maliranta (2012), who found show evidence that, in Finland, firms exposed to international trade show a systematic micro-structural change in terms of value added towards those firms that have a lower labour share.

4.4. Elasticity of substitution

As already mentioned, the most salient parameter influencing the factor shares of income is the elasticity of substitution between capital and labour, which measures how easily one is substituted with the other when their relative cost changes.

We follow Karabarbounis and Neiman (2014) to provide estimations of the implied elasticity of substitution between capital and labour σ, by estimating the equation below:[37]

$$\frac{LS_j}{1-LS_j}\widehat{LS_j} = (\sigma - 1)\widehat{P_j^{Inv}} + u_j \qquad (4)$$

where *j* indexes country-industry observations for 19 industries and 25 countries. [38,] The hat notation refers to percentage changes, which are measured as the linear trend in the log of the variable. Therefore, $\widehat{LS_j}$ is the percent change of the labour

[36] Including combined country-industry-year fixed effects does not allow identifying explicitly the effect of changes in industry-level relative investment prices and in GVC participation.
[37] For more details on how this equation is derived, see Karabarbounis and Neiman (2014) section III.
[38] Those are the same countries as in the industry-level analysis, except for Latvia for which data of external financial dependence at the macro-level are unavailable.

share, and $\widehat{P_j^{Inv}}$ is the percentage change of the log of the relative investment price. LS_j is the average value of labour share per country and industry, and u_j is an idiosyncratic error term. We control for country and industry fixed effects in the regression. To ensure that outliers are not driving the results, we make use of the robust regression estimator, which places less weight on extreme values that are identified endogenously.

The idea here is straightforward: a falling trend in the relative price of investment goods $\widehat{P_j^{Inv}}$ will lead to a falling trend in the labour share $\widehat{LS_j}$, if and only if, the elasticity of substitution σ is higher than 1. This positive relationship implies that when the fall in the relative investment prices leads to a fall in the cost of capital, then firms will substitute labour for capital, pushing the labour share down. In the case where σ is below 1, trends in the labour share and the relative investment price will display a negative relationship. If however there is no apparent relationship between the two, then this implies a Cobb-Douglas production function where σ is equal to 1.

[Table 4]

Table 4 presents the results of the estimates of σ from equation (4). The first row shows the estimated elasticity of substitution for all countries and industries in the sample, while the second and third row show the estimate for the non- or low-financially constrained countries and the high financially constrained countries, respectively. From the first row of the table, we see that the elasticity of substitution for all countries is equal to 1.08 and it is significantly greater than 1. This result is in line with Karabarbounis and Neiman (2014). While estimating the elasticity for the two different set of countries, we find this elasticity is slightly lower for countries with high financial constraints, 1.07, however the confidence interval suggests that it is not significantly different from 1. On the other hand, the last row of the table suggests that no or low financially constrained countries have a higher elasticity of substitution in the long-run at 1.11, and this elasticity is significantly higher than 1.

For robustness, we also estimate the country-industry specific σ's based on the long-term time-series trends. We therefore use the industry-level dataset and estimate the elasticity of substitution for each observation, following equation 4 above:

$$\widetilde{\sigma_j} = 1 + \frac{LS_j * \widehat{LS_j}}{(1 - LS_j)\widehat{P_j^{Inv}}}$$

We then take the median elasticity across (*i*) all countries and industries, (*ii*) no or low financially constrained countries and industries and, (*iii*) high financially constrained countries and industries. The results are very similar to what we present in Table 4. More specifically, the median elasticity of substitution across all countries is 1.06, the one for no or low financially constrained countries is 1.09, and the one for highly financially constrained countries is lower at 1.03.

Clearly, these estimates support our previous results and are in line with the descriptive findings depicted in Figures 2 and 3. Overall, a drop in the relative price of investment good that leads to a fall in the cost of capital causes firms to substitute away from labour and towards capital. This relationship seems to hold in countries that are no or low financially constrained but less so in countries with high financial constraints. Financial frictions seem therefore to reduce the ability of firms to take advantage of declines in the cost of capital.

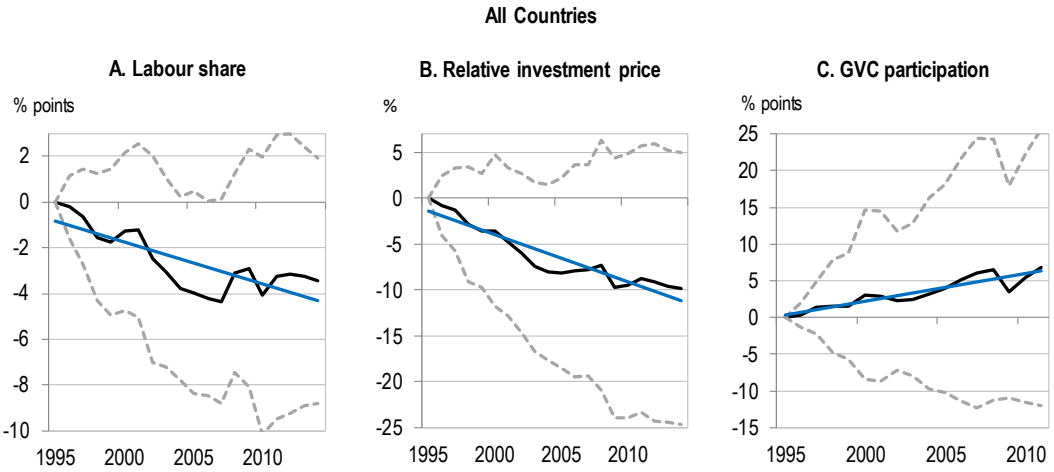
5. Conclusions

In this paper, we have tested an underexplored channel through which relative investment price affects labour share developments at both aggregated and disaggregated level. While past literature has often established that changes in relative investment prices matter for labour share developments, both at macro and micro level, no particular channel has been explicitly analysed. We argue that firms need external finance to make the most of relative investment prices declines and to fund their investments in technology that allow to substitute labour with capital. We take this prediction to the data and we test it empirically using macro-level, industry-level and firm-level data. We find strong evidence of financial constraints acting as a channel to hamper the effect of relative investment prices

change on labour share. Our analysis presents evidence that an increase in the share of firms facing financial constraints at the country level tends to be associated with an overall lower effect of relative investment prices on labour share developments. Additional evidence from industry-level data confirms this result: sectors that rely less on external finance can benefit less from a relative investment price decline. Thus, financial constraints account for part of the cross-country and cross-industry heterogeneous effect of the technology change on labour share development. Finally, firm-level data are consistent with cross-firm heterogeneity as they show that firms whose leverage ratio is lower, experience a stronger decline in their labour share as a response to declines in industry-level relative investment price. Thus, results suggest that the effect of changes in relative investment prices partly operates through within-firm changes, with larger effects in highly productive firms and smaller effects in firms that are more dependent on external finance. In line with these results, we estimate the elasticity of substitution between labour and capital to be higher in no or low financially constrained countries than it is for highly financially constrained ones. When considering all countries and industries, we find that this elasticity is significantly higher than 1, suggesting a positive relationship between trends in the labour share and the relative price of investment goods. In short, the effect of a decline in relative investment price tends to be larger in countries, industries and firms less exposed to financial constraints and with a higher elasticity of substitution between labour and capital.

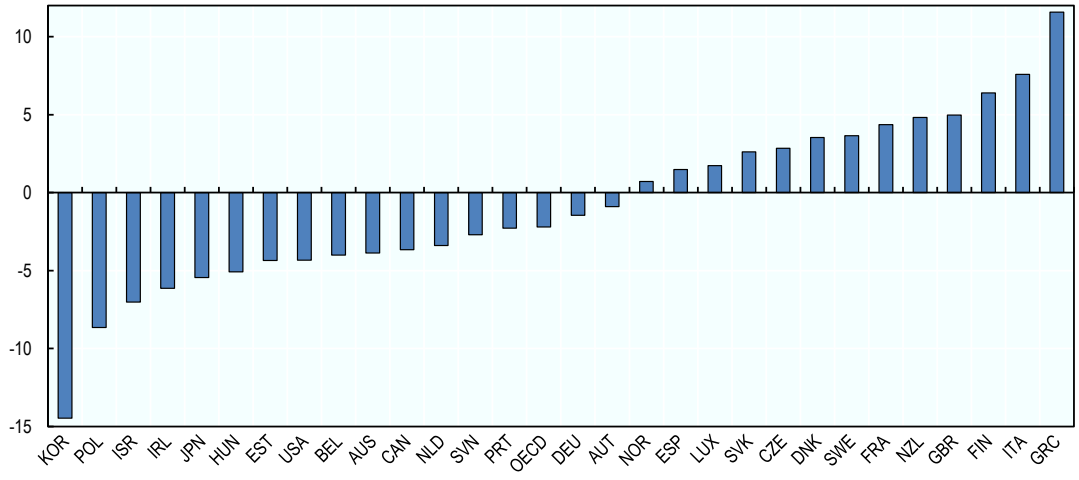
The robustness of these results suggests the existence of a systematic relationship between financial constraints and labour share developments, implying that technical change and innovations can often be obstructed or abandoned due to financing obstacles. Certainly, these results call for more research on the mechanisms behind the drivers of labour share and the role of finance.

Figure 1. Trends in labour share, relative investment price and global value chain



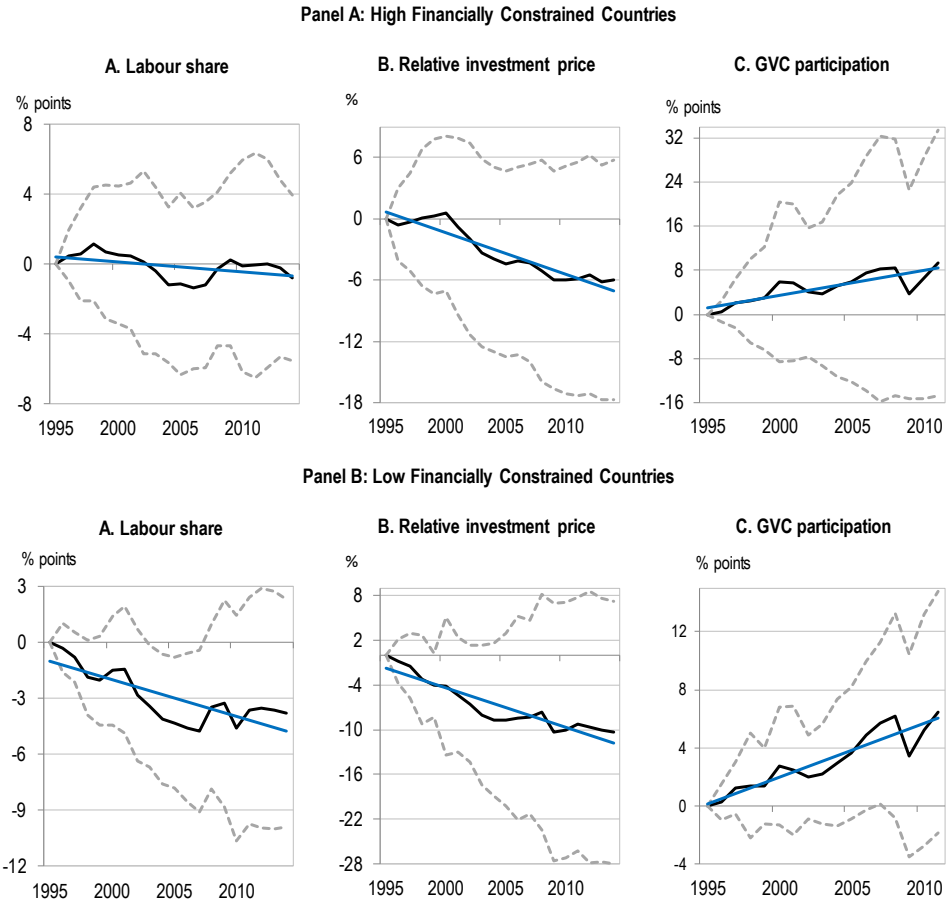
Note: GDP weighted average of 29 OECD countries: Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Israel, Italy, Japan, Korea, Luxembourg, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, United States, United Kingdom. The solid black lines indicate the cumulated changes in the weighted average, the blue solid lines indicate the corresponding trend and the dotted grey lines indicate the interval around the weighted average (minus/plus the standard deviation).
Source: OECD National Accounts Database and OECD TiVA Database.

Figure 2. Cumulative changes in labour share by country - 1995-2014, % points
(excluding the primary, coke and refined petroleum, housing and non-market industries)



Note: Three-year averages starting and ending in indicated years. The OECD average is the GDP weighted average of changes in labour shares over the 29 countries included in the figure. Deviations from period covered: 1995-2014 for Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Israel, Italy, Japan, Luxembourg, Netherlands, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden and United Kingdom; 1995-2013 for Australia and Korea; 1995-2012 for New Zealand; 1997-2012 for Canada; 1998-2014 for Ireland and United States.
Source: OECD National Accounts Database.

Figure 3. Trends in labour share, relative investment price and global value chain for high and low financially constrained countries



Note: High Financially Constrained countries are: Austria, Belgium, Canada, Czech Republic, Denmark, Estonia, Greece, Hungary, Luxembourg, Norway, Poland, Portugal, Slovak Republic, Slovenia, and Spain. Low Financially Constrained countries are: Australia, Finland, France, Germany, Ireland, Israel, Italy, Japan, Korea, Netherlands, New Zealand, Sweden, United Kingdom and the United States. The solid black lines indicate the cumulated changes in the weighted average, the blue solid lines indicate the corresponding trend and the dotted grey lines indicate the interval around the weighted average (minus/plus the standard deviation).
Source: OECD National Accounts Database and OECD TiVA Database.

Table 1. Baseline aggregate results

Selected OECD countries, 1995-2014

	1	2	3	4	5
Dependent Variable	Change in business labour share excluding primary, coke and housing industries				
Change in RIP	0.208**	0.302***	0.346***	0.295***	0.331***
	(0.096)	(0.079)	(0.107)	(0.081)	(0.106)
Change in GVC participation	-0.047	-0.067*	-0.0577	-0.066*	-0.057
	(0.033)	(0.032)	(0.035)	(0.032)	(0.034)
Change in output gap	-0.199**	-0.182*	-0.152*	-0.190**	-0.166*
	(0.082)	(0.087)	(0.082)	(0.089)	(0.086)
Change in financial development				-0.580	-0.957
				(1.081)	(1.029)
High EFD * Changes in RIP		-0.130***		-0.124**	
		(0.044)		(0.053)	
High Debt to Assets * Changes in RIP			-0.260**		-0.242**
			(0.102)		(0.100)
Initial Financial Constraints	NO	YES	YES	YES	YES
Country fixed effects	YES	YES	YES	YES	YES
Period fixed effects	YES	YES	YES	YES	YES
Observations	207	203	203	203	203
R-squared	0.664	0.713	0.702	0.714	0.704

Note: *RIP* stands for relative investment price and *EFD* for external financial dependence. The countries included in the analysis are: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Slovak Republic and Sweden, United Kingdom and the United States. Changes denote 8-year overlapping differences. Robust standard errors are clustered at the country level. *, **, *** denote statistical significance at the 10%, 5% and 1% levels.

Source: Authors' calculations based on data sources presented in Sections 2 and 3.

Table 2. Industry-level results

Selected OECD countries, 1995-2014

	1	2	3
Dependent Variable	Change in business labour share excluding primary, coke and housing industries		
Change in RIP	0.118***	0.123***	0.240***
	(0.0187)	(0.0194)	(0.0797)
Change in GVC participation	-0.132**	-0.134***	-0.130***
	(0.0491)	(0.0429)	(0.0426)
Change in output gap		-0.255*	-0.221*
		(0.147)	(0.122)
High EFD * Changes in RIP			-0.188**
			(0.0889)
High external finance dependence	NO	NO	YES
Industry x period fixed effects	YES	YES	YES
Country x period fixed effects	YES	NO	NO
Country fixed effects	NO	YES	YES
Observations	4,101	4,101	4,101
R-squared	0.343	0.280	0.305

Note: *RIP* stands for relative investment price and *EFD* for external financial dependence. The included countries in the analysis are: Australia, Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Korea, Luxembourg, Latvia, Netherlands, Norway, Portugal, Slovak Republic, Slovenia, Spain, Sweden, United Kingdom, and United States. Changes denote 8-year overlapping differences. Weighted OLS, with the share of industry-level value added in total value as weights. Robust standard errors are clustered at the country-industry level. *, **, *** denote statistical significance at the 10%, 5% and 1% levels.

Source: Authors' calculations based on data sources presented in Sections 2 and 3.

Table 3. Firm-level results

Selected OECD countries, 2001-2013

	1	2	3	4	5
Dependent Variable	Change in firm-level labour share				
Change in RIP	0.14***	0.18***	0.15***	0.17***	
	(0.05)	(0.05)	(0.05)	(0.06)	
Change in GVC participation	-0.02	-0.02	-0.02	-0.01	
	(0.05)	(0.05)	(0.05)	(0.05)	
Leverage x Change in RIP		-0.06**		-0.05**	-0.06**
		(0.02)		(0.03)	(0.02)
High leverage x Change in RIP			-0.02*		
			(0.01)		
Leader x Change in RIP				0.19***	0.18**
				(0.07)	(0.07)
Initial leverage and/or initial leade	NO	YES	YES	YES	YES
Firm-level controls	YES	YES	YES	YES	YES
Country x industry fixed effects	YES	YES	YES	YES	NO
Year fixed effects	YES	YES	YES	YES	NO
Country x industry x year fixed effe	NO	NO	NO	NO	YES
Observations	416,888	416,888	416,888	416,888	416,888
Adjusted R^2	0.21	0.21	0.21	0.22	0.22

Note: *RIP* stands for relative investment price. The included countries are Belgium, Germany, Spain, Finland, France, Italy, Korea, Sweden and United Kingdom. Firm-level financial leverage is proxied by the ratio of current liabilities and long term debt to total assets. A leader is defined as belonging to the top 5% firms within an industry with the highest labour productivity across the countries covered by the analysis. Standard errors are clustered at the country-industry level. *, **, *** denote statistical significance at the 10%, 5% and 1% levels.

Source: Authors' calculations based on data sources presented in Sections 2 and 3.

Table 4. Estimates of Elasticity of Substitution

Countries	$\hat{\sigma}$	Std. err.	90% Conf. interval	Obs.
All	1.08	0.04	[1.01, 1.15]	411
High financially constrained countries	1.07	0.06	[0.97, 1.18]	214
Low financially constrained countries	1.11	0.06	[1.01, 1.21]	197

Source: Authors' calculations based on data sources presented in Sections 2 and 3.

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