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Abstract

The development accounting literature assumes that sector labor income shares and output per person across countries are not correlated. In this paper, I show that the data reject this assumption for a large set of countries. The labor shares in the manufacturing and the market-services sectors increase significantly more with output per person than in other sectors, leading to a shift of labor income across sectors with economic development. The empirical evidence suggests that capital deepening is the primary driver of these patterns. Researchers can directly use the new dataset of labor shares to calibrate multisector models.

Keywords: Capital intensity; Economic development; Input-output tables; Multisector models; Sector development accounting
JEL codes: E01, E25, O11

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1 Introduction

Since Bernanke and Gürkaynak (2001) and Gollin (2002) documented that the labor share of national income is uncorrelated with output per person across a large number of countries, this fact has become a standard feature of macroeconomic models, with broad implications for the shape of the production function, inequality, and cross-country comparisons.[1] What's more, even studies seeking to understand outcomes at the *sectoral* level, such as which sectors are responsible for developing countries' low productivity, generally assume that the steadiness of the national labor share carries over to sector labor income shares.[2] However, this aggregate steadiness might hide underlying, offsetting movements of sector labor shares. If such movements were systematically related to output per person, they would bias the results of studies that assume common sector labor shares across countries. Yet, despite their central role in economic analysis, there is a surprising lack of data on sector labor shares in general and whether they correlate with output per person in particular.

This paper addresses the question of whether sector labor income shares correlate with the level of development across countries, measured by output per person. To shed light on the issue, I first create a comprehensive panel dataset of sector labor shares covering several years and a wide range of development levels: The maximum value of real output per person, adjusted for purchasing power, is over 17 times larger than the minimum value (United States $51,119 versus India $2,909). Then, I use panel regression techniques to analyze whether sector labor income shares change systematically with national output per person across and within countries and to what extent other variables, such as capital intensity and trade openness, matter for the evolution of sector labor shares.

This paper makes three main contributions. First, it provides a novel panel dataset of sector labor shares, considering intermediate input linkages across sectors and the labor income of the self-employed. This extends the seminal studies of cross-country national labor shares by Bernanke and Gürkaynak (2001) and Gollin (2002) to the sectoral level. Additionally, the dataset substantially increases the number of data points on sector labor shares by expanding the point-in-time results for the United States in 1997 by

[1]The development accounting literature typically assumes an aggregate production function of the Cobb-Douglas type with labor shares that are identical across countries (e.g., Hall and Jones, 1999; Caselli, 2005; Hsieh and Klenow, 2010; Jones, 2016). The consequences of changes in the national labor share on inequality and how this affects the wealth-income ratio are discussed by, e.g., Acemoglu and Robinson (2015) and Jones (2015).

[2]The assumption that sector labor shares are common to all countries is standard in the development accounting literature (e.g., Gollin, Lagakos, and Waugh, 2014; Herrendorf and Valentinyi, 2012; Hsieh and Klenow, 2007).

Valentinyi and Herrendorf (2008) to several countries and years. Previous studies that analyzed labor shares across countries at the sub-national level (e.g., Azmat, Manning, and Van Reenen, 2012; Bentolila and Saint-Paul, 2003; Daudey and García-Peñalosa, 2007; Mareek and Orgiazzi, 2013, 2020; Oishi and Saumik, 2018; Ortega and Rodgríguez, 2006) have two important limitations that this paper addresses. First, these studies did not adjust for the labor income of the self-employed.[3] This matters because Gollin (2002) showed that the significantly higher self-employment rates in developing countries can lead to a systematic understatement of the national labor share in those countries, potentially biasing cross-country comparisons. The second limitation is that these previous studies focused on industry-level labor shares, whereas this paper studies sector (or final expenditure) labor shares (e.g., the car manufacturing industry *versus* cars). This is important because of the possibility that changes in industry labor shares over the course of economic development may reflect a relabeling of activity due to outsourcing, as opposed to shifts in economic fundamentals (van Neuss, 2019). Outsourcing does not affect the sector labor shares computed here because they incorporate intermediate input linkages, which effectively capture any outsourcing.[4] The resulting labor shares vary considerably across sectors. Whereas the agriculture sector in the United States has an average labor share of only 0.46, construction has a labor share as high as 0.71. Even more striking are differences across countries: in Mexico, the construction sector's labor share is only 0.39 on average.

The second contribution of this paper is to analyze the relationship between sector labor shares and output per person. In contrast to the standard assumption in the development accounting literature, I find that sector labor shares significantly correlate with output per person both across and within countries; the steadiness of the

[3]Specifically, Daudey and García-Peñalosa (2007), Mareek and Orgiazzi (2013, 2020) and Ortega and Rodgríguez (2006), used data from the United Nations Industrial Development Organization on corporate employees' earnings in manufacturing. Azmat, Manning, and Van Reenen (2012) analyzed the Structural Analysis Database of the Organisation for Economic Co-operation and Development (OECD), which additionally covers the services sector. However, the database does not adjust for the labor income of the self-employed. Oishi and Saumik (2018) combined several datasets and focused on the labor share of corporate employees only. An exception is Bentolila and Saint-Paul (2003), who analyzed 12 industrialized countries using data from the OECD International Sectoral Data Base that imputes labor earnings, assuming that the self-employed earn the same wages as employees. Section 3 discusses this approach's drawbacks.

[4]For example, if car manufacturers change from having in-house cleaning staff at their factories to purchasing cleaning services from an outside firm, and cleaning services have, on average, lower labor shares than car manufacturers, the data will show this as an increase in the industry labor share of car manufacturers. Indeed, Berlingieri (2014) presents evidence that outsourcing can account for a sizable share of the reallocation from the manufacturing to the services sector in the US economy between 1947-2002. This problem does not plague final expenditure: Holding the labor share of cleaning services fixed, it does not matter if the cleaning services implicitly reflected (via intermediate inputs) in the final expenditure labor share of cars were supplied in-house or outsourced (Herrendorf, Rogerson, and Valentinyi, 2013).

national labor share does not carry over to the sectoral level.[5] This finding suggests that development accounting studies that rely on the assumption of common sector labor shares across countries may produce biased results. The labor shares of the manufacturing and the services sectors evolve significantly differently with economic development compared to the labor share of the other sectors (agriculture, mining, construction, and utilities), leading to a shift in labor income between sectors as countries grow more prosperous. Additionally, while the labor share dynamics in the manufacturing sector are relatively homogenous, the services sector labor shares display a significant degree of heterogeneity: Labor shares in the market services sector (e.g., communication and transport services) rise relatively strongly with output per person compared to non-market services (e.g., health and social services). These sectoral results are informative for economic models investigating the determinants of structural change and which sectors are responsible for low productivity in developing countries. Moreover, these findings identify sectors that, all else equal, tend to decrease the extent of inequality in society over the course of economic development: the manufacturing and market services sectors.[6] This matters because inequality can fuel social conflict, and recent research suggests it can also harm economic growth (Halter, Oechslin, and Zweimüller, 2014).

In the third contribution, this paper provides evidence on the channel through which development and sector labor shares are linked. In line with evidence on the evolution of national labor shares (Karabarbounis and Neiman, 2014) and industry-level labor shares (Bentolila and Saint-Paul, 2003) *within* countries over time, I find that capital deepening is the main channel through which development affects sector labor shares *across* countries.[7] The effect of capital deepening on sector labor shares is significantly weaker in the manufacturing and market services sectors than in the other sectors. This fact is consistent with findings in Alvarez-Cuadrado, Van Long, and Poschke (2018), who argued that the differences in time paths of the manufacturing and services industry labor shares require production functions with non-unitary elasticities of substitution that differ between industries. All the findings are robust to controlling for other relevant factors that the literature frequently uses to explain the movement of national labor shares, including trade openness (Elsby, Hobijn, and Şahin, 2013; Harrison, 2022; Jayadev, 2007; Stockhammer, 2017), union density (Fichtenbaum, 2011),

[5]Recently, Izyumov and Vahaly (2015) documented a positive correlation between national labor shares and the level of economic development. By contrast, another recent study by van Treeck (2020) did not find evidence for such a link.

[6]Checchi and García-Peñalosa (2010) showed that labor shares are an important determinant of income inequality in developed economies.

[7]Intuitively, in a competitive world where sector production functions are not Cobb-Douglas, changes in sector labor shares are exclusively related to capital deepening and hence reflect changes in the competitive price of capital.

and product market price-setting power (De Loecker and Eeckhout, 2018; Diez, Leigh, and Tambunlertchai, 2018).

The finding that meaningful heterogeneity exists between market and non-market services in itself is not new, though it had not previously been documented for labor shares. Baumol, Blackan, and Wolff (1985) found that labor productivity growth in the United States greatly varies within the services sub-industries, and Jorgensen and Timmer (2011) documented the same for a set of 10 major European economies, Japan, and the United States. Timmer and de Vries (2009) provided similar evidence for Asian and Latin American economies. My work is also related to that of Inklaar and Timmer (2014). For 42 countries, they showed that the relative price of market services increased much more modestly with income across countries than that of non-market services. All these studies focused on industry-level outcomes, so they are silent about labor shares in general and sector labor shares in particular, which is the focus of this study. An exception is the study by Duarte and Restuccia (2020), which emphasized the importance of heterogeneity in the services sector for a modern analysis of sector productivity differences. In their insightful work, Duarte and Restuccia (2020) account for input-output linkages and analyzed final expenditure data. However, they focused on intermediate input shares and relative price differences within the services sector, so they have nothing to say about sectoral labor shares.

Another literature to which this paper relates has shown that labor shares evolve differently in industries over time in the United States (Elsby, Hobijn, and Şahin, 2013; Jones, 2003; Young, 2010). Specifically, Elsby, Hobijn, and Şahin (2013) found that the labor share in manufacturing industries declined substantially more than in the services industries in the United States during 1987-2011, and Young (2010) documented the same pattern for the period 1958-1996, whereas Jones (2003) found the opposite during 1960-1996. Rodríguez and Jayadev (2013) used United Nations National Accounts Data for 11 industries and found that most industry labor shares show statistically significant negative time trends. Still, two out of 11 industries show statistically significant positive time trends.

Finally, there are two relevant papers that have studied the correlation between the industry labor shares of corporate employees and output per person across countries. Ortega and Rodgríguez (2006) analyzed United Nations data on 28 manufacturing sub-industries and found that the labor income shares in the manufacturing industry decrease with income across countries, which suggests increasing labor income shares with development. Recently, Mareek and Orgiazzi (2020), analyzing the same United Nations data, found a clear U-shaped pattern with development: manufacturing labor shares first decline with output per person and then rise again. An advantage of these studies is their data coverage, which includes some of the least-developed economies. In addition to taking intermediate input linkages and labor income of the self-employed into account, I extend these insightful studies by additionally documenting the evolution of other sectors, such as services, which typically account for larger shares of labor income and employment across countries than manufacturing.

This paper is organized as follows. Section 2 outlines the methodology for mapping labor shares by industry into final expenditure using input-output tables. Section 3 describes the data sources used and discusses the different adjustments for the labor income of the self-employed. Section 4 analyzes the relationship between sector labor shares and output per person. Section 5 discusses to what extent capital depending and other possible factors can account for the findings, and Section 6 concludes.

2 Method - Linking Industries and Sectors

In the real world and the data, industries use capital, labor, and intermediate inputs to produce both output for final expenditure and intermediate inputs for other industries. Moreover, industries may produce more than one output, and different industries may produce the same output. In other words, the use of intermediate inputs leads to a whole chain of intersectoral linkages that one must consider to compute sector of final expenditure labor shares. Establishing a mapping between industries in the data and final expenditure, therefore, requires additional information about industry output and labor income as well as intersectoral linkages through intermediate inputs. Basically, given the necessary information, one can first compute the industry labor shares and then subsequently collect all the industry labor shares that belong to a particular final expenditure sector, both directly because the industry delivers final output to that sector and indirectly through the provision of intermediate inputs to other industries whose output belongs to that particular sector. The remainder of this section describes the method in detail, closely following Valentinyi and Herrendorf (2008).

Suppose the economy consists of I industries and C commodities (goods and services), where industries combine intermediate inputs with capital and labor to produce output. Let $\mathbf{W}$ denote the $(C \times I)$ Make Matrix.[8] Rows are associated with commodities and columns with industries: element (c,i) gives the share of one dollar of commodity c that industry i produces. The $(C \times 1)$ commodity output vector $\mathbf{q}$ shows for each commodity the total dollar value of the output of that commodity that is delivered to final expenditures and other industries as intermediate inputs. Let $\mathbf{B}$ denote the $(C \times I)$ Use Matrix. Entry (c,i) shows the dollar value of commodity c that industry i uses as intermediate input

[8]Boldface letters denote vectors and matrices throughout the paper.

per dollar of gross output that it produces. The $(I \times 1)$ industry output vector $\mathbf{g}$ shows for each industry the total dollar value of the gross output of that industry. Finally, let the $(C \times 1)$ vector $\mathbf{e}$ denote the vector of dollar expenditure for final uses. Entry c gives the final uses of commodity c.

The vectors and matrices are linked by accounting identities as follows:

$$\mathbf{q} = \mathbf{B}\mathbf{g} + \mathbf{e} \,, \tag{1}$$

$$\mathbf{g} = \mathbf{W}'\mathbf{q} \,. \tag{2}$$

The first identity (1) states that the value of the total output of a commodity equals the value of this commodity used as an intermediate input in the production of gross output by the different industries plus the value of final expenditure on this commodity. The second identity (2) links the value of an industry's gross output to the value of this industry's commodity output that is used as intermediate inputs and for final uses.

Denote the $(I \times I)$ identity matrix by $\mathbf{1}$. Combining the above identities to eliminate the vector of commodity outputs gives

$$\mathbf{g} = \mathbf{W}'(\mathbf{1} - \mathbf{B}\mathbf{W}')^{-1}\mathbf{e} \,, \tag{3}$$

whereby the $(I \times C)$ matrix $\mathbf{W}'(\mathbf{1} - \mathbf{B}\mathbf{W}')^{-1}$ is the Industry-by-Commodity Total Requirements Matrix. Rows are associated with industries and columns with commodities: entry (i, c) shows the dollar value of industry i's gross output required, directly and indirectly through intermediate input linkages, to deliver one dollar of commodity c to final uses.

For each commodity c, denote by $\mathbf{e}_c$ the $(C \times 1)$ vector that records the final dollar expenditures on commodity c, such that all other entries except c equal zero. Let α_{li} and α_{ki} denote the labor and capital incomes generated per unit of industry i's gross output and collect all the values in the $(I \times 1)$ vectors $\boldsymbol{\alpha}_l$ and $\boldsymbol{\alpha}_k$. With this notation, the labor share in commodity c is

$$\lambda_c = \frac{\boldsymbol{\alpha}_l'\mathbf{W}'(\mathbf{1} - \mathbf{B}\mathbf{W}')^{-1}\mathbf{e}_c}{(\boldsymbol{\alpha}_l + \boldsymbol{\alpha}_k)'\mathbf{W}'(\mathbf{1} - \mathbf{B}\mathbf{W}')^{-1}\mathbf{e}_c} \,. \tag{4}$$

Here, the vector $\boldsymbol{\alpha}_l'\mathbf{W}'(\mathbf{1} - \mathbf{B}\mathbf{W}')^{-1}$ computes labor income in each commodity, the vector $(\boldsymbol{\alpha}_l + \boldsymbol{\alpha}_k)'\mathbf{W}'(\mathbf{1} - \mathbf{B}\mathbf{W}')^{-1}$ computes value-added in each commodity. The expenditure vector $\mathbf{e}_c$ selects a particular commodity for which to compute the labor share. Note that using a $(C \times 1)$ vector of ones computes a measure of the national labor share as a simple average over all final expenditure labor shares.

For future reference, note that the method allows mapping labor and capital inputs from industries to commodities. Let $\tilde{h}_i$ and $\tilde{k}_i$ denote the labor and capital inputs per unit of industry i's gross output and collect all the values in the $(I \times 1)$ vectors $\mathbf{H}$ and $\mathbf{K}$, respectively. With this notation, the capital and labor inputs embodied in commodity c are

$$h_c = \mathbf{H}'\mathbf{W}'(\mathbf{1} - \mathbf{B}\mathbf{W}')^{-1}\mathbf{1}_c \,, \tag{5}$$

$$k_c = \mathbf{K}'\mathbf{W}'(\mathbf{1} - \mathbf{B}\mathbf{W}')^{-1}\mathbf{1}_c \,, \tag{6}$$

whereby $\mathbf{1}_c$ is a $(C \times 1)$ selection vector with entry c equal to one for commodity c and zero otherwise.

3 Data

To assess the correlation between sector labor shares and output per person, I combine several sources to construct a panel dataset of such shares for a large cross-section of countries spanning the years 1995-2009.[9] This requires three datasets: first, labor income and gross output at the industry level, which are taken from the World Input-Output Database (WIOD), described in Timmer et al. (2015). Second, data on industry-level net operating surplus and mixed income from Eurostat, national statistics offices, and the OECD (Appendix A.3 lists the sources). This variable is the sum of corporate-sector profits and the operating surplus of private unincorporated enterprises net of the consumption of fixed capital. Third, I compute the Industry-by-Commodity Total Requirements Matrix from the Supply and Use Matrices in the WIOD to link industries to sectors.

3.1 Labor Income

Labor income is the sum of two components: (1) the compensation of employees and (2) the labor income of the self-employed. Data on the first component is readily available in the WIOD, which uses national account statistics and labor force surveys to compute employees' total compensation. However, as Krueger (1999) emphasizes, national account statistics do *not* account for the second component, labor income of the self-employed. Some share of the reported earnings of the self-employed should

[9]These countries are Austria, Australia, Belgium, Brazil, Bulgaria, Canada, China, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Italy, India, Indonesia, Japan, Korea, Latvia, Lithuania, Malta, Mexico, Netherlands, Poland, Portugal, Romania, russia, Slovakia, Slovenia, Spain, Sweden, Taiwan, Turkey, the United Kingdom, and the United States.

be attributed to labor income, with the remainder then comprising returns on invested capital, land rents, or monopoly profits. Gollin (2002) shows that the significantly higher self-employment rates in developing countries can lead to a systematic understatement of the national labor share in developing countries if the labor income of the self-employed is not properly taken into account. I consider three measures of the labor income share, each dealing with the labor income of the self-employed differently.[10]

Payroll share. For the first measure, I consider only the labor income of employees in the corporate sector. This *payroll share* measure has the advantage of being transparent, and results reflect unambiguous payments to labor, as advocated by Karabarbounis and Neiman (2014). However, if the structure of employment changes with development, especially in the importance of self-employment as Gollin (2002) documents, then the payroll share might be a poor approximation of the labor share. Studies of industry labor shares typically rely on this measure; see, for example, Azmat, Manning, and Van Reenen (2012), Daudey and García-Peñalosa (2007), Mareek and Orgiazzi (2013, 2020), Oishi and Saumik (2018), and Ortega and Rodgríguez (2006).

Equal wages. Second, the WIOD contains information about the average working hours of employees and self-employed by industry, which I use to impute the same hourly wage for the self-employed as for corporate employees. I do this separately for each year and industry to increase the accuracy of the imputation. This method is the same as that used by the United States Bureau of Labor Statistics to compute their headline measure of labor income. This *equal wages* measure will provide a good approximation of the labor share to the extent that the self-employed command essentially the same wages as employees in the corporate sector. It will be a poor approximation if there are systematic differences in earnings ability between employees and the self-employed. A version of this measure, using the ratio of the number of self-employed to employees instead of their worked hours, was analyzed by Bentolila and Saint-Paul (2003).

Imputed OSPUE. In national accounts statistics, the income of the self-employed is a part of the operating surplus of private unincorporated enterprises (OSPUE). As Gollin (2002) argues, reallocating OSPUE between capital and labor of the self-employed may provide an improved measure of the labor share. One problem is that OSPUE usually is not available at the industry level; countries report only the sum of corporate-sector profits and the operating surplus of private unincorporated enterprises net of the consumption of fixed capital (NOPS). Therefore, I follow Bernanke and Gürkaynak (2001) and construct an alternative measure of the labor share that combines information about the corporate share of the labor force from the WIOD with manually collected data on NOPS by industry. I derive *imputed OSPUE* for each industry by the following procedure:

[10] A discussion of various adjustment methods in the context of developing countries is provided by van Treeck (2020).

First, I compute total income as the sum of NOPS and corporate-employee compensation. Second, I multiply total income by the share of non-corporate employees in the labor force. Assuming that the non-corporate share of total income is the same as the share of the non-corporate labor force, this last step yields the measure of imputed OSPUE. Finally, I split imputed OSPUE into labor and non-labor income by assuming that the share of labor income in imputed OSPUE is the same as in the corporate sector. The advantage of this approach is that it is simple and transparent, and it makes sense to assume that imputed OSPUE includes some capital income as well as some labor income. The disadvantage of this approach is that it implicitly assumes that income shares are the same for establishments that differ significantly in size and structure. To implement this approach, I collect data on NOPS from Eurostat, national statistics offices, and the OECD.[11]

3.2 Supply and Use Matrices

The WIOD provides Supply and Use Matrices for each year from 1995 to 2011 for 40 countries.[12] This set of countries contains all major economies, covering more than 85 percent of world GDP. A disadvantage of the WIOD is the lack of observations for the least-developed countries, specifically Sub-Saharan Africa. However, the dataset is ideally suited for the analysis of sectoral labor shares for three main reasons: First, the WIOD is based on official and publicly available data from statistical offices to ensure high data quality and harmonization. Second, the dataset has been specifically designed to trace developments over time through benchmarking to time series of output, value-added, trade, and consumption from national accounts statistics. Dietzenbacher et al. (2013) describe the construction and concepts of the WIOD in detail. Finally, the WIOD provides data on the quantity and prices of input factors by industry, including data on capital and labor inputs. These data are provided in the so-called Socio-Economic Accounts and can be used with the Supply and Use Matrices as they follow the same industry classifications. I use the International Supply and Use Matrices to compute sector labor shares because these matrices allow me to distinguish domestic and foreign buyers of goods and services and domestic and foreign suppliers of intermediate inputs. The matrices are in basic prices, and margin values are included in the trade and transport industries. This approach means that margins are treated as intermediate inputs, with the margin industries as the supplying industries. The International

[11] The WIOD already adjusts for the labor income of the self-employed using household surveys and census data for a subset of countries: Brazil, China, India, Indonesia, Mexico, Taiwan, and Turkey. For these countries, I do not make any additional adjustments for the labor income of the self-employed.

[12] I only compute labor shares up to 2009 because of missing data on employment and labor income in the later years.

Use Matrix also contains information on final domestic expenditure by category of expenditure. Finally, the Supply and Use Matrices provide harmonized information about intermediate input linkages between 35 industries and 59 final expenditure categories (Appendix Tables A1-A3 list the industries and categories).

4 Empirical Results

This section first examines the correlation between national labor share measures and economic development. It benchmarks the results using three different labor share measures (payroll share, equal wages, imputed OSPUE) against those often found in the literature. Subsequently, this section presents evidence that sector labor income shares increase with output per person and discusses heterogeneity across sectors.

4.1 The National Labor Share

To assess how the different adjustment methods affect the association between the national labor share and the level of economic development, I use least squares to estimate

$$\log(\lambda_{jt}^{\text{GDP}}) = \delta + \beta \log(\text{GDP}_{jt}) + \varepsilon_{jt} \ , \tag{7}$$

where $\lambda_{jt}^{\text{GDP}}$ is the national labor share in country j in year t, and GDP_{jt} denotes real output per person using prices that are constant across countries and over time, hereafter PPP, from the Penn World Table 10.01 (PWT), see Feenstra, Inklaar, and Timmer (2015). The parameter β is the *income elasticity of the labor share*, measuring the percentage change in the labor share associated with a one-percent increase in output per person. Table 1 presents the regression results for each measure of labor income (Appendix Figure D1 displays the underlying data).[13]

Column (1) shows that the average payroll share is only 49.1%, and this measure exhibits the relatively highest variation across time and countries. The income elasticity is positive and statistically significant: the payroll share increases by 0.193% when output per person increases by one percent, on average. If a country with a labor share equal to the sample average experienced output per person growth of 20%, the payroll labor share is predicted to increase from 49.1% to 51.0%. Consistent with the literature, adjusting for the labor income of the self-employed weakens the positive association between the labor share and the level of development. The income

[13] I exclude Ireland and Luxembourg from the analysis because these countries have high numbers of observations where the sector labor shares persistently exceed one or are negative.

TABLE 1: Income elasticity estimates of the national labor share

	Payroll share (1)	Equal wages (2)	Imputed OSPUE (3)
Log(GDP) ($\hat{\beta}$)	0.193***	0.116***	0.123***
	(0.034)	(0.027)	(0.031)
Mean	0.491	0.577	0.571
Standard deviation	0.093	0.085	0.089
Observations (country × year)	570	570	570

Notes: Estimates of the income elasticity of the national labor share, $\hat{\beta}$, from Regression (7). Log(GDP) is the log of real output per person, measured in PPP (2017 US $).
Standard errors in parentheses, allowing for clustering at the country level.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

elasticity of the equal-wage labor share is only 0.116, but the average equal-wage labor share is almost nine percentage points higher than the average payroll share. The estimated income elasticity and the average value of the imputed OSPUE labor share fall between the values of the other two measures. The finding that the national payroll share is increasing with development is consistent with previous studies (e.g., Gollin, 2002; Jayadev, 2007). However, the estimated slope coefficients of the equal-wage and imputed-OSPUE labor shares are significantly positive, which contrasts with Bernanke and Gürkaynak (2001) and Gollin (2002), who did not find a significant relationship between this labor share measure and economic development. By contrast, Izyumov and Vahaly (2015) also found that national labor income shares positively correlate with output per person. They updated Gollin's results to the period 1990-2008 and included additional countries, using the same database as he but instead analyzed imputed OSPUE.

To better understand why the results here differ from those of the majority of the literature, Panel A of Figure 1 shows a comparison of the imputed-OSPUE labor share to the OSPUE labor share as documented in Gollin (2002) (Table 2, p. 470). Because the sample period of Gollin's data and the WIOD do not overlap - Gollin's latest observation is from 1992, while the WIOD begins in 1995 - the horizontal axis uses a normalization; it expresses a country's output per person in PPP relative to the US in 1992 for Gollin's sample and 1995 for the WIOD sample. The countries in the WIOD more than proportionally represent countries with low labor shares as compared to Gollin, and some of the relatively least-developed countries with high labor shares are absent from the WIOD (e.g., Burundi, Réunion, Ukraine, Vietnam). This selection tends to increase the correlation between labor shares and development in the WIOD data. As an additional check, Panel B compares the imputed OSPUE labor share and the labor share in the PWT, both for 1995. The national labor shares generally match each other closely, and the relatively low labor shares among developing countries are visible in both datasets. These findings suggest that it is unlikely that systematic measurement differences between this paper and the earlier studies and benchmark data account for the positive relationship between national labor share and development. Instead, the differences seem driven by the selection of countries in the WIOD. Appendix Figure D2 presents further evidence supporting this conclusion: unlike in the WIOD subsample, there is no significant correlation between the national labor share and output per person when all countries in the PWT are considered.

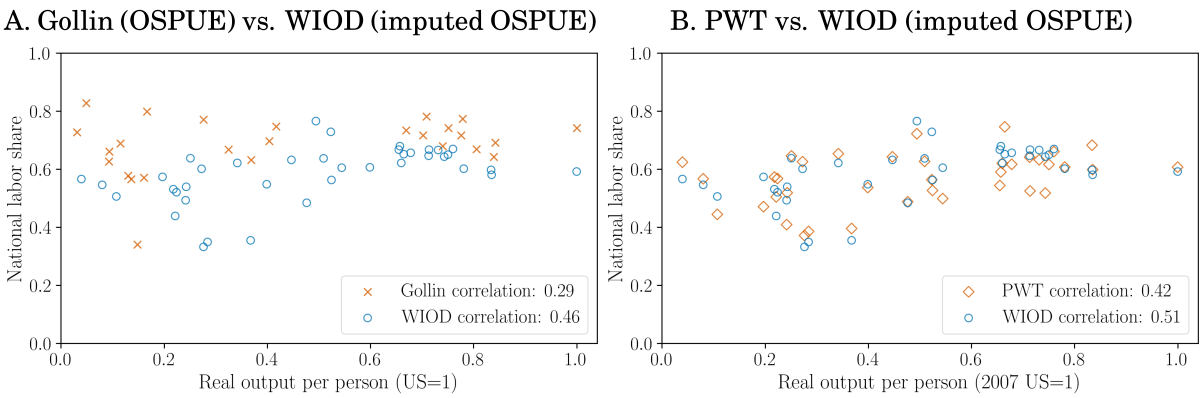

FIGURE 1: Benchmarking national labor income shares

Notes: Panel A shows the national labor shares computed using OSPUE in Gollin (2002) (Table 2, p. 470, "Adjustment 2") and using imputed OSPUE here. The horizontal axis in Panel A shows a country's real output per person relative to the US in 1992 for Gollin's data and 1995 for the WIOD data. Panel B compares the 1995 national labor shares in the PWT to the same countries as in the WIOD.

Despite observing a selected set of countries, my analysis provides a unique view of sector labor shares in a large set of countries covering various stages of development and all major economies, accounting for over 85% of world GDP. Importantly, the selection of countries should not affect results about *relative* sector labor shares - differences within countries between sectors - and within-country results over time. Accordingly, I confirm below that the findings for the income elasticity of sector labor shares hold when using only within-country variation for the estimation.

4.2 The Sector Labor Shares

This section investigates the relationship between sector labor shares and development. Following Bernanke and Gürkaynak (2001), all the analyses use the imputed-OSPUE labor shares. Initially, I allocate final expenditure to three sectors: manufacturing outputs, services, and other goods (agriculture, mining, utilities, and construction), see Appendix Tables A1-A2. Note that the national labor share is the weighted average of the underlying sector labor shares, with weights equal to the amount of final expenditure. Therefore, the national labor share may change when the expenditure vector changes with development, even when the sector labor shares are fixed. To prevent potential shifts in expenditure vectors from affecting results, I compute the national and sector labor shares in the following analyses using simple averages of all the underlying final expenditure labor shares. Using uniform weights marginally increases the correlation between the national labor share and development from 0.58 to 0.61 (Appendix D3), suggesting that expenditure weights of final expenditure categories with relatively small income elasticities tend to increase with development.

Overview. I begin with some simple graphs indicating correlations before applying regression techniques. Figure 2 displays the national and sector labor shares. The labor shares of the manufacturing (Panel B) and services sectors (Panel C) increase at a similar rate with development; the correlation coefficients are 0.62 and 0.65, respectively, slightly exceeding the correlation of the national labor share with output per person. That is, the relative labor shares of manufacturing and services are higher in rich countries compared to developing countries. The labor share of other goods sector also increases with development but at a much lower rate than manufacturing and services (Panel D). As argued in the previous section, the positive correlations may be due to the selection of countries in the WIOD rather than a stylized fact that holds in a representative cross-section of countries. However, there is no reason to expect this country selection to affect the *relative* correlations between the national and sector labor shares.

As argued earlier, substantial heterogeneity within the service sector has long been recognized in the literature; see, for example, Baumol, Blackan, and Wolff (1985); Duarte and Restuccia (2020); Elsby, Hobijn, and Şahin (2013); Inklaar and Timmer (2014); Jorgensen and Timmer (2011). To investigate whether differential patterns exist among the labor shares within the services sectors, I follow Inklaar and Timmer (2014) by splitting services into market services and non-market services. Non-market services include real estate, government and defense, health and social work, education, and sanitation services. Appendix A describes each non-market service in detail and explains that although the public sector typically carries out these services, private-sector companies also frequently provide these services. Market services include all other services, such as wholesale and retail trade, communication and transport services, financial intermediation, and research and development. Figure 3 displays the average labor shares of these two sectors. The figure reveals substantial heterogeneity in market and non-market services: Labor shares in the former increase more with development than those in non-market services; the correlation coefficients are 0.69 *versus* 0.44, respectively.

Regression Analyses. To examine the relationship of the sector labor shares relative to the national labor share, I begin by computing the ratio of each final expenditure category

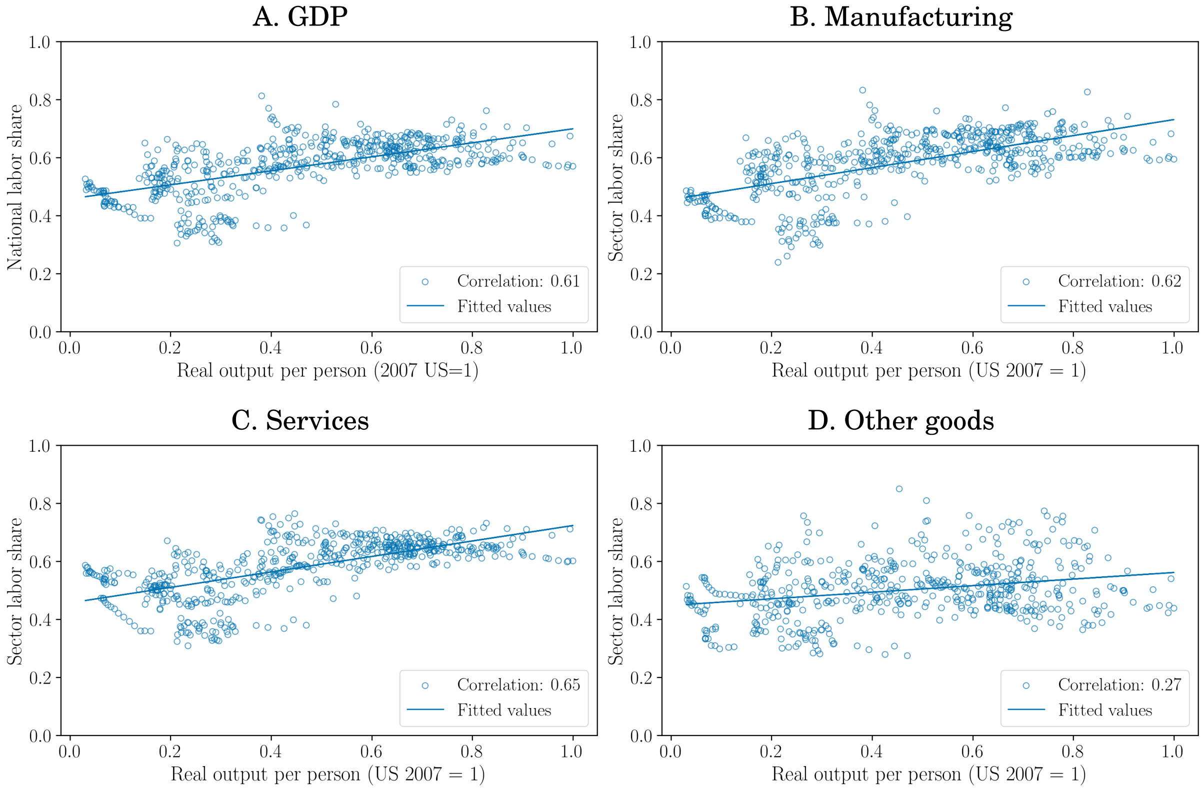

FIGURE 2: National and sector labor shares

Notes: National and sector labor shares for each year and country. Fitted values from regressing the respective labor share on real output per person (PPP) relative to the United States in 2007. Appendix Tables A1-A2 provide the allocation of final expenditure categories to sectors.

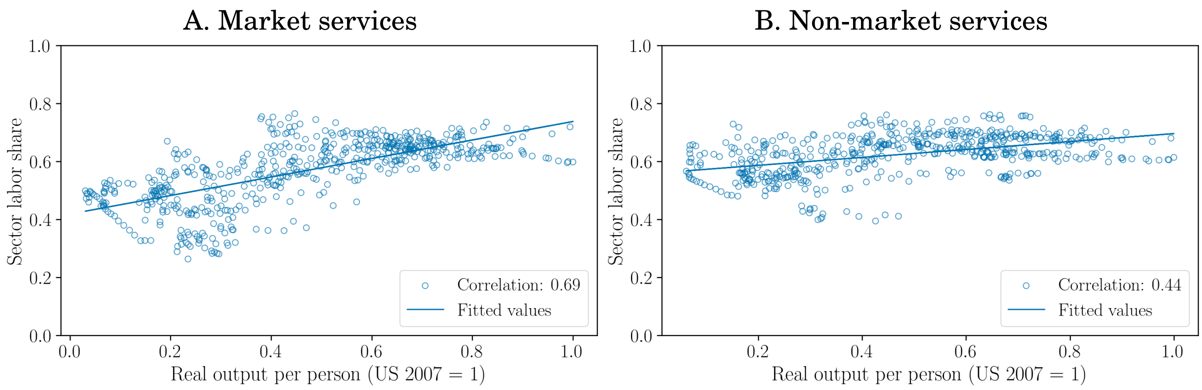

FIGURE 3: Market and non-market services labor shares

Notes: Sector labor shares for each year and country. See notes in Figure 2.

labor share to the unweighted national labor share. Then, I estimate the following regression separately for each category

$$\log(\lambda_{cjt}/\lambda_{jt}^{\text{GDP}}) = \delta + \beta_c \log(\text{GDP}_{jt}) + \varepsilon_{cjt} \ , \tag{8}$$

whereby λ_{cjt} is the labor share in final expenditure category c, in country j, in year t. The coefficient estimates $\hat{\beta}_c$, as well as the sample average of each labor share, are displayed in Table 2 for the manufacturing and other goods sectors, and in Table 3 for the services sector.

Most of the manufacturing sector's labor shares increase relative to the national labor share with economic development. By contrast, labor shares of the other goods sector exhibit a relative decline, which is strongest in the utilities categories (Electrical energy, gas, steam and hot water; Collected and purified water, distribution of water) and among agriculture, forestry, and fishing. The exception is construction work, which has a significantly positive coefficient estimate.

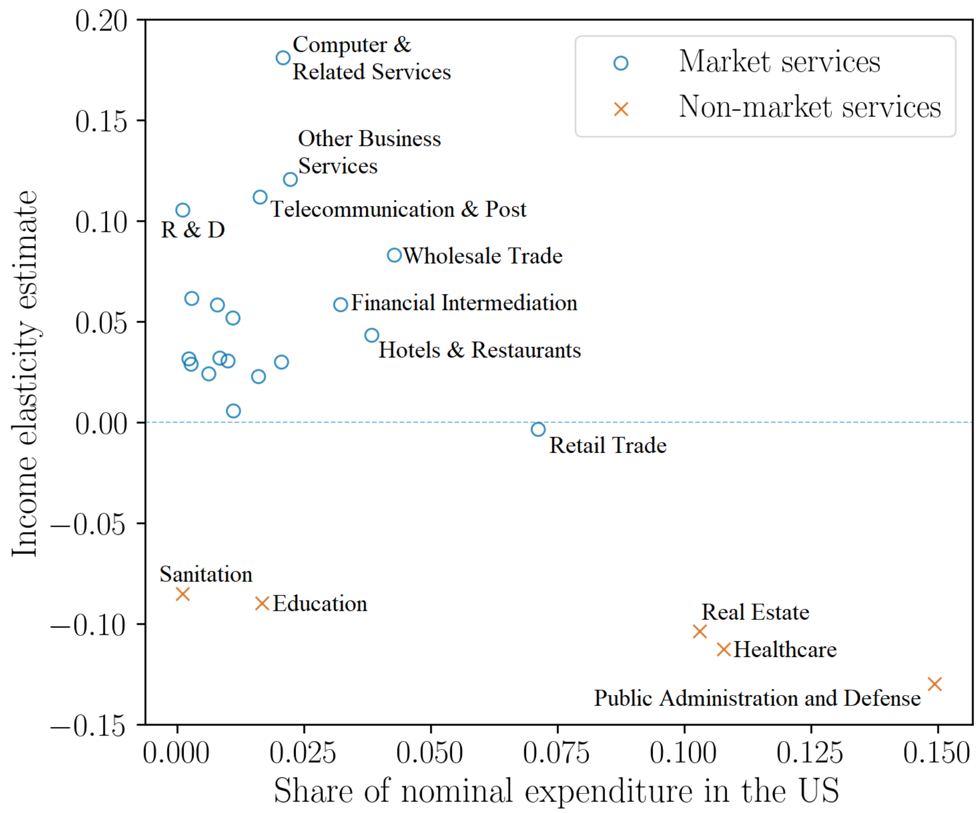

FIGURE 4: Income elasticity of relative labor shares: Pooled estimates

Notes: Coefficient estimates $\hat{\beta}_c$ from Regression (8). See Table 3 for underlying coefficient and standard error estimates. The horizontal axis shows the nominal expenditure share of the relevant commodity in GDP in the US.

The estimates for the services sector lie in a wide range, from -0.13 to 0.18. There are individual services for which the labor share systematically rises faster than the aggregate labor share with development, e.g., computer and related services, research and development, and business services. In contrast, for non-market services, the labor shares generally decline relative to the aggregate labor share, e.g., real estate, education, government, and health and social work.

TABLE 2: Regression estimates of relative labor shares in the manufacturing and other goods sectors

Final expenditure category	$\hat{\beta}_c$	S.e.	Mean
Panel A. Manufacturing goods			
Food products and beverages	-0.022^{***}	(0.008)	0.550
Tobacco products	-0.031^{***}	(0.007)	0.543
Textiles	0.013^{**}	(0.006)	0.634
Wearing apparel; furs	0.016^{**}	(0.006)	0.637
Leather and leather products	-0.026^{***}	(0.008)	0.649
Wood and products of wood and cork (except furniture)	0.031^{***}	(0.007)	0.610
Pulp, paper and paper products	0.040^{***}	(0.006)	0.575
Printed matter and recorded media	0.041^{***}	(0.006)	0.577
Coke, refined petroleum products and nuclear fuels	-0.052^{***}	(0.019)	0.428
Chemicals, chemical products and man-made fibres	0.003	(0.008)	0.500
Rubber and plastic products	0.027^{***}	(0.006)	0.576
Other non-metallic mineral products	0.019^{***}	(0.006)	0.551
Basic metals	0.058^{***}	(0.007)	0.586
Fabricated metal products, except machinery and equipment	0.061^{***}	(0.007)	0.588
Machinery and equipment n.e.c.	−0.001	(0.007)	0.627
Office machinery and computers	0.058^{***}	(0.007)	0.595
Electrical machinery and apparatus n.e.c.	0.055^{***}	(0.007)	0.586
Radio, television and communication equipment	0.055^{***}	(0.007)	0.585
Medical, precision and optical instruments, watches	0.052^{***}	(0.007)	0.585
Motor vehicles, trailers and semi-trailers	0.056^{***}	(0.008)	0.607
Other transport equipment	0.054^{***}	(0.008)	0.611
Furniture; other manufactured goods n.e.c.	0.065^{***}	(0.006)	0.625
Secondary raw materials	0.110^{***}	(0.008)	0.628
Panel B. Other goods			
Products of agriculture, hunting and related services	-0.106^{***}	(0.020)	0.583
Products of forestry, logging and related services	-0.098^{***}	(0.019)	0.594
Fish and fishing products; services incidental of fishing	-0.091^{***}	(0.022)	0.588
Coal and lignite; peat	-0.065^{***}	(0.021)	0.501
Crude petroleum and natural gas	-0.054^{***}	(0.020)	0.482
Metal ores	−0.021	(0.023)	0.483
Other mining and quarrying products	-0.091^{***}	(0.020)	0.488
Electrical energy, gas, steam and hot water	-0.161^{***}	(0.013)	0.393
Collected and purified water, distribution of water	-0.139^{***}	(0.015)	0.413
Construction work	0.036^{***}	(0.008)	0.617

Notes: Coefficient estimates $\hat{\beta}_j$ from Regression (8).
Standard errors are in parentheses, allowing for clustering at the country level.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Figure 4 visualizes the relationship between estimates for the services sector and nominal expenditure shares. The non-market services categories command the largest shares in nominal expenditure. This explains the above finding that the expenditure-weighted aggregate labor share displays a somewhat weaker correlation with development than the unweighted labor share.

TABLE 3: Regression estimates of relative labor Shares in the services sector

Final expenditure category	$\hat{\beta}_c$	S.e.	Mean
Panel A. Market services			
Trade, maintenance of motor vehicles	0.006	(0.011)	0.468
Wholesale trade	0.083***	(0.011)	0.557
Retail trade; repair	−0.003	(0.011)	0.609
Hotels and restaurants	0.043***	(0.011)	0.609
Land transport	0.052***	(0.010)	0.596
Water transport	0.032***	(0.011)	0.578
Air transport	0.058***	(0.010)	0.580
Supporting transport	0.062***	(0.013)	0.542
Post and telecommunication	0.112***	(0.013)	0.563
Financial intermediation	0.058***	(0.013)	0.498
Insurance and pension funding	0.030**	(0.013)	0.508
Services auxiliary to financial intermediation	0.032*	(0.019)	0.523
Renting of machinery and equipment	0.024*	(0.014)	0.582
Computer and related services	0.181***	(0.022)	0.589
Research and development	0.105***	(0.021)	0.601
Other business services	0.121***	(0.019)	0.592
Membership organisation	0.031**	(0.014)	0.627
Recreation	0.023*	(0.013)	0.629
Other services	0.029**	(0.013)	0.629
Panel B. Non-market services			
Real estate	−0.104***	(0.029)	0.195
Public administration and defence services	−0.130***	(0.010)	0.749
Education	−0.090***	(0.008)	0.833
Health and social work	−0.112***	(0.007)	0.752
Sewage and sanitation	−0.085***	(0.010)	0.637

Notes: Coefficient estimates $\hat{\beta}_j$ from Regression (8).
Standard errors are in parentheses, allowing for clustering at the country level.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

The wide range of relative income elasticities in services, ranging from very positive to very negative, is an essential component of the heterogeneity in services highlighted in this paper. For comparison, relative labor shares in the manufacturing sector exhibit much less variation. The large majority shows a positive relationship with output per person, with a maximum estimate of 0.11 and the negative coefficient estimates not falling below -0.05. The standard deviation of the coefficient estimates is over twice as large in the services sector as compared to manufacturing, 0.077 and 0.037, respectively.

To further analyze the relationship between development and sector labor shares, I estimate the following regression:

$$\log(\lambda_{cjt}) = \delta + \beta \log(\text{GDP}_{jt}) + \sum_s \omega_s [\log(\text{GDP}_{jt}) \times D_s] + \sum_s \gamma_s D_s + \varepsilon_{cjt} , \tag{9}$$

whereby D_s is an indicator variable that equals one if the labor share is associated with commodity sector s. The parameters of interest are $\hat{\omega}_s$, which measure the *relative* income elasticity of the labor shares in sector s compared to the omitted category. Since the WIOD is a non-representative sample of countries, focusing on relative (within-country) income elasticities is necessary to obtain reliable estimates. To examine the potential heterogeneous effects of development on sector labor shares, I estimate regression (9) with different interaction terms.

Table 4 displays the main results, whereby the omitted category in columns (2)-(5) is the other goods sector. Column (1) shows that, on average, labor shares increase with development: the estimated income elasticity is 0.162. This estimate is higher than the estimate presented in Table 1 because here I include year-fixed effects and use simple averages to compute national labor shares to prevent expenditure weights from affecting results. The estimates of the interaction terms in column (2) show the manufacturing ($\hat{\omega}_M$) and services sector's ($\hat{\omega}_S$) excess income elasticity compared to the other goods sector ($\hat{\beta}$). Both coefficients are positive and statistically significant, whereas there is no evidence that the labor shares of the other goods sector ($\hat{\beta}$) correlate with economic development.

In column (3), I again split the services sector into market and non-market services. The results confirm the heterogeneity apparent from Figures 3 and 4. The labor shares in the market services sector rise significantly faster with economic development than in the other goods sector. The interaction term of non-market services with income per capita is not significant. Because some countries have not reported expenditures on some commodities in some years, the panel is unbalanced. If richer countries systematically stopped spending money on low-income elasticity expenditure categories, such as mining, this would bias the estimates. Column (4) shows that this is not a concern because controlling for possible changes in the composition of expenditure across countries does not notably change the estimates.

Finally, column (5) adds country-fixed effects, so the coefficients only measure the relative income elasticity within countries. The point estimate of the other goods sector decreases by 0.2 percentage points from 0.07 to -0.13 but continues to be not significantly different from zero. Importantly, the *relative* income elasticity estimates do not notably change: The labor shares of the manufacturing and market services sector have significantly higher income elasticities than those of the other goods and non-market services sector. However, even in the selected WIOD sample of countries, the labor income shares of the manufacturing and market services sectors are no longer increasing with development. At the usual confidence levels, I cannot reject the hypotheses that the sums of $(\hat{\beta}+\hat{\omega}_M)$ and $(\hat{\beta}+\hat{\omega}_{MS})$ each equal zero. This result aligns with the recent literature documenting a decline in labor shares in the United States and other countries over time.[14] The novel contribution here is to identify the other goods and non-market services sectors as the main drivers of this decline.

TABLE 4: Relative income elasticity of sector labor shares: Regression estimates

	(1)	(2)	(3)	(4)	(5)
Log(GDP) ($\hat{\beta}$)	0.162***	0.071	0.071	0.070	−0.131
	(0.034)	(0.043)	(0.043)	(0.042)	(0.079)
Manufacturing ($\hat{\gamma}_M$)		−0.968**	−0.968**	−1.123***	−1.051***
		(0.370)	(0.370)	(0.366)	(0.363)
Manufacturing × log(GDP) ($\hat{\omega}_M$)		0.113***	0.113***	0.114***	0.107***
		(0.037)	(0.037)	(0.036)	(0.036)
Services ($\hat{\gamma}_S$)		−0.978			
		(0.618)			
Services × log(GDP) ($\hat{\omega}_S$)		0.110*			
		(0.061)			
Market serv. ($\hat{\gamma}_{MS}$)			−1.393**	−1.507**	−1.344**
			(0.612)	(0.595)	(0.577)
Market serv. × log(GDP) ($\hat{\omega}_{MS}$)			0.151**	0.150**	0.135**
			(0.060)	(0.059)	(0.058)
Non-market serv. ($\hat{\gamma}_{NM}$)			0.341	0.268	0.275
			(0.605)	(0.587)	(0.589)
Non-market serv. × log(GDP) ($\hat{\omega}_{NM}$)			−0.022	−0.022	−0.025
			(0.060)	(0.058)	(0.058)
Constant ($\hat{\delta}$)	−2.240***	−1.445***	−1.445***	−1.227***	0.917
	(0.361)	(0.435)	(0.435)	(0.433)	(0.841)
Year-fixed effects	✓	✓	✓	✓	✓
Category-fixed effects				✓	✓
Country-fixed effects					✓
Observations	31,157	31,157	31,157	31,157	31,157
Adjusted R^2	0.097	0.130	0.138	0.470	0.638

Notes: Coefficient estimates from Regression (9). The dependent variable is the log labor share, pooled across final expenditure categories, years, and countries. Log(GDP) is the log of real output per person, measured in PPP (2017 US $). The excluded category is other goods. Appendix Tables A1-A2 list the allocation of expenditure categories to the manufacturing, services, other goods, market services, and non-market services sectors.
Standard errors are in parentheses, allowing for clustering at the country level.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Appendix Table C1 shows that the results are robust to variations of the regression. Specifically, using an alternative measure for output per person; excluding real estate services from non-market services because of issues with the interpretation of the labor share in this category (Rognlie, 2015) and in the statistical practice across countries

[14]For example, Elsby, Hobijn, and Şahin (2013), Karabarbounis and Neiman (2014), and Rodríguez and Jayadev (2013).

(Gutiérrez and Piton, 2020); using weighted least squares with weights equal to the expenditure weights. The relative income elasticity estimates resulting from expenditure weights are only around half as large as the equally weighted elasticities computed. The interaction terms of output per person with manufacturing remains significant, but market services become insignificant. This finding suggests that commodities with relatively high elasticities receive a systematically lower share of aggregate expenditure than the other goods sector with development.

The striking fact that emerges from Figures 3 and 4 and Table 4 is that many individual market services labor shares increase systematically faster with development than the labor shares in non-market services that show a relative decline with development. These results hold across countries as well as within countries. Additionally, the recent decline of national labor shares over time seems driven mainly by the other goods and non-market services sectors, while manufacturing and market services labor shares are roughly constant within countries.

5 Discussion of Possible Mechanisms

What may explain the observed patterns in sector labor shares? One possible explanation is that countries do not operate the same sector technology, and these differences in production technologies are somehow correlated with output per person. As Gollin (2002) argues, this answer is not very appealing because why should the relationship between inputs and outputs suddenly shift at national borders? And if geography is so essential for sector production technologies, then how come sector labor shares differ more between the US and Mexico than between the US and Japan? Therefore, this section focuses on two other possible explanations: differences in sector factor inputs combined with production functions with a non-unitary elasticity of substitution and differences across countries in the competitiveness of factor markets that create a gap between the wage and the marginal value product of labor.

5.1 The Capital-Labor Ratio

In a competitive world where the production function is not Cobb-Douglas, changes in the labor share are exclusively related to capital accumulation and hence reflect changes in the competitive price of capital (Karabarbounis and Neiman, 2014). In an imperfectly competitive world, the capital share partially reflects pure profits. To examine to what extent differences in sector capital accumulation can explain the relationship between income and sector labor shares, I compute the ratio of capital services to total hours worked by employees and self-employed within each sector, the *capital-labor ratio*.[15] This is achieved in four steps: First, I link data on total hours worked by employees and self-employed by industry to sectors using the Industry-by-Commodity Total Requirements Matrix, see equation (5). Data on total hours by industry is directly available in the WIOD. Second, using the same linking process, I compute the capital stock in each sector according to equation (6). The WIOD provides data on the real fixed capital stocks at constant national prices by industry.[16] Third, because the capital stock data are recorded in national currency units, I compute each sector's share of the aggregate capital stock in the WIOD and use these capital input shares to allocate a country's aggregate capital services in PPP from the PWT to commodities.

This approach produces comparable capital input series even if the relative capital prices between sectors vary by sector. It will produce biased estimates if the relative capital prices across sectors systematically vary with income levels. I have analyzed capital PPPs at the industry level for a subsample of 20 countries for which capital PPPs are available in the Groningen Growth and Development Centre database (Inklaar and Timmer, 2009). I can reject the hypothesis at the usual confidence level that the industry capital PPPs relative to the aggregate capital PPP correlate with output per person, with absolute values of t-statistics typically less than one. This analysis suggests that disaggregated capital PPPs do not systematically vary with income levels for the subset of studied countries, beyond the variation already captured by the aggregate capital PPPs.

Table 5 shows that the capital-labor ratio positively correlates with output per person and the national labor share. Because of missing data on gross-fixed capital or hours worked in the WIOD, mainly for the categories "metal ores" and "secondary raw materials", the sample size decreases by 2%.

To examine whether changes in the capital-labor ratio can account for the variation in the labor share, I estimate the following regression:

$$\begin{aligned}\log(\lambda_{cjt}) =& \delta + \beta \log(\text{GDP}_{jt}) + \sum_s \omega_s [\log(\text{GDP}_{jt}) \times D_s] + \sum_s \gamma_s D_s \\ &+ \beta^k \log(k_{cjt}) + \sum_s \omega_s^k [\log(k_{cjt}) \times D_s] + \sum_s \gamma_s^k D_s + \varepsilon_{cjt} \,, \qquad (10)\end{aligned}$$

[15] I use data on capital services rather than capital stocks because countries differ systematically in their investment patterns: high-income countries tend to invest more in short-lived assets, such as computers and software, and less in long-lived assets, like office buildings or roads. The data on capital services consider differences in the marginal product of the various capital assets; see the discussion in Inklaar, Gallardo Albarrán, and Pieter (2019).

[16] For a limited set of OECD countries for which EU KLEMS data was available, WIOD uses the investment and capital stock estimates in the EU KLEMS dataset. Capital stocks have been constructed for other countries using the Perpetual Inventory Method. Erumban et al. (2012) describe the sources and methods of computing labor and capital inputs in the WIOD.

TABLE 5: Correlation matrix and summary statistics

	National labor share	Output per person	Capital-labor ratio
National labor share	1		
Output per person	0.650***	1	
Capital-labor ratio	0.621***	0.855***	1
Mean	0.560	25,799	2,415
Standard deviation	0.085	13,002	1,366

Notes: Output per person gives real output per person, measured in PPP (2017 US $); Capital-to-labor ratio gives the capital stock, adjusted for the flow of services, measured in capital PPPs (2017 US $) per hour worked by employees and self-employed; see Section 3 for more details.

whereby k_{cjt} is the capital-labor ratio in expenditure category c, in country j, in year t. The coefficient ω_s^k gives the relative capital-labor elasticity of the labor shares associated with sector s.

Table 6 displays the results. For comparability, columns (1) and (3) repeat the baseline regression estimates from (9) using only labor share observations for which the capital-labor ratios are available, with and without country-fixed effects, respectively. It is apparent that the previous findings continue to hold in this sample; the coefficient estimates in Columns (1) and (3) are virtually unchanged compared to the results using the full sample.

Column (2) displays the effects of controlling for the log capital-labor ratios and their interactions with the sector-indicator variables. The other goods sector labor shares now display a significantly positive income elasticity of 0.291, and the relative income elasticity estimates of the other sectors are no longer significantly different. Again, because the set of countries in the WIOD is not representative, the finding that all sector labor shares increase with development may reflect sample selection bias. The estimated elasticity of the labor shares in the other goods sector with respect to the capital-labor ratio, hereafter *capital-labor elasticity*, is significantly negative with $\hat{\beta}^k = -0.178$. The relative capital-labor elasticity of the manufacturing sector labor share ($\hat{\omega}_M^k$) is statistically significant and positive: a one percent increase in the capital-labor ratio is associated with a 0.134 percent increase in the manufacturing sector labor share relative to the other goods sector. A similar observation holds for the market services sector: labor shares associated with market services show significantly larger increases than other goods when the capital-labor ratio increases. The results presented here align with those in Mareek and Orgiazzi (2020), who show that the national capital-to-output ratio is negatively correlated with manufacturing industries' labor shares within a large set of developing countries.

TABLE 6: Regression estimates: Controlling for the capital-labor ratio

	(1)	(2)	(3)	(4)
Log(GDP) ($\hat{\beta}$)	0.070	0.291***	−0.131	0.096
	(0.042)	(0.072)	(0.079)	(0.069)
Manufacturing	−1.123***	0.235	−1.051***	−0.094
	(0.366)	(0.417)	(0.362)	(0.412)
Manufacturing × log(GDP) ($\hat{\omega}_M$)	0.114***	−0.055	0.107***	−0.003
	(0.036)	(0.047)	(0.036)	(0.046)
Market serv.	−1.513**	−0.262	−1.352**	−0.278
	(0.593)	(0.674)	(0.571)	(0.670)
Market serv. × log(GDP) ($\hat{\omega}_{MS}$)	0.150**	−0.003	0.135**	0.012
	(0.059)	(0.075)	(0.057)	(0.075)
Non-market serv.	0.268	0.962	0.276	0.936
	(0.587)	(0.908)	(0.589)	(0.800)
Non-market serv. × log(GDP) ($\hat{\omega}_{NMS}$)	−0.022	−0.096	−0.026	−0.090
	(0.058)	(0.111)	(0.058)	(0.095)
Log(k) ($\hat{\beta}^k$)		−0.178***		−0.221***
		(0.043)		(0.036)
Manufacturing × log(k) ($\hat{\omega}^k_M$)		0.134***		0.079**
		(0.031)		(0.030)
Market serv. × log(k) ($\hat{\omega}^k_{MS}$)		0.119***		0.085**
		(0.043)		(0.041)
Non-market serv. × log(k) ($\hat{\omega}^k_{NMS}$)		0.049		0.038
		(0.081)		(0.062)
Constant	−1.227***	−2.962***	0.914	−0.769
	(0.434)	(0.638)	(0.835)	(0.694)
Year-fixed effects	✓	✓	✓	✓
Category-fixed effects	✓	✓	✓	✓
Country-fixed effects			✓	✓
Observations	31,157	31,157	30,576	30,576
Adjusted R^2	0.638	0.638	0.568	0.778

Notes: Coefficient estimates from Regression (10). The dependent variable is the log labor share, pooled across final expenditure categories, years, and countries. Log(GDP) is the log of real output per person, measured in PPP (2017 US $). Log($k$) is the capital-labor ratio. The excluded category is other goods. Appendix Tables A1-A2 list the allocation of expenditure categories to the manufacturing, services, other goods, market services, and non-market services sectors.
Standard errors are in parentheses, allowing for clustering at the country level.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Column (4) focuses on within-country variation. Controlling for the capital-labor ratio renders all relative income-elasticity estimates insignificant. In contrast, the relative capital-labor elasticity of the other goods sector is significantly negative, and that of the manufacturing and market services sectors is now significantly positive. I can reject that $(\hat{\beta}^k + \hat{\omega}^k_M)$ and $(\hat{\beta}^k + \hat{\omega}^k_{MS})$ each equal zero at the usual confidence levels. These results suggest that the relative income elasticity estimates in the previous section were proxying for the relative capital-labor elasticities of sectoral labor shares across and within countries.

5.2 Union Density, Markups, and Trade Openness

Appendix B discusses to what extent union bargaining power, product market power, and trade openness might be able to explain the differences in the relative capital-labor and income elasticities of sector labor shares. While there is no conclusive evidence that union bargaining power, as proxied by union density, affects the relationship between the capital-output ratios and the sectoral labor shares, higher aggregate markups significantly decrease the relative labor shares of the other goods and the non-market services sector, but have a considerably smaller effect on the labor shares in the manufacturing and market-services sectors. That markups affect labor shares in the non-market services sector might seem surprising, given they are called "non-market". However, this sector also includes private companies that provide healthcare and education services as well as property developers related to real estate services, which operate in market environments. Overall, the tendency of rising markups to decrease the labor shares documented here dovetails with the findings in De Loecker and Eeckhout (2018) and Diez, Leigh, and Tambunlertchai (2018), who document that rising markups have played an important role in the decline of labor shares around the world over the last three decades. More trade openness, measured as higher shares of exports and imports in GDP, significantly affects labor shares in the market services sector but does not impact the relative income elasticity and capital-labor elasticity. This finding provides a more nuanced picture of the effects of trade than the results for national labor share in the existing literature (Harrison, 2022; Jayadev, 2007; Stockhammer, 2017).

The evidence presented here suggests that the capita-labor ratio is the primary driver of the observed relationship between relative labor shares and output per person within and between countries. This is consistent with the view that the evolution of labor shares mainly reflects changes in competitive prices due to capital accumulation (Alvarez-Cuadrado, Van Long, and Poschke, 2018; Bentolila and Saint-Paul, 2003; Dao et al., 2017; Karabarbounis and Neiman, 2014).

6 Conclusion

In this paper, I measure sector labor income shares for a large set of 38 countries over the period 1995-2009, taking intermediate input linkages and the labor income of the self-employed into account. I find evidence that these shares systematically vary with output per person and that the labor shares of the manufacturing and market services sectors increase significantly more with development than those of the non-market and other goods sectors. I document that these findings hold across and within economies. Importantly, these findings are incompatible with the standard assumption in the development accounting literature that sector labor shares are common to all countries. Instead, the here computed sector labor share numbers can directly be used to calibrate multi-sector models for many countries.

Capital deepening is the primary driver of the relationship between sector labor shares and development, while trade openness, product market power, and union density play only a limited role. This finding attributes most of the evolution of sector labor shares to changes in competitive factor prices rather than deviations from the competitive benchmark, on average. Several forces may be driving up aggregate savings relative to labor in more developed countries, which results in higher ratios of capital to labor. Alternatively, Karabarbounis and Neiman (2014) stress the role of falling prices for investment goods; in their account, lower prices lead to more aggregate capital investment and, ultimately, capital deepening. However, investigating the sources of the differences in capital intensity is beyond the scope of this paper.

While the studied sample of countries covers a wide range of development levels, the analysis does not cover some important regions that have typically been the focus of the development literature, such as Sub-Saharan Africa. Expanding the set of sector labor shares to include more countries, particularly the least-developed ones, is a promising avenue for future research.

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Development and Sector Labor Income Shares[†]

Online Appendix

Appendix A. Further Details of the Data

A.1 Final Expenditure Classification

CPA 70: The activities of real estate services are very diverse: real estate agents rent or sell on a commission basis; traders buy and sell property; valuers, facilities, and estate managers provide professional services; owners let property; and finally, it includes imputed rents of owner-occupied dwellings. Most of these activities are related to the secondary market, which is concerned with existing property. However, some, such as property developers, are active in the primary market and are more closely related to construction.

CPA 75: This section includes activities of a governmental nature, typically carried out by the public administration. This consists of the enactment and judicial interpretation of laws and their pursuant regulation, as well as the administration of programs based on them, legislative activities, taxation, national defense, public order and safety, immigration services, foreign affairs, and the administration of government programs. The legal or institutional status is not, in itself, the determining factor for an activity to belong in this section rather than the activity being of a nature specified in the previous paragraph. This means that activities classified elsewhere in NACE do not fall under this section, even if carried out by public entities. For example, administration of the school system (i.e., regulations, checks, curricula) falls under this section, but teaching itself does not (CPA 80), and a prison or military hospital is classified as health (CPA 85). Similarly, non-government units may carry out some activities described in this section.

CPA 80: This section includes education at any level or for any profession. The instructions may be oral or written and may be provided by, for example, the Internet. It includes education by driving schools and the different institutions in the regular school system at different levels, as well as adult education, literacy programs, etc. Also included are military schools and academies, prison schools, etc., at their respective levels. The section includes public as well as private education.

CPA 85: This section includes the provision of health and social work activities. Activities include a wide range of activities, from health care provided by trained medical professionals in hospitals and other facilities to residential care activities that still involve a degree of health care activities to social work activities without any involvement of health care professionals. Dental and veterinary practice services are also included.

CPA 90: This section includes activities related to the management (including collection, treatment, and disposal) of various forms of waste, such as solid or non-solid industrial or

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household waste, as well as contaminated sites. The output of the waste or sewage treatment process can either be disposed of or become an input into other production processes. Water supply activities are also grouped in this section since they are often carried out in connection with, or by units also engaged in, sewage treatment.

TABLE A1: Classification of expenditure categories - Manufacturing and Other Goods

CPA	Description	Sector
1	Products of agriculture, hunting, and related services	Other Goods
2	Products of forestry, logging, and related services	Other Goods
5	Fish and other fishing products; services incidental of fishing	Other Goods
10	Coal and lignite; peat	Other Goods
11	Crude petroleum and natural gas; services incidental to oil and gas extraction excluding surveying	Other Goods
12	Uranium and thorium ores	(omitted)
13	Metal ores	Other Goods
14	Other mining and quarrying products	Other Goods
15	Food products and beverages	Manufacturing
16	Tobacco products	Manufacturing
17	Textiles	Manufacturing
18	Wearing apparel; furs	Manufacturing
19	Leather and leather products	Manufacturing
20	Wood and products of wood and cork (except furniture); articles of straw and plaiting materials	Manufacturing
21	Pulp, paper and paper products	Manufacturing
22	Printed matter and recorded media	Manufacturing
23	Coke, refined petroleum products and nuclear fuels	Manufacturing
24	Chemicals, chemical products and man-made fibers	Manufacturing
25	Rubber and plastic products	Manufacturing
26	Other non-metallic mineral products	Manufacturing
27	Basic metals	Manufacturing
28	Fabricated metal products, except machinery and equipment	Manufacturing
29	Machinery and equipment n.e.c.	Manufacturing
30	Office machinery and computers	Manufacturing
31	Electrical machinery and apparatus n.e.c.	Manufacturing
32	Radio, television and communication equipment and apparatus	Manufacturing
33	Medical, precision and optical instruments, watches and clocks	Manufacturing
34	Motor vehicles, trailers and semi-trailers	Manufacturing
35	Other transport equipment	Manufacturing
36	Furniture; other manufactured goods n.e.c.	Manufacturing
37	Secondary raw materials	Manufacturing
40	Electrical energy, gas, steam and hot water	Other Goods
41	Collected and purified water, distribution services of water	Other Goods
45	Construction work	Other Goods

Notes: Classification according to the 2002 version of the *statistical classification of products by activity* (CPA) in the European Economic Community. See: `https://ec.europa.eu/eurostat/web/products-manuals-and-guidelines/-/ks-44-02-610-1f`.

TABLE A2: Classification of expenditure categories - Market and Non-Market Services

CPA	Description	Sector
50	Trade, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel	Market Services
51	Wholesale trade and commission trade, except of motor vehicles and motorcycles	Market Services
52	Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods	Market Services
55	Hotel and restaurant services	Market Services
60	Land transport; transport via pipeline services	Market Services
61	Water transport services	Market Services
62	Air transport services	Market Services
63	Supporting and auxiliary transport services travel agency services	Market Services;
64	Post and telecommunication services	Market Services
65	Financial intermediation services, except insurance and pension funding services	Market Services
66	Insurance and pension funding services, except compulsory social security services	Market Services
67	Services auxiliary to financial intermediation	Market Services
70	Real estate services	Non-Market Services
71	Renting services of machinery and equipment without operator and of personal and household goods	Market Services
72	Computer and related services	Market Services
73	Research and development services	Market Services
74	Other business services	Market Services
75	Public administration and defense services; compulsory social security services	Non-Market Services
80	Education services	Non-Market Services
85	Health and social work services	Non-Market Services
90	Sewage and refuse disposal services, sanitation and similar services	Non-Market Services
91	Membership organisation services n.e.c.	Market Services
92	Recreational, cultural and sporting services	Market Services
93	Other services	Market Services
95	Private households with employed persons	(omitted)

Notes: Classification according to the 2002 version of the *statistical classification of products by activity* (CPA) in the European Economic Community. See: `https://ec.europa.eu/eurostat/web/products-manuals-and-guidelines/-/ks-44-02-610-1f`.

A.2 Industry Classification

TABLE A3: Classification of industries

ISIC rev.3 code	Industry name
AtB	Agriculture, Hunting, Forestry and Fishing
C	Mining and Quarrying
15t16	Food, Beverages and Tobacco
17t18	Textiles and Textile Products
19	Leather, Leather and Footwear
20	Wood and Products of Wood and Cork
21t22	Pulp, Paper, Paper, Printing and Publishing
23	Coke, Refined Petroleum and Nuclear Fuel
24	Chemicals and Chemical Products
25	Rubber and Plastics
26	Other Non-Metallic Mineral
27t28	Basic Metals and Fabricated Metal
29	Machinery, n.e.c.
30t33	Electrical and Optical Equipment
34t35	Transport Equipment
36t37	Manufacturing, n.e.c.; Recycling
E	Electricity, Gas and Water Supply
F	Construction
50	Sale and Repair of Motor Vehicles and Motorcycles; Retail Sale of Fuel
51	Wholesale Trade, Except of Motor Vehicles and Motorcycles
52	Retail Trade and repair, Except of Motor Vehicles and Motorcycles
H	Hotels and Restaurants
60	Inland Transport
61	Water Transport
62	Air Transport
63	Other Supporting Transport Activities; Activities of Travel Agencies
64	Post and Telecommunications
J	Financial Intermediation
70	Real Estate Activities
71t74	Renting of Machinery and Equipment; Other Business Activities
L	Public Admin and Defence; Compulsory Social Security
M	Education
N	Health and Social Work
O	Other Community, Social and Personal Services
P	Private Households with Employed Persons

Notes: Codes follow the International Standard Industrial Classification of All Economic Activities (ISIC) Rev. 3.

A.3 Sources for Net Operating Surplus and Mixed Income

I use data on Net Operating Surplus and Mixed Income (NOPS) at the industry level from the OECD's Database for Structural Analysis (STAN) and National Accounts Aggregates by Industry from Eurostat. I turn to national statistics offices for some countries where no data on NOPS is available in these two databases.

STAN is based on OECD countries' Annual National Accounts By Activity tables and uses national industrial surveys and census data to estimate any missing detail. At the time of writing, the latest version of STAN is based on the International Standard Industrial Classification of all economic activities, Revision 4 (ISIC Rev. 4). However, due to the more extensive coverage of countries in the previous version, STAN based on ISIC Rev. 3 will be used, which was last updated in May 2011. Since the WIOD classifies industries according to the Statistical Classification of Economic Activities in the European Community (NACE) revision 1, NOPS industry data is linked between STAN and the WIOD using correspondence tables from the United Nations Statistics Division. All data in national currencies has been converted into US dollars using the exchange rates provided by the WIOD. I use data on NOPS for the following countries from OECD STAN: Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Korea, Latvia, Lithuania, Netherlands, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, United Kingdom, and United States.

Eurostat collects data from European Union member states and also compiles data at the industry level. The primary data sources are enterprise surveys, production surveys, and major companies' annual reports or business accounts. Eurostat's National Accounts Aggregates by Industry Database uses a different classification system than the WIOD, namely NACE Rev. 2. Thus, correspondence tables to NACE Rev. 1, available from Eurostat, are used to allocate NOPS to industries in the WIOD. The aggregate "Manufacture of textiles, wearing apparel, leather, and related products" must be split between NACE Rev. 1 codes 17t18 and 19. For this, I use value-added shares from the WIOD. I use data on NOPS for the following countries from Eurostat: Bulgaria, Cyprus, Luxembourg, Malta, and Romania.

Australia: NOPS data are obtained from the Australian System of National Accounts - 5204.0, Tables 46 & 47. Industries between ANZSIC and the WIOD are mapped according to the EU KLEMS correspondence table. The aggregate value of "transport" is allocated to NACE 60-63 according to value-added shares from the WIOD. **Canada**: Data on self-employed income comes from Statistics Canada, Table 36-10-0489-04 Compensation, by NAICS industry. **Russia**: Agricultural labor income is based on Mincer-type regressions, and for other industries, wages of employees are imputed for the self-employed (Voskoboynikov, 2012). Data on NOPS is generally not available, thus Gross Operating Surplus (GOPS), obtained from Rosstat, (only post 2001) for main sectors is used instead. I allocate GOPS according to value-added shares from the WIOD. Before 2001, I used least squares projections on value-added from the WIOD.

Appendix B. Union Density, Product Market Power, and Trade Openness

The literature commonly analyzes three key variables that can affect labor shares and capital-labor ratios simultaneously: union bargaining, product market power, and trade openness; see, for example, Bentolila and Saint-Paul (2003), Blanchard and Giavazzi (2003), Harrison (2022), and Jayadev (2007). First, consider the effects of increasing union bargaining power. Under a right-to-manage model, firms and unions first bargain over wages, and then firms set employment unilaterally, taking wages as given. But then, because firms are wage-takers when setting employment, the marginal product of labor equals the real wage. Under this model, strengthening union bargaining power creates a wage push that increases the capital-labor ratio as firms substitute capital for workers. However, the labor share may rise or fall depending on the elasticity of substitution between labor and capital. If, on the other hand, firms and workers bargain over both wages and employment, they will set employment in an efficient way. In the short run, an increase in union bargaining power raises the labor share because employment is not affected (Bentolila and Saint-Paul, 2003).

To proxy for union bargaining power, I use union density, which is defined as union membership as a proportion of employees. Given a substantial union wage premium, a large increase in union density might be expected to result in a rising aggregate labor share. Indeed, Blanchflower and Bryson (2003) estimate that union wage premiums across a sample of 17 countries were about 12 percent in the late 1990s. Harmonized data on union density at the year-by-country level is available from the OECD/AIAS database on Institutional Characteristics of Trade Unions, Wage Setting, State Intervention and Social Pacts (ICTWSS); see Visser (2021) for further details on definitions, measurement, and sources. Table B1 displays summary statistics and correlation coefficients. The average union density is 29.4% across sample countries and time, and union density is significantly positively correlated with the national labor share, output per person, and capital-labor ratio.

Another variable considered is product market power. Suppose firms charge a markup $\mu > 1$ over the marginal cost of production. This means that the labor share with market power is $\lambda^{MP} = \mu^{-1}\lambda$, such that $\lambda^{MP} < \lambda$ (Bentolila and Saint-Paul, 2003), whereby λ is the labor share under perfect competition in product markets. If the economies in richer countries more closely resemble the situation under perfect competition, then one should observe higher labor shares in rich countries, all else equal. Data on national markups are taken from De Loecker and Eeckhout (2018), who use firms' financial statements to measure the ratio of the output price to the marginal cost in a large set of countries. Unfortunately, this dataset does not cover all countries in the WIOD, so I have to rely on a smaller sample. Specifically, no markups are available for many Eastern European countries, Russia, and Malta, decreasing the sample size by a fifth. The markups in the United States are roughly constant over the study period, with an average value of 1.56. Italy in 2002 had the highest markup at 2.55, and Belgium in 1996 had the lowest with 0.98. The average markup in the sample is 1.35 and, consistent with the above reasoning, negatively correlated with the national labor share (Table B1).

TABLE B1: Correlation matrix and summary statistics

	National labor share	Output per person	Capital-labor ratio	Union density	Aggregate markup	EX/GDP	IM/GDP
National labor share	1						
Output per person	0.650***	1					
Capital-labor ratio	0.621***	0.855***	1				
Union density	0.356***	0.276***	0.412***	1			
Aggregate markup	−0.131***	0.027	−0.060	−0.047	1		
EX/GDP	0.430***	0.470***	0.488***	0.389***	−0.161***	1	
IM/GDP	0.379***	0.394***	0.438***	0.296***	−0.174***	0.944***	1
Mean	0.560	25,799	2,415	0.294	1.347	0.328	0.373
Standard deviation	0.085	13,002	1,366	0.184	0.227	0.227	0.239

Notes: Output per person gives the output-side real GDP in PPP (2017 US $); Capital-to-labor ratio gives the capital stock, adjusted for the flow of services, in capital PPPs (2017 US $) per hour worked by employees and self-employed; Union density gives the percentage of the national workforce affiliated with labor unions; Aggregate markup gives the average ratio of firms' output prices to their marginal costs in an economy; EX/GDP and IM/GDP give the shares of exports and imports in GDP at current PPPs, respectively.

Finally, it is necessary to control for globalization, as various studies have shown that trade openness can significantly impact the national labor share (see, for example, Elsby, Hobijn, and Şahin (2013), Harrison (2022), Jayadev (2007)), and trade is very likely correlated with development. The channel here could be through the standard Heckscher-Ohlin effect, where higher capital mobility possibly decreases workers' bargaining power. To proxy for trade openness, I use the shares of imports and exports in GDP at current PPPs from the Penn World Table 10.01 (Feenstra, Inklaar, and Timmer, 2015).

The results of re-estimating Regression (10) with additional interaction terms between sector labor shares and the log union density, log markups, and the shares of import and exports in GDP are displayed in Table B2. To assess the effect of having to drop some countries from the analysis, Table B2, columns (1) and (3) show that the results from estimating Regression (10) using the smaller set of countries are not notably different from those obtained using the full set. The only exception is the coefficient estimate of the income elasticity of the other goods sector within countries ($\hat{\beta}$, column (3), Table B2), which is significant at the 10% level in the smaller sample.

Next, columns (2) and (4) display the results when I include the additional control variables and their interaction terms in Regression (10), without and with country-fixed effects, respectively. The relative income elasticity estimates are approximately unchanged and insignificant when including measures of market imperfections. Similarly, the relative capital-labor elasticities are not affected. All the interaction terms between the union density and sectoral labor shares are statistically insignificant. This finding is consistent with the evidence in Elsby, Hobijn, and Şahin (2013), who also find no evidence that changing union density had a meaningful impact on the US labor share. These findings also align with evidence in Checchi and García-Peñalosa (2010), who find some evidence that the labor share increases with union density across countries, but this effect disappears when they include country-fixed effects in a sample of OECD countries.

The interaction-term estimates of aggregate markups and the sector labor shares of the other goods sector are significantly negative, and the estimates for the non-market labor shares are not significantly different. The labor shares in both sectors substantially decline with rising markups. The positive interaction-term coefficients of the manufacturing and market services labor shares imply that rising markups less negatively impact these sectors' labor shares. The overall tendency of rising markups to decrease the labor shares documented here supports the findings in De Loecker and Eeckhout (2018) and Diez, Leigh, and Tambunlertchai (2018), who document that rising markups have played an essential role in the decline of labor shares around the world over the last three decades.

A rising share of exports in GDP significantly increases the relative labor shares in the market services sector across and within countries. At the same time, a rising share of imports has a roughly equally sized negative effect.

TABLE B2: Relative income elasticity of sector labor shares: Additional control variables

	(1)	(2)	(3)	(4)
Log(GDP) ($\hat{\beta}$)	0.319***	0.302***	0.138*	0.107*
	(0.071)	(0.064)	(0.075)	(0.062)
Manufacturing	0.390	0.272	0.072	−0.065
	(0.379)	(0.346)	(0.365)	(0.329)
Manufacturing × log(GDP) ($\hat{\omega}_M$)	−0.071	−0.062	−0.020	−0.013
	(0.044)	(0.041)	(0.041)	(0.038)
Market serv.	0.063	0.100	0.093	0.144
	(0.588)	(0.515)	(0.608)	(0.480)
Market serv. × log(GDP) ($\hat{\omega}_{MS}$)	−0.039	−0.054	−0.029	−0.050
	(0.066)	(0.059)	(0.069)	(0.055)
Non-market serv.	1.314	1.226	1.296*	1.190*
	(0.848)	(0.823)	(0.727)	(0.676)
Non-market serv. × log(GDP) ($\hat{\omega}_{NMS}$)	−0.130	−0.126	−0.126	−0.122
	(0.108)	(0.104)	(0.089)	(0.083)
Log(k) ($\hat{\beta}^k$)	−0.183***	−0.197***	−0.222***	−0.230***
	(0.040)	(0.039)	(0.036)	(0.035)
Manufacturing × log(k) ($\hat{\omega}^k_M$)	0.136***	0.136***	0.083***	0.086***
	(0.033)	(0.030)	(0.029)	(0.029)
Market serv. × log(k) ($\hat{\omega}^k_{MS}$)	0.135***	0.151***	0.104**	0.125***
	(0.042)	(0.040)	(0.040)	(0.038)
Non-market serv. × log(k) ($\hat{\omega}^k_{NMS}$)	0.052	0.055	0.044	0.049
	(0.085)	(0.081)	(0.065)	(0.060)
Union density		0.048		−0.004
		(0.045)		(0.043)
Manufacturing × union density		−0.009		−0.015
		(0.042)		(0.039)
Market serv. × union density		−0.042		−0.050
		(0.054)		(0.053)
Non-market serv. × union density		−0.050		−0.057
		(0.053)		(0.055)
Aggregate markup		−0.324*		−0.254**
		(0.189)		(0.110)
Manufacturing × aggregate markup		0.194*		0.238**
		(0.104)		(0.090)
Market serv. × aggregate markup		0.225*		0.263**
		(0.131)		(0.120)
Non-market serv. × aggregate markup		0.023		0.024

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TABLE B2 – continued from previous page

	(1)	(2)	(3)	(4)
		(0.184)		(0.184)
EX/GDP		−0.221		−0.724***
		(0.359)		(0.243)
Manufacturing × EX/GDP		0.073		0.105
		(0.258)		(0.244)
Market serv. × EX/GDP		0.743**		0.811**
		(0.338)		(0.329)
Non-market serv. × EX/GDP		0.587		0.628
		(0.428)		(0.415)
IM/GDP		0.438		0.764***
		(0.384)		(0.230)
Manufacturing × IM/GDP		−0.163		−0.185
		(0.246)		(0.233)
Market serv. × IM/GDP		−0.832**		−0.888**
		(0.348)		(0.336)
Non-market serv. × IM/GDP		−0.637		−0.671*
		(0.386)		(0.374)
Constant ($\hat{\delta}$)	−3.240***	−2.958***	−1.210	−0.833
	(0.646)	(0.577)	(0.784)	(0.625)
Year-fixed effects	✓	✓	✓	✓
Category-fixed effects	✓	✓	✓	✓
Country-fixed effects			✓	✓
Observations	25,335	25,335	25,335	25,335
Adjusted R^2	0.523	0.547	0.707	0.716

Notes: Coefficient estimates from Regression (10). The dependent variable is the log labor share, pooled across final expenditure categories, years, and countries. Log(GDP) is the log of real output per person, measured in PPP (2017 US $). Log($k$) is the capital-to-labor ratio, adjusted for the flow of services, in capital PPPs (2017 US $) per hour worked by employees and self-employed; Union density gives the percentage of the national workforce affiliated with labor unions; Aggregate markup gives the average ratio of firms' output prices to their marginal costs in an economy; EX/GDP and IM/GDP give the shares of exports and imports in GDP at current PPPs, respectively. The excluded category is other goods. Appendix Tables A1-A2 list the allocation of expenditure categories to the manufacturing, services, other goods, market services, and non-market services sectors.
Standard errors are in parentheses, allowing for clustering at the country level.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Appendix C. Additional Tables

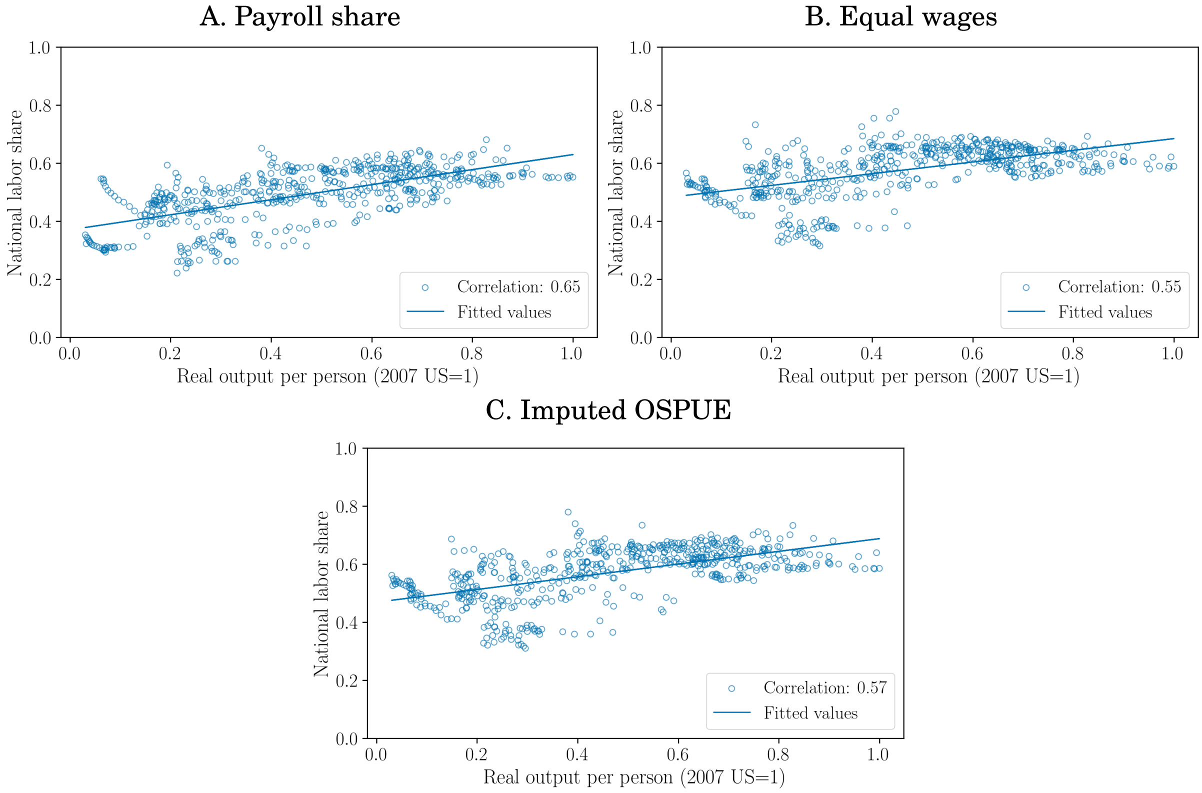
TABLE C1: Variations of the baseline regression: Robustness checks

	Baseline results (1)	Alt. output per person (2)	Real estate excluded (3)	Expenditure weights (4)
Log(GDP) ($\hat{\beta}$)	−0.131	−0.126	−0.133	−0.041
	(0.079)	(0.080)	(0.079)	(0.087)
Manufacturing ($\hat{\gamma}_M$)	-1.051^{***}	-1.056^{***}	-1.053^{***}	−0.337
	(0.363)	(0.358)	(0.363)	(0.219)
Manufacturing × log(GDP) ($\hat{\omega}_M$)	0.107^{***}	0.108^{***}	0.107^{***}	0.043^{*}
	(0.036)	(0.036)	(0.036)	(0.022)
Market serv. ($\hat{\gamma}_{MS}$)	-1.344^{**}	-1.342^{**}	-1.350^{**}	−0.494
	(0.577)	(0.568)	(0.577)	(0.414)
Market serv. × log(GDP) ($\hat{\omega}_{MS}$)	0.135^{**}	0.134^{**}	0.135^{**}	0.053
	(0.058)	(0.057)	(0.058)	(0.041)
Non-market serv. ($\hat{\gamma}_{NMS}$)	0.275	0.263	0.280	0.606
	(0.589)	(0.587)	(0.538)	(0.412)
Non-market serv. × log(GDP) ($\hat{\omega}_{NMS}$)	−0.025	−0.024	−0.026	−0.058
	(0.058)	(0.058)	(0.053)	(0.040)
Constant ($\hat{\delta}$)	0.917	0.860	0.934	0.008
	(0.841)	(0.851)	(0.839)	(0.943)
Year-fixed effects	✓	✓	✓	✓
Category-fixed effects	✓	✓	✓	✓
Country-fixed effects	✓	✓	✓	✓
Observations	31,157	31,157	30,587	31,157
Adjusted R^2	0.638	0.638	0.568	0.778

Notes: Coefficient estimates from regression (9). Column (1) repeats the baseline results. Column (2) uses an alternative measure for output per person computed from the expenditure side. Column (3) excludes real estate services from non-market services. Column (4) uses nominal shares in aggregate expenditure as regression weights. See Table 4 in the main text for further descriptions.
Standard errors are in parentheses, allowing for clustering at the country level.
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Appendix D. Additional Figures

FIGURE D1: National labor income shares across countries, 1995-2009: Comparing adjustment methods for the labor income of the self-employed



Notes: The Figure plots the national labor shares of all countries over 1995-2009 against real output per person (PPP) relative to the United States in 2007. Fitted values from regressing the respective labor share on real output per person (PPP) relative to the United States in 2007.

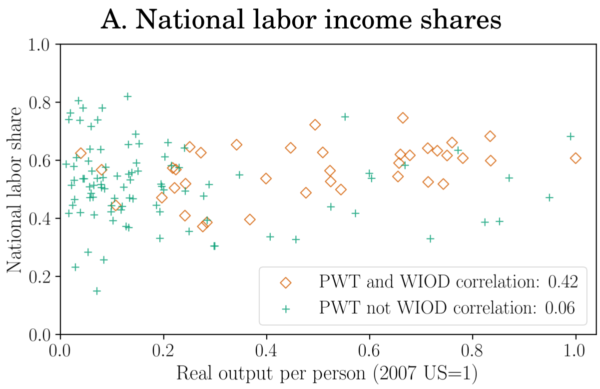
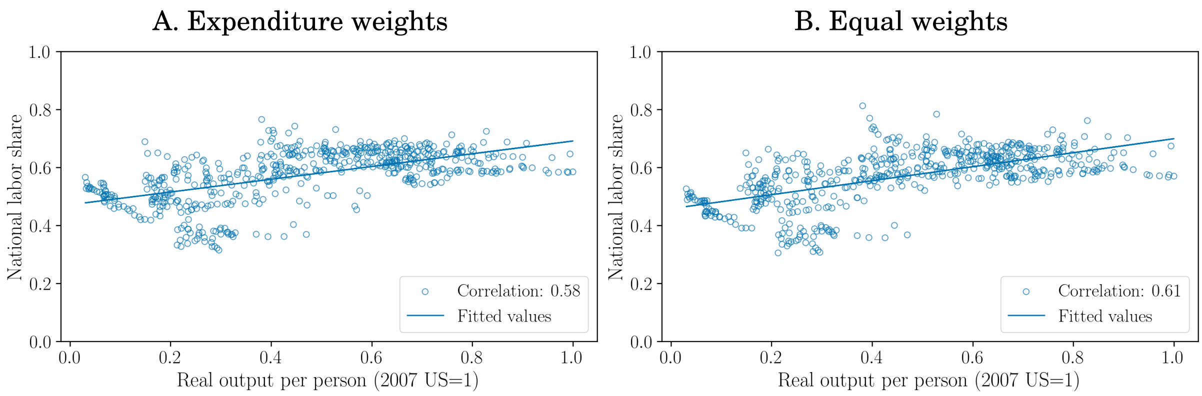


FIGURE D2: Selection of WIOD countries

Notes: “PWT and WIOD” is the intersection of the set of countries in the WIOD and the PWT. “PWT not WIOD” is the set of countries in the PWT that are not in the WIOD.

FIGURE D3: National labor income shares across countries, 1995-2009: The effect of expenditure weights



Notes: The Figure plots the national labor shares of all countries over 1995-2009 against real output per person (PPP) relative to the United States in 2007. Fitted values from regressing the respective labor share on real output per person (PPP) relative to the United States in 2007.