III. The labour income share in the euro area

This section analyses the evolution of the labour income share at the national and sectoral levels across euro area Member States. For the euro area as a whole, changes in the labour income share mostly reflect countercyclical dynamics over 2000-2017. National labour income shares are strongly countercyclical as well, but there are country specificities and some evidence of cross-country convergence. For most euro area Member States, the observed evolution of the national labour share is attributable to within-sectoral changes in the labour income share, in particular its reduction in manufacturing and its increase in business services.

A reduced form estimation approach suggests that technological progress and capital deepening are the main determinants of sectoral labour income shares. These factors determine sectoral labour productivity growth, providing the basis for a sustained increase in the sectoral real wage, but they may also result in a reduction of the sectoral labour share if technical change is capital-augmenting and capital-labour substitutability is sufficiently high. As capital-labour substitutability is likely decreasing in the employees' level of skills, such results suggest that investing in skills can produce a double dividend: strengthening macro-economic performance and productivity growth on the one hand, and supporting a commensurate development of workers' living standards. ([120])

III.1. Introduction

Until recently, wage growth in the euro area has remained below what has historically been observed at similar levels of unemployment. Low productivity growth, low inflation and remaining labour market slack in certain member states help to explain this. ([121]) But some have argued that structural factors such as labour-replacing technical change and the internationalisation of production have also kept wage growth down. ([122])

A major policy concern is that labour productivity growth no longer translates one-for-one into real wage growth, resulting in a lower labour income share. ([123]) Several recent studies describe the decoupling of median wage growth from labour productivity growth and a declining labour share as a share of value added as a more general trend in advanced countries over recent decades. ([124])

Declining labour shares have been linked not only to automation and globalisation, but also to the by-products of these processes, i.e. the increasingly oligopolistic structure of markets attributable to winner-take-all dynamics. The reduction in the labour share may thus be a consequence of the increasing market power of a small group of firms and/or of a longer-term decline in worker bargaining power. ([125])

However, most of the available micro-level evidence underpinning the evolution of the aggregate labour share is based on US data. Cross-country analysis by international institutions such as OECD and IMF is obtained on a sample that has only partial overlap with the euro area. For Europe, the evidence on the evolution of labour shares in previous work is mixed and suggestive of significant cross-country heterogeneity. ([126]) Also, the timeframe considered in previous studies mostly fails to cover the recovery period. To shed more light on which of these trends apply to euro area Member States, this section provides a set of stylised facts on the evolution of labour income shares in the euro area Member States over 2000-2017 and identifies the technological and

([120]) This section was prepared by Elizaveta Archanskaia, Eric Meyermans, and Anneleen Vandeplas. The authors wish to thank Alfonso Arpaia, Erik Canton, Alexander Hobza, Aron Kiss, Zenon Kontolemis and Karl Pichelmann for useful comments.

([121]) See Vandeplas, A., Arpaia, A., Ruscher, E., Turrini, A. and W. Röger (2018), 'Wage dynamics in the EMU', *QREA* Vol. 16, No. 3, pp. 1-20; and European Commission (2018), Labour Market and Wage Developments in Europe. Annual Review.

([122]) Dao, M.C., Das, M., Koczan, Z., and W. Lian (2017), 'Why is labour receiving a smaller share of global income? Theory and Empirical Evidence', *IMF Working Paper* No. 17/169.

([123]) The labour income share is defined as the share of gross value added paid to workers – as distinct from the share going to capital compensation and to profits.

([124]) Autor D. and A. Salomons (2018), Is Automation Labor-Displacing? Productivity growth, employment, and the labour share', *NBER Working Paper* No. 24871; Karabarbounis, L., and B. Neiman (2014), 'The global decline of the labour share', *Quarterly Journal of Economics* 121(9). See also Schwellnus, C., Kappeler, A.,

and P-A Pionnier (2017), 'Decoupling of wages from productivity: macro-level facts', *OECD Working Paper* No. 1373.

([125]) Kehrig M. and N. Vincent (2018), 'The micro-level anatomy of the labor share decline', *NBER Working Paper* No. 25275; Barkai S. (2018), 'Declining labor and capital shares', *mimeo*; Autor D., Dorn D., Katz L., Patterson C., and J. Van Reenen (2017a), 'The fall of the labor share and the rise of superstar firms', *NBER Working Papers* 23396.

([126]) See Dao et al. (2017) *op cit*. and Schwellnus et al. (2017), *op cit*.

institutional determinants of labour share dynamics in the euro area.

The labour income share is one of four components of GDP, the other ones being the capital income share (e.g. interest payments, depreciation), the profit share (or mark-up), and net taxes (taxes-subsidies on products). [127] Put differently, labour productivity or GDP per person employed is used to pay for wages, capital compensation, and profits.

The labour share can affect socio-economic outcomes via several channels, including the following. *First*, labour share dynamics relate to the relative distribution of income among labour, capital and profits. With labour income distributed more evenly than income from capital and profits, a lower labour share might be associated with higher income inequality. [128] *Second*, changes in the labour share can have a feedback effect on aggregate (domestic) demand if the marginal propensity to spend labour income is higher than the marginal propensity to spend income from capital or profits. [129] *Third*, changes in the labour share mirror the evolution of real unit labour costs (RULC). [130] An increase in the labour share may make it relatively less attractive to hire labour, favouring investment in labour replacing technologies. Through their interaction with real effective exchange rates, sectoral RULC can also affect cost competitiveness in tradable sectors.

This section is structured as follows. The second sub-section presents stylised facts on aggregate labour share dynamics in the euro area. The third subsection reviews recent evidence on the determinants of the labour share. The fourth sub-section presents stylised facts on sectoral labour share dynamics in the euro area using a shift-share decomposition. The fifth sub-section estimates the impact of technological and institutional factors on

the evolution of sectoral labour shares. The sixth sub-section summarises the findings and draws some policy conclusions.

III.2. Labour share dynamics at the euro area and the Member State level

The global decline in the labour income share since the late 1970s has been well documented by now. This decline has been observed in the US as well as in Europe. Both regions started started out from roughly similar labour income shares in the 1960s, and both experienced a strong decline until roughly 1990. The labour share in Europe continued to decline over 1990-2000, after which it remained roughly stable (see Graph III.1). The decline in the US was more gradual until around 2000, after which it accelerated. In 2017, the labour share in Europe (EA and EU alike) remains above that in the US. [131]

Graph III.1: **Labour share dynamics over 1960-2017, US and Europe**
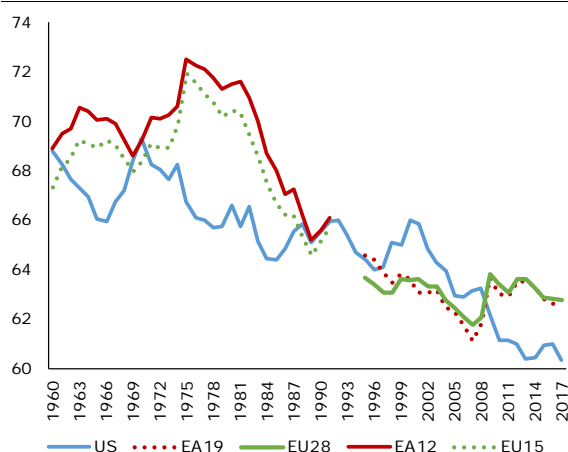
(1) The labour share is measured as the adjusted wage share (AMECO variable ALCD2: Compensation per employee as percentage of GDP at factor cost per person employed, corrected for self-employment, Total economy). Before 1995, partial EU and EA aggregates are considered for lack of full data availability.
Source: AMECO

Most of the variation of the euro area labour share since 2000 seems linked to the economic cycle, [132]

[127] The tax part reflects the difference between GDP and Gross Value Added (GVA), and it is in practice relatively small. In this study, for clarity of exposition, the tax part is neglected.

[128] See Box III.I for a broader discussion on the link between the labour share and income inequality.

[129] See, for instance, Stiglitz, J. (2018), 'Where modern macroeconomics went wrong', *Oxford Review of Economic Policy*, Vol. 34, No 1-2, pp. 70–106.

[130] Unless otherwise mentioned, the labour share is defined as follows (AMECO definition), where total employment comprises employees and self-employed:

$$LS = \frac{employee\ compensation}{GDP\ at\ current\ prices} \times \frac{total\ employment}{nr\ employees}$$

This definition aligns with the one of real unit labour costs.

[131] AMECO also provides data on the adjusted wage share expressed as % of GDP per employed person in current prices. We follow Dünhaupt (2017) in considering the measure expressed of GDP per person employed at factor cost. If the alternative measure were considered, a closure of the gap between Europe and the US would be observed. See Dünhaupt, C. (2017) 'Determinants of labour's income share in the era of financialisation', *Cambridge Journal of Economics*, Vol. 41, No.1, pp.: 283-306.

[132] A simple bivariate regression of the labour share on a time trend suggests the absence of a significant trend over the period 2000-

with the labour income share hitting rock bottom (at around 61%) in 2007, then climbing up to more than 63% in the crisis period, only to start gradually declining again as of 2013, to reach 62.8% in 2017. This counter-cyclical pattern of labour shares has been documented in previous work. [133] It likely results from the fact that employment and wages tend to move more slowly than output, and it can therefore be considered as socially desirable. [134]

When comparing labour share levels across euro area Member States, significant variation is observed. First, in terms of levels, in 2017 the labour share varied from around 38% in Ireland (which is a clear outlier, however) to 70% in Slovenia. Other countries with a labour share above the euro area average are France, Belgium, and the Netherlands. Labour income shares are relatively low in Slovakia, Malta, and Lithuania.

Graph III.2: **Labour income shares across EA countries, 2000 and 2017**
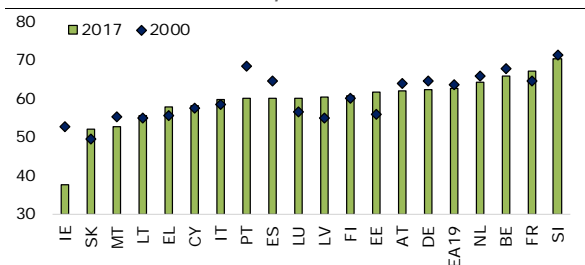

Source: AMECO

Member States also differ in terms of labour share dynamics. Most countries (except for Spain and Portugal and possibly Ireland) have not seen a general downward trend in labour shares over the period 2000-17 in the way there had been one over previous decades. Some countries which started out from relatively low labour share levels in 2000 (most notably Estonia and Latvia) show an upward trend in the labour share. Labour share movements in countries such as Finland, France, Italy, Malta

and Slovenia seem to reflect mostly business cycle effects (see Graph III.4).

The data hint at convergence in labour shares across Member States, as those countries which had the highest labour shares in 2000 (such as Portugal and Spain), saw it decline over the period 2000-17; while countries with relatively low labour shares in 2000 (such as Slovakia, Latvia, Estonia) experienced increases (see Graph III.3). [135]

Graph III.3: **Convergence in labour shares over time across the EA, 2000-17**
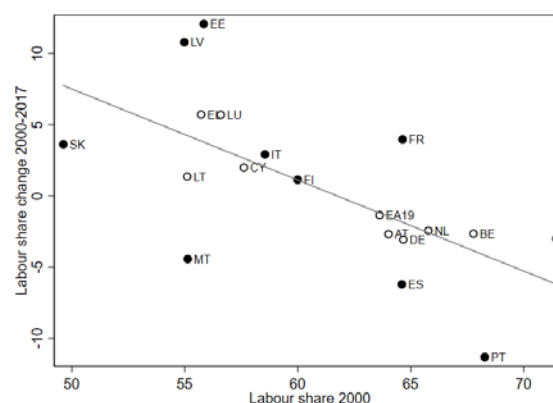
(1) Changes in labour shares are expressed in % (but a similar relationship is observed when they are expressed in ppt). IE is dropped from the graph as it represents a significant outlier (mostly as a result of substantial GDP revisions in 2015 relating to transfer pricing by multinational companies). The bivariate regression model has an R-squared of 0.42. EU28 and EA19 are not included in the linear fit. Dark bullets reflect countries in which the labour share shows a significant (positive or negative) time trend over the considered period.
Source: EC calculations based on AMECO

Hence, in summary, the broad stability of the labour share in the euro area over the period 2000-17 hides more interesting, but also heterogeneous, dynamics at the Member State level. The following subsections will explore in more detail what could be driving these dynamics. We start by briefly reviewing the literature on the determinants of the labour share in subsection IV.3. Next, empirical analysis is presented based on data from a set of euro area Member States in order to investigate some of the suggested hypotheses (subsections IV.4 and IV.5).

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17. Over the same period, around 40% of the variation in the labour share is explained by fluctuations in the output gap.

[133] IMF (2012). World Economic Outlook: Growth Resuming, Dangers Remain. Washington, April, 2012.

[134] see e.g. Pino, G., Soto, A. (2014) Analysis of wage flexibility across the Euro Area: evidence from the process of convergence of the labour income share ratio. *Applied Economics*, 46(29): 3572-80; and Hutchinson, J., Persyn, D. (2012) Globalisation, concentration and footloose firms: in search of the main cause of the declining labour share. *Review of World Economics*, 148(1): 17-43; Growiec, J., McAdam, P., Muck, J. (2018) On the optimal labor income share. *ECB Working Paper Series* No. 2142.

[135] The major change in IE is largely due to a structural break in the data in 2015 (see above). If IE is not taken into account, the standard deviation of labour shares across countries is significantly lower in 2017 than in 2000.
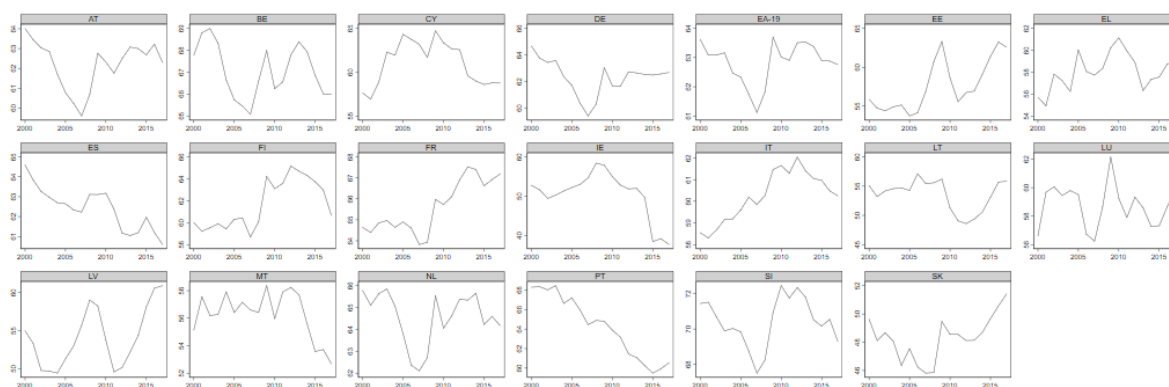
Source: AMECO ALCD2

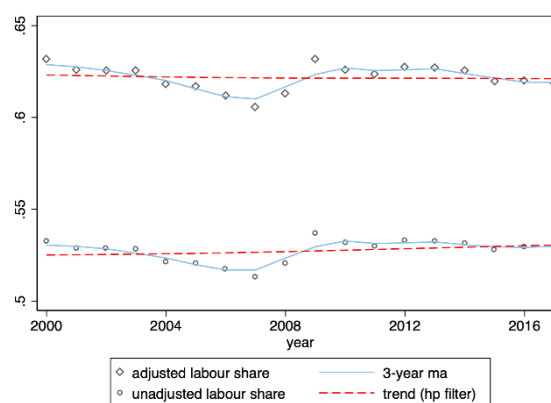### III.3. Determinants of labour shares: a brief literature review

Various factors have been proposed as contributing to the evolution of the labour share, including compositional shifts in economic activity, technological change, globalisation (including global value chain integration), financialisation, and institutional settings (such as product and labour market regulations). In what follows, we will briefly review each of these factors.

Sectoral shifts can have a notable impact on the labour income share. As agriculture, manufacturing and construction used to have higher labour shares than other service sectors, the structural shift towards these service sectors exerted downward pressure on the labour share in Europe prior to 2000. [136] In more recent years, the labour share in the services sector bypassed the one in manufacturing, and strong shifts in labour shares within sectors have been observed (see Section IV.4). Such shifts do not necessarily result from labour share changes within incumbent firms: they may also reflect within-sector compositional shifts from (to) firms with a higher labour share to (from) firms with a lower labour share. [137]

Graph III.5: **Labour share in EA19**

(1) The figure shows the observed annual labour share as well as its 3- and 5-year moving average and its trend (HP filtering) focussing on employee compensation only in the right panel and adjusting for the compensation of the self-employed in the left panel.
Source: Eurostat

Shifts in the *relative distribution of employees versus self-employed* can contribute to magnifying measurement error in the computation of the labour share since compensation of the self-employed is not reported as labour income but rather is included in the gross operating surplus of the sector. The standard way of adjusting for the compensation of the self-employed is to assume that they receive the same compensation as the average employee.

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[136] See Arpaia, A., Pérez, E., and K. Pichelmann (2009), 'Understanding Labour Income Share Dynamics in Europe', *ECFIN Economic Papers* 379, European Commission; De Serres, A., Scarpetta, S., and C. De La Maisonneuve (2001), 'Falling wage shares in Europe and the United States: How Important is Aggregation Bias?', *Empirica,* Vol. 28, No. 4, pp. 375-401.

[137] Autor et al. (2017a) argue that most of the within-sectoral change in the labour share results from the reallocation of activities between firms, towards firms with high profits and low labour shares, for example because firms with a higher labour share are generally less profitable and therefore have a higher exit rate.

Box III.1: Labour income shares and wage dispersion

Around 1900, studies of inequality in the economics literature focused on the functional distribution of income, in other words the division of income among labour (often farmers), landowners, and capitalists. At that time, wage earners were often identified as "the poor", underscoring the relevance of the labour share for distributional considerations.[1] This approximation became less satisfactory with economic development, which led to a blurring of the correspondence between classes of people and sources of income. Also the increased availability of household- and individual-level income data, and the emergence of human capital theory which highlighted the differences in returns to skills contributed to a rising interest among economics scholars in the personal income distribution and wage inequality as of the 1960s.

At the same time, looking at functional income distribution rather than the personal income distribution might still be attractive as a relatively simple and pragmatic way to incorporate distributional concerns into modern macro-theoretical models (such as real business cycle models). Moreover, the functional income distribution still raises questions of social fairness, as many perceive the extent to which real wage growth reflects labour productivity growth as a crucial element of fair division of the benefits from production. [2]

Nevertheless, caution is due in drawing a direct link between factor shares and the personal income distribution, given that individuals increasingly draw income from a variety of sources, and given that also within categories of income, there is substantial inequality.[3] Earlier QREA analysis concluded that the link between income inequality and the wage share is complex, and that in some euro area countries, the decline in the labour share was not associated with a commensurate increase in disposable inequality, partly because of an equalising impact of taxes and transfers. [4]

Graph 1 and 2 present scatter plots of wage inequality and the labour income share, in two different years (2006 and 2014), highlighting the complex relationship between these two variables. While the 2014 graph shows a relatively strong

negative correlation; the correlation in 2006 was close to nil. On average, the data suggest that wage dispersion has declined over time; and there is some evidence of convergence in wage inequality across EU member states over time. Further work is needed to explore the reasons for these differences over time.
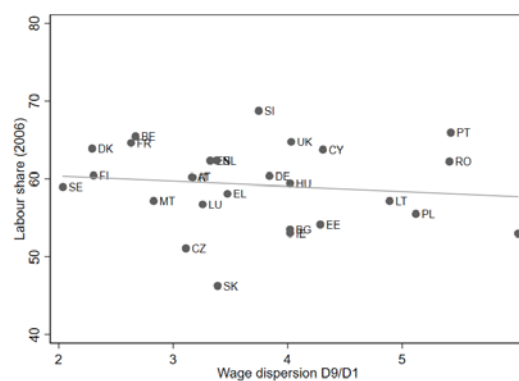
Graph 1: **Wage inequality versus the labour income share, 2014**
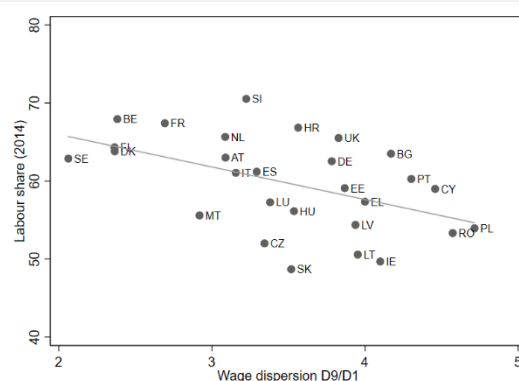
(1) D9/D1 is defined as the ratio of the upper decile over the lower decile of wages for companies with at least 10 employees. R² adj linear fit=0.22.
Source: Eurostat, Structure of Earnings Survey 2014

Graph 2: **Wage inequality versus the labour income share, 2006**

(1) D9/D1 defined as above. R² adj linear fit≈0.
Source: Eurostat, Structure of Earnings Survey 2006

[1] See Goldfarb, R.S., Leonard, T.C. (2005) Inequality of what among whom?: Rival conceptions of distribution in the 20th Century. In: *A Research Annual. Research in the History of Economic Thought and Methodology*, Volume 23A: 75-118.

[2] see Atkinson, A.B. (2009) Factor shares: the principal problem of political economy? Oxford Review of Economic Policy, 25(1): 3-16.
[3] see Atkinson (2009, *op cit.*)
[4] European Commission (2008) Income inequality and wage share: patterns and determinants. *QREA*, III/2008: 31-44.

This is a quite rough approximation, [138] and increases in the share of self-employed (which have been reported in Europe since the 1980s) may exacerbate the measurement error. In the case of the euro area, the adjustment for self-employment does not change the qualitative results on the evolution of the labour share over 2000-2017 (Graph III.5).

Recent work suggests that *technological progress* has considerably reduced the price of investment goods, inducing firms to shift resources away from labour towards capital, resulting in a declining labour share. [139] At the same time, the reduction in the relative price of investment goods (such as computer equipment) is argued to have contributed to economic growth and the increase in the skills premium. [140] A related driver is capital-augmenting technological progress, [141] which raises the productivity of capital relative to that of labour. The fact that labour shares vary more strongly across sectors within a country than across countries, suggests indeed the importance of technology as a determinant of the labour share. [142]

The effect of rising capital intensity and capital augmenting technical change on the labour income share may differ across industries or across workers of different skills levels. Notably, in sectors (or among workers) where labour and capital are strong substitutes, capital is likely to replace labour and therefore reduce labour demand and the labour income share. This mostly concerns sectors with a high share of jobs involving routine tasks

(such as traditional manufacturing [143]) and low- or medium-skilled workers. [144] However, in industries (or groups of workers) where labour is rather a complement to capital, rising capital intensity is more likely to increase the demand for labour and as a result also increase the labour income share. This mechanism likely plays out in skill-intensive services and for highly qualified workers. [145] Hence, variation across sectors in the elasticity of substitution between capital and labour could give rise to differences in the size and the direction of the effect of technological progress.

Globalisation has also been identified as an important contributor to the evolution of the labour share. On the one hand, offshoring of the most labour-intensive parts of production processes may contribute to reduce labour shares in advanced economies. [146] It may also reduce the relative bargaining power of labour. [147] Further, trade integration may increase the market share of the exporting firms, which tend to be more capital intensive. There is some empirical evidence for Europe that the labour share is lower for exporting firms and those engaged in foreign direct investment and offshoring. [148] On the other hand, increased specialisation of advanced economies in

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[138] Notably, in countries with a high incidence of agriculture, self-employed are likely to earn less than employees; in other countries, where self-employed are often high-skilled freelancers, they are likely to earn more than the average employee. Schwellnus (2017) has proposed a more refined way to correct for self-employment, notably by approximating income from self-employment by sectoral wages, weighted by the sectoral incidence of self-employment. Alternative methods are discussed by Schwellnus et al. (2017), *op cit.,* and Cho, T., Hwang, S. and P. Schreyer (2017), 'Has the labour share declined?: It depends', *OECD Statistics Working Paper* No. 2017/01.

[139] See Karabarbounis & Neiman (2014) *op cit.*

[140] See, for instance, Greenwood, J., Hercowitz, Z., and P. Krusell (1997), 'Long-Run Implications of Investment-Specific Technological Change', *American Economic Review*, Vol. 87, No. 3, pp. 342-62; Krusell, P., Ohanian, L. E., Rios-Rull, J.-V., and G.L. Violante (2000), 'Capital-Skill Complementarity and Inequality: A Macroeconomic Analysis', *Econometrica*, Vol. 68, No. 5, pp. 1029-53.

[141] Berman E., Bound, J., and Z. Griliches (1994), 'Changes in the Demand for Skilled Labor within US Manufacturing: Evidence from the Annual Survey of Manufactures', *Quarterly Journal of Economics*, Vol. 109, No. 2, pp. 367–397.

[142] Arpaia et al., *op cit.*

[143] Which is in sharp contrast to the emerging industries using key enabling technologies (KETs) such as micro-/nano-electronics, nanotechnology, photonics, advanced materials, industrial biotechnology and advanced manufacturing technologies such as bio-based products, smart vehicles, sustainable construction and smart grids. For more details, see for instance http://ec.europa.eu/growth/industry/policy/key-enabling-technologies_en

[144] See for instance Marcolin, L., Miroudot, S., and M. Squicciarini (2018), 'To be (routine) or not to be (routine), that is the question: a cross-country task-based answer', *Industrial and Corporate Change*, 2018: 1-25; and Marcolin, L., Miroudot, S., M. Squicciarini (2016), 'The Routine Content Of Occupations: New Cross-Country Measures Based On PIAAC', *OECD Trade Policy Papers*, No. 188, OECD Publishing, Paris.

[145] At the same time, the value of the elasticity of capital-labour substitution remains highly debated in the economics literature. See e.g. Guschanski, A. and A. Onaran (2018), 'Determinants of the wage share: a cross-country comparison using sectoral data', *CESifo Forum* 2/2018, June, Volume 19.

[146] See, for instance, Elsby, M.W., Hobijn, B. and A. Sahin (2013), 'The decline of the US Labor Share. Brooking papers on Economic Activity;' in IMF (2007) 'The globalisation of labor', Chapter 5 in World Economic Outlook, April 2007 (Washington, DC: IMF).

[147] As globalisation increases the bargaining position of the "most mobile" factor, and capital is considered more mobile than labour (See Stockhammer, E. (2013), 'Why have wage shares fallen? An analysis of the determinants of functional income distribution' in Lavoie M. and E. Stockhammer (eds) *Wage-led Growth*. Advances in Labour Studies. Palgrave Macmillan, London.).

[148] Perugini, C., Vecchi, M. and F. Venturini (2017), 'Globalisation and the decline of the labour share: a microeconomic perspective', *Economic Systems*, Vol. 41, No. 4, pp 524-536.

the skill-intensive parts of the production process may increase the aggregate labour share.

Another potentially contributing factor is *financialisation* whereby more developed and less regulated financial markets may lower the labour share via various channels such as increased pressure for dividend payments and enhanced exit options of capital. [149] Hence, financialisation may also affect the bargaining power of labour. [150]

Finally, some have pointed at the impact of *policies and institutions*, such as labour or product markets regulations, and other institutional settings that influence worker bargaining power (such as union density, unemployment benefit levels and coverage, minimum wages, centralisation of bargaining and so on). The direction of the impact of factors that raise worker bargaining power is difficult to determine ex ante on theoretical grounds: while they might have a positive impact on wages, they might as well have a negative impact on employment. [151] A recent study by IMF staff suggests that deregulation of employment protection legislation has had a large and robust negative impact on the labour share in advanced economies over the period 1970-2015. [152]

A new strand of literature points at the influence of *between-firm productivity differences* on the labour share. More specifically, some have observed an increasing divergence in productivity between frontier firms and the other ones. [153] A possible driver is the progressive digitalisation of the economy, and the increased importance of intangible capital assets. This evolution may generate global winner-takes-all dynamics, [154] resulting in a *stronger concentration* of sales in large firms which have higher mark-ups and lower, or declining, labour shares. [155] A recent study documents a rise in mark-ups in the US over 1980-2014, driven by a set of firms with already above-median mark-ups. [156] However, more work is needed to see if this finding applies to the EU. [157] Understanding whether increasing concentration of firms results in increasing mark-ups and declining labour shares is important for policymakers, as it could imply a role for strengthening or modernising competition policy.

Recent work by the OECD asserts that the decline in the labour share in firms at the technological frontier is not driven by rising mark-ups or capital intensity in incumbent frontier firms. Instead, it comes about through the entry of new firms that start out as relatively capital intensive and have relatively high mark-ups. [158]

Past research has arrived at diverging conclusions regarding the significance (and sometimes even the direction) of the reviewed determinants, depending on the country sample and timespan considered. In this section, we explore whether the drivers identified in the existing studies have had a discernible impact on the evolution of the labour share in the euro area over the period 2000-17. We first look at the impact of sectoral shifts (Subsection IV.4) and then consider the impact of other factors such as capital accumulation, technological change, globalisation and institutional factors in Subsection IV.5.

[149] Giovannoni, O. (2014), 'What do we know about the labour share and the profit share? Part II: Empirical Studies. Levy Economics' Institute of Bard College Working Paper 804; Dünhaupt, P. (2017), *op. cit.*

[150] See Guschanksi and Onaran (2018), *op cit.* for additional details

[151] For example, Jaumotte and Tytell (2007) find that unemployment benefit replacement rates and union density have a negative impact on labour shares (albeit not significant in the latter case). Checchi and Garcia (2008) also find a negative significant effect of unemployment benefit replacement rates, but no impact of union density. See Jaumotte, F., Tytell, I. (2007) How has the globalisation of labor affected the labor income share in advanced countries? IMF Working Paper 07/298; Checchi, D., García-Peñalosa, C. (2008) Labour market institutions and income inequality. *Economic Policy*, 23(56): 602-649.

[152] Ciminelli, G., Duval, R.A. and D. Furceri (2018), 'Employment Protection Deregulation and Labor Shares in Advanced Economies', *IMF Working Paper* 18/186.

[153] Frontier firms are often defined as the top 5% best performers in terms of productivity. See e.g. Andrews, D, Criscuolo, C. and P.N. Gal (2016), 'The Best versus the Rest: The Global Productivity Slowdown, Divergence across Firms and the Role of Public Policy', OECD Productivity Working Papers No. 5, OECD Publishing, Paris.

[154] See Brynjolfsson, E, and A McAfee (2011), Race Against The Machine: How the Digital Revolution is Accelerating Innovation, Driving Productivity, and Irreversibly Transforming Employment and the Economy, Digital Frontier Press.

[155] Autor, D., Dorn, D., Katz, L.F., Patterson, C. and J. Van Reenen (2017b), 'Concentrating on the Fall of the Labor Share', *American Economic Review Papers and Proceedings*, Vol. 107, No. 5, pp. 180-85.

[156] De Loecker, J. and J. Eeckhout (2017), 'The rise of market power and the macroeconomic implications', NBER Working Paper 23687.

[157] An earlier paper by ECB was not able to discern a clear trend in markups over the 1980s and 1990s in the Euro Area (see Christopoulou, R. and P. Vermeulen (2008), 'Markups in the Euro Area and the US over the period 1981-2004: a comparison of 50 sectors', *ECB Working Paper* No. 856. Analysis by Guschanski and Onaran (2018) does not confirm the expected impact of firm concentration on the labour share. See Guschanski, A., Onaran, Ö. (2018) The labour share and financialisation: Evidence from publicly listed firms. *Greenwich Papers in Political Economy* No. GPERC59. See also De Loecker, J. and J. Eeckhout (2018), 'Global Market Power', *NBER Working Paper* 24768.

[158] This finding aligns with views by Autor et al. (2017b), *op cit.*

III.4. Labour share dynamics in the euro area: a sectoral perspective

Sectoral variation in the labour share (both between sectors and over time) tends to outweigh variation at the euro area and the Member State level. [159] For example, in the euro area, just 11% of the variation in the data on country-sector specific labour shares is attributable to the country dimension while 63% is attributable to the sectoral dimension. [160] While at the aggregate level the labour share does not show any significant trend since 2000 in the euro area, Graph III.6 documents that significant trends can be discerned at the sectoral level. [161]

Graph III.6: **Evolution of sectoral labour shares, 2000-17, euro area**
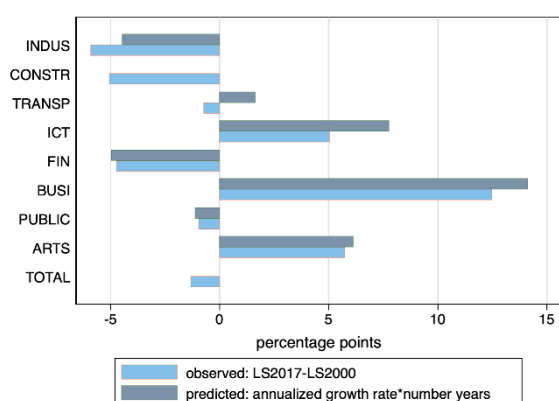
The figure plots the observed ppt change in the sectoral labour share (blue) and the predicted change over 2000-17 based on a simple bivariate regression of the sectoral labour share on a time trend. Blue bars that are not matched by grey bars hint at stationary fluctuations around a relatively stable medium-term average.
Source: EC calculations based on Eurostat

Notably, a significant negative trend is observed in the Industry (other than construction) sector (INDUS) and in Finance (FIN). In the construction (CONSTR) sector the change in the labour share appears significant between 2000 and 2017 (*light blue bar*), but it actually does not correspond to a significant time trend (*blue-grey bar*). Significant positive trends are discerned in the Information-Communication Services (ICT), the professional activities and business services (BUSI) and the arts and entertainment (ARTS) sectors. In other words, the weak dynamics at the euro area aggregate level hide substantial variation at the sectoral level, where changes in opposite directions mitigate each other. Accounting for the relative size of each sector, the most influential sectoral trends are those in Industry other than construction (INDUS), closely followed by professional activities/business services (BUSI).

The difference in trend between, on the one hand the Industry sector; and on the other hand the Professional activities/Business services and ICT sectors over a period of capital deepening is in line with theory arguing that differences in capital-labour substitutability between sectors lead to different effects of capital accumulation and technological change (see Section IV.3). Notably, theory predicts that more 'flexible' sectors (where capital-labour substitutability is higher) are more likely to substitute away from progressively more costly input (labour) to the progressively cheaper input (capital), resulting in diverging capital-labour ratios and factor income shares. [162]

It is typically assumed that labour is less easily replaceable in sectors with a higher skills intensity. Not surprisingly, the considered sectors show notable differences in skills intensity. In 2017, in the euro area, 26% of employees in Manufacturing held a tertiary qualification, versus around 60% in ICT, and around 45% in Professional activities/Business services respectively. [163] Hence, in line with our expectations, sectors employing mostly less-skilled workers have seen labour share declines, while skills-intensive sectors have mostly witnessed labour share increases.

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[159] see e.g. Arpaia et al. (2009), *op. cit.*
[160] The remaining variation is attributable to time, country-time, sector-time, and country-sector-time dimensions.
[161] As data on sectoral labour shares are not available from AMECO; sectoral adjusted labour shares are calculated based on EUROSTAT data using the following formula: $LIS_s = [sectoral GVA (mio EUR)/sectoral employee compensation (mio EUR)]*[sectoral employment (persons)/sectoral employees (persons)]$, using national sectoral account statistics (nama_10_a10). Total economy comprises 10 sectors: agriculture (AGRI), industry other than construction (INDUS), construction (CONSTR), trade and transport (TRANSP), information and communication (ICT), finance and insurance (FIN), real estate (ESTATE), administrative, technical and scientific services (BUSI), the public sector (PUBLIC), arts and entertainment (ARTS).

[162] See, for instance Alvarez-Cuadrado, F., Van Long, N., and M. Poschke (2017), 'Capital-labor substitution, structural change, and growth', *Theoretical Economics*, Vol. 12, pp. 1229-1266; Diez Catalan, L. (2018), The labour share in the service economy. Spain and Portugal Unit, BBVA Research.
[163] Own calculations (for age group 25-64) based on Eurostat LFS data [edat_lfs_9910]

Graph III.7: **Relationship between changes in sectoral labour shares, labour productivity, and wages , euro area**
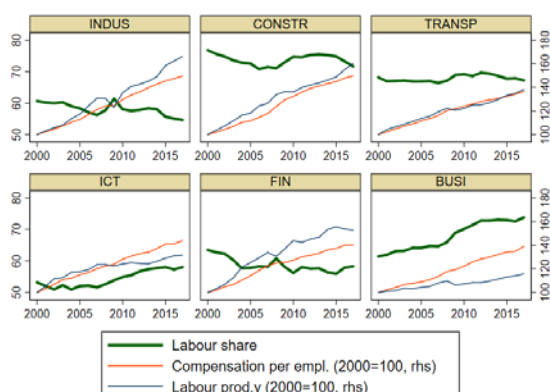

(1) The labour share is measured as the adjusted wage share (AMECO definition)
Source: AMECO

There are important differences between, *on the one hand*, the size and the direction of relative sectoral labour share dynamics, and *on the other hand,* changes in relative sectoral wages. Graph III.7 illustrates that while labour productivity in Industry grew dramatically over the period 2000-17 (by more than 60%), labour productivity in Professional activities/business services grew by less than 20%. Sectoral wage growth was much more similar: around 50% in Industry, and around 40% in Professional activities/business services. This evolution corresponded to an increasing labour share in the latter sector, and a reduced labour share in the former sector. In other words, workers in sectors with declining labour shares are not necessarily worse off than workers in other sectors in terms of nominal compensation growth. While the labour share in Industry started out at a level similar to Professional activities/business services (60.7% vs. 61.4%) in 2000, by 2017 a significant gap has emerged (54.6% vs. 73.8%).
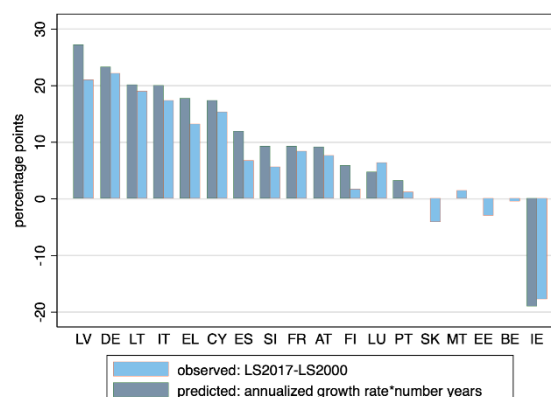
Graph III.8: **Evolution of the sectoral labour share in industry (B-E), 2000-17**
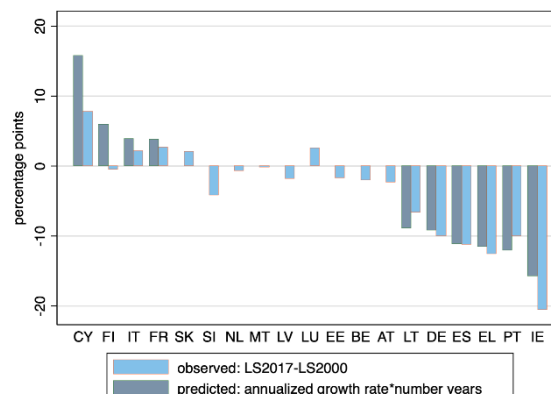
(1) The figure plots the observed percentage point change in the labour share over 2000-2017 as well as the predicted change based on a simple bivariate regression of the labour share on a time trend.
Source: EC calculations based on Eurostat

Graph III.9: **Evolution of the sectoral labour share in Professional Activities/Business services (M-N), 2000-17**

(1) The figure plots the observed percentage point change in the labour share over 2000-2017 as well as the predicted change based on a simple bivariate regression of the labour share on a time trend.
Source: EC calculations based on Eurostat

At the individual Member State level, similar patterns are observed as for the euro area as a whole: most saw a reduction in the labour share in industry (manufacturing), and an increase in prof. activities/business services (see Graphs III.8 and III.9). At the same time, the starting points and the slope of the change are often very different.

A formal shift-share decomposition can be used to pin down the relative importance of within-sectoral changes in the labour share relative to compositional effects, i.e. the changing weight of sectors in total value added. The results of this decomposition as well as the total change in the

aggregate labour share are shown in Graph IV.9 for the euro area. The decomposition is carried out for the total economy as well as for the so-called 'market economy', i.e. the subset of sectors for which the labour share is well defined (excluding agriculture, real estate, the public sector, as well as the arts-entertainment sector).

Graph III.10: **Shift-share decomposition of labour share dynamics in EA19, 2000-17**
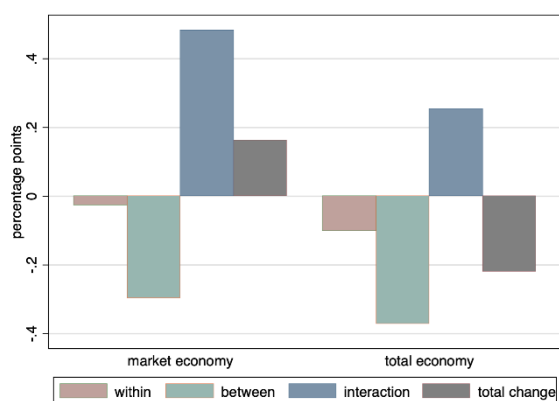
(1) Total economy corresponds to sectors A-U (10 sectors). Market economy comprises sectors B-N, while excluding the real estate sector (L) (6 sectors). Results are qualitatively similar if manufacturing (C) is used instead of industry other than construction (B-E).
Source: EC calculations based on Eurostat

The shift-share decomposition contains three terms.[164] The first term is the *'within' effect*. It is negative (see Graph III.10), suggesting that the aggregate labour share would have declined, had the sectoral composition of the economy remained unchanged. The *'within' effect* is measured as the weighted average of changes in the sectoral labour shares, with the weights given by the initial share of each sector in total value added.

The second term is the *'between' effect*. It reflects the change in the aggregate labour share due to shifts in the sectoral composition of the economy. Put differently, it indicates how the aggregate labour share would have evolved if sectoral labour shares had remained unchanged. It is equal to the weighted average of changes in the share of each sector in total value added, with the weights given by the initial labour share in each sector. The negative *'between' effect* in Graph III.11 suggests that the euro area economy saw a relative shift (in value

added) from sectors with relatively higher to sectors with relatively lower labour shares.

The third term is the *'interaction term'*. It captures to what extent sectoral labour shares move in the same direction as sectoral value added shares. The interaction term is positive for the euro area level, suggesting that labour shares increased (decreased) in sectors whose share in total value added also increased (decreased). Typically, the interaction term is relatively small in shift-share decompositions and therefore sometimes even neglected.[165] However, in this case, given the small magnitude of the between and the within effects, the interaction term is relatively sizeable.

In all, the shift-share decomposition at the euro area level indicates that shifts *between* sectors (and in particular from high-labour share to low-labour share sectors) have had a stronger impact on the euro area labour share than shifts *within* sectors (leading to a reduction of sectoral labour shares on average), even if both effects moved in the same direction. At the same time, sectors that had initially a low labour share and saw their share in value added increase, also experienced an increase in the labour share, exerting countervailing (upward) pressure on the euro area labour share.

Graph III.11: **Shift-share decomposition at the level of labour share dynamics, euro area individual Member States, 2000-17**
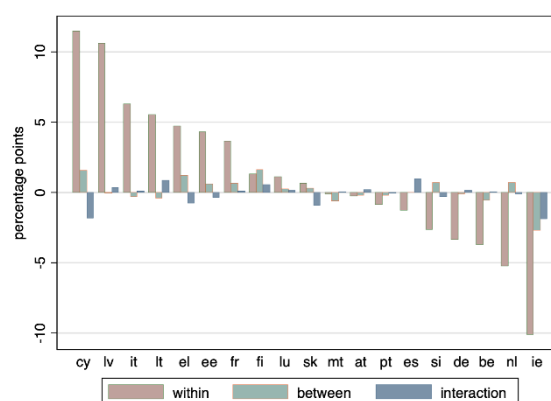
(1) The shift-share decomposition is carried out for the 6 sectors of the 'market economy', i.e. sectors B-N, but excluding the real estate sector (L).
Source: EC calculations based on Eurostat

A similar analysis (focusing on the market economy) can be carried out at the Member State level. The results are presented in Graph III.11.

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[164] $LS_{2017} - LS_{2000} = \sum_{k=1}^{K} \Delta ls_k \omega_{k,2000} + \sum_{k=1}^{K} \Delta \omega_k ls_{k,2000} + \sum_{k=1}^{K} \Delta ls_k \Delta \omega_k$,where LS (ls) is the aggregate (sectoral) labour share, k is the sector, and ω_k is the share of sector k in total value added.

[165] see e.g. Dao et al. (2017) *op cit.*

They show that at this level, within-sector effects clearly trump the effects of sectoral shifts and the interaction term. These results are more in line with other recent studies. ([166]) At the same time, the direction of these within-sector changes varies considerably, with more (albeit generally smaller) Member States experiencing positive than negative within-sector changes. Sectoral shifts are typically small in magnitude, and their sign varies across countries as well. The finding that intra-sectoral changes in the labour share are the main driving force behind changes in country-level labour share dynamics motivates the estimation approach in section IV.5, which focuses on sector-level changes. This also allows to explore whether there are relevant differences in the impact of certain variables across sectors, such as for example a different effect of capital accumulation as a result of differences between sectors at the level of capital-labour substitutability.

III.5. Determinants of sectoral labour share dynamics in the euro area

This sub-section examines empirically the factors that affect the adjusted labour income share at sectoral level ([167]) – within the limits set by data availability. Box IV.4 provides a brief overview of the sectors covered and the data.

An econometric analysis at the sectoral level may give us a better understanding of labour income share developments at national level in recent decades as the shift-share analysis of the previous sub-section showed that the overall changes at national level is to a large extent due to changes of the labour income share at sectoral level rather than changes in the economy's sectoral composition.

In perfect markets, assuming a CES production function with capital and labour as inputs, and allowing for capital- and labour-augmenting technical change, the sectoral labour income share is determined by the relative cost of production factors, scaled by their relative technical efficiency. ([168]) The impact of capital deepening and of technical progress on the relative income shares of labour and capital depends on the

elasticity of substitution between the two production factors. More specifically, further capital deepening and technical progress will induce an increase in the relative share of labour income if labour and capital are complements and technical progress is capital-augmenting; but a reduction in the relative share of labour income if labour and capital are substitutes and if technical progress is labour-augmenting.

In practice however, the direction of technical progress is not observed. Further, it may be argued that a refined production function with multiple labour and capital types is needed, to take into account differences in the relative substitutability of tangible and intangible capital with labour in routine and non-routine tasks. The analysis in this sub-section takes two shortcuts, mainly due to data limitations. ([169]) Firstly, it is not possible to include multiple labour and capital types. Secondly, sectoral total factor productivity (TFP) growth is used to proxy technological progress, i.e. *de facto* assuming Hicks-neutral rather than factor-biased technical change. ([170])

Graph IV.12 shows developments in manufacturing's labour share as well as developments in its TFP growth ([171]) and capital to labour ratio for an aggregate of a selected set of euro area Member States for which sufficient data are available to cover the 2000-2017 period.

([166]) such as Dao et al. (2017) *op cit.*

([167]) This section analyses the adjusted sectoral adjusted labour income share, assuming that the self-employed earn the same compensation as the employees in the sector.

([168]) See for instance Elsby et al. (2013), *op cit.*

([169]) See Box IV.3 for a detailed discussion of the dataset.

([170]) The use of the Solow residual obtained by fitting a Cobb-Douglas production function impedes the interpretation of the coefficient estimated on the TFP as a structural parameter of the CES production function. Interpreting the coefficient estimated on the capital-labour ratio as an estimate of capital-labour substitutability may also be problematic.

([171]) In EU KLEMS sectoral TFP data are indices with base year 2010. As such their levels can not be compared or aggregated into an EA aggregate, but growth rates can be estimated taking the geometric average of sectoral TFPs for the countries for which the data are available, with weights given by the share of each country in total output.

Graph III.12: **Labour income share, TFP growth and capital deepening in Manufacturing**
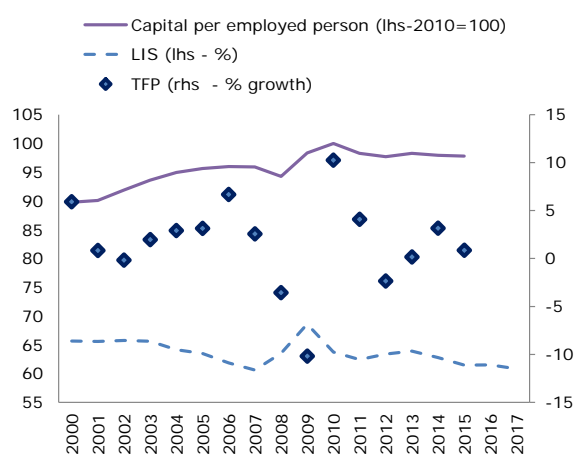
(1) EA aggregate limited to Member States for which only the whole sample range is available. 1995 2015 last year of observation for EUKLEMS data on sectoral TFP and capital deepening.
Source: Eurostat and EUKLEMS.

Graph IV.13 shows the same euro area aggregate for the sector providing professional activities and business services. For this sector, a steady rise in the labour share is concomitant with low (negative) TFP growth ([172]) and capital deepening.

A first look at the data thus suggests a negative correlation between developments in the labour share and capital deepening in manufacturing, and rather the opposite in professional activities and business services. ([173]) Such an unconditional correlation does not indicate causality.

Nevertheless, under the assumption that the relative cost of capital and labour evolved similarly in both sectors, a switch in the sign of the relationship between sectors may either indicate differences in the underlying capital-labour substitutability, or, alternatively, a different path of technological progress. ([174])

Graph III.13: **Labour income share, TFP growth and capital deepening in Professional activities/business services**
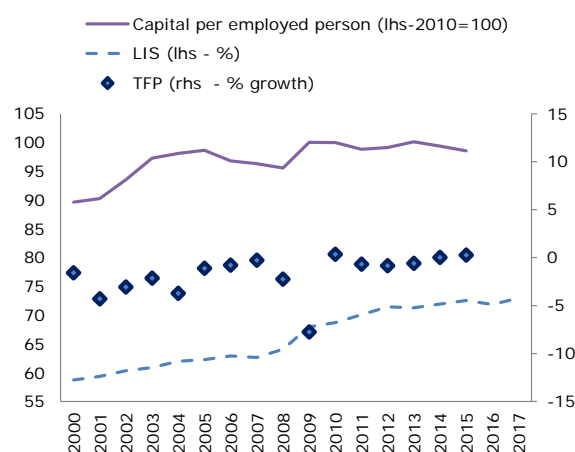
(1) EA aggregate limited to Member States for which only the whole sample range is available. 2011995 last year of observation for EUKLEMS data on sectoral TFP and capital deepening.
Source: Eurostat and EUKLEMS.

Technological progress and capital deepening are not the only determinants of sectoral labour shares. Trade integration and institutional settings likely contribute as well. In imperfect markets, labour and firms bargain ([175]) about the distribution of total factor income, whereby firms maximise profits and workers maximise the difference between the real wage earned and the reservation wage. ([176]) Several factors affect worker bargaining power, including employment protection legislation, trade openness, minimum wages, as well as labour market tightness (i.e. the business cycle).

([172]) Total factor productivity may show negative growth rates as it may include besides technical innovation (which cannot be unlearnt) also the effects from organisational and institutional change as well as the effect of unmeasured inputs such as R&D. For instance, organisational changes may have in the short- to medium-run a negative impact as resources are diverted to the reorganisation and employees have to learn new tasks. A negative change could also stem from within-sector compositional changes in the type services provided. See, for instance, O'Mahony, M. and M. Timmer (2009), *op cit.*, and Basu, S., Fernald, J., Oulton, N. and S. Srinivasan (2004), "The Case of the Missing Productivity Growth, or Does Information Technology Explain Why Productivity Accelerated in the United States But Not in the United Kingdom?', Chapter 1 in Gertler, M. and K. Rogoff (eds.) (2004), NBER Macroeconomics Annual 2003, Vol. 18.

([173]) One could argue that capital-augmenting technical change embodied in new capital goods is at least in part captured by the measure of capital input in EU KLEMS through the use of quality-adjusted prices and user costs as weights in asset aggregation. However, the labour input is measured as the number of persons employed and does not account for changes in labour efficiency. For more details, see O'Mahony, M. and M. Timmer (2009), 'Output, Input and Productivity Measures at the Industry Level: The EU KLEMS Database', *The Economic Journal*, Vol. 119, pp. F374–F403.

([174]) See, for instance, Acemoglu, D. (2003), 'Labor- and capital-augmenting technical change', *Journal of the European Economic Association*, Vol. 1, No. 1, pp. 1–37.

([175]) For a discussion of alternative wage bargaining models see for instance, Alogoskoufis, G. and A. Manning (1991), 'Tests of alternative wage employment bargaining models with an application to the UK aggregate labour market', *European Economic Review*, Vol. 35, pp. 23-37.

([176]) I.e. income received when unemployed. The reservation wage is not observed but various factors may affect it including unemployment benefits (UB), the wage earned in the informal sector, and household production. In this study, the reservation wage is assumed proportional to the replacement rate (UB).

Box III.2: **Towards empirical estimation**

The econometric analysis in this section covers 9 sectors, i.e. i) manufacturing, iii) industry without manufacturing and construction, iii) construction, iv) wholesale and retail trade, v) transport and storage, vi) accommodation and food service activities, vii) information and communication ([1]), viii) financial and insurance activities, and ix) professional, scientific and technical activities; administrative and support – as defined by the European System of National Accounts 2010.

The econometric analysis does not cover i) agriculture, forestry and fishing, ii) real estate activities, iii) public administration, defence, education, human health and social work or iv) arts, entertainment and recreation because measuring economic activity in these sectors poses some challenges. First, gross value added of the public service sector is difficult to measure as its output is often unpriced and public services are often consumed collectively ([2]) so that output of this sector is measured as the total value of inputs. ([3]) Second, gross value added of real estate activities is difficult to measure because financial costs and depreciation are not considered in the calculation of gross value added, in spite of representing the main costs in some parts of the real estate sector, ([4]) and also because gross value added in the real estate sector covers imputed rent for owner-occupied dwellings. ([5]) Third, the agricultural sector (compared with the other sectors) has a disproportionally high share of self-employed which creates a strong wedge between its unadjusted labour income share (based solely on employees) and the adjusted labour income share (which includes the self-employed).

For each sector a reduced form regression equation is estimated by pooling the data of the 10 euro area Member States ([6]) for which sufficient data are available. The dependent variable is the sectoral adjusted labour income share, assuming that the self-employed earn the same compensation as the employees in the sector.

While the transmission mechanisms via which the explanatory variables affect the sectoral labour income share are discussed in more detail in the main text, this box briefly describes their main characteristics and source:

- sectoral total factor productivity growth: disembodied technological change available for a selected set of euro area Member States in the EUKLEMS database, ([7])

- sectoral non-residential real fixed capital stock per person employed: technical change embodied in new capital goods is captured through the use of quality-adjusted prices and user costs as weights in asset aggregation ([8]) available for a selected set of euro area Member States in the EUKLEMS database,

- sectoral openness to international trade: openness to international trade of the Manufacturing sector and Other industry is approximated as the sum of a country's exports and imports of goods divided by GDP. Openness of the service sectors (Finance, Professional activities and business services) and Construction are approximated by the sum of exports and imports of services divided by GDP. Hodrick-Prescot filtered series used in the regression analysis. These data are available in the AMECO database,

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[1] Which includes publishing activities, telecommunications, computer programming, consultancy and related activities , data processing, hosting and related activities; web portals, motion picture, video and television programme production, sound recording and music publishing activities.

[2] See, for instance, Boyle, R. (2006), 'Measuring Public services sector Productivity: Lessons from International Experience,' CPMR Discussion Paper 35.

[3] For more details, see European Commission *et al.* (2008), System of National Accounts 2008

[4] See, for instance, http://ec.europa.eu/eurostat/statistics-explained/index.php/Real_estate_activity_statistics_-_NACE_Rev._2

[5] This component of gross value added stems from the use by employed persons or households of stocks of dwellings, and as such it does not correspond with observed paid labour input in the real estate sector.

[6] I.e. DE, ES, FR, IT, LU, NL, AT, SI, SK and FI.

[7] For more details, see O'Mahony, M. and M. Timmer (2009), 'Output, Input and Productivity Measures at the Industry Level: The EU KLEMS Database', The Economic Journal, Vol. 119, pp. F374–F403.

[8] For more details, see O'Mahony, M. and M. Timmer (2009), *op cit.*

- the sectoral output gap: the difference between the observed value of the sectoral gross value added in constant prices and its Hodrick-Prescott filtered trend, divided by the Hodrick-Prescott filtered trend using Eurostat's National Accounts data,

- net replacement rate: based on unemployment benefits of a single earner without children previously earning 100% of the national wage and unemployed for less than 7 months – as reported in OECD/ECFIN Tax and benefits indicators database ([10]),

- union density: national net union membership as a proportion of wage earners in employment available in the ICTWSS database. ([11])

Country dummies are included to capture specific (unobserved) country characteristics that differ across Member States and that are assumed not to have changed over the sample period. A time trend is added to capture trend developments not captured by the explanatory variables.

Focussing on co-integrated long-term relationships between the dependent and explanatory variable, no lagged variables are included and the equations are estimated applying ordinary least squares taking into account Member State differences in the variance of the stochastic term (i.e. heteroskedasticity) and contemporaneous correlation between Member States' stochastic terms.

([10]) This database is accessible at http://europa.eu/economy_finance/db_indicators/tab/#
([11]) Visser, J. (2016) ICTWSS Data base. version 5.1. Amsterdam: Amsterdam Institute for Advanced Labour Studies (AIAS), University of Amsterdam. September 2016.

Table III.1: **Factors affecting sectoral labour income share**

	Manufacturing	Other industry	Construction	Wholesale retail	Transport and storage	Accommodation and food services	Information	Finance	Professional services
Sectoral capital per employed person	-0.43 ***	-0.01 ***	-0.07 ***	-0.59 ***	-0.13 ***	-0.24 ***	-0.11 ***	-0.09 ***	0.15
	(-20.19)	(-4.76)	(-8.35)	(-7.42)	(-11.23)	(-3.69)	(-4.26)	(-3.16)	(1.32)
Sectoral TFP	-0.03	-0.20 ***	-0.26 ***	-0.28 ***	-0.51 ***	-0.27 ***	-0.22 ***	-0.06 **	-0.25 ***
	(-1.06)	(-15.50)	(-9.87)	(-9.69)	(-18.60)	(-12.36)	(-10.49)	(-2.54)	(-16.06)
Sectoral international trade openness	-0.12 ***	0.04	-0.07 ***	-0.05 **	-0.06 *	-0.02	-0.02	-0.05 ***	-0.05 ***
	(-3.15)	(1.51)	(-5.97)	(-2.06)	(-1.80)	(-1.56)	(-1.19)	(-3.93)	(-4.56)
National minimum wage relative to national wage	-0.12 ***	0.10 *	-0.10 ***	-0.06 **	-0.16 ***	-0.02	-0.04 *	0.03	0.09 ***
	(-4.49)	(1.79)	(-2.67)	(-2.21)	(-6.61)	(-1.06)	(-1.76)	(0.36)	(2.88)
Sectoral output gap	-0.48 ***	0.12 ***	-0.27 ***	-0.20 ***	0.27 ***	-0.17 ***	-0.03	-0.18 ***	-0.12 ***
	(-11.40)	(3.95)	(-6.38)	(-6.11)	(5.72)	(-2.96)	(-0.86)	(-2.67)	(-3.36)
Replacement ratio	0.05 ***	0.00	0.02	0.09 ***	-0.01 **	0.01	0.03 ***	-0.03	0.01
	(5.05)	(0.41)	(1.56)	(6.82)	(-2.26)	(1.15)	(3.23)	(-1.11)	(1.40)
Union density rate	0.12 ***	0.25 ***	0.19 ***	0.16 ***	-0.45 ***	0.16 ***	-0.21 ***	-0.24 ***	-0.05 **
	(2.89)	(6.23)	(3.62)	(3.58)	(-10.36)	(4.00)	(-5.70)	(-3.05)	(-2.20)
Time trend	0.40 ***	-0.42 ***	-0.08	0.61 ***	0.31 ***	0.10 ***	0.80 ***	-0.02	0.38 ***
	(8.06)	(-10.79)	(-1.29)	(19.53)	(6.04)	(2.74)	(23.87)	(-0.48)	(14.33)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared	0.91	0.94	0.93	0.95	0.90	0.97	0.92	0.82	0.97
Durbin-Watson	1.48	1.48	1.23	1.58	1.55	1.43	1.56	1.54	1.60
Number of observations	127	127	127	127	127	127	127	127	127
Number of explanatory variables	18	18	18	18	18	18	18	18	18
Kao residual cointegration test (p-values)	0.000	0.022	0.039	0.000	0.126	0.002	0.000	0.034	0.004

(1) See Box IV.3. for data and estimation procedure
(2) t-values between brackets; *** for p < 0.01, ** for p < 0.05, * for p < 0.1.
(3) p-values for Kao Residual Panel Cointegration Test with Null Hypothesis no cointegration.
Source: Authors' estimates

Controlling for technological progress and capital deepening allows investigating whether the residual variation in the labour share is connected to specific institutional features and to integration in the global economy.

In order to investigate in a more rigorous way how technological and institutional changes contributed to determine the evolution of sectoral labour shares since 2000, a sectoral regression of labour shares on a set of determinants is implemented.

The estimation is carried out in an unbalanced panel covering 10 euro area Member States for which harmonised sectoral data are available. ([177])

([177]) The sample includes DE, ES, FR, IT, LU, NL, AT, SI, SK, FI with sample size from 2001-2015 for all, except IT (2001-2014), SK (2005-2015), SI (2009-2013), LU (2009-2015).

The dependent variable is the adjusted sectoral labour share. The explanatory variables defined at the sectoral level are: capital-labour ratios, TFP, trade openness, and the output gap. The explanatory variables defined at the national level are the ratio of the statutory minimum wage to the average wage, the replacement ratio, and the union density. (178) The sample (set by data availability) covers the 2001-2015 period. The data and estimation method are described in Box IV.3.

Table III.1 shows the results. (179) Focussing on capital deepening, the significant negative point estimates for most sectors suggest a relatively high degree of substitutability between capital and labour (under the restrictive assumption that the TFP variable adequately controls for the unobserved process of technical change). (180) The only sector in which the coefficient on the capital-labour ratio is not significantly negative is in professional and business services. In the latter sector, the estimated coefficient on capital deepening is positive but insignificant. (181)

Whenever significant, trade openness also appears negatively linked to sectoral labour share dynamics. The relationship is significantly negative in manufacturing and finance, but also in business services, transport and storage, as well as construction, possibly reflecting a reduction in worker bargaining power. (182) This variable is

marginally significant in the wholesale-retail and ICT sectors, and insignificant in the accommodation-food sector as well as in the industries other than manufacturing and construction.

Changes in the ratio of the statutory minimum wage to the average national wage are significantly related with changes in sectoral labour shares in most sectors. An increase in this ratio is associated to a reduction in the labour share in all sectors except Other industries and professional services (183).

In most sectors, no significant linkage between replacement ratios and sectoral labour shares is picked up. The replacement ratio affects the fall-back position of a worker in the case of unemployment. The relationship is estimated as significantly positive in Manufacturing, Wholesale/retail trade, and the ICT sector.

A higher trade union density has a significantly positive relation with the labour share in all sectors (except for transport and storage, finance, ICT and professional series). At the same time, its coefficient is significantly negative in Transport and Finance.

The labour income share shows a significant counter-cyclical pattern for all sectors (except for Other industries and Transport and Storage where it shows a significant pro-cyclical pattern). This finding may reflect the fact that output decreases at a stronger pace than employment as labour gets hoarded at the beginning of a downturn so that labour productivity decreases.

Finally, while these point estimates provide a first indication of the impact of various factors on the sectoral labour income share, it should be recognised that with more detailed harmonised

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(178) Here it should be noted that some variables, such as employment protection legislation have not been included in the regression analysis as they show often little variation over time within Member States so that their impact is captured by the country dummies. This does not mean that they would not have an impact on the labour income share.

(179) Except for the sector construction, the Durbin Watson statistics have a value at or above 1.5 suggesting that null hypothesis of no autocorrelation in residuals cannot be rejected with high confidence. Also included the p-values for the Kao Residual Panel Cointegration Test with as Null Hypothesis no cointegration between the dependent and explanatory variables. The Null Hypothesis can be rejected with high confidence for all sectors, except the sector transport and storage.

(180) See footnote 53 for a caveat on the interpretation of this coefficient.

(181) Here it should be noted that manufacturing covers both traditional industrial activities such as textiles and food processing, as well as technology- and knowledge-intensive industrial activities such as semiconductors and communications equipment. Insufficient data are available to cover these differences in the regression analysis.

(182) However, at the same time a further opening also provides countries the opportunity to specialise in those activities in which they have a comparative advantage (provided resources can be reallocated in a flexible way). Such specialisation will then increase productivity and wages while at the same time lowering the price of imports (provided free and fair trade is not hindered). All these effects may then increase the standard of living of workers in

absolute terms – even if the labour income share is declining at the same time.

(183) In this reduced form approach it is not possible to identify how changes in the minimum wage affect the wage distribution. For instance, firms may choose to reflect the change in the minimum wage, thereby keeping the ratio constant. An increase in the minimum wage may increase the labour income share in the short run, as discussed for instance in Neumark, D., J. Salas and W. Wascher (2014), 'Revisiting the Minimum Wage-Employment Debate: Throwing Out the Baby with the Bathwater?', *Industrial & Labor Relations Review*, Vol. 67/Supplement, pp. 608-648. But this section estimates the long-run effects in which case it is more likely that increases in minimum wages trigger capital-labour substitution.

data at the sectoral level, such as the skills and the asset composition, the analysis could be significantly sharpened.

Zooming in on developments in the labour income share in manufacturing (which recorded a sharp decrease in the euro area as a whole) and Professional activities/business services (which recorded a sharp increase in the euro area as a whole) as well as whole and retail sale (which recorded a less pronounced change) for the selected set of Member States for which sufficient data are available, Graph IV.14 shows that between 2001 and 2015 (or a shorter period) changes in trade openness had a relative limited impact on the labour income share especially in the professional services and wholesale and retail. TFP growth in combination with capital deepening exerted especially a negative impact in the manufacturing sector, but a positive one in the professional services sector.

Graph III.14: **Impact of selected set of factors (2001-2015)**
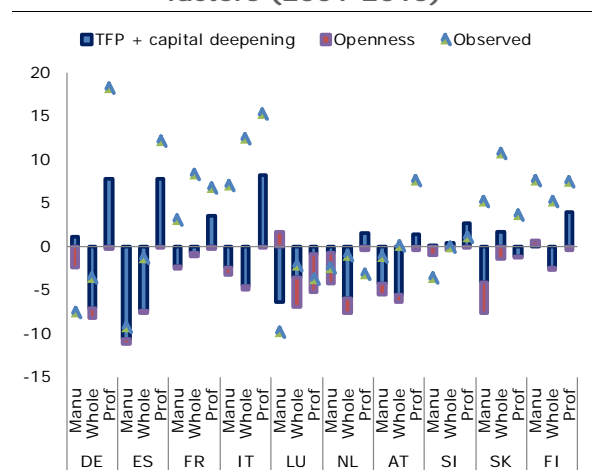
(1) "Manu" short for manufacturing, "Whole" short for wholesale and retail, "Prof" short for professional services. For all MS the change between 2001-2015 except IT (2001-2014), LU (2009-2015), NL (2001-,2015), SK (2005-2015), SI (2009-2013).
(2) These estimates are obtained by multiplying the point estimate with the observed change in the underlying factor.
Source: Authors' estimates

III.6. Conclusions and policy implications

The analysis in this section highlights that changes in the labour income share in the euro area over 2000-2017 mostly reflect countercyclical movements, without a significant downward trend. At the individual Member State level, no trend in the labour income share is found over this period in Austria, Belgium, Cyprus, Germany, Lithuania,

Luxembourg, the Netherlands, and Slovenia. The labour income share increased in Estonia, Finland, France, Italy, Latvia, and Slovakia while it was reduced in Ireland, Malta, Portugal, and Spain. The more pronounced reduction in the total labour income share in these countries, in particular in Spain and Portugal, is attributable to a strong reduction in the labour income share in Industry and a relatively weak increase in the labour income share in Professional activities /Business services. The analysis also underpins weak convergence in labour shares across the euro area as the labour income share increased in some Member States with initially low labour shares (Estonia, Latvia) while decreasing in some Member States with initially high labour shares (Portugal).

A shift-share analysis showed that in most Member States changes in the total labour income share of the market sector was mainly affected by changes in the labour income share within sectors rather than a reallocation of labour across sectors. The strongest impact derives from a declining labour share in Industry, coinciding with a rising labour share in the Professional Activities/Business services. When aggregating these changes, within-sector changes across euro area Member States almost fully counteract each other, such that at the euro area-level, within-sector variation (slightly negative) is much weaker than the impact of sectoral shifts (which is also negative, pointing at a move towards sectors with relatively lower labour shares). The interaction effect is positive, suggesting that sectors that are gaining market share (in particular the Professional Activities/Business services) are witnessing an increase in the labour share, and vice versa.

Focussing on developments within the market sectors shows that technological progress in combination with capital deepening as well as trade opening had an important impact on labour shares - which is in line with earlier results reported for the total labour income share. [184]

While the estimation results suggest that these structural factors reduced the labour income share in several sectors, and the labour income share may

[184] See, for instance, Schwellnus, C., Pak, M., Pionnier, P-A, Crivellaro, E. (2018), 'Labour share developments over the past two decades: the role of technological progress, globalisation and "winner-takes-most" dynamics', *OECD Working Paper* No. 1503; and by Dao et al. (2017), *op cit.*

be viewed as a measure of social fairness ([185]), these structural factors contributed nevertheless to productivity growth. The latter provides the basis for sustained increases in the overall wage level as well as quality improvements and lower quality-adjusted prices, thereby contributing to higher consumer purchasing power (i.e., welfare). Moreover, households also draw income from capital gains and profits - albeit that the distribution of capital income is skewed towards households in the very top of the income distribution. ([186]) Such trade-offs should be taken into account when formulating policies aimed at promoting smart, sustainable and inclusive growth.

The empirical analysis in this section also shows that since 2000 a large share of the variation over time in the labour share has reflected countercyclical movements. While overly rigid labour market institutions may delay the necessary reallocation of labour during a recovery, the counter-cyclical nature of the labour income share can act as a stabilising factor in the face of a temporary shock and therefore be socially desirable. Again, policymakers should be aware of such trade-offs when formulating policies to strengthen economic resilience.

For the other factors, which have a smaller impact on the sectoral labour income share, the econometric analysis suggests that specific factors do not have the same impact across sectors. For example, the impact of changes in the minimum wage differs across sectors partly reflecting differences in the substitutability between labour and capital as well as differences in the pass-through of wage changes at the bottom to the overall wage structure. Such findings highlight the complexity of targeting the labour share directly using existing labour market policy instruments – if such targeting would be considered desirable at all.

At the same time, available evidence indicates that higher sectoral skill intensity is associated to relatively high labour income shares, and greater likelihood of increasing labour shares over time. This finding is likely due to high skilled labour's higher complementarity with capital in production. Hence, investing in skills can produce a double dividend: strengthening macro-economic performance and productivity growth on the one hand, and supporting a commensurate development of workers' living standards.

To the extent that labour share dynamics are influenced by a reallocation of market shares towards firms with lower labour shares at the technology frontier, policymakers may also want to monitor that the competitive advantage that these firms have does not become entrenched over time or give rise to anticompetitive behaviour such as the establishment of entry barriers. A lively debate is taking place in the academic literature in connection to US developments where changing market structures appear to be generating on the one hand higher allocative efficiency, with higher profits for a limited set of firms but lower labour shares, and on the other hand relatively low investment effort possibly indicating weakening competition pressure. For Europe, the evidence as regards the intensity of competition is inconclusive to date.

Further research could focus on a more rigorous specification of the transmission mechanisms via which the various factors affect the sectoral labour income share, and look beyond the traditional NACE sectoral classification making a distinction between economic activities according to technology and knowledge intensity (if adequate harmonised data become available).

([185]) See Atkinson, A. (2009), *op cit.* and Goldfarb, R. and T. Leonard, (2005), *op cit.*.

([186]) For instance, Balestra, C. and R. Tonkin (2018), 'Inequalities in household wealth across OECD countries: Evidence from the OECD Wealth Distribution Database', OECD Statistics and Data Directorate Working Paper No.88 estimate that across the 28 OECD countries covered, the wealthiest 10% of households hold, on average, 52% of total household wealth, while the 60% least wealthy households own little over 12%.