Revisiting the Global Decline of the (Non-Housing) Labor Share

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Abstract:

We identify two undocumented measurement challenges affecting corporate sector labor shares outside the United States: the inclusion of dwellings and the inclusion of self-employed workers in the corresponding sectoral accounts. Both issues have become more important over time, biasing corporate labor shares downward. We propose two methods to correct for these challenges and obtain 'true' non-housing labor share series. Contrary to common wisdom, the corrected series exhibit stable labor shares across all major economies, except the US, where the corrected labor share declines by 6 percentage points since 1980.

JEL: E22, E25, L85.

Key words: Labor Share, Residential Real Estate, Self-Employment, National Accounts.

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1. Introduction

Much research indicates that aggregate labor shares, defined as the ratio of labor compensation to value added, have declined in the past decades (Karabarbounis and Neiman, 2014b, among others). The grey solid line in Figure 1 illustrates this decline. It shows the total economy gross domestic labor share for selected advanced economies, which declined steadily since 1980.

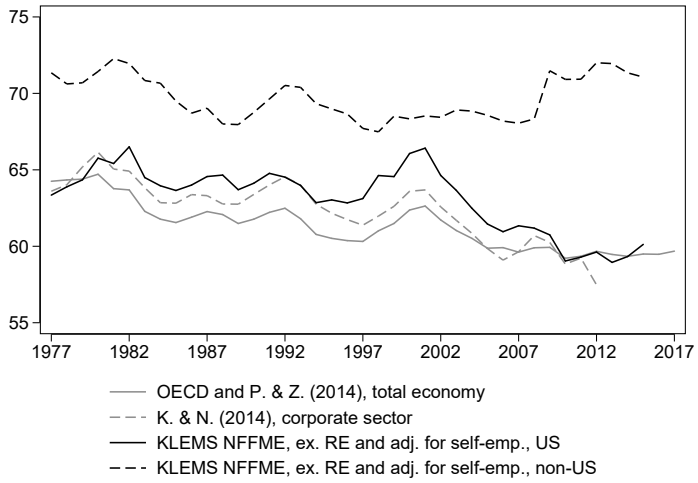
Despite the broad consensus around this decline, there remains substantial controversy on its explanations. Rognlie (2015) showed that an important driver is the rise of housing income as a share of value added. This led researchers to focus on corporate sector labor shares as a "common way to deal with... measurement difficulties... including ambiguity in the labor/capital split of mixed income [i.e., self-employment], as well as the crucial role of housing" (Rognlie, 2015, pp.14-15). The corporate labor share (grey dotted line) also fell, so the quest for a global explanation for the decline in the *non-housing* labor share raged forward.[1] Most prominent explanations emphasize some form of technological change: declining relative price of capital (Karabarbounis and Neiman, 2014b); capital-biased technical change and automation (e.g. Acemoglu and Restrepo, 2018; Martinez, 2018); or network effects leading to 'superstar' firms (Autor et al., 2017a,b). All of these explanations are founded on – indeed aim to explain – a *common* and global decline in the non-housing labor share. They would all presumably have similar effects across advanced economies.

But is there really a global decline in the non-housing labor share? This short paper revisits the evidence, using data across countries and industries. It emphasizes two measurement challenges hitherto undocumented in the literature. First, the inclusion of substantial housing services in the nonfinancial corporate (NFC) sector of most countries; particularly in Europe where 20% of the capital stock of NFCs are dwellings. Second, the inclusion of self-employed workers in the NFC sector of selected economies, notably Italy and Germany.

Both issues have become more important over time, biasing NFC labor shares downwards. We propose two methods to correct for these measurement challenges and obtain 'true' non-housing labor share series. The first measure excludes all real estate activities – from both wages and value added – using industry accounts. This measure covers the full economy and fully controls for housing, but it has two limitations: (i) it 'over-controls' by excluding commercial in addition to residential real estate and (ii) it relies on imputed wages for the self-employed, which are difficult to estimate. Our second measure mitigates these limitations by focusing on the NFC sector. The NFC sector excludes self-employment in most but not all countries. We use national account data to estimate the contribution of housing to NFC value added and – where possible and relevant – estimate wages for the self-employed. Data limitations restrict the sample for the second measure but where available, it behaves similar to the labor share excluding real estate.

[1] The gross corporate labor share declined since the 1980s and is now at its lowest historical level. The net labor share rose before 1980 and fell afterwards, as shown by Rognlie (2015).

Figure 1 – Domestic gross labor share, G5 (G7 excl. Canada and Japan), 1960-2015, in %



Source: authors' calculation using KLEMS, OECD, Piketty and Zucman (2014) and Karabarbounis and Neiman (2014b).
Note: Share of total labor compensations in GVA at basic prices, accounting for the self-employed (see Appendix A for more details). NFFME: non-financial non-farm market economy. RE: real estate activities. G5 includes the United States, France, Italy, Germany and the UK. Weighted average by GDP, measured in US dollars at market exchange rates.

The corrected series suggest that non-housing labor shares have remained broadly stable since 1970 for all advanced economies but the US. This is our main result, illustrated by the dashed line in Figure 1. A corollary of this result is that housing explains all of the decline in European total economy labor shares. The US NFC labor share is largely unaffected by housing or self-employment, so it still exhibits a sharp decline – particularly after 2000 (black solid line).

To conclude, we look within regions, across industries. We find that labor shares have remained largely stable across EU industries and US non-manufacturing industries – on average. Thus, most of the decline in the US labor share is due to manufacturing.

The uniqueness of US trends and the critical role of manufacturing cast doubts on most technological explanations for the labor share decline, which apply both across regions and across industries. They either point towards US-specific explanations – perhaps a decline in competition as emphasized by Gutiérrez and Philippon (2018) – or at least an offsetting mechanism keeping non-US labor shares flat.

The remainder of this paper is organized as follows. Section 2 discusses well-known challenges for measuring the labor share. In doing so, it provides a literature review. Section 3 discusses the treatment of housing and self-employment in national accounts, and their implications for the

labor share. Section 4 constructs two measures of non-housing labor shares, which are compared to common measures in the literature in Section 5. Section 6 discusses industry trends, and section 7 concludes.

2. Measuring the Labor Share: Overview and Known Challenges

The labor share can be measured using two National account databases. Sector accounts divide the economy into five institutional sectors: households, nonprofit institutions serving households, general government, financial corporations, and non-financial corporations. Industry accounts divide activity according to an industrial classification (usually the International Standard Industrial Classification). Both sets of accounts rely on the accounting identities defined in the 2008 System of National Accounts (United Nations, 2008).

For each sector/industry, value added measures the value generated by production activities (output less intermediate consumption).[2] It can be decomposed into income paid to capital (Gross Operating Surplus, GOS), income paid to labor, and net taxes on production. The (gross) labor share is defined as the ratio of income paid to labor to nominal gross value added. This measure faces two well-known challenges:

1. **Treatment of mixed income of the self-employed.** National accounts use mixed income as the balancing item for unincorporated enterprises owned by households (and not treated as quasi-corporations).[3] Mixed income combines labor and capital income of the self-employed, so that an assumption is needed to separate the labor component when estimating the labor share. Gollin (2002) describes alternative approaches. The most common ones involve (i) applying the corporate sector labor share to the non-corporate sector (Piketty and Zucman, 2014, among others); or (ii) assuming that hourly earnings of the self-employed are the same as hourly earnings of employees, at the industry-level (e.g., EU KLEMS). Both approaches are prone to errors, unfortunately. The former because the mix of non-corporate businesses may differ from corporate ones (or because corporate labor shares are measured with error); and the latter because self-employed workers may differ from employees (e.g., they may be more or less skilled, on average).
2. **Gross vs. net labor shares.** Rognlie (2015) argues that net labor shares are most appropriate when studying the distribution of income between labor and capital. They control for secular changes in depreciation (Koh et al., 2015) and measure what we are often interested in: how

[2] By aggregating GVA (at basic prices) over the total economy, we get a measure of gross domestic product (at market prices) less net taxes on products.

[3] See SNA (United Nations, 2008), §7.9, p.132: "The balancing item [closing the generation of income account] is described as operating surplus [for all enterprises] except ... unincorporated enterprises owned by households... [For the latter], the balancing item is described as mixed income because it implicitly contains an element of remuneration for work done by the owner, or other members of the household, that cannot be separately identified from the return to the owner as entrepreneur."

resources *available for consumption* are split between labor and capital. That said, gross value added is better and more consistently measured than its net counterpart (Karabarbounis and Neiman, 2014a), and it may be more appropriate if firms can adjust their depreciation expenditures on the margin. We focus on gross shares in the body of the document to cover as large a sample as possible, but discuss net shares in the Appendix (Figure A.3). Given the rise in depreciation, using net shares only strengthens our conclusions.[4]

In light of these challenges, the literature has focused on the net labor share of the domestic corporate sector – dividing employee compensations by the sum of employee compensations and net operating surplus. Rognlie (2018, p.2) summarizes the prevailing view, calling it "the single best measure" of the US labor share because it "excludes [mixed] income, excludes depreciation, and is unaffected by the split between capital income accruing to debt vs. equity." It also excludes imputed rents of owner-occupiers. It does not account for profit shifting but it is the best we have.

Rognlie (2018)'s conclusions are largely true in the US, where the integrated macroeconomic accounts include a corporate and a non-corporate business sector.[5] The latter combines activities that would be mapped to the corporate as well as the household sectors under SNA guidelines (Moulton, 2014), leaving only legally organized corporations required to file corporate tax returns in the NFC sector.[6] But this is not true outside the US.

3. NFC Sectors Outside the US: Two Undocumented Measurement Challenges

Most non-US countries follow the 2008 SNA (United Nations, 2008). Under the SNA, all units engaged in market production that act independently of their owners belong to the corporate sector. This includes legally constituted corporations (as in the US), as well as cooperatives, limited liability partnerships, notional resident units and quasi-corporations.[7] The broader definition of corporations introduces two additional challenges for measuring the labor share outside the US.

1. **Inclusion of residential real estate.** Cooperatives, limited liability partnerships, notional resident units and quasi-corporations can all own and operate housing. As a result, non-US NFC sectors own a substantial amount of dwellings. As shown in Figure 2, 18% of the capital stock

[4] A related issue is whether we should include foreign income as part of value added. Income from foreign investments have no labor income counterpart and are conceptually not part of the domestic production function. However, Tørsløv et al. (2018) document a rise in profit-shifting from corporations, which may bias labor shares upward. They quantify the bias to about 2% on average for EU4 countries and 1% in the US in 2015. Accounting for profit shifting might therefore amplify the decline of the labor share.

[5] The one exception is the growth of US S-coprporations, discussed below.

[6] Tenant-occupied dwellings owned by corporations are included in the NFC sector, but these account for 5% of the stock of tenant-occupied housing and 1% of the total stock of housing in 2015. See Figure A.14 in the Appendix.

[7] Quasi-corporations are unincorporated enterprises owned by households, governments, or non-residents. They have no legal status separate from their owners but are engaged in market production and act independently of their owners – hence are included in the NFC sector.

of NFCs in the EU27 is in housing, reaching 30% for France. The US is the outlier, with only a 1% housing share.[8] The inclusion of housing biases the NFC labor share downward, for the reasons emphasized in Rognlie (2015): rising house prices increase the housing share of NFC value added and, since housing has a low labor share relative to the rest of the NFC sector (∼6% vs. ∼66%, respectively), the NFC labor share falls.

2. **Inclusion of self-employed workers.** Quasi-corporations may include a substantial share of self-employed workers. In that case, labor compensation of the self-employed is included in corporate GOS (Lequiller and Blades, 2014). GOS of quasi-corporations is therefore analogous to mixed income of households: it requires an assumption to separate labor and capital income. Absent such an assumption, the NFC wage share is underestimated.

   This issue was first discussed in the Appendix of Piketty and Zucman (2014)[9], who focus on the case of small businesses with partners. Partner earnings should logically be recorded as mixed income, but are sometimes treated as corporate dividends. Such dividends are recorded as income of corporations, and partners are recorded as self-employed. A distinct, but related issue is the remarkable rise of S-Corporations in the US (Smith et al., 2019). S-corporations have a tax incentive to shift labor income to profits, which biases downward the trend in the NFC wage share.

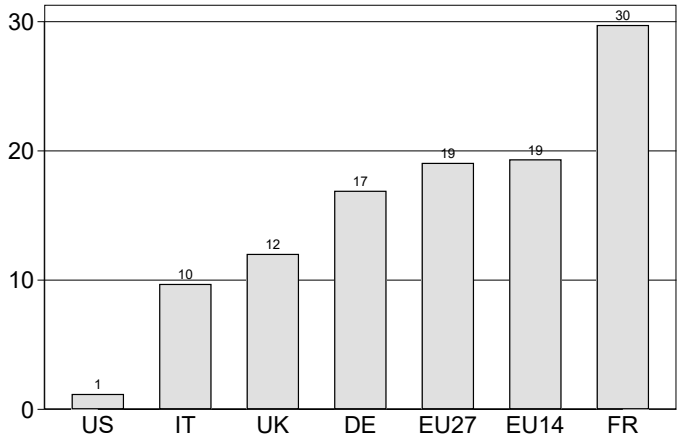
   Unfortunately, since employment data by institutional sector are only available in Italy, this problem is quite difficult to identify and solve in practice. We know from Lequiller and Blades (2014) that this is particularly relevant for countries with a vast network of small and medium enterprises, such as Italy and Germany.[10] We do our best to estimate corrections in section 4, but acknowledge that some corrected series may still be biased downward. Industry accounts provide some solace, however: data on self-employment are available at the industry-level, and can be used to estimate an adjustment.

[8] An example may help clarify the inclusion of housing. Consider France, which has the highest share of housing in NFC fixed assets among the major economies. As shown in Figure A.13 in the Appendix, social entities (including HLM, i.e., rent-controlled housing) own ∼15% of the French housing stock in 2015. These entities act independently from their owners and are therefore classified as corporations. Their housing stock accounts for 30% of NFC produced fixed assets. The remaining housing stock includes owner-occupiers (65%) and tenant-occupied dwellings owned by households (20%), both of which are included in the household sector. Tenant-occupied dwellings owned by private corporations account for less than 1% of the French housing stock – in line with the US. Similar ownership structures/definitions apply to the remaining countries, explaining the sizable but heterogeneous share of housing in total assets across NFC sectors. See also Figure A.15 in the Appendix for the sectoral composition of rental income (both residential and commercial) in the UK.

[9] Piketty and Zucman (2014), Data Appendix, p.41.

[10] Lequiller and Blades (2014) report that 7 out of 28 EU countries do not include quasi-corporations in their national accounts (Cyprus, France, Hungary, Luxembourg, Romania, Slovakia and Spain) and that Netherlands allocates all quasi-corporations to the household sector. Hence 20 out of 28 EU countries may be affected by this.

Figure 2 – Share of residential assets in total assets owned by NFCs, Europe and United States, 2015, in %



Source: authors' calculations using OECD.
Note: Total assets include all produced non-financial assets and thereby intangibles. Residential assets are dwellings and exclude commercial real estate or other buildings, see Table A.2 in Appendix for a definition. EU14 includes France (FR), Germany (DE), Italy (IT), and the UK as well as Austria, Belgium, Denmark, Greece, Spain, Finland, Luxembourg, the Netherlands, Portugal and Sweden. EU27 includes all European countries except Malta.

4. Two Methods for Estimating 'True' Non-Housing Labor Shares

Let us now propose two methods to estimate true non-housing labor shares: one based on industry accounts and one based on NFC accounts.

Method 1: excluding all real estate activities from industry accounts. Our first method is the most straightforward: we simply exclude real estate activities from the calculation of the labor share, using KLEMS. In particular, we compute the labor share for the non-financial non-farm market economy (NFFME)[11] excluding Real Estate (RE)[12]:

[11]The NFFME is composed of 18 industries, as shown in the Appendix Table A.1. Non-market services (real estate, public administration, health, education, activities of households as employers and activities of non-profits serving households) are excluded because their output is often valued at the cost of production, so the net operating surplus is null and the labor share is close to one. The government also plays a significant role in these sectors. Finance and insurance activities are excluded because of the difficulties measuring value added (particularly the exclusion of capital gains and losses emphasized by Temin, 2018). Farm activities are excluded because of the large share of self-employment, which introduces substantial measurement error to the labor share (estimates often exceed 1). Importantly, our conclusions do not depend on which industries are excluded beyond real estate, as shown in the Appendix Figure A.5.

[12]We use KLEMS' estimates of labor income for the self-employed, which assume the average earning per hour worked for self-employed is the same as for employees at the industry-level. Self-employment represents, on average,

$$LS^{ex\,\mathrm{RE}} = \frac{\sum_k W^k(N^{self,k} + N^{emp,k}) - W^{\mathrm{RE}}(N^{self,RE} + N^{emp,RE})}{Y - Y^{\mathrm{RE}}} = \sum_{k \text{ ex RE}} LS^k \omega^k,$$

where LS is the labor share of the NFFME and LS^k is the labor share in sub-sector k. W^k is the average hourly wage of employees and $(N^{self,k}+N^{emp,k})$ are total hours worked (of both employees, emp, and self-employed, $self$), so that $W^k(N^{self,k}+N^{emp,k})$ is total labor compensations in sector k and $W^{\mathrm{RE}}(N^{self,RE}+N^{emp,RE})$ total labor compensations in the RE sector. Y is total gross value added and Y^{RE} the RE sector gross value added. ω^k is the sector k's share in total gross value added.

Since all dwellings are included in the real estate sector, excluding it fully controls for the rise of housing. However, this measure is not perfect: it relies on imputed wages for the self-employed, and requires that we exclude commercial in addition to residential real estate.[13]

Method 2: adjusting for real estate and self-employment activities in the corporate sector. Our second method mitigates these issues by focusing on the NFC sector. The benefit is that self-employment affects only a few countries, and we can control for housing directly. The downside is that information documenting the prevalence of self-employment in the NFC sector is fairly limited.

The goal is to estimate adjusted NFC labor shares as:

$$LS^{NFC\,ex\,H} = \frac{W(N^{self} + N^{emp})}{Y^{NFC} - Y^{H,NFC}}, \tag{1}$$

where $Y^{H,NFC}$ denotes housing value added in the NFC sector and $W(N^{self} + N^{emp})$ is total labor compensations in the NFC sector, adjusted for self-employed where possible.

We are able to estimate self-employment adjustments for Italy and Germany – two of the countries most affected by this phenomenon. For Italy, official data shows that self-employed workers contribute more than 15% of hours worked in the NFC sector (see Figure A.16 in the Appendix). Following standard methods (i.e., estimating the hourly earnings of the self-employed using the hourly earnings of employees), this implies a 10p.p. adjustment in the level of the labor share on average over 1995-2015, and a further 0.2p.p. increase over the period. For Germany, comparing adjustment methods for the income of the self-employed provides an estimation of the impact of quasi-corporations: before 1995, we obtain similar estimates imputing wages for the self-employed based on mixed income or using hours worked. Since 1995, however, the two series diverge – with

14% of total employment, with the highest share in Italy (31%) and the lowest share in the United States (8%). On average, the labor share is thus 1.16 (1/(1-14%)) times the wage share.

[13] Appendix B provides additional details on the composition of the real estate sector. Housing accounts for ∼70% of activity in most countries, with the remainder composed of non-residential rental activities (∼15%), fee-based activities (∼10%) and buying and selling of own real estate (∼5%)

the gap rising from 1p.p. to 3p.p. by 2015 (see Figure A.2 in the Appendix). We apply the same adjustment to the NFC labor share.[14]

Next, we estimate the contribution of housing to NFC value added. We obtain actual and imputed rents on housing from SNA table 5 and gross operating surplus in the household sector from SNA table 14A ($Rents$ and GOS^{HH}, respectively).[15] $Rents$ include all housing expenditures in the economy, while GOS^{HH} "capture the income generated from households' housing activities" (Piketty and Zucman, 2014, Data Appendix pp. 42).[16] Thus, the difference between $Rents$ and GOS^{HH} isolates rents outside the household sector. Most, but not all, of the housing stock outside the household sector is owned by non-financial corporations so we allocate rental income according to the distribution of residential structures:

$$Y^{H,NFC} = (Rents - GOS^{HH})\frac{ResK^{NFC}}{ResK - ResK^{HH}} \tag{2}$$

where $ResK$ denotes the current-cost value of residential structures in the economy, and $ResK^j$ the value for sector j. We acknowledge that $Rents$ and GOS^{HH} are not entirely consistent: they are compiled separately, and sometimes use different definitions (e.g., rents include spending on repairs, while value added does not). As a result, GOS^{HH} exceeds $Rents$ in a few countries with limited housing ownership outside the household sector (e.g., Luxembourg). Appendix C provides additional details on the calculation, and discusses several alternate methods that avoid these limitations. All of them yield broadly similar conclusions.

5. Results

To quantify the impact of housing and self-employment, this section compares our corrected measures of the labor share against four measures commonly used in the literature:[17]

- The labor share for the NFFME including real estate (using KLEMS):
  $LS^{in\,\mathrm{RE}} = \sum_{k \text{ inc RE}} LS^k \omega^k$

[14]For further validation, Figure A.3 in the Appendix shows that the wage share in the NFC sector is similar to the wage share (not adjusted for self-employed) in the NFFME sector in KLEMS – again suggesting an underestimation of labor income in the NFC sector.

[15]Ideally, we would use the household sector alone, but data is often missing, so we combine the households and non profit institutions serving households instead.

[16]See also SNA (United Nations, 2008), §7.9, p.2: "In practice, all unincorporated enterprises owned by households that are not quasi-corporations are deemed to have mixed income as their balancing item, except for owner-occupiers in their capacity as producers of housing services for own final consumption, households leasing dwellings and households employing paid domestic staff. For owner-occupiers and those leasing dwellings, all value added is operating surplus."

[17]To align with KLEMS, we report shares based on GVA at basic prices (i.e. including only net taxes on production and not on products) in Europe and at market prices (i.e. including both net taxes on production and not on products) in the US. This adjustment affects the level but not the dynamics of the labor share (see Figure A.1 in the Appendix).

- The labor share for the total economy (total compensation of employees and self-employed to total gross value added) using OECD sector accounts data and extended using Piketty and Zucman (2014);[18]
- The wage share for the corporate sector (total compensation of employees to total gross value added in the corporate sector) using Karabarbounis and Neiman (2014b);
- The wage share for the NFC sector using OECD data.

We begin with 4 European countries (EU4 including France, Italy, Germany and the UK) and the United States, for which we have the longest data coverage. We compute sector labor shares back to 1950 (1960 for Italy) using OECD and Piketty and Zucman (2014) data; and industry labor shares back to 1970 (1977 for the United States) using EU KLEMS. The results are shown in Figure 3. Gray lines report uncorrected series and black lines report corrected ones.

In the US, all measures behave similarly. They exhibit a ∼6p.p. decline from 1980 to 2015, concentrated in the post-2000 period. Consistent with the exclusion of housing activities from the NFC sector, the corresponding labor share closely follows the labor share of the NFFME *excluding* real estate.

By contrast, the series evolve quite differently in the EU4. Consistent with the inclusion of housing services in the NFC sector, the raw NFC labor share closely follows the NFFME labor share *including* real estate. *Excluding* real estate, however, the share is larger and far more stable. It increases in the late 1970s; falls in the late 1980s; and recovers in the 2010s. It is remarkably stable overall.[19] The corrected NFC series – available only since 1995 – behave similar to the NFFME excluding real estate series. The levels differ due to different weights/industry mixes but the trends are quite consistent.

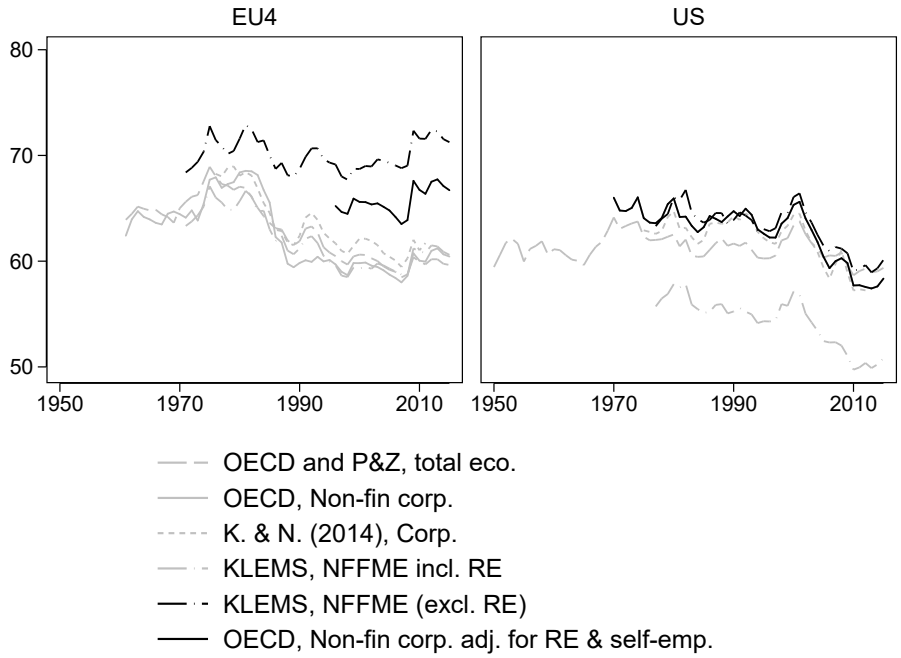
The stability in EU series is true across all EU countries, as shown in Figure 4. In fact, the NFFME excluding real estate series is higher in 2015 than in the early 1970s in all major European countries except for France, where our data starts at the historical peak. It is also higher for the EU14 and EU28 aggregates; and only slightly lower for the Global series.

The adjusted NFC series behave very similar to the NFFME excluding real estate series, validating

[18]We follow Piketty and Zucman (2014) and estimate labor compensation of the self-employed by imposing the labor share of the corporate sector to the non-corporate sector. We do not use Karabarbounis and Neiman (2014b) total economy series as they do not adjust for self-employed but only present the wage share.

[19]The symmetric rise and fall of the capital share was well understood in the late 1990s. Blanchard (1998), for example, argues that the initial rise was due to a large adverse labor supply shift – which increased wages and decreased profits. Firms reacted to the shock by moving away from labor, so that – by the early 1980s – the labor share had returned to it's 1970s level. But the labor share continued to fall through the mid-1990s. Blanchard interprets the continued fall, as resulting from an adverse labor demand shock – perhaps due to a rise in mark-ups or capital-biased technical change. The critical insight for us – however – is Blanchard's forecast that the unemployment rate would eventually fall and the labor share would recover as firms reacted to higher profits by investing. This is precisely what happened in Europe from the late 1990s to the Great Recession.

Figure 3 – Gross domestic labor share, EU4 and United States, 1950-2015, in %



Source: authors' calculations using OECD, KLEMS, ISTAT, Karabarbounis and Neiman (2014b) and Piketty and Zucman (2014).

Note: Share of total labor compensations in GVA at basic prices. To account for self-employed in the total economy, the corporate labor share is applied to the non-corporate sector. To account for self-employed in KLEMS, we use KLEMS' estimates, which assume the average earning per hour worked for self-employed is the same as for employees at the sector-level. Adjusted NFC labor share as defined in the text – includes housing adjustment for all countries and self-employment adjustments for Italy and Germany. NFFME: non-financial non-farm market economy. RE: real estate activities. NFC: non-financial corporations. EU4 includes France, Italy, Germany and the UK. The series for Europe plot the year fixed effects from a regression of labor shares that also includes country fixed effects, to account for entry and exit during the sample. The regressions are weighted by GDP measured in US dollars at market exchange rates. The effects have been normalized to equal to the average labor share in 1995.

the use of KLEMS. The only slight divergence is for France, where the KLEMS labor share rises faster than the adjusted NFC series. This is likely because of an over-estimation of wages for the self-employed in KLEMS, given the prevalence of 'auto-entreprenariats' with relatively low income compared to their industry (Askenazy and Palier, 2018).[20] Regardless, using other series to backfill

[20]Figure A.10 in the Appendix confirms this, by estimating an alternative measure of the labor share that relies on mixed income data from French industry accounts to estimate wages of the self-employed. More specifically, we measure the labor share at the industry-level as follows: $LS = [COMP + MI\,(COMP/(GVA - MI))]\,/GVA$ with $COMP$ employee compensations, MI mixed income and GVA gross value added. The resulting series is much closer

the French NFC adjusted labor share suggests that the French labor share today is essentially the same as in 1960: there is no substantial decline.

To contrast our results with Karabarbounis and Neiman (2014b), we estimate country-level trends in the NFFME labor share excluding real estate and compare them with their corporate sector series. Trends using KLEMS exhibit a smaller decline in most countries, and for a few countries a much bigger increase (Figure A.6 in the Appendix). Starting from 1970 instead of the 1980 historical peak used by Karabarbounis and Neiman (2014b) further strengthens the results (Figure A.7): the trend is stable for the EU4, EU14 and EU27 aggregates (zero p.p. change per decade). Last, we can focus on the post-2000 period, when the US experienced the sharpest decrease. As shown in Figure A.7, Italy, France and the UK as well as all European aggregates exhibit an increasing trend. Only Germany experiences a decline (less than 2p.p. per decade) – and it is much lower than the US (almost 5p.p.).

6. Industry Trends

To conclude, let us study the evolution of labor shares within regions, across industries. We follow Melitz and Polanec (2015) and decompose the change in the labor share into shift and share effects, where the share effect is measured relative to the aggregate labor share:[21]

$$\begin{aligned}\Delta LS_i &= \sum_k \Delta\left(LS_{i,k,t}\omega_{i,k,t}\right)\\ &= \underbrace{\sum_k \bar{\omega}_{i,k}\Delta LS_{i,k,t}}_{\text{within effect}} + \underbrace{\sum_k (L\bar{S}_{i,k} - L\bar{S}_i)\Delta\omega_{i,k,t}}_{\text{between effect}},\end{aligned}$$

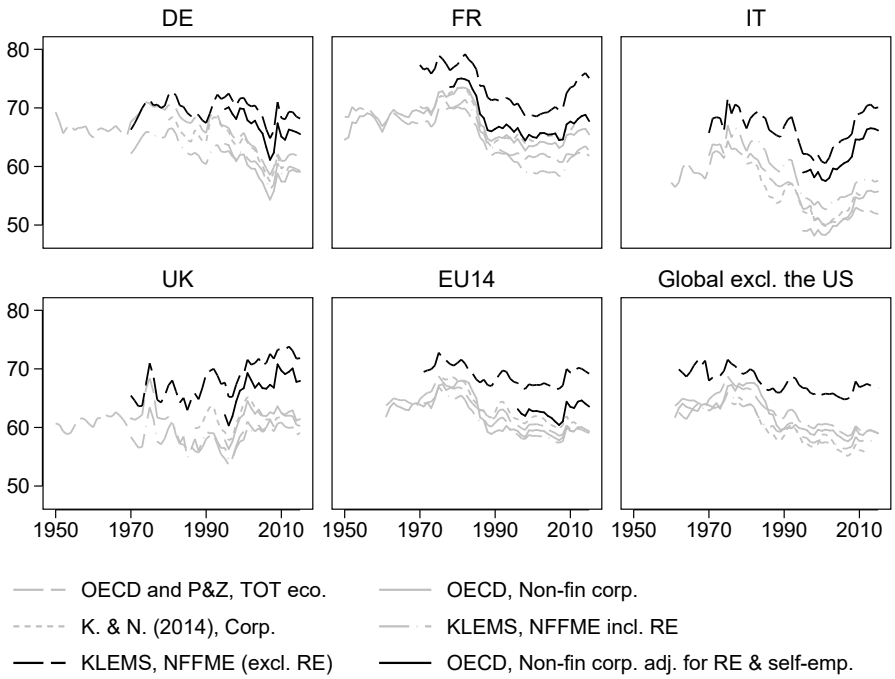
where $LS_{i,k,t}$ is the labor share in country i and sector k in year t, $\omega_{i,k,t}$ is the sector k's share in country i's gross value added in year t, Δx is the p.p. change in x over 1977-2015 and $\bar{x}$ is its average.

Results are presented in Table 1 for the EU4 and the US. As expected, the total economy labor share declined in both the US and EU since 1977. The decline in the EU, however, is entirely explained by the rise of real estate. The NFFME labor share excluding real estate exhibits a 0.8p.p *increase*, driven by small and offsetting contributions across industries. By contrast, only a small

to the adjusted NFC series.

[21] This decomposition is not standard in the labor share literature. Most decompositions measure share contributions as the product of changes in GVA and initial (or average) labor shares (see Reshef and Santoni (2019) for a recent overview). In that case, any industry that grows faster than the aggregate will have a positive share contribution, and any industry that shrinks will have a negative one. Such decompositions are correct mathematically, of course, but they are difficult to interpret. Consider real estate: its share of value added increased so it would appear to have a positive share effect. But we know its growth pushes the aggregate labor share down. This is because the negative effect would be distributed among all the other shrinking industries. This is not very intuitive, so we borrow from the productivity literature and measure share effects relative to the aggregate.

Figure 4 – Global gross domestic labor share, 1950-2015, in %



Source: authors' calculations using OECD, KLEMS, ISTAT, Karabarbounis and Neiman (2014b) and Piketty and Zucman (2014).

Note: Share of total labor compensations in GVA at basic prices. To account for self-employed in the total economy, the corporate labor share is applied to the non-corporate sector. To account for self-employed in KLEMS, we use KLEMS' estimates, which assume the average earning per hour worked for self-employed is the same as for employees at the sector-level. Adjusted NFC labor share as defined in the text – includes housing adjustment for all countries and self-employment adjustments for Italy and Germany. NFFME: non-financial non-farm market economy. RE: real estate activities. NFC: non-financial corporations. EU14 includes EU4 countries plus Austria, Belgium, Denmark, Greece, Spain, Finland, Luxembourg, the Netherlands, Portugal and Sweden. See Data Appendix for global sample of countries. EU14 and Global series plot the year fixed effects from a regression of labor shares that also includes country fixed effects, to account for entry and exit during the sample. The regressions are weighted by real GDP at PPP. The effects have been normalized to equal to the average labor share in 1995.

portion of the US labor share decline is explained by real estate. Excluding real estate, the US NFFME labor share declines by 3.2p.p primarily due to a large decline in the manufacturing labor share.[22]

Table 1 – Sector contributions to the change in the labor share, 1977-2015

Sector	ΔLS, p.p.	LS_{2015}, %	$\Delta\omega$, p.p.	ω_{2015}, in %	within effect, p.p.	between effect, p.p.	total contrib., p.p.
EU4							
Total	-3.62	65.53	-	-	0.53	-4.15	-
Real Estate	-2.31	5.47	5.65	12.14	-0.21	-3.43	-3.64
Financial, farm and non market sectors	-1.82	80.32	1.31	25.63	0.10	-0.37	-0.27
NFFME	0.82	71.15	-6.96	62.23	0.65	-0.35	0.30
Manuf.	-1.52	67.98	-11.89	16.89	-0.22	-0.30	-0.51
Business services	0.07	70.90	7.84	39.94	0.28	0.03	0.30
Other market activities	11.60	82.92	-2.90	5.41	0.59	-0.08	0.51
United States							
Total	-2.10	58.09	-	-	-1.49	-0.61	-
Real Estate	0.54	6.02	2.53	12.13	0.06	-1.35	-1.29
Financial, farm and non market sectors	3.16	75.46	2.58	29.52	0.67	0.61	1.27
NFFME	-3.19	60.12	-5.11	58.35	-2.21	0.13	-2.08
Manuf.	-20.82	47.14	-10.07	12.20	-2.84	-0.58	-3.43
Business services	4.73	63.73	5.81	40.20	1.12	0.78	1.89
Other market activities	-7.54	62.34	-0.85	5.96	-0.48	-0.06	-0.54

Source: author's calculations using EU KLEMS.
Note: EU4 includes France, Italy, Germany and the UK. The aggreate is the year fixed effects from a regression of labor shares that also includes country fixed effects, to account for entry and exit during the sample. The regressions are weighted by real GDP GDP measured in US dollars at market exchange rates. NFFME: non-financial non-farm market economy.

7. Conclusions and Implications

Our results challenge the common wisdom of a global decline in the non-housing labor share, and cast doubt on most common explanations for these trends: technological changes – including declining capital prices, automation, import competition and intangibles – which would all presumably have similar effects across advanced economies and across industries.

The next question, of course, is why the (non-housing) labor share declined in the US, but not

[22]As a further robustness test, Appendix Figure A.17 confirms that EU manufacturing labor shares remain stable when using firm-level data of non-financial corporations. Thus, the divergence between the US and EU appears in firm-level data and is not due to self-employment adjustments.

elsewhere. Perhaps declining competition has led to rising profits in selected US industries, as emphasized by Gutiérrez and Philippon (2018). Or perhaps there is an offsetting mechanism at work in other regions. This is an important area of future research.

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Appendix for "Revisiting the Global Decline of the (Non-Housing) Labor Share"

A. Data

We use two National account databases to measure labor shares: sector and industry accounts. Both sets of accounts rely on the same accounting identities defined in the 2008 System of National Accounts (SNA, United Nations, 2008). Data coverage for both sources is summarized in Tables A.3 and A.4. To compare our results with prior literature, we also gather labor share series from Karabarbounis and Neiman (2014b) and Piketty and Zucman (2014).

A.1. Sector Data

Data for sector accounts are easily downloadable from the OECD's website – particularly SNA Table 14A. Sector accounts divide the economy into five institutional sectors: households (HH), nonprofit institutions serving households ($NPISH$), general government (G), financial corporations (FC), and non-financial corporations (NFC). GDP can thus be decomposed as follows:

$$GDP = Y^{NFC} + Y^{FC} + Y^{HH} + Y^{NPISH} + Y^{G} + \text{Net Taxes on products}$$

with Y^x the nominal gross value added (GVA) of sector x. GVA for sector x can be further decomposed into

$$Y^x = W^x L^x + GOS^x + MI^x + \text{Net Taxes on production}^x$$

with $W^x L^x$ the compensation of employees, GOS^x the gross operating surplus, and MI^x mixed income of unincorporated enterprises (containing an element of remuneration for work that cannot be separated from the return to the owner as entrepreneur).

Total economy labor shares. The total economy labor share is defined as the ratio of total employee compensations to GDP. We account for the income of the self-employed by applying the corporate labor share to the noncorporate sector.[23] Karabarbounis and Neiman (2014b) series for the total economy do not account for self-employment, so we use Piketty and Zucman (2014) to extend our series and get more historical data.

[23] To do this, we split mixed income using the corporate wage share, so that total labor compensations in the noncorporate sector is this estimated "labor compensation" part of mixed income plus observed employee compensations. Piketty and Zucman (2014) simply apply the corporate wage share to the noncorporate GVA, without using the information on mixed income nor employee compensations in this sector.

NFC labor shares. The labor share for the nonfinancial corporate (NFC) sector is defined as the ratio of employee compensations to GVA in the corresponding sector. Karabarbounis and Neiman (2014b) use the same definition but combine the financial and nonfinancial corporate sectors. Most of our results use the raw NFC labor shares. However, Figure 3 of the paper does correct for the labor compensation of the self-employed in Italy and Germany. See the main text for additional details.

A.2. Industry Data

Industry accounts divide activity according to an industrial classification. As for sectors, industry-level GVA can be decomposed into compensation of employees, gross operating surplus, mixed income, and net taxes on production. In the US, industry-level GVA also include net taxes on products.[24]

Our primary dataset is the 2018 vintage of EU KLEMS, which covers all European countries as well as the United States. Data is split into 33 industries, which follow the ISIC rev. 4 classification. Whenever a longer history is available in previous vintages, we use them to extend our data as far back as possible. To do so, we construct an industrial classification with 26 industries, shown in Table A.1, which ensures correspondence across vintages. We extend each industry series by applying the absolute change in the labor share of the previous vintage to the last observation in the 2018 vintage. We also extend series of GVA by applying the previous vintage growth rates to the 2018 vintage level in 1995. Finally, we use Eurostat, world KLEMS and OECD STAN to build series for non European countries (see Table A.4). Our dataset covers up to 39 countries from up to 1961-2017.

A.3. Firm-level data

For some of our robustness tests, we complement KLEMS with firm-level data from the ECB's CompNet. CompNet's data is sourced from Central Banks and National Institutes, and consolidated into a common industry hierarchy (NACE). We use the 4th vintage of CompNet, which covers 18 European countries from 2001 to 2012. We focus on manufacturing firms with more than 20 employees, since they provides the best coverage over time and across countries. The labor share is defined as total employee compensations to nominal GVA.

[24] For consistency, all labor shares series are presented at basic prices (i.e. including only net taxes on production and not on products) for Europe and market prices (i.e. including both net taxes on production and not on products) for the US. As a result, the levels of the US and EU labor shares are not comparable: the US labor share is lower because the GVA includes more taxes.

Table A.1 – Industrial classification and correspondence table with various KLEMS vintages

Sector code in 2018 or 2012 vintages	Sector code in 2009 vintage	Sector description	Included in the NFFME*?
A	AtB	Agriculture, forestry and fishing	No
B	C	Mining and quarrying	Yes
10-12	15t16	Food products, beverages and tobacco	Yes
13-15	17t19	Textiles, wearing apparel, leather and related products	Yes
16-18	20 + 21t22	Wood and paper products; printing and reproduction of recorded media	Yes
19-23	23t25 + 26	Chemical, rubber, plastics, fuel and oter non-metallic products	Yes
24-25	27t28	Basic metals and fabricated metal products	Yes
26-27	30t33	Electrical and optical equipment	Yes
28	29	Machinery and equipment n.e.c.	Yes
29-30	34t35	Transport equipment	Yes
31-33	36t37	Other manufacturing; repair of machinery and equipment	Yes
D-E	E	Electricity, gas and water supply	Yes
F	F	Construction	Yes
G	G	Wholesale and retail trade; repair of motor vehicles	Yes
I	H	Accomodation and food service activities	Yes
49-52	60t63	Transport and storage	Yes
53 + 61	64	Post and telecommunications	Yes
K	J	Financial and insurance activities	No
L	70	Real estate activities	No
M-N + 58-60 + 62-63	71t74	Other business activities	Yes
O	L	Public administration and defence; compulsory social security	No
P	M	Education	No
Q	N	Health and social work	No
R-S	O	Arts, entertainment, recreation and other service activities	Yes
T	P	Activities of households as employers	No
U	Q	Activities of extraterritorial organizations and bodies	No

*NFFME: nonfinancial non-farm market economy, excl. real estate.

Table A.2 – Produced non-financial fixed assets classification

SNA (2008) asset code	KLEMS code	Asset description
N111	Rstruc	Dwellings
N112	Ocon	Other buildings and structures
N1131	TraEq	Transport equipment
N11321	IT	Computer hardware
N11322	CT	Telecommunications equipment
N11O	Omach	Other machinery and equipment and weapons systems
N115	Cult	Cultivated biological resources
N1171	RD	Research and development
N1173	Soft_DB	Computer software and databases
N117 - N1171 - N1173	OIPP	Other intellectual property products

A.4. Real estate data

Last, we gather data on rental income, housing prices and housing structures from the OECD. We use these data to estimate the contribution of housing to NFC value added. The following fields are used in our main results:

- Actual and imputed rents on housing (P31CP041 and P31CP042 from SNA table 5, respectively)
- Gross operating surplus for the housing sector (field NFB2GP from SNA Table 14A)
- Current cost value of housing structures, by sector (field N1111 from SNA table 9B)

We complement these data with a few additional fields used for robustness tests, described in Appendix C:

- Current cost value of land, by sector (field N211 from SNA table 9B)
- 3-month and 10 year interest rates (fields IR3TIB01 and IRLTLT01 from table KEI)
- Nominal housing price index (field HPI from table HOUSE PRICES)

Table A.3 – Coverage of final dataset, European countries and United States

Country group	Country	Country code	KLEMS, NFFME	K. & N. (2014), Corp.	OECD & P. & Z. (2014), Total eco.	OECD, Non-fin corp.
US	United States	US	1977-2015	1975-2012	1950-2016	1970-2016
EU4	Germany	DE	1970-2015	1980-2011	1950-2017	1995-2017
EU4	France	FR	1970-2015	1975-2011	1950-2017	1950-2017
EU4	Italy	IT	1970-2015	1980-2011	1960-2017	1995-2017
EU4	United Kingdom	UK	1970-2015	1987-2011	1950-2017	1995-2017
EU14	Austria	AT	1970-2015	1995-2011	1995-2017	1995-2017
EU14	Belgium	BE	1970-2015	1985-2011	1995-2017	1995-2017
EU14	Denmark	DK	1970-2015	1981-2011	1995-2017	1995-2017
EU14	Greece	EL	1970-2015	2000-2011	1995-2016	1995-2016
EU14	Spain	ES	1970-2015	1995-2011	1999-2017	1999-2017
EU14	Finland	FI	1970-2015	1975-2011	1995-2017	1995-2017
EU14	Luxembourg	LU	1970-2015	1995-2009	1995-2016	1995-2016
EU14	Netherlands	NL	1970-2015	1980-2011	1995-2017	1995-2017
EU14	Portugal	PT	1970-2015	1995-2012	1995-2017	1995-2017
EU14	Sweden	SE	1970-2015	1980-2012	1993-2017	1993-2017
EU27	Bulgaria	BG	2000-2015	2005-2010		
EU27	Cyprus	CY	1995-2015	1995-2007		
EU27	Czech Republic	CZ	1995-2015	1993-2011	1995-2017	1995-2017
EU27	Estonia	EE	1995-2015	1994-2011	1995-2017	1995-2017
EU27	Croatia	HR	2008-2015	1997-2007		
EU27	Hungary	HU	2010-2015	1995-2011	1995-2017	1995-2017
EU27	Ireland	IE	1970-2015	2002-2011	1995-2017	1995-2017
EU27	Lithuania	LT	1995-2015	1995-2011	1995-2017	1995-2017
EU27	Latvia	LV	1995-2015	1994-2011	1995-2017	1995-2017
EU27	Poland	PL	1995-2015	1995-2011	1995-2016	1995-2016
EU27	Romania	RO	1995-2015	1989-2009		
EU27	Slovenia	SI	1995-2015	1995-2011	1995-2017	1995-2017
EU27	Slovakia	SK	1995-2015	1995-2011	1995-2017	1995-2017

Table A.4 – Coverage of final dataset, additional countries

Country group	Country	Country code	NFFME	K. & N. (2014), Corp.	OECD & P. & Z. (2014), Total eco.	OECD, Non-fin corp.
Global	Australia	AU	1970-2007			
Global	Canada	CA	1961-2014			
Global	Switzerland	CH		1995-2010	1995-2016	1995-2016
Global	Chile	CL		1996-2009		2003-2016
Global	Costa Rica	CR	1991-2016			
Global	Israel	IL		2000-2009	2000-2016	2000-2016
Global	Iceland	IS	1997-2016			
Global	Japan	JP	2007-2014			
Global	Korea	KR	1980-2015			2010-2016
Global	Malta	MT	1995-2017	2000-2007		
Global	Mexico	MX		1993-2011	2003-2016	2003-2016
Global	Norway	NO	1970-2015	1978-2012	1978-2017	1978-2017
Global	New Zealand	NZ	2009-2015			1998-2016
Global	Turkey	TR	2009-2016		2009-2015	2009-2015
Global	Taiwan	TW	1980-2009			

Note: NFFME series use data from KLEMS, STAN and Eurostat. Karabarbounis and Neiman (2014b) global series include 74 additional countries.

B. Additional Tables and Figures

We begin by providing additional details on the real estate sector. This sector is composed of three NACE groups:

- Buying and selling own real estate (Group 68.1);
- Renting (to third parties) and operating own or leased residential and non-residential real estate, including both furnished and unfurnished property; the development of building projects for own operation is also included (Group 68.2);
- Appraising real estate; providing real estate agency services as an intermediary; managing property as an agent (Group 68.3).

Table A.5 provides a breakdown of the composition of real estate activity by country and activity. It shows that nearly 75% of real estate value added is composed of actual and imputed rents. Importantly, real estate activities do not include facilities management (which are part of administrative and support services), development of building projects for later sale (which are part of construction), nor short-stay letting of accommodation (which are part of accommodation and food services). Real estate also excludes rental and leasing services of non-real estate assets, which are part of the business services sector.

Table A.5 also shows that the vast majority of real estate activity is concentrated in residential property. In particular, column 5 shows that imputed rents on owner-occupied properties account for over 60% of real estate value added in most countries. And column 6 shows that actual rents on tenant-occupied properties are approximately 30% of imputed rents on owner-occupied properties. Combined, actual and imputed rents on residential property account for the vast majority of real estate activity. The remaining activity includes property rental for businesses and fee- or contract-based activities. The former are again mainly driven by real estate prices, while the latter may actually be affected by technological change.[25]

The rest of the Appendix provides a variety of robustness tests:

- Figure A.1 shows that labor shares measures with GVA at basic and market prices behave similarly.
- Figure A.2 contrasts the two main approaches for estimating wages of the self-employed for the total economy. Unadjusted series (wage shares) from KLEMS and the OECD are very close to each other, which validates the two data sources. In the US, estimating the compensations of self-employed using mixed income or hours worked yields a similar labor share for the total economy. In Europe, using hours worked yields a larger labor compensation for the self-employed, and therefore a higher labor share. The gap between the two, however, is relatively stable for most countries except Germany, where the difference is due to quasi-corporations, as described in the text.

[25] Ideally, we would keep all non-housing activities, but this is not feasible due to data limitations.

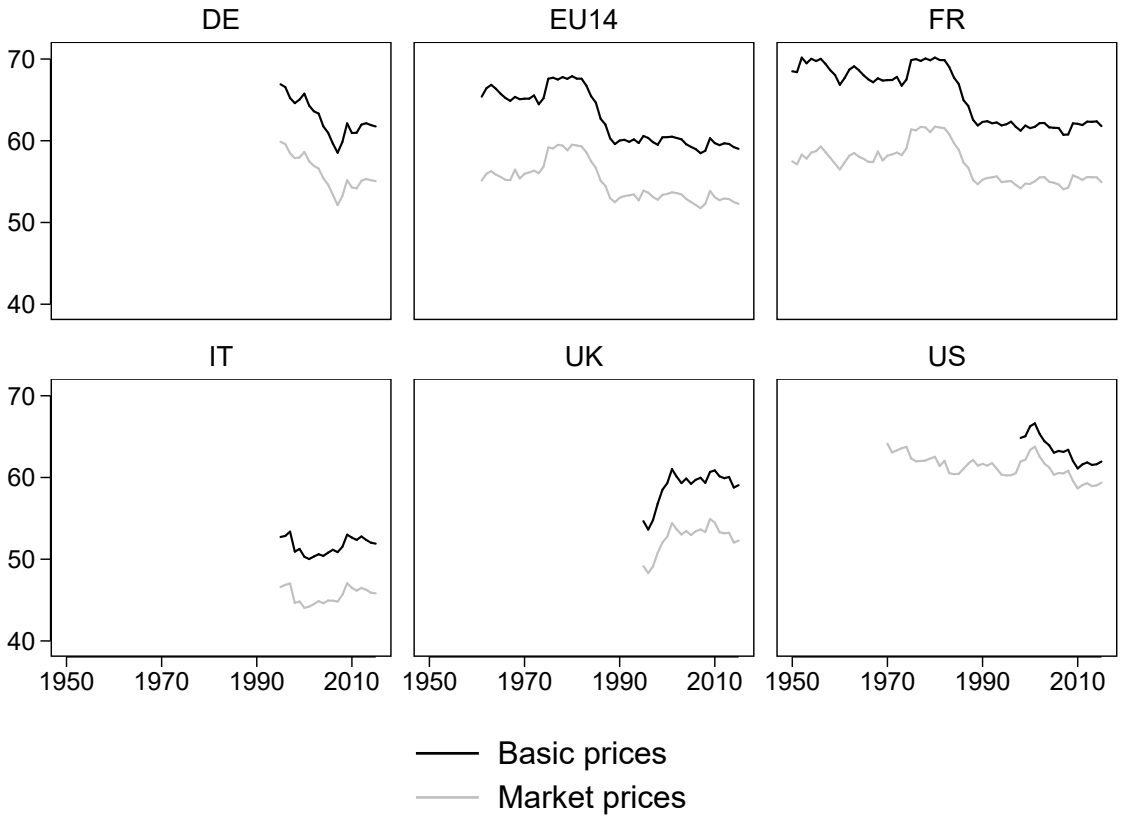
Table A.5 – Real estate share of GVA and effect on aggregate labor share

Country	Composition of RE activities (% of VA)			Housing share of RE	
	Renting and operating of RE	Activities on a fee or contract basis	Buying and selling of own RE	Imputed rents on own-occ. properties as % of RE GVA	Ratio of actual to imputed rents in housing
AT	78	18	4	55	33
DE	82	13	5	37	80
ES	89	13	-2	73	17
FR	70	21	8	62	30
IT	75	11	14	66	15
NL	73	16	11	23	54
FI	NA	NA	NA	63	34
UK	63	35	1	73	35
SE	91	8	0	42	63
CA	NA	NA	NA	66	34
US	NA	NA	NA	59	32

Notes: Table shows the average values from 2005 to 2015, when available. Columns 2-4 show the composition of real estate activities in European economies from Eurostat. Columns 5-6 show the housing share of real estate GVA and the ratio of household expenditures on actual and imputed rents for housing (from SNA Tables 5 and 6A sourced from the OECD).

- Figure A.3 presents a similar analysis as Figure A.2, but focusing on the NFFME (KLEMS) and NFC (OECD) sectors. The NFC series is in-between the adjusted and unadjusted KLEMS series for most countries, primarily due to differences in industry composition. Germany is the exception, where the KLEMS and OECD *unadjusted* series are essentially equivalent. Again, this suggests an underestimation of income for the self-employed due to quasi-corporations.
- Figure A.4 contrasts net and gross labor share measures using both National Accounts and KLEMS depreciation estimates. Given the rise in depreciation, net labor shares exhibit slightly more positive trends than gross shares.
- Figure A.5 shows that EU labor shares are stable so long as real estate is excluded, irrespective of which other industries are excluded.
- Figure A.6 and A.7 contrast estimated trends using corrected series against those of Karabarbounis and Neiman (2014b).
- Figure A.8 presents results for global labor shares. We find a slight decline relative to Europe but much lower than for the US.
- Figure A.9 shows the contribution of real estate to value added, which increased much faster in Europe than the US.
- Figure A.10 contrasts alternate self-employment adjustments for France.
- Figure A.11 and A.12 document the important share of ownership of dwellings in European NFC sectors.
- Figure A.13 to A.15 provide additional details on the ownership of dwellings for selected countries.
- Figure A.16 shows the prevalence of self-employment in Italy.
- Figure A.17 contrasts KLEMS and CompNET based labor share estimates in manufacturing industries, to show that they behave remarkably similar. CompNET series are based on firm-level data of NFCs, hence no self-employment adjustment.

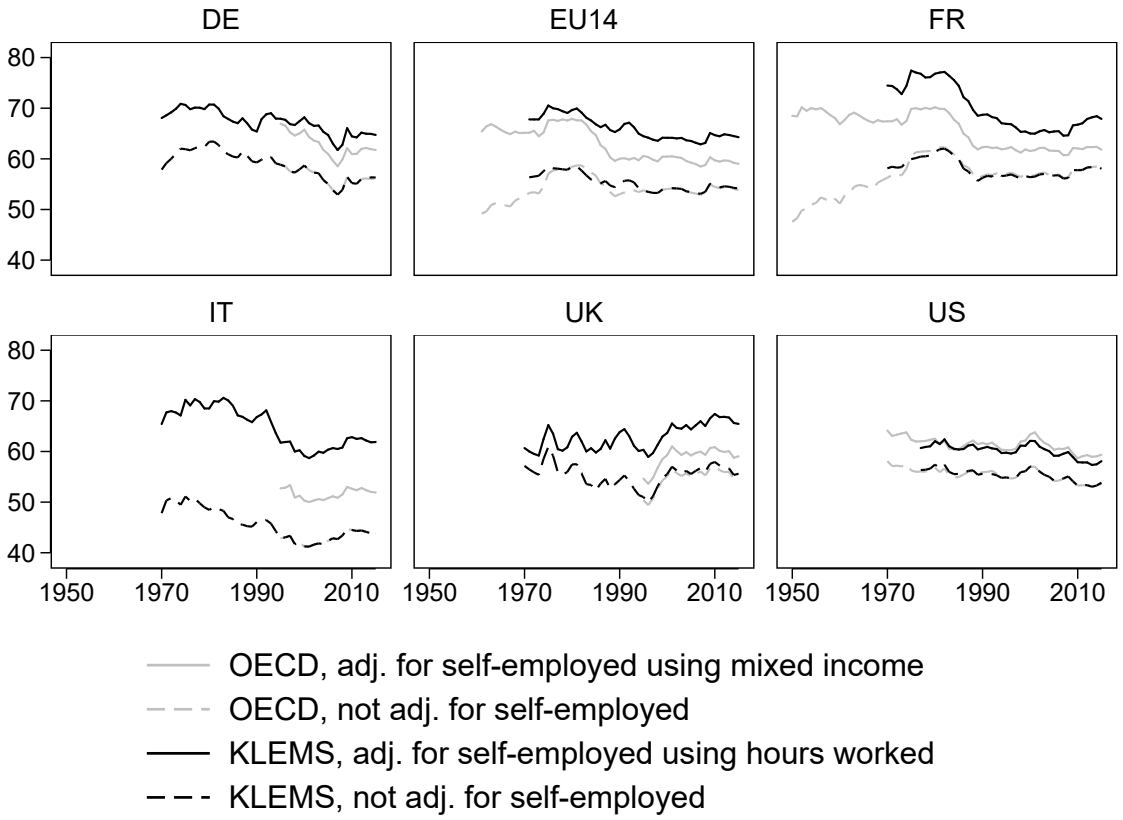
Figure A.1 – Domestic gross labor share at market and basic prices, total economy, Europe and United States, 1950-2015, in %



Source: authors' calculation using OECD.

Note: Share of total labor compensations in GVA. Series are adjusted for self-employed (see Appendix section A for a description of the adjustment). EU14 includes France, Italy, Germany, the UK as well as Austria, Belgium, Denmark, Greece, Spain, Finland, Luxembourg, the Netherlands, Portugal and Sweden. It plots the year fixed effects from a regression of labor shares that also includes country fixed effects, to account for entry and exit during the sample. The regressions are weighted by GDP measured in US dollars at market exchange rates. The effects have been normalized to equal to the average labor share in 1995.

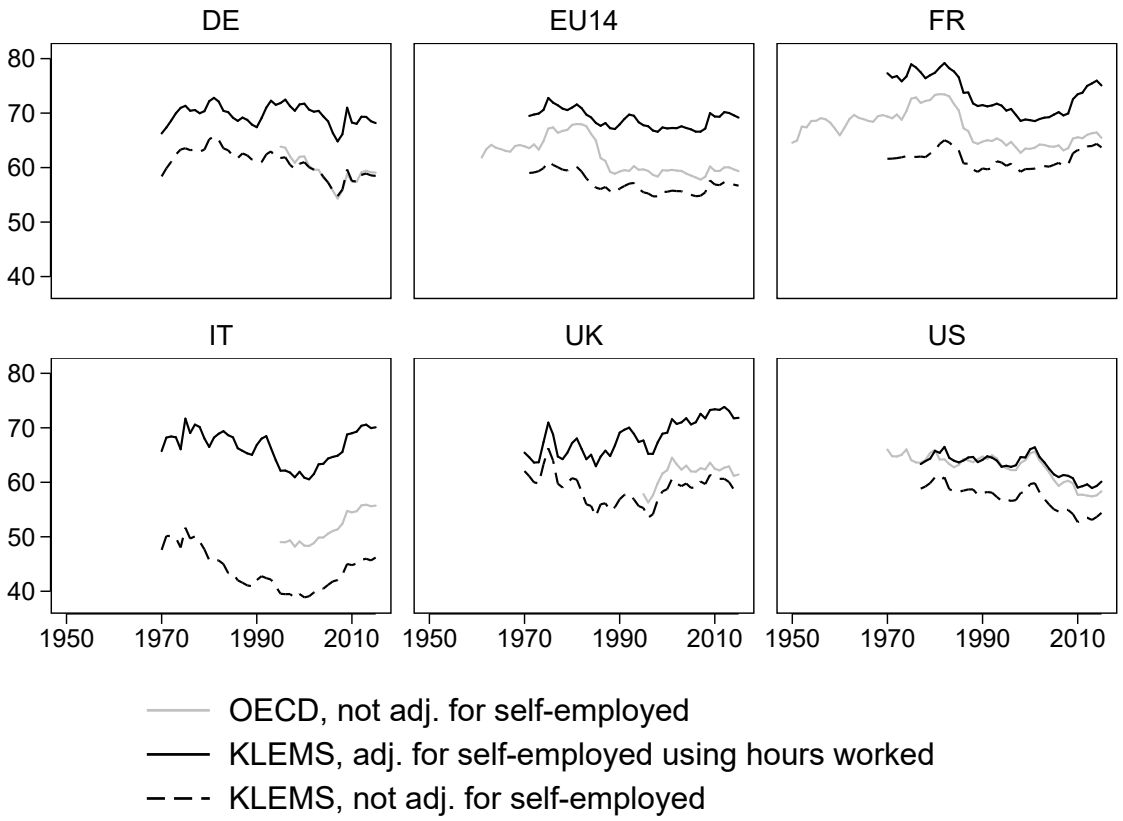
Figure A.2 – Domestic gross labor share adj. or not for self-employed, total economy, Europe and United States, 1950-2015, in %



Source: authors' calculation using OECD and EU KLEMS.

Note: Share of total labor compensations in GVA. Series are adjusted for self-employed (see Appendix section A for a description of the adjustments). EU14 includes France, Italy, Germany, the UK as well as Austria, Belgium, Denmark, Greece, Spain, Finland, Luxembourg, the Netherlands, Portugal and Sweden. It plots the year fixed effects from a regression of labor shares that also includes country fixed effects, to account for entry and exit during the sample. The regressions are weighted by GDP measured in US dollars at market exchange rates. The effects have been normalized to equal to the average labor share in 1995.

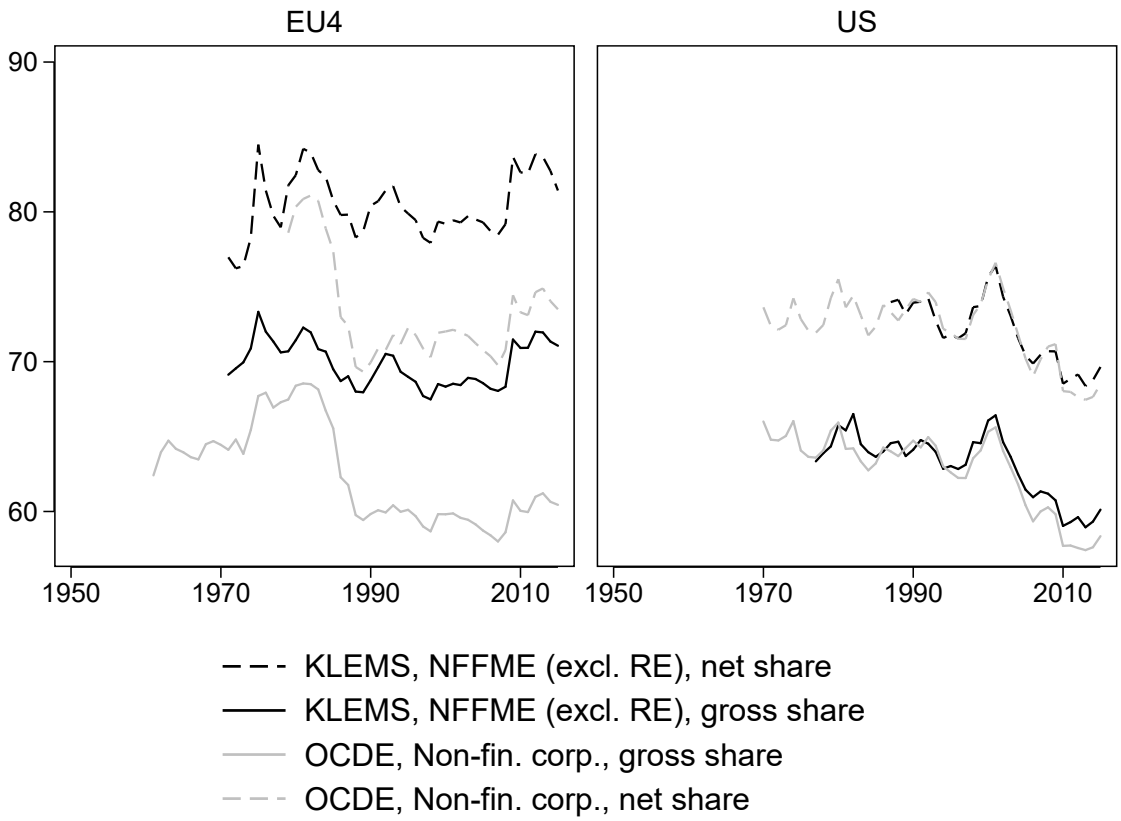
Figure A.3 – Domestic gross labor share adj. or not for self-employed, NFFME and NFC, Europe and United States, 1950-2015, in %



Source: authors' calculation using OECD and EU KLEMS.

Note: NFFME: non-financial non-farm market economy, excl. real estate. NFC: non-financial corporations. Share of total labor compensations in GVA. Series are adjusted for self-employed (see Appendix section A for a description of the adjustments). EU14 includes France, Italy, Germany, the UK as well as Austria, Belgium, Denmark, Greece, Spain, Finland, Luxembourg, the Netherlands, Portugal and Sweden. It plots the year fixed effects from a regression of labor shares that also includes country fixed effects, to account for entry and exit during the sample. The regressions are weighted by GDP measured in US dollars at market exchange rates. The effects have been normalized to equal to the average labor share in 1995.

Figure A.4 – Gross and net domestic labor share, EU4 and United States, 1950-2015, in %

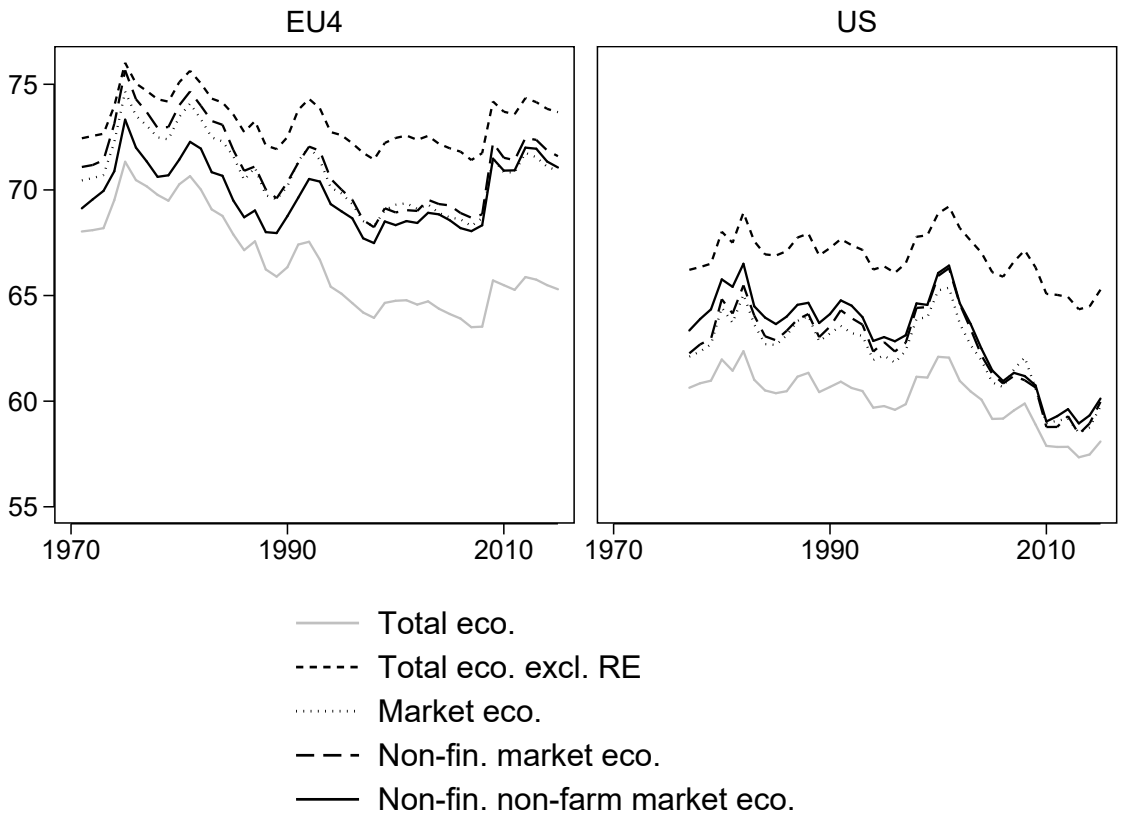


Source: authors' calculation using EU KLEMS and OECD.

Note: Share of total labor compensations in GVA. Series are adjusted for self-employed (see Appendix section A for a description of the adjustment). EU4 includes France, Italy, Germany and the UK and plots the year fixed effects from a regression of labor shares that also includes country fixed effects, to account for entry and exit during the sample. The regressions are weighted by GDP measured in US dollars at market exchange rates. The effects have been normalized to equal to the average labor share in 1995. NFFME: non-financial non-farm market economy.

The non-housing gross labor share (NFFME) declined by 0.2p.p. per decade for EU4 countries, while the net labor share increased by 0.1p.p. In the US, respective numbers are -1.4p.p. for the gross share and -1.6p.p. for the net share.

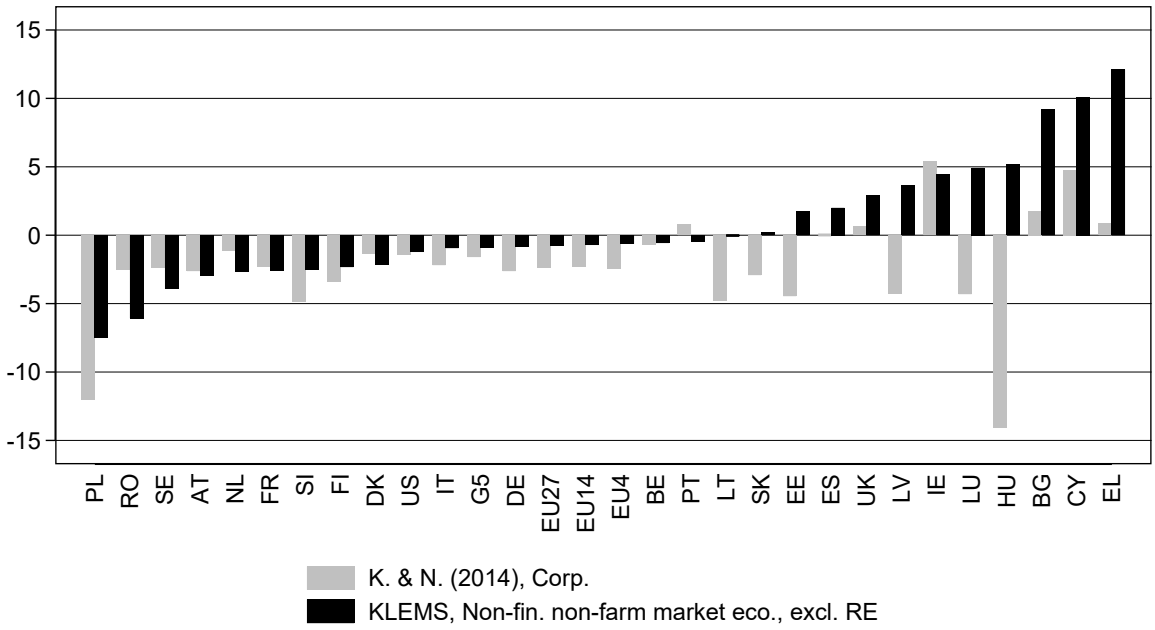
Figure A.5 – Gross labor share in the total, market and non-fin. non-farm market economy, EU4 and United States, 1970-2015, in %



Source: authors' calculation using EU KLEMS.

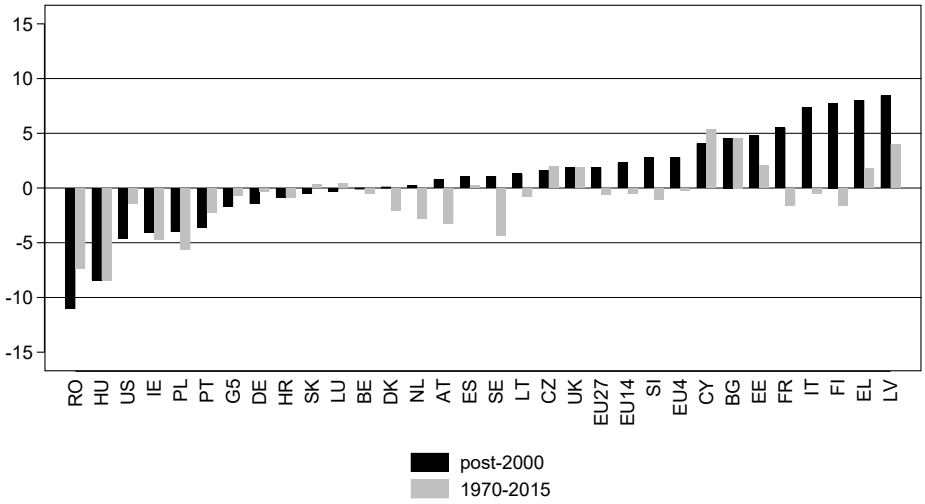
Note: RE: real estate. Share of total labor compensations in GVA. Series are adjusted for self-employed (see Appendix section A for a description of the adjustment). EU4 includes France, Italy, Germany and the UK and plots the year fixed effects from a regression of labor shares that also includes country fixed effects, to account for entry and exit during the sample. The regressions are weighted by GDP measured in US dollars at market exchange rates. The effects have been normalized to equal to the average labor share in 1995.

Figure A.6 – Labor share trends, in percentage points per 10 years, comparison with Karabarbounis and Neiman (2014b)



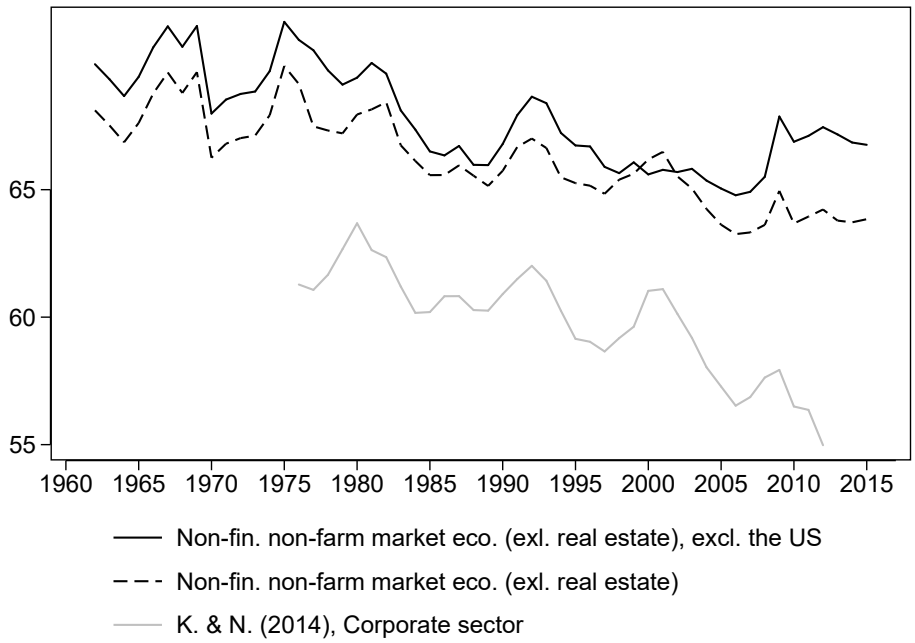
Source: authors' calculations using EU KLEMS and Karabarbounis and Neiman (2014b). The figure shows estimated trends in the labor share for all countries and years available in both datasets. Trend coefficients are reported in units per 10 years (i.e. a value of -5 means a 5 percentage point decline every 10 years). EU4 includes France, Italy, Germany and the UK. EU14 includes EU4 as well as Austria, Belgium, Denmark, Greece, Spain, Finland, Luxembourg, the Netherlands, Portugal and Sweden. EU27 includes all European countries except Malta. G5 includes EU4 plus the United States.

Figure A.7 – Labor share trends, in percentage points per 10 years, 1970-2015 and 2000-2015



Source: authors' calculations using EU KLEMS. The figure shows estimated trends in the labor share for all countries and years available in the dataset. Trend coefficients are reported in units per 10 years (i.e. a value of -5 means a 5 percentage point decline every 10 years). EU4 includes France, Italy, Germany and the UK. EU14 includes EU4 as well as Austria, Belgium, Denmark, Greece, Spain, Finland, Luxembourg, the Netherlands, Portugal and Sweden. EU27 includes all European countries except Malta. G5 includes EU4 plus the United States.

Figure A.8 – Global domestic gross labor share, 1980-2015

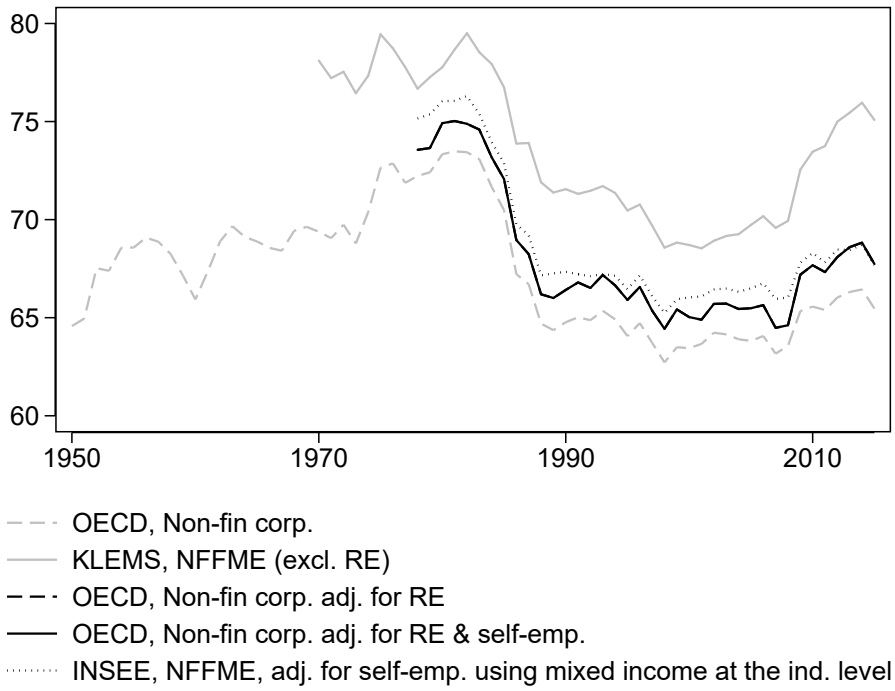


Source: authors' calculations using Eurostat, KLEMS, OECD STAN and Karabarbounis and Neiman (2014b). The Figure plots year fixed effects from a weighted regression of labor shares that also includes country fixed effects, to account for entry and exit during the sample. The regressions are weighted by GDP measured in US dollars at market exchange rates. The effects have been normalized to equal to the average labor share in 1995. The coverage of NFFME series is given in Table A.3 and Table A.4 and includes up to 39 countries. The coverage of Karabarbounis and Neiman (2014b) dataset is available in their paper, it includes up to 82 countries.

Figure A.9 – Share of the real estate sector in total GVA, Europe and United States, 1970-2015, in %

Source: authors' calculations using EU KLEMS. Real estate activities is sector L in ISIC rev. 4. EU14 includes France, Italy, Germany, the UK as well as Austria, Belgium, Denmark, Greece, Spain, Finland, Luxembourg, the Netherlands, Portugal and Sweden. EU27 includes all European countries except Malta. Series for Europe plot the year fixed effects from a regression of shares that also includes country fixed effects, to account for entry and exit during the sample. The regressions are weighted by GDP measured in US dollars at market exchange rates. The effects have been normalized to equal to the average share in 1995.

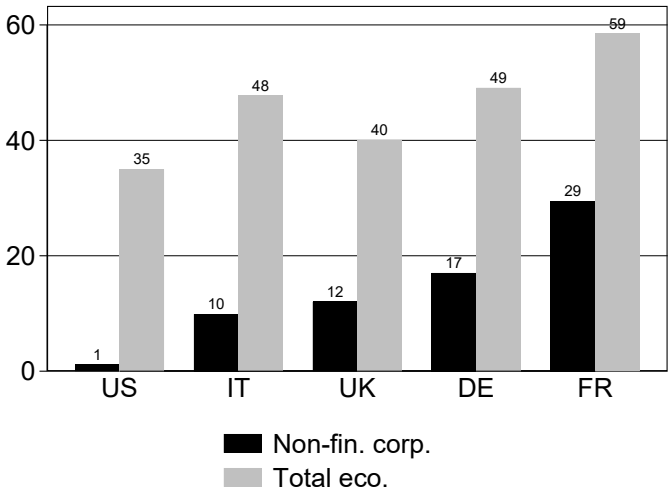
Figure A.10 – Gross labor share for France with alternate self-employment adjustments, in %



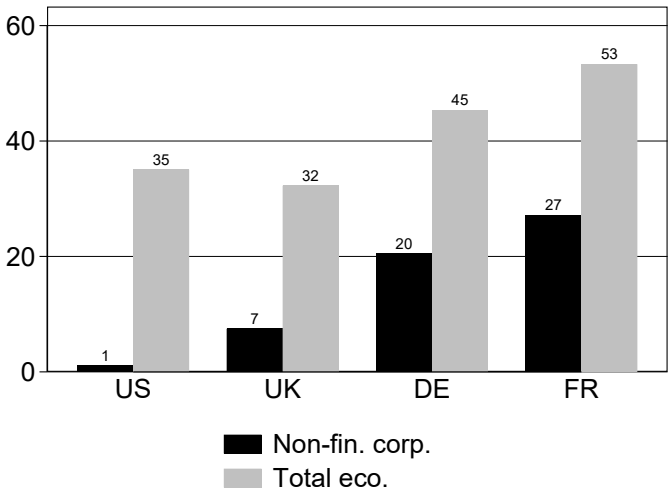
Source: authors' calculations using OECD, KLEMS, and INSEE.
Note: Non-financial corporation and KLEMS labor shares as defined in the text. We use INSEE data to correct the NFFME series for self-employed in France using mixed income at the industry-level. NFFME: non-financial non-farm market economy. RE: real estate.

Figure A.11 – Share of dwellings in the stock of non-fin. produced fixed assets by sector and country, in %

(a) 2014

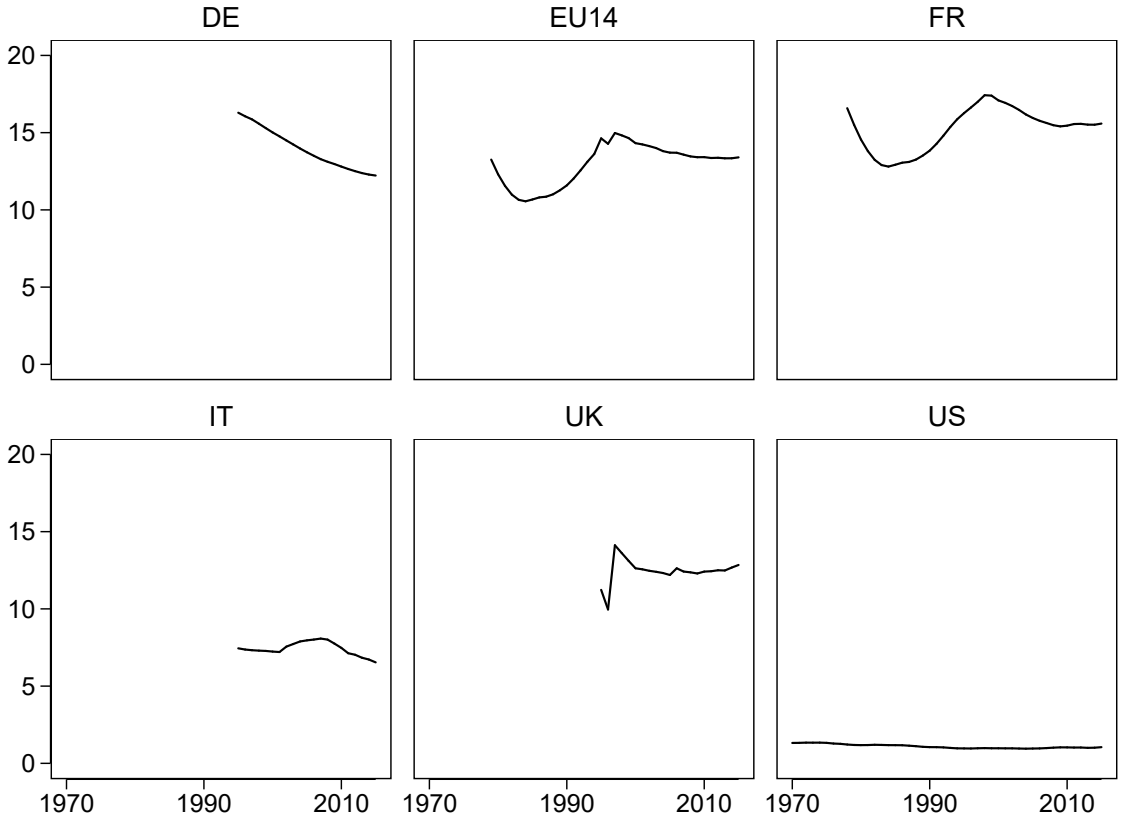


(b) 1995



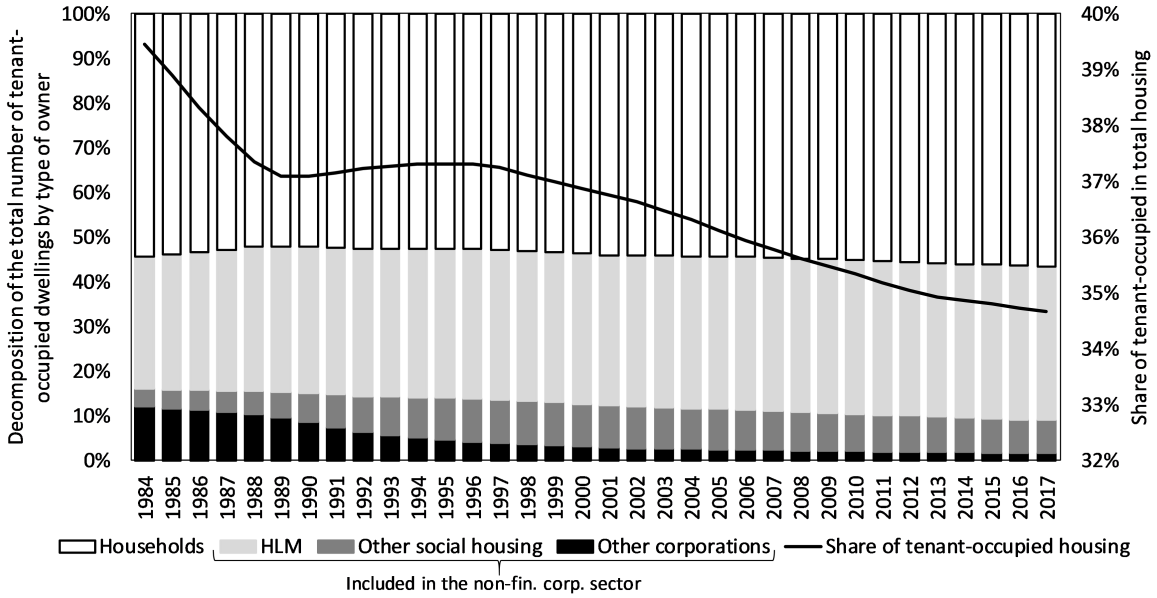
Source: authors' calculations using OECD. See Table A.2 for a description of non-financial produced fixed assets.

Figure A.12 – Share of dwellings in the non-fin. corp. sector in the total stock of dwellings, by country, 1970-2015, in %



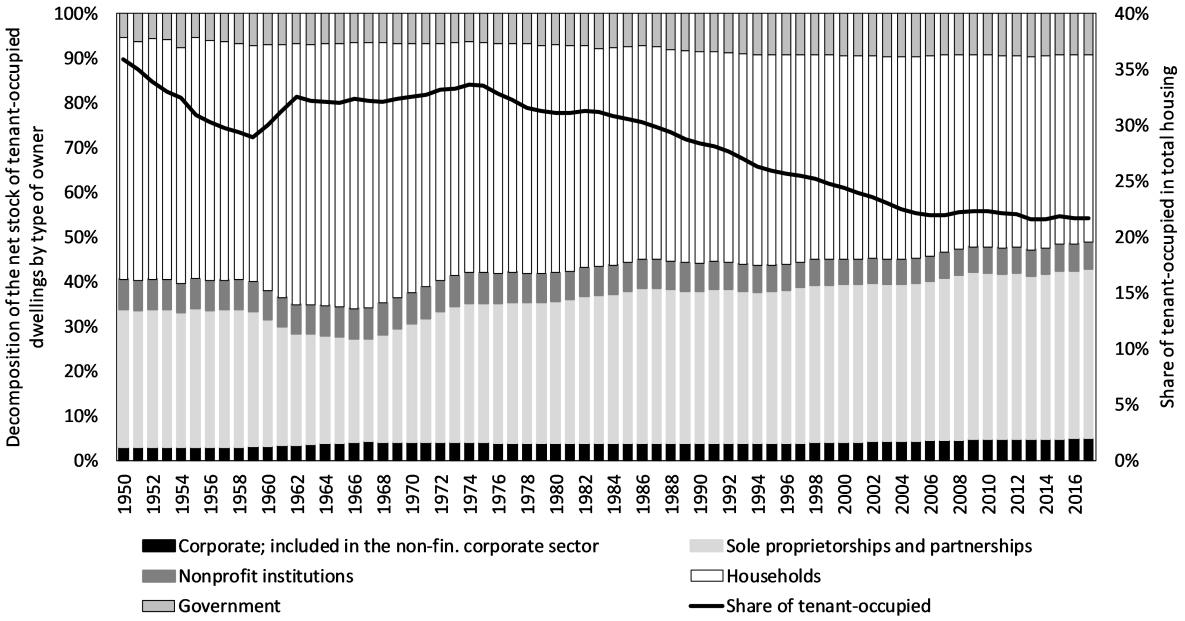
Source: authors' calculations using OECD. See Table A.2 for a description of non-financial produced fixed assets. EU14 includes France, Italy, Germany, the UK as well as Austria, Belgium, Denmark, Greece, Spain, Finland, Luxembourg, the Netherlands, Portugal and Sweden. It plots the year fixed effects from a regression of shares that also includes country fixed effects, to account for entry and exit during the sample. The regressions are weighted by GDP measured in US dollars at market exchange rates. The effects have been normalized to equal to the average share in 1995.

Figure A.13 – Housing stock, by type of owner, France, 1984-2017, in %



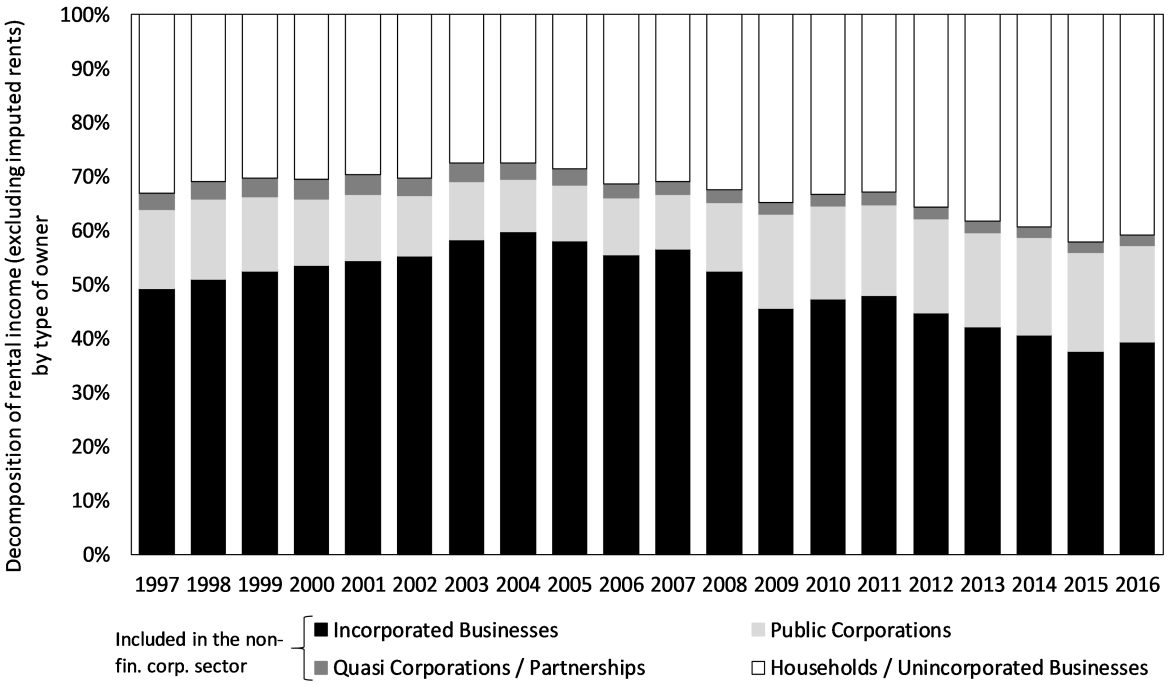
Source: authors' calculations using *Compte satellite du logement*, 2018 Edition. See INSEE methodological note for Eurostat entitled "ESA 2010 Gross National Income Inventory" and last accessed here in Feb. 2019, on p.142, for a more detailed discussion.

Figure A.14 – Current-cost net housing stock, by type of owner, United-States, 1950-2017, in %



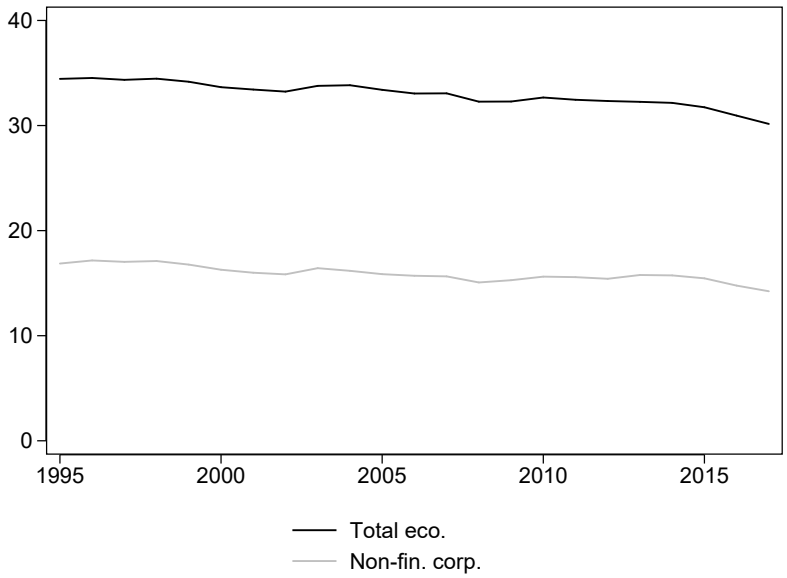
Source: authors' calculations using BEA.

Figure A.15 – Percentage of rental income by institutional sector, 1997-2016, in %



Source: *UK National Accounts, The Blue Book: 2018*, ONS.

Figure A.16 – Share of self-employed in total hours worked, by sector, Italy, 1995-2017, in %



Source: authors' calculations using ISTAT.

Table A.6 – Sector contributions to the change in the labor share, 1977-2015, EU4

Sector	ΔLS, p.p.	LS_{2015}, %	$\Delta\omega$, p.p.	ω_{2015}, in %	within effect, p.p.	between effect, p.p.	total contrib., p.p.
Total	-3.62	65.53	-	-	0.53	-4.15	-
Real Estate	-2.31	5.47	5.65	12.14	-0.21	-3.43	-3.64
Financial, farm and non market sectors	-1.82	80.32	1.31	25.63	0.10	-0.37	-0.27
Agriculture, forestry and fishing	-13.94	99.17	-2.10	1.14	-0.30	-0.81	-1.12
Financial and insurance activities	2.30	63.86	0.85	4.98	0.10	-0.04	0.07
Public administration and defence	-0.98	76.68	-1.05	6.31	-0.07	-0.10	-0.17
Education	9.56	93.85	0.36	4.89	0.45	0.08	0.53
Health and social work	-1.63	80.49	3.08	7.86	-0.10	0.43	0.33
Activities of households as employers	4.02	116.97	0.17	0.44	0.01	0.08	0.09
Activities of extraterritorial organizations and bodies	-	-	-	-	-	-	-
NFFME	0.82	71.15	-6.96	62.23	0.65	-0.35	0.30
Manuf.	-1.52	67.98	-11.89	16.89	-0.22	-0.30	-0.51
Food products, beverages and tobacco	5.21	70.66	-1.25	1.78	0.13	-0.01	0.12
Textiles, wearing apparel and leather products	-2.80	75.44	-1.43	0.50	-0.03	-0.14	-0.17
Wood/paper products; printing of recorded media	3.21	76.20	-0.92	0.83	0.04	-0.07	-0.03
Chemical, rubber, plastics and fuel products	-2.71	59.25	-2.34	3.31	-0.12	0.16	0.04
Basic metals and fabricated metal products	-2.21	74.66	-1.66	2.15	-0.07	-0.14	-0.21
Electrical and optical equipment	8.41	68.32	-1.97	1.86	0.24	0.06	0.30
Machinery and equipment n.e.c.	0.05	73.61	-1.10	2.20	-	-0.07	-0.07
Transport equipment	-12.38	57.67	-0.35	2.87	-0.38	0.01	-0.37
Other manufacturing	-1.37	79.39	-0.87	1.39	-0.02	-0.11	-0.14
Business services	0.07	70.90	7.84	39.94	0.28	0.03	0.30
Transport and storage	-19.41	64.05	0.09	4.22	-0.81	0.01	-0.80
Post and telecommunications	-8.11	54.51	-0.60	1.71	-0.16	0.05	-0.11
Electricity, gas and water supply	-6.90	38.71	-0.14	2.72	-0.19	0.03	-0.16
Wholesale and retail trade; repair of motor vehicles	-0.25	78.00	-1.00	10.28	-0.03	-0.11	-0.13
Accomodation and food service activities	-16.10	85.04	0.83	2.42	-0.32	0.21	-0.11
Other business activities	14.23	71.44	7.94	15.25	1.60	-0.24	1.37
Arts, entertainment, recreation and other activities	6.26	79.57	0.72	3.34	0.19	0.07	0.25
Other market activities	11.60	82.92	-2.90	5.41	0.59	-0.08	0.51
Mining and quarrying	14.48	58.62	-1.05	0.31	0.12	0.17	0.29
Construction	7.76	84.42	-1.85	5.09	0.47	-0.24	0.22

Source: author's calculations using EU KLEMS.

Note: EU4 includes France, Italy, Germany and the UK. The aggreate is the year fixed effects from a regression of labor shares that also includes country fixed effects, to account for entry and exit during the sample. The regressions are weighted by real GDP GDP measured in US dollars at market exchange rates. NFFME: non-financial non-farm market economy.

Table A.7 – Sector contributions to the change in the labor share, 1977-2015, United States

Sector	ΔLS, p.p.	LS_{2015}, %	$\Delta\omega$, p.p.	ω_{2015}, in %	within effect, p.p.	between effect, p.p.	total contrib., p.p.
Total	-2.10	58.09	-	-	-1.49	-0.61	-
Real Estate	0.54	6.02	2.53	12.13	0.06	-1.35	-1.29
Financial, farm and non market sectors	3.16	75.46	2.58	29.52	0.67	0.61	1.27
Agriculture, forestry and fishing	13.33	50.65	-1.42	0.98	0.23	0.21	0.44
Financial and insurance activities	3.38	58.07	2.82	7.27	0.20	-0.08	0.12
Public administration and defence	-0.51	78.76	-2.35	12.84	-0.07	-0.47	-0.54
Education	1.92	94.87	0.38	1.14	0.02	0.13	0.15
Health and social work	5.16	87.31	3.15	7.30	0.30	0.81	1.10
Activities of households as employers	-	-	-	-	-	-	-
Activities of extraterritorial organizations and bodies	-	-	-	-	-	-	-
NFFME	-3.19	60.12	-5.11	58.35	-2.21	0.13	-2.08
Manuf.	-20.82	47.14	-10.07	12.20	-2.84	-0.58	-3.43
Food products, beverages and tobacco	-15.13	40.86	-0.80	1.45	-0.28	0.09	-0.19
Textiles, wearing apparel and leather products	-	79.74	-1.24	0.16	-	-0.26	-0.26
Wood/paper products; printing of recorded media	-8.83	61.67	-1.20	0.72	-0.12	-0.08	-0.20
Chemical, rubber, plastics and fuel products	-24.77	29.29	-0.65	3.70	-1.00	0.11	-0.88
Basic metals and fabricated metal products	-12.32	63.77	-2.23	1.15	-0.28	-0.24	-0.52
Electrical and optical equipment	-24.96	51.54	-0.55	1.88	-0.54	-0.03	-0.56
Machinery and equipment n.e.c.	-8.11	61.92	-1.42	0.86	-0.13	-0.10	-0.22
Transport equipment	-17.55	50.12	-1.46	1.65	-0.42	-	-0.41
Other manufacturing	-10.00	70.03	-0.52	0.62	-0.09	-0.08	-0.17
Business services	4.73	63.73	5.81	40.20	1.12	0.78	1.89
Transport and storage	-8.50	62.53	-0.62	3.05	-0.29	-0.05	-0.33
Post and telecommunications	6.01	110.55	-0.35	0.30	0.03	-0.17	-0.14
Electricity, gas and water supply	4.47	31.95	-0.63	1.85	0.10	0.19	0.28
Wholesale and retail trade; repair of motor vehicles	-4.53	52.43	-2.61	12.08	-0.61	0.12	-0.49
Accomodation and food service activities	3.08	65.93	0.64	2.95	0.08	0.03	0.11
Other business activities	10.47	71.16	9.04	16.67	1.27	0.61	1.89
Arts, entertainment, recreation and other activities	16.88	80.32	0.33	3.30	0.53	0.04	0.57
Other market activities	-7.54	62.34	-0.85	5.96	-0.48	-0.06	-0.54
Mining and quarrying	-9.25	28.43	-0.27	1.84	-0.18	0.07	-0.11
Construction	-6.84	77.53	-0.58	4.11	-0.30	-0.13	-0.43

Source: author's calculations using EU KLEMS.

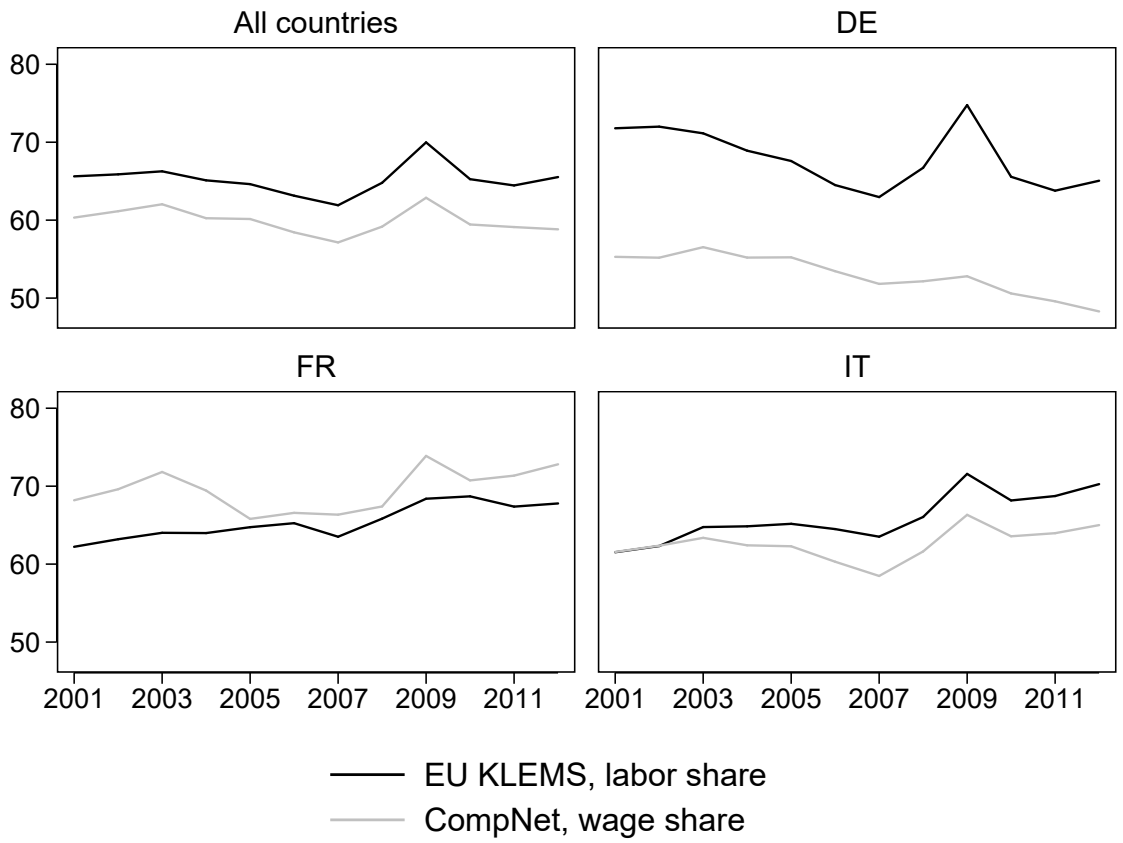
NFFME: non-financial non-farm market economy.

Table A.8 – Adjustment contributions to the change in the labor share, US and EU4

	Germany	France	Italy	United Kingdom	United States
Total eco. Labor share	-3.34	-6.59	-3.55	4.77	-2.59
Contribution of:					
Real estate activities	-3.59	-3.57	-6.39	-3.21	-1.65
Other activities	-1.4	0	-1.46	1.76	2.25
Non-fin., non-farm market activities	1.65	-3.03	4.3	6.21	-3.19
of which, wage share	0.09	2.09	-1.41	-2.94	-4.46
of which, adj. for self-emp.	1.56	-5.11	5.7	9.16	1.26

Source: author's calculations using EU KLEMS. Data cover the period 1970-2015 except for the US where data starts in 1977.

Figure A.17 – Labor share, comparison EU KLEMS and CompNet, manufacturing sector, 2001-2012, in %



Source: authors' calculations using EU KLEMS and CompNet. The figures shows the average wage share over sub-sectors of the manufacturing sector where the value is reported in both datasets. Averages are weighted by the share in GVA of the sub-sector in EU KLEMS.

C. Estimating the Housing Share of NFC Value Added

In this Appendix we describe four different methods to measure returns to housing R^H so as to get housing value added in the NFC sector: $Y^{H,NFC} = R^H \times ResK^{NFC}$, with $ResK^{NFC}$ residential capital in the housing sector.

National Accounts report housing income in three different ways:

- Y^{RE}: real estate value added from industry accounts (including all activites related to both residential and non residential real estate);
- $Rents$: total housing rents paid by households in their final expenditure accounts;
- GOS^{HH}: gross operating surplus of households and NPISH in sector accounts, composed only of rental income of tenant-occupied dwellings owned by households and imputed rents on owner-occupied dwellings.

Figure A.18 contrasts the three measure for France. As shown, all three series differ in levels. Household value added includes (GOS^{HH}) only rents on dwellings owned by the household sector, while $Rents$ cover all dwellings. Real estate value added (Y^{RE}) combines commercial and residential real estate. Value added and rents also differ because the former excludes expenditures on maintenance and repairs, as well as FISIM (i.e. associated financial services) – while rents include the former and sometimes the latter. Yet, all measures evolve close to each other.

In the case of France, it is worth mentioning that the $Rents$ series increase faster than rents paid to households (GOS^{HH}), meaning that there is an increasing share of rental income outside of the households sector. And since the corporate sector owns 80% of dwellings outside the household sector, this suggests that our housing bias in the NFC sector has been increasing over time.

These definitions, combined with economic theory, provide at least four ways of estimating R^H.

1. Using the return from housing in the HH sector (HH Y/Kstruc). We can get R^H using the ratio of housing value added to residential structures in the household sector, $R^H = \frac{GOS^{HH}}{ResK^{HH}}$. Assuming that housing assets in the NFC sector attain the same return as in the household sector, we can estimate:

$$\hat{Y}^{H,NFC} = \frac{Y^{HH}}{ResK^{HH}} \times ResK^{NFC}$$

2. Allocating rental expenditures across sectors – our main approach (Rents ex HH/Kstruc). Unfortunately, returns to dwellings in the overall economy may differ substantially from returns in the NFC sector (e.g., if NFC dwellings are rent-controlled). Our second –and preferred method described in the body – aims at addressing this concern. We isolate value added outside the household sector by taking the difference between total rents paid by households ($Rents$) and

value added in the household sector (rental income of dwellings owned by households, GOS^{HH}), and allocate the corresponding income across sectors. In other words:

$$\hat{Y}^{H,NFC} = \frac{Rents - GOS^{HH}}{ResK - ResK^{HH}} \times ResK^{NFC}$$

NFCs own more than 90% of dwellings outside the household sector, so this method is likely to closely capture housing income in the NFC sector.

3. Estimating user-costs following Hall and Jorgenson (1967) (User-cost R*Ktot). Alternatively, we can impose more structure on the problem, and estimate R^H following the now standard formula of Hall and Jorgenson (1967):

$$R^{HJ} = r_f + \delta^H - g^e_{p^H} \tag{3}$$

where r_f denotes the risk-free rate, $g^e_{p^H}$ the expected growth in the price of housing and δ^H the depreciation of housing. We set r_f equal to the 10-year centered moving average of the country-specific risk-free rate.[26] We set $\delta^H = 0.0114$, which is the assumed depreciation rate of housing structures in EU KLEMS. Last, we estimate $g^e_{p^H}$ as the 10-year centered moving average of housing price changes, as measured by the OECD's house price indices. Importantly, K^H under Hall and Jorgenson (1967) should include land as well as structures. The data includes the value of residential and non residential structures, as well as (total) land. We assume the value of land splits between residential and non residential assets according to the share of residential and non residential structures.

4. Using rent-to-price indices (Rent-to-Price*Ktot) Last, note that R^H under Hall and Jorgenson (1967) is the rental rate for a unit of capital. This is precisely what rent-to-price ratios aim to measure, so we can let R^H equal the rent-to-price ratio. Unfortunately, long time series are not widely available for all countries. We obtain the ratio for France from Knoll (2017), Figure B.10.

C.1. Drill-down: France

Let us compare the estimates across all methods. We focus on France, because it is the country with the best data availability; but also report labor share results for selected countries below.

[26] Using a moving average accounts for the fact that housing assets are often purchased through long maturity mortgages, hence the appropriate rate would be a rolling average of spot rates. The moving average also tracks the actual cost of debt of non-financial corporations far more closely than the spot rate.

Rates of return. Figure A.19 contrasts our four estimates of R^H. Note that returns based on residential structures (first two) are not necessarily comparable to returns based on total house prices (last two). Estimates of returns on housing structures behave similarly over time. They are largely stable, whether based on household value added or rents. This is consistent with Figure A.20, which shows similar patterns in rental price inflation of social and private housing. By contrast, estimates based on house prices fall over time – likely due to the rise in land values.

The user-cost implied estimate (which follows Hall and Jorgenson, 1967) is far more volatile than all other estimates. This appears to be due to deviation between expected and actual price gains, as shown in Figure A.21. The left plot shows the realized home price change against the expected home price changes implied by rent-to-price indices, interest rates and depreciation (using equation 3 above). The expected series is more stable and lags realized changes slightly, consistent with agents updating their expectations over time. The right plot shows the residuals, which are noisy and centered around zero. Thus, user-cost estimates of required returns appear to be a noisy proxy of rental-price based estimates. We exclude the former in the remainder of this section, but include them in cross-country comparisons because a long history of rent-price indices is not readily available for most countries.

Housing share of NFC gross value added. Applying the required returns to the appropriate capital stock, we obtain estimates of housing value added in the NFC sector. Figure A.22 plots the results, as a share of total NFC value added. The share of housing in NFC value added increases from about 1.5% to 3.5% for all three methods.

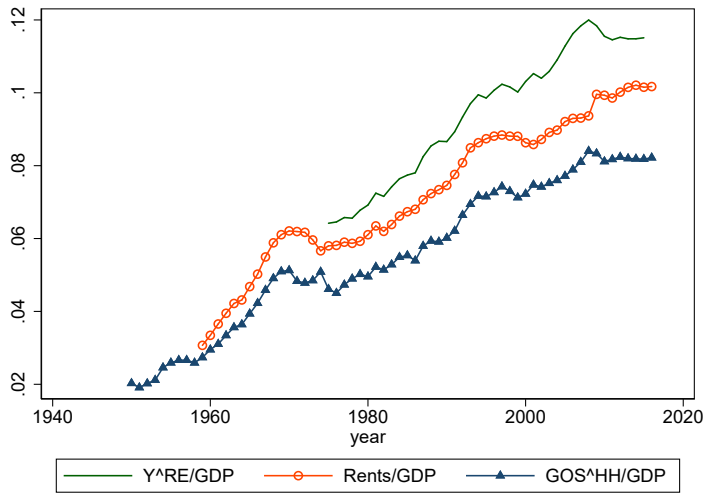
Labor shares. Since housing has virtually no labor income, the rise in housing value added biases down the trend in the French NFC labor share. Figure A.23 plots the change in raw and adjusted NFC labor shares, from 1979 to 2015, following each method. We include the KLEMS NFFME series (excluding Real Estate) for comparison. As shown, the corrected NFC series fall by 1 to 2 p.p less than the raw NFC series. This explains about half of the difference between the KLEMS NFFME and the raw NFC series – the rest is likely explained by differences in industry mix and, potentially, differences in the estimates of imputed wages. Regardless, the adjusted series ends only slightly below the average labor share from 1950 to 1970 – before the cyclical rise and fall emphasized by Blanchard (1998).

C.2. All countries.

Figure A.24 shows the share of dwellings owned by the NFC sector among the countries for which data are available. Figure A.25 shows the raw and corrected labor shares for the EU15 and the top 3 countries by NFC share of dwellings: Sweden, Denmark and Netherlands. As shown, the corrected series are much closer and behave similar to the KLEMS series. They are always higher

than the NFC labor share. Figure A.26 plots the same data in changes since 1995. Again, the adjusted series behave closer to the KLEMS NFFME series than the raw NFC series.

Figure A.18 – Real estate and housing share of value added in France, 1950-2017, in %



Source: Real estate value added from EU KLEMS. Rents from SNA Table 5 (expenditures); and housing value added from SNA Table 14A (GOS of household and NPISH sector). SNA data sourced via the OECD.

Figure A.19 – Four estimates of R for France

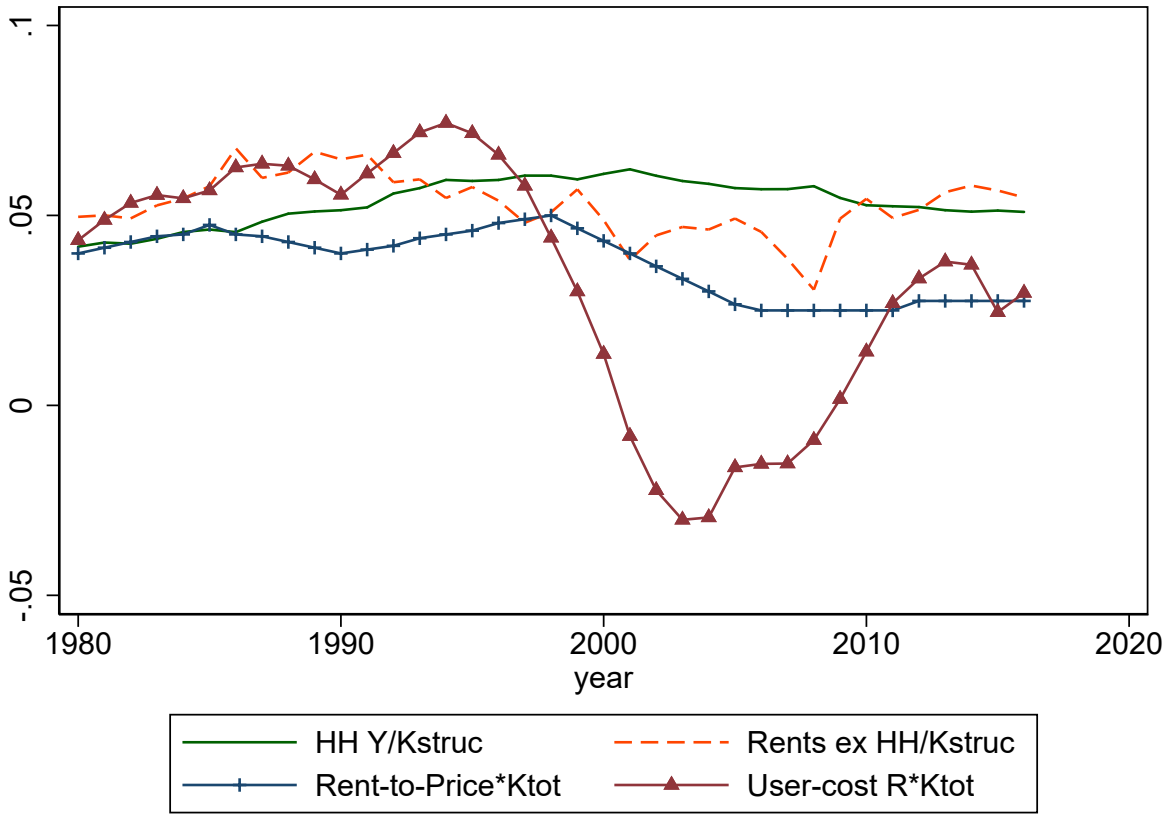
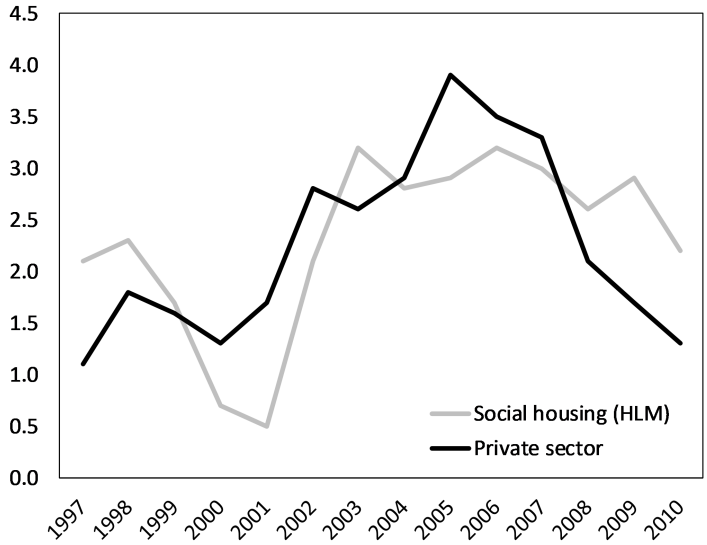


Figure A.20 – Rental price inflation in France



Source: authors' calculations using *Compte satellite du logement*, 2018 Edition. See INSEE methodological note for Eurostat entitled "ESA 2010 Gross National Income Inventory" and last accessed here in Feb. 2019, on p.142, for a more detailed discussion.

Figure A.21 – Explaining the difference between user-cost and rent-price indices for France

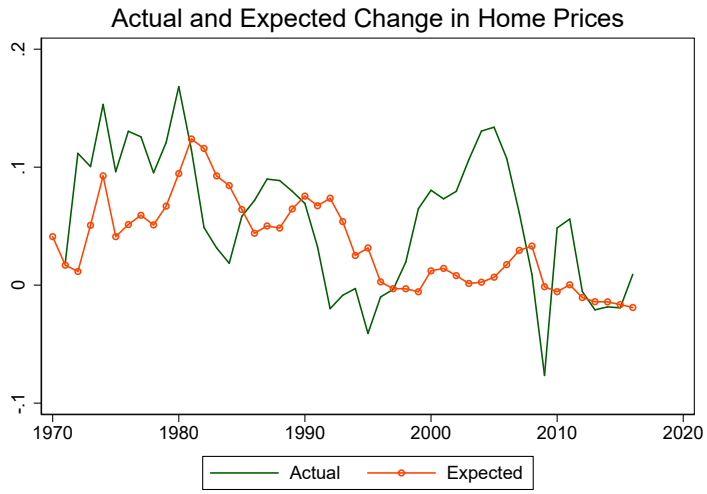


Figure A.22 – Housing share of NFC gross value added for France

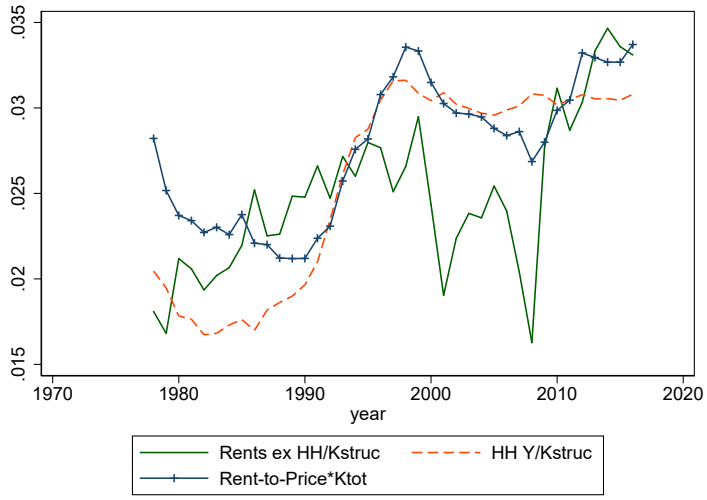


Figure A.23 – Raw and corrected labor shares for France (change from 1979)

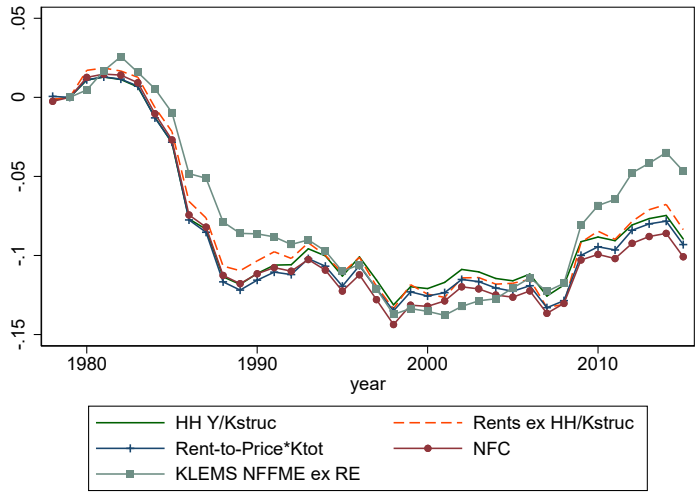


Figure A.24 – NFC share of dwellings, by country, 2015

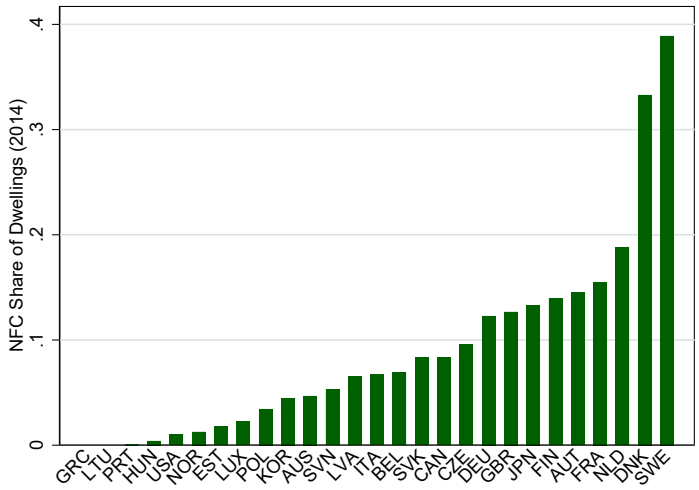


Figure A.25 – Raw and corrected labor shares

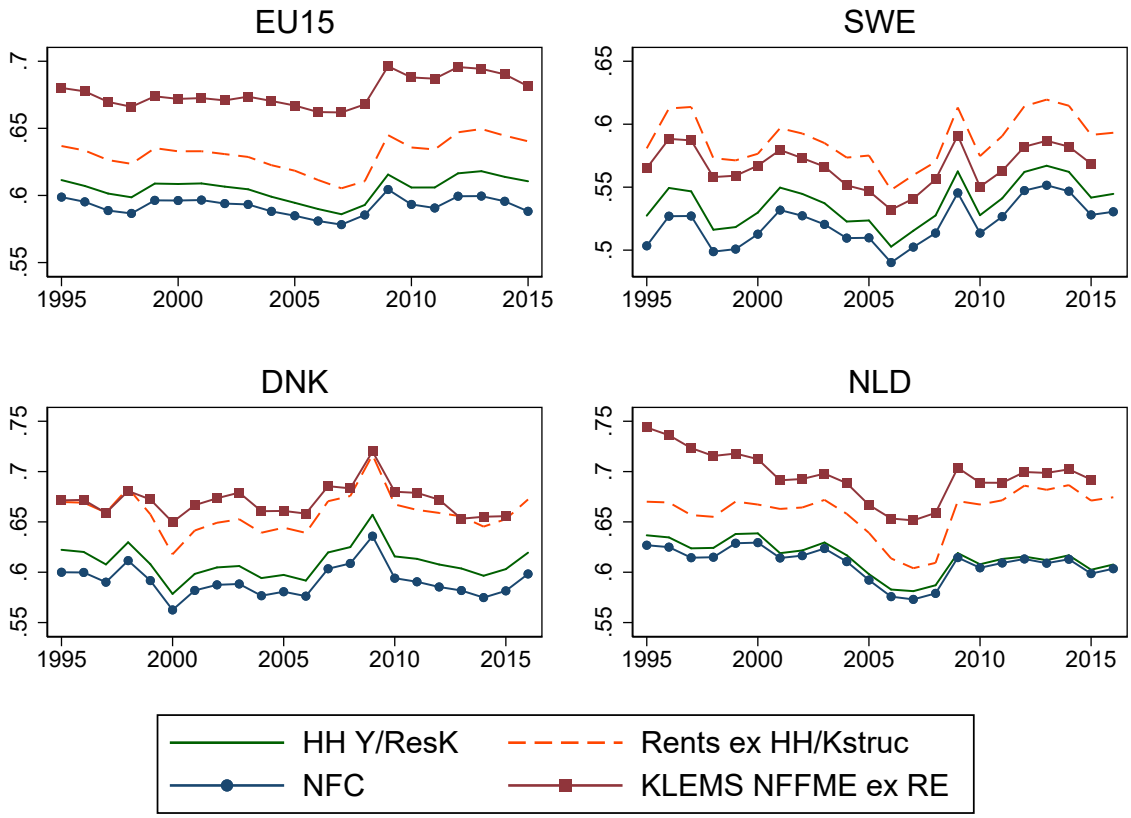


Figure A.26 – Change in raw and corrected labor shares since 1995