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

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The appendix is divided into the following sections:

1. **Data:** describes the data sources and definitions used throughout the paper.
2. **Comparison of labor shares across alternate sources:** compares labor shares across a wide range of sources including the different vintages of National Accounts, Karabarbounis and Neiman (2014*b*), Piketty and Zucman (2014*b*) and the Penn World Table version 9.1 (Feenstra, Inklaar and Timmer, 2015). It shows that neither revisions to national accounts, nor differences in sources or treatment of taxes change the long term trends in labor shares.
3. **Labor shares in China and India:** discusses the evolution of the labor for these two major developing economies. In particular, it compares labor shares across a wide range of sources including the different vintages of National Accounts, Karabarbounis and Neiman (2014*a*), Piketty and Zucman (2014*a*) and the Penn World Table version 9.1 (Feenstra, Inklaar and Timmer, 2015). Revisions and data sources matter much more for these countries. While some series show significant declines, others remain largely stable. Given the lack of agreement, we exclude these countries from the main document.
4. **Robustness tests around measurement choices:** presents a series of robustness tests on the treatment of depreciation and non-market sectors for estimating the labor share.
5. **Additional details on real estate:** provides additional details on the inclusion of housing in the corporate sector of selected economies, and presents several robustness tests for the housing adjustment.
6. **Additional details on self-employment:** provides additional details on the inclusion of self-employed workers in the corporate sector of selected economies.
7. **Additional details on timing:** provides additional details and results on the initial period of analysis. It shows that shocks to commodity terms of trade are strongly correlated with the rise and fall of the labor share during the Global Stagflation period.

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A. Data

We use two National account databases to measure labor shares: sector and industry accounts. Both sets of accounts rely on the accounting identities defined in the 2008 System of National Accounts (SNA, United Nations, 2008). Data coverage for both sources is summarized in Tables A.2 and A.3. To compare our results with prior literature, we also gather labor share series from Karabarbounis and Neiman (2014*b*), Piketty and Zucman (2014*b*) and the Penn World Table version 9.1 (Feenstra, Inklaar and Timmer, 2015).

A.1. Sector Data

Data for sector accounts are easily downloadable from the OECD's website (OECD, 2020)[1] – 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 capital 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, as in Karabarbounis and Neiman (2014*a*). To account for the income of the self-employed, Piketty and Zucman (2014*a*) apply the corporate wage share to the noncorporate GVA.

Corporate sector labor shares. The labor share for the corporate sector is defined as the ratio of employee compensations to GVA in the corresponding sector. We primarily use OECD data but complement it with Karabarbounis and Neiman (2014*a*) to extend our series back in time. Most of our results use the raw corporate sector labor shares. However, Figure 1 of the paper corrects for housing services and labor compensation of the self-employed. See the main text for additional details.

[1] We also use sector accounts from other Statistical agencies (Eurostat, 2020; BEA, 2020*b*).

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 includes net taxes on products.[2]

Differences across EU KLEMS vintages. Our primary dataset is the 2018 vintage of EU KLEMS (2018), 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. This introduces two challenges. First, as discussed by Autor and Salomons (2018), revisions to the industry definitions in KLEMS (and underlying raw data) were implemented in the 2016 release. To ensure consistency over time, we construct an industrial classification with 25 industries, shown in Table A.1, that ensures correspondence across vintages. The second challenge is that data in recent vintages are not comparable due to changes in national accounting manuals (ESA 1995 vs. ESA 2010, see EU KLEMS methodological note for more details). We thus cannot concatenate labor shares in levels across vintages. Instead, we extend each industry series backward by applying the absolute change in the labor share of the previous vintage to the 2018 vintage level in 1995. We also extend series of GVA by applying the previous vintage growth rates to the 2018 vintage level in 1995.

Business sector labor shares. The labor share for the business sector in industry accounts is defined as total business sector employee compensations plus an estimate of the labor compensations of self-employed (assuming they earn on average the same hourly wage as employees in the same industry, see main text for more details) to total business sector gross value added. The business sector is defined in Table A.1.

Figures A.1 to A.3 compare labor shares for the total economy and business sector of G7 countries from various vintages: KLEMS 2008, 2009, 2012 and 2018 KLEMS vintages. It also exhibits our final extended series KLEMS GP. Wage shares (employee compensation to gross value added) in previous vintages are systematically larger than in the most recent vintages, but they exhibit similar trends when they overlap. Concatenating the two series would then automatically result in a large drop in the labor share, but concatenating the trends – as we do – appears reasonable. Labor shares differ more, certainly due to improving data on hours worked, leading to revisions of estimates of

[2]For consistency, all labor shares series are presented at basic prices for Europe (i.e. including only net taxes on production and not on products) and market prices for the US and South Korea (i.e. including both net taxes on production and not on products). As a result, the levels of labor shares are not comparable: the US labor share is lower than in Europe because the GVA includes more taxes. Appendix B shows that the different treatment of taxes only affect the levels of the labor shares, not the dynamics.

the compensation of self-employed. See Appendix Section 2 for additional comparisons of labor shares across sources.

Finally, we use Eurostat (2020); OECD (2017); World KLEMS (2020) to build series for non European countries (see Tables A.2 and A.3). Our dataset covers up to 37 countries.

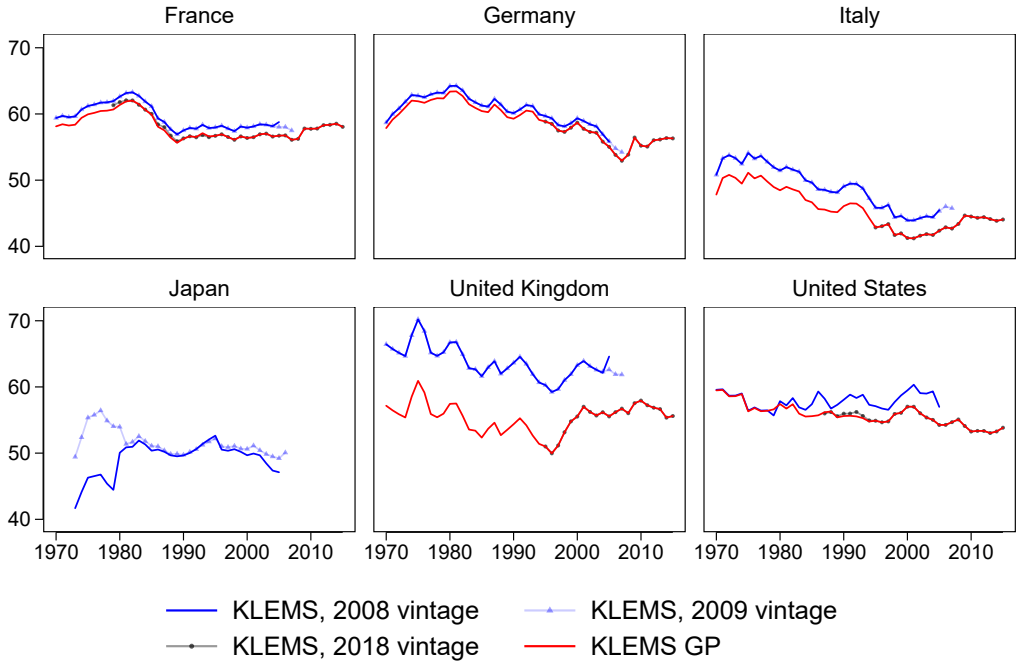
A.3. Firm-level Data

For some of our robustness tests, we complement KLEMS with firm-level data from the ECB's CompNet (CompNet, 2015). Data are freely available upon request (see www.comp-net.org). CompNet 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 provide the best coverage over time and across countries. The labor share is defined as total labor costs to nominal GVA.

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 business sector?
A	AtB	Agriculture, forestry and fishing	
B	C	Mining and quarrying	✓
10-12	15t16	Food products, beverages and tobacco	✓
13-15	17t19	Textiles, wearing apparel, leather and related products	✓
16-18	20 + 21t22	Wood and paper products; printing and reproduction of recorded media	✓
19-23	23t25 + 26	Chemical, rubber, plastics, fuel and oter non-metallic products	✓
24-25	27t28	Basic metals and fabricated metal products	✓
26-27	30t33	Electrical and optical equipment	✓
28	29	Machinery and equipment n.e.c.	✓
29-30	34t35	Transport equipment	✓
31-33	36t37	Other manufacturing; repair of machinery and equipment	✓
D-E	E	Electricity, gas and water supply	✓
F	F	Construction	✓
G	G	Wholesale and retail trade; repair of motor vehicles	✓
I	H	Accomodation and food service activities	✓
H + 61	60t63 + 64	Transport and storage, post and telecommunications	✓
K	J	Financial and insurance activities	✓
L	70	Real estate activities	
M-N + 58-60 + 62-63	71t74	Other business activities	✓
O	L	Public administration and defence; compulsory social security	
P	M	Education	
Q	N	Health and social work	
R-S	O	Arts, entertainment, recreation and other service activities	✓
T	P	Activities of households as employers	
U	Q	Activities of extraterritorial organizations and bodies	

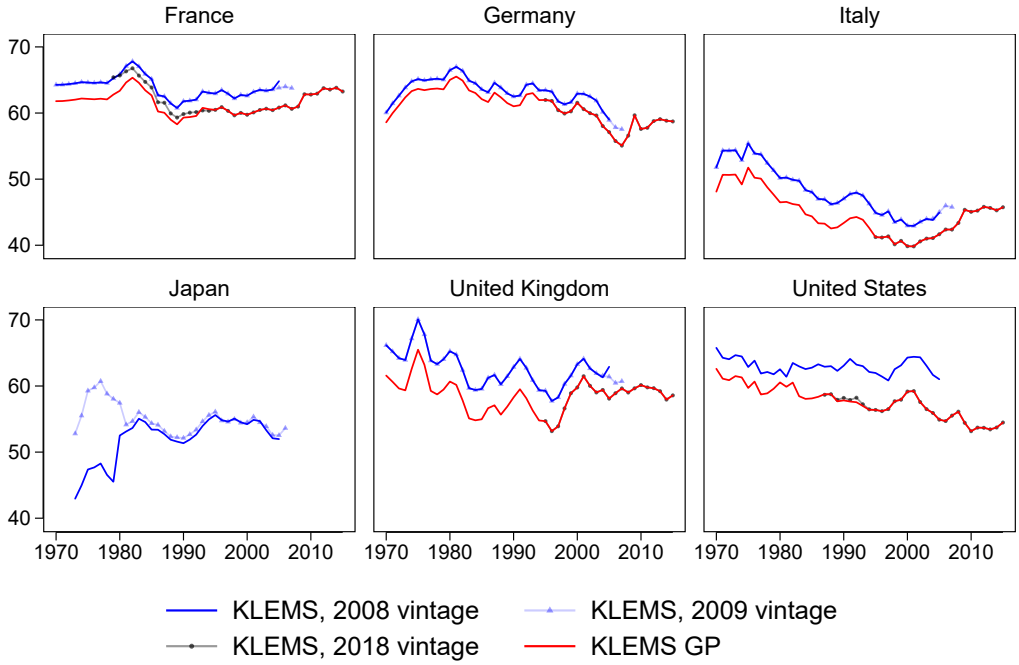
Figure A.1 – Gross domestic wage share, comparison across different KLEMS vintages for the G7, total economy, 1970-2015, in %



Source: authors' calculation using EU KLEMS (2018).

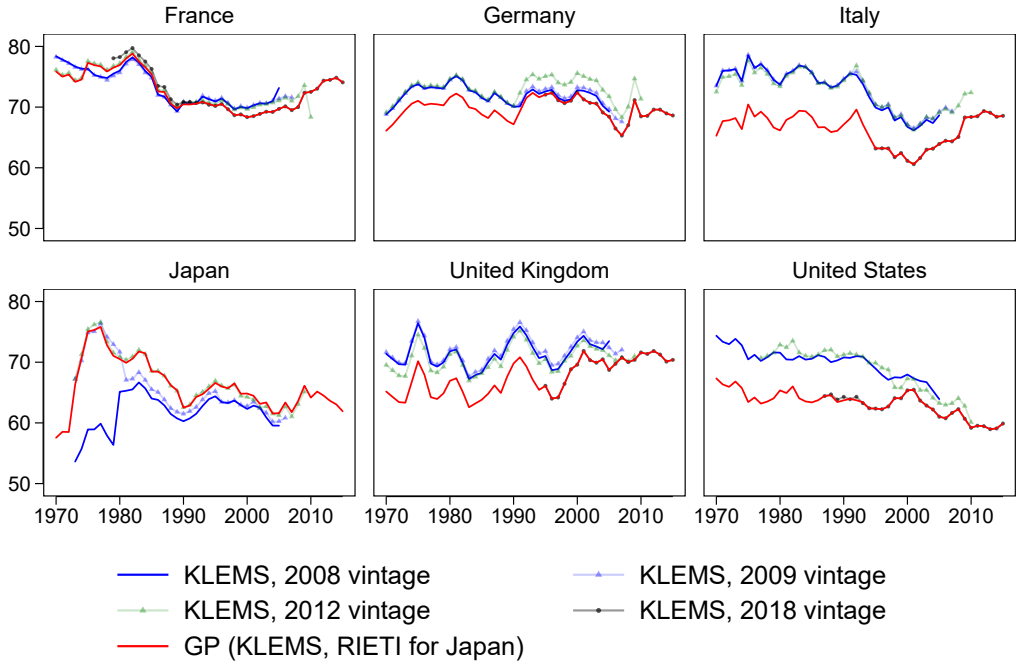
Note: Share of total employee compensations in GVA. KLEMS GP shows our final extended series. We do not show Canada as it is only available in the 2008 update, nor Japan in 2018 or GP because only labor shares are available. KLEMS 2008 data for the US shows the SIC dataset (not consistent with the NIPA tables), whereas the 2018 vintage shows the NAICS dataset (consistent with the NIPA tables). KLEMS GP uses the SIC data only before 1977 since NAICS data are only available starting in 1977. Autor and Salomons (2018) use SIC data for all years available in the 2008 vintage.

Figure A.2 – Gross domestic wage share, comparison across different KLEMS vintages for the G7, business sector, 1970-2015, in %



Source: authors' calculation using EU KLEMS (2018).
Note: Share of total employee compensations in GVA. We do not show Canada as it is only available in the 2008 update, nor Japan in 2018 or GP because only labor shares are available. KLEMS 2008 data for the US shows the SIC dataset (not consistent with the NIPA tables), whereas the 2018 vintage shows the NAICS dataset (consistent with the NIPA tables). KLEMS GP uses the SIC data only before 1977 since NAICS data are only available starting in 1977. Autor and Salomons (2018) use SIC data for all years available in the 2008 vintage.

Figure A.3 – Gross domestic labor share, comparison across different KLEMS vintages for the G7, business sector, 1970-2015, in %



Source: authors' calculation using EU KLEMS (2018).
Note: Share of total labor compensations in GVA. KLEMS GP shows our final extended series (using RIETI (2015*b*) for Japan). We do not show Canada as it is only available in the 2008 update. KLEMS 2008 data for the US shows the SIC dataset (not consistent with the NIPA tables), whereas the 2018 vintage shows the NAICS dataset (consistent with the NIPA tables). KLEMS GP uses the SIC data only before 1977 since NAICS data are only available starting in 1977. Autor and Salomons (2018) use SIC data for all years available in the 2008 vintage.

Table A.2 – Coverage of final dataset

Country group	Country	Code	Adj. business sector	Business sector: source	Unadj. corp. sector	Corp. sector: source	Adj. corp. sector
G7	Canada	CA	1970-2014	STAN, pre-1997: world KLEMS			
G7	France	FR	1970-2015	EU KLEMS	1970-2015	Eurostat	1995-2015
G7	Germany	DE	1970-2015	EU KLEMS	1980-2015	Eurostat and K. & N. (2014)	1995-2015
G7	Italy	IT	1970-2015	EU KLEMS	1980-2015	Eurostat and K. & N. (2014)	1995-2015
G7	Japan	JP	1970-2015	RIETI 2015, post-2012: STAN			
G7	United Kingdom	UK	1970-2015	EU KLEMS	1987-2015	Eurostat and K. & N. (2014)	1995-2015
G7	United States	US	1970-2015	EU KLEMS	1970-2015	Eurostat	
EU15	Austria	AT	1970-2015	EU KLEMS	1995-2015	Eurostat	1995-2015
EU15	Belgium	BE	1970-2015	EU KLEMS	1985-2015	Eurostat and K. & N. (2014)	
EU15	Denmark	DK	1970-2015	EU KLEMS	1981-2015	Eurostat and K. & N. (2014)	1995-2015
EU15	Finland	FI	1970-2015	EU KLEMS	1975-2015	Eurostat and K. & N. (2014)	1995-2015
EU15	Greece	EL	1970-2015	EU KLEMS	1995-2015	Eurostat	
EU15	Ireland	IE	1970-2014	EU KLEMS	1995-2014	Eurostat	
EU15	Luxembourg	LU	1970-2015	EU KLEMS	1995-2015	Eurostat	1995-2015
EU15	Netherlands	NL	1970-2015	EU KLEMS	1980-2015	Eurostat and K. & N. (2014)	1995-2015
EU15	Portugal	PT	1970-2015	EU KLEMS	1995-2015	Eurostat	1995-2015
EU15	Spain	ES	1970-2015	EU KLEMS	1995-2015	Eurostat	
EU15	Sweden	SE	1970-2015	EU KLEMS	1970-2015	Eurostat	1995-2015
EU28, AE	Cyprus	CY	1995-2015	EU KLEMS	1995-2015	Eurostat	
EU28, AE	Czech Republic	CZ	1995-2015	EU KLEMS	1993-2015	Eurostat and K. & N. (2014)	1995-2015
EU28, AE	Estonia	EE	1995-2015	EU KLEMS	1994-2015	Eurostat and K. & N. (2014)	1995-2015
EU28, AE	Latvia	LV	1995-2015	EUKLEMS	1994-2015	Eurostat and K. & N. (2014)	1995-2015

Table A.3 – Coverage of final dataset, continued

Country group	Country	Code	Adj. business sector	Business sector: source	Unadj. corp. sector	Corp. sector: source	Adj. corp. sector
EU28, AE	Lithuania	LT	1995-2015	EU KLEMS	1995-2015	Eurostat	
EU28, AE	Malta	MT	2007-2015	Eurostat	2000-2015	Eurostat and K. & N. (2014)	
EU28, AE	Slovakia	SK	1995-2015	EU KLEMS	1995-2015	Eurostat	1995-2015
EU28, AE	Slovenia	SI	1995-2015	EU KLEMS	1995-2015	Eurostat	1995-2015
AE	Iceland	IS	2008-2015	Eurostat	2000-2014	Eurostat	
AE	Korea	KR	1970-2012	World KLEMS*			
AE	Norway	NO	1975-2015	Eurostat	1978-2015	Eurostat	2012-2015
EU28, EE	Bulgaria	BG	2000-2015	EU KLEMS	1995-2015	Eurostat	
EU28, EE	Croatia	HR	2008-2015	EU KLEMS	1997-2012	Eurostat and K. & N. (2014)	
EU28, EE	Hungary	HU	2010-2015	EU KLEMS	1995-2015	Eurostat	
EU28, EE	Poland	PL	1995-2015	EU KLEMS	1995-2015	Eurostat	
EU28, EE	Romania	RO	1995-2015	EU KLEMS	1989-2015	Eurostat and K. & N. (2014)	
global	China	CN	1987-2010	World KLEMS, not adj. for self-empl.	1992-2015	Eurostat	
global	India	IN	1980-2015	World KLEMS	1999-2010	K. & N. (2014)	
global	Russia	RU	1995-2014	World KLEMS	2002-2015	OECD	

*Only partly adjusted for self-employed.

A.4. Real Estate Data

Last, we gather data on rental income, housing prices and housing structures from the (OECD, 2020). 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). See Table A.4 for a classification of fixed assets available in national accounts. Housing structures correspond to "dwellings".

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.4 – 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

B. Comparison of labor shares across alternate sources

This appendix compares total economy and corporate sector wage shares across a wide range of sources for the main countries in our sample: the G7. Data for each country is shown only when concurrent data sources exist.

We first focus on the total economy wage share (total employee compensations to total gross value added, with no adjustments). We include as many of the following series as they are available:

- Karabarbounis and Neiman (2014*b*, merged);
- Piketty and Zucman (2014*b*, not adjusted for self-employed);
- the Penn World Table version 9.1 (share of labor income of employees in total GDP, not adjusted for self-employed) (Feenstra, Inklaar and Timmer, 2015);
- EU KLEMS (2018); OECD (2017); World KLEMS (2020); RIETI (2015*b*) (KLEMS world data source for Japan);
- OECD (2020); Eurostat (2020); BEA (2020*b*), using sector accounts ("sec.") or using industry accounts ("ind."), at market prices ("market pr.", including both taxes on production and products) and at basic prices ("basic pr.", including only taxes on products).

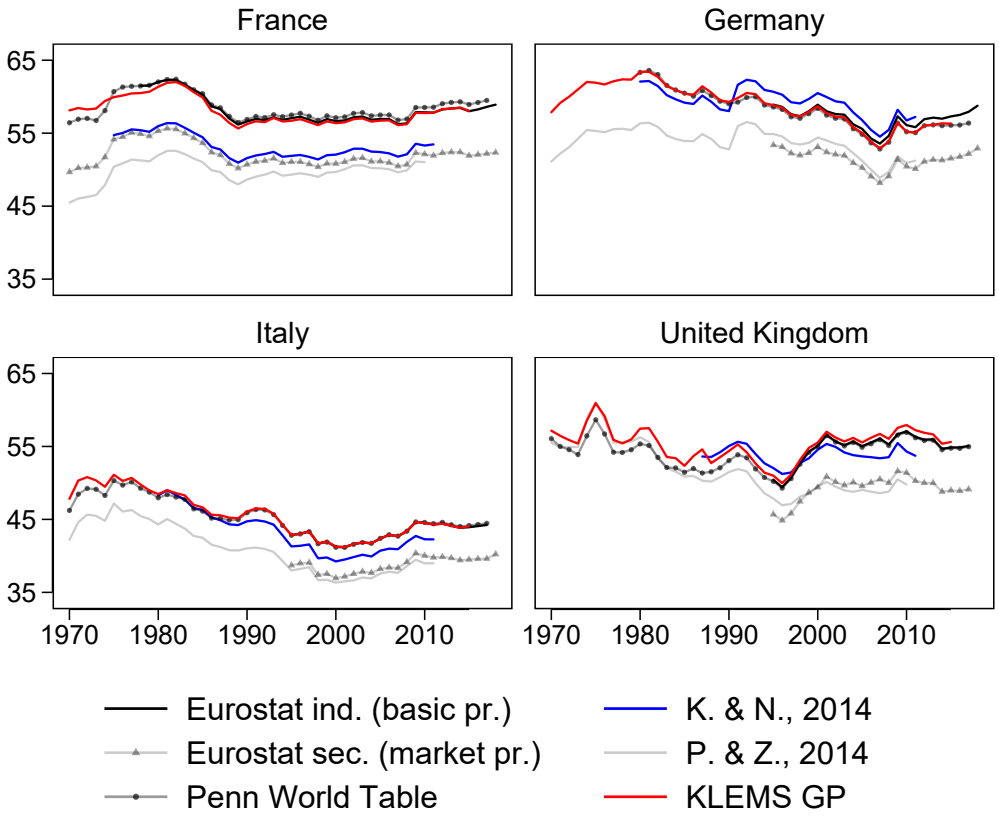
We then focus on the corporate sector wage share (total employee compensations to total gross value added in the corporate sector, again with no adjustments). We include as many of the following series as they are available:

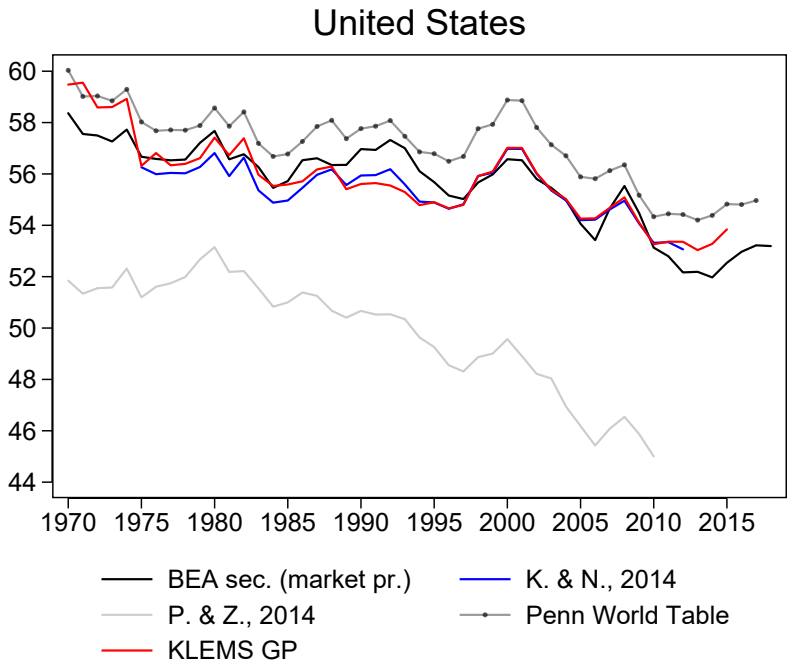
- Karabarbounis and Neiman (2014*b*, merged);
- Piketty and Zucman (2014*b*);
- OECD (2020); Eurostat (2020) sector accounts data.

The trends generally agree across sources, which suggests that neither revisions in national accounts nor the use of EU KLEMS drive our results. The levels differ in some cases due to different treatment of taxes.

Three differences are worth highlighting: first, Karabarbounis and Neiman (2014*a*) and Piketty and Zucman (2014*a*) series for Germany jump in 1990. This appears to be driven by the concatenation of two series with different definitions, and disappears in more recent vintages. Second, the Japanese wage share used in Karabarbounis and Neiman (2014*a*) – which is the basis for the corporate series reported in the main results – appears to concatenate series in basic prices and market prices which leads to a sizable decline. Series using consistent definitions are essentially stable since 1975. Third, the Piketty and Zucman (2014*a*) wage shares for the US are lower than the rest due to differences in the definition of employees.

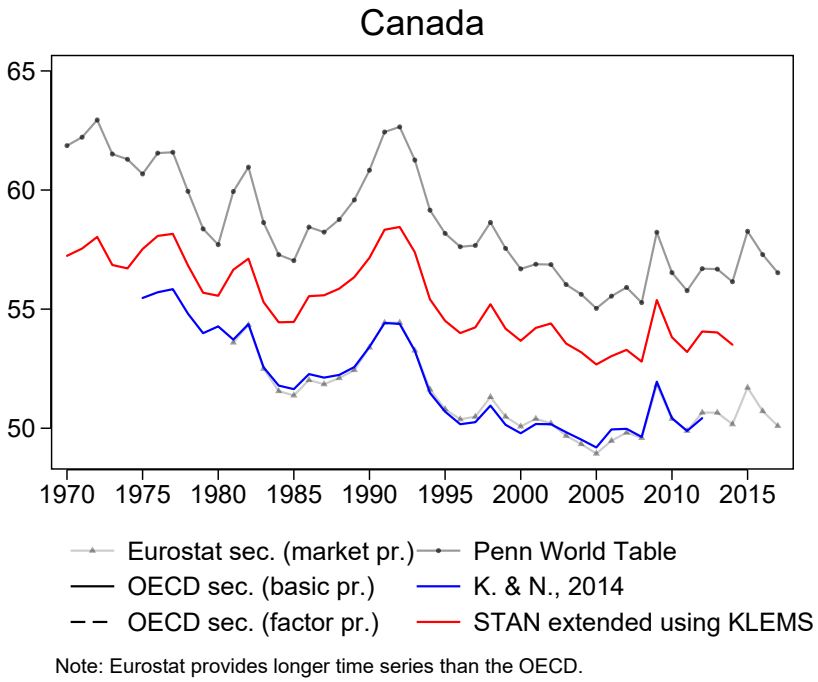
Figure B.1 – Gross domestic wage share, total economy, comparison across data sources, selected countries, 1970-2015, in %

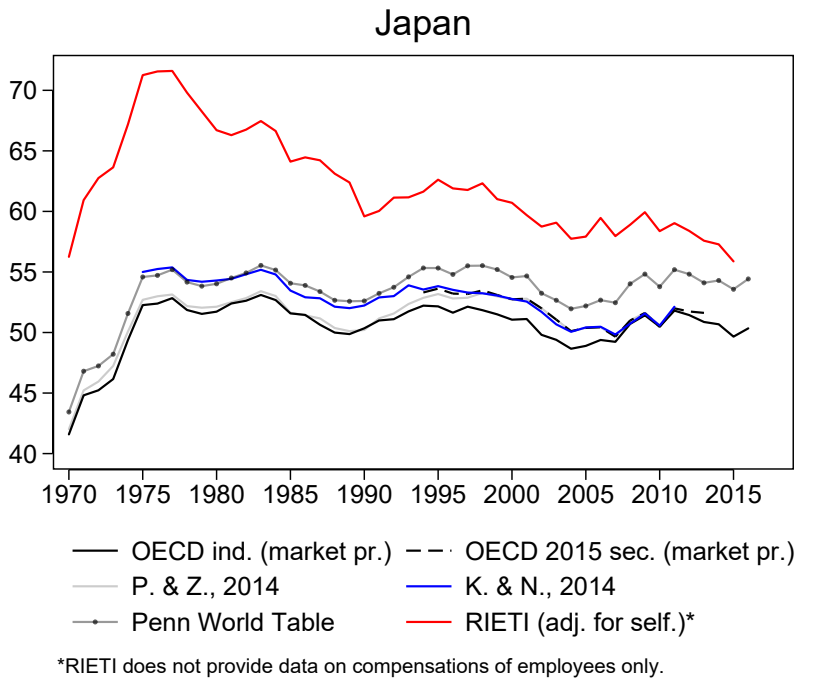




Source: authors' calculations. Share of total employee compensations in total GVA.

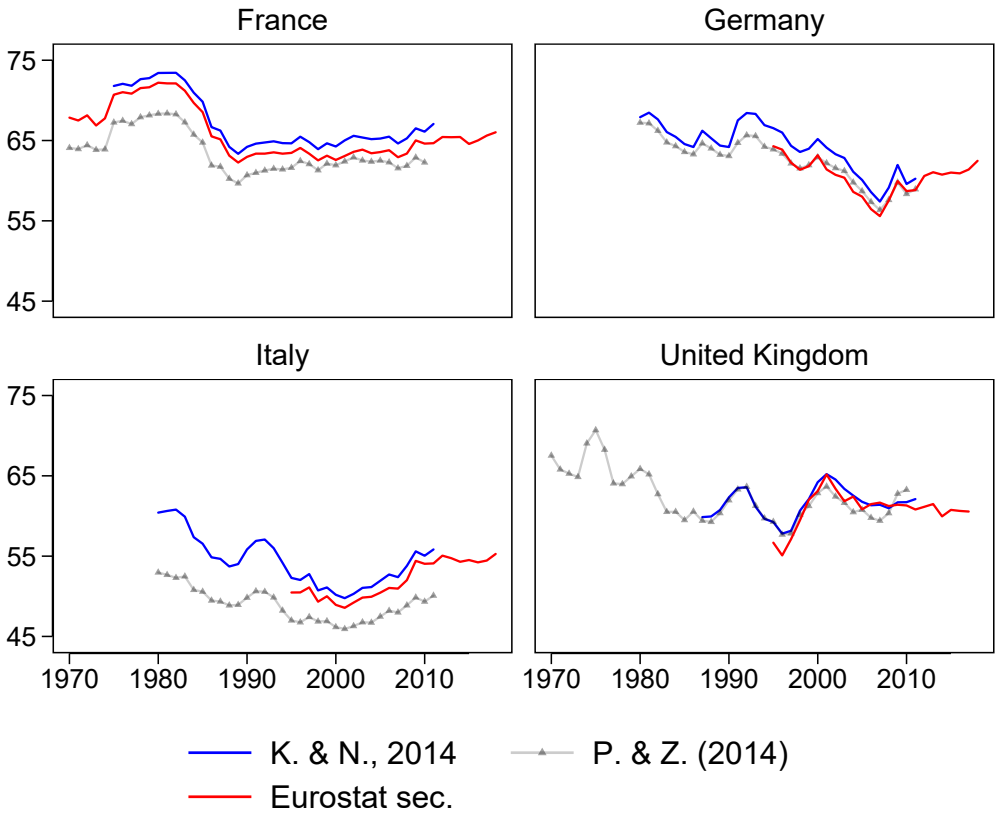
Figure B.2 – Gross domestic wage share, total economy, comparison across data sources, selected countries, 1970-2015, in %

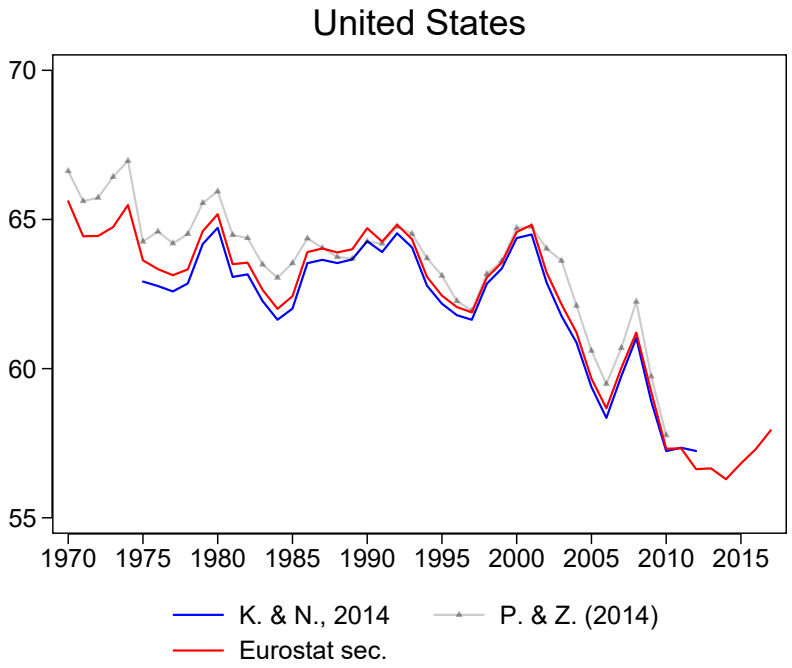




Source: authors' calculations. Share of total employee compensations in total GVA. OECD uses the latest vintage (2019), except when indicated otherwise.

Figure B.3 – Gross domestic wage share, corporate sector, comparison across data sources, G7, 1970-2015, in %





Source: authors' calculations. Share of total employee compensations in total GVA.

C. Comparison of labor shares for China and India:

Next we discuss the evolution of the labor share for China and India. We focus on these two countries given their size and the fact that they publish industry accounts through the KLEMS consortium.

We begin with the total economy wage share (total employee compensations to total gross value added, with no adjustments), and compare as many of the following series as they are available:

- Karabarbounis and Neiman (2014*b*, merged);
- the Penn World Table version 9.1 (share of labor income of employees in total GDP, not adjusted for self-employed) (Feenstra, Inklaar and Timmer, 2015);
- World KLEMS (2020) complemented with RIETI (2015*a*); Reserve Bank of India (2019);
- OECD (2020); Eurostat (2020) national accounts data, using sector accounts ("sec.") or using industry accounts ("ind."), at market prices ("market pr.", including both taxes on production and products) and at basic prices ("basic pr.", including only taxes on products).

We then focus on the corporate sector wage share (total employee compensations to total gross value added in the corporate sector, again with no adjustments) for China. We do not show evidence for India as we only have the Karabarbounis and Neiman (2014*a*) series available.

Revisions in the treatment of taxes seem to affect the Chinese series reported by Karabarbounis and Neiman (2014*a*), albeit in opposite directions: they exaggerate the decline in the total economy wage share, but temper the decline in the corporate wage share. Using consistent definitions, the total economy wage share remains stable but the corporate wage share falls by more. Importantly, note that neither of these series are adjusted for the self-employed: Chinese industry accounts do not include data on self-employment and it is not clear whether the corporate sector includes incorporated self-employed. Note also that nearly all Chinese series exhibit a large decline in 2004. This is likely driven by revisions to national accounts, as reported by Bai and Qian (2010). Excluding the 2004 drop, even the corporate wage share remains largely stable since 1990.

In India, the total economy wage share falls by approximately five percent. Adjusting for self-employment, however, yields a stable labor share, in both the total economy and the business sector – a result in contrast with Karabarbounis and Neiman (2014*a*).

In total, this evidence tempers the decline in the labor share in both countries and emphasizes difficulties in measurement. This is why we focus on advanced economies in the body of the document.

Figure C.1 – Gross domestic wage share, total economy, comparison across data sources, China, 1970-2015, in %

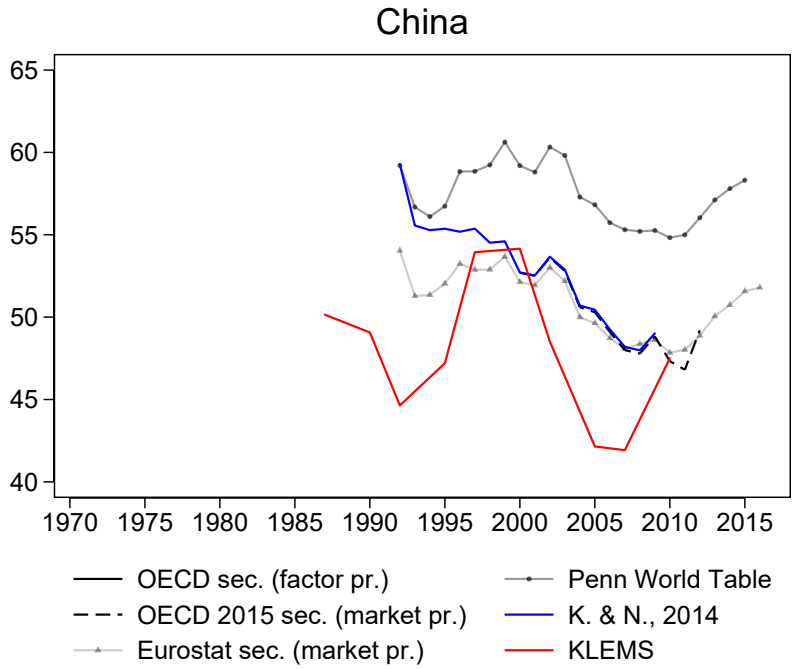
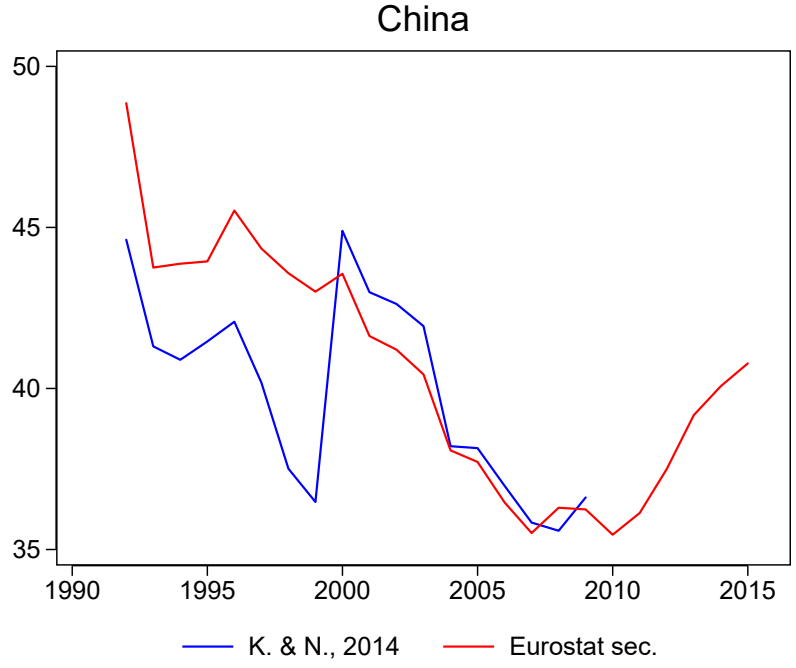


Figure C.2 – Gross domestic wage share, corporate sector, comparison across data sources, China, 1970-2015, in %



Source: authors' calculations. Share of total employee compensations in total GVA.

Figure C.3 – Gross domestic wage shares, total economy, comparison across data sources, India, 1970-2015, in %

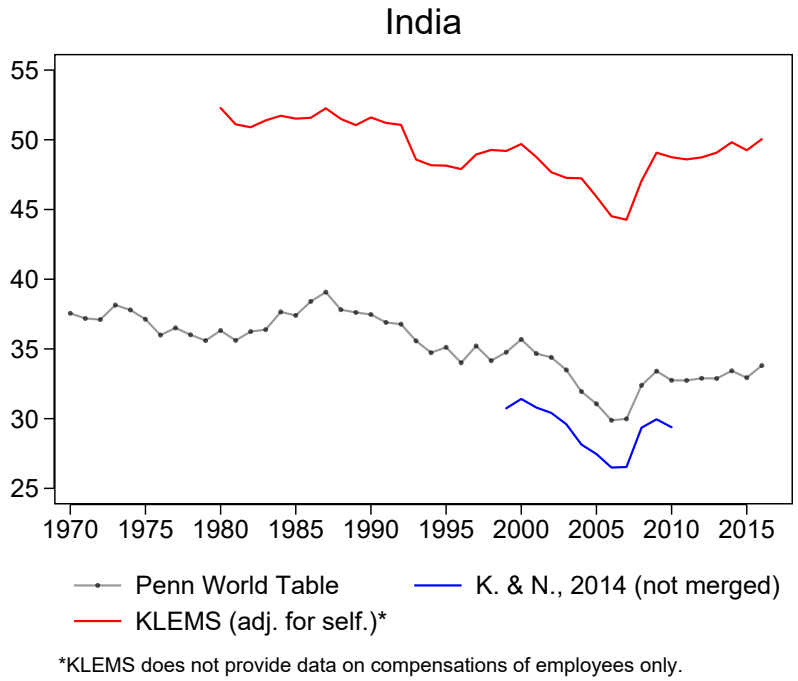
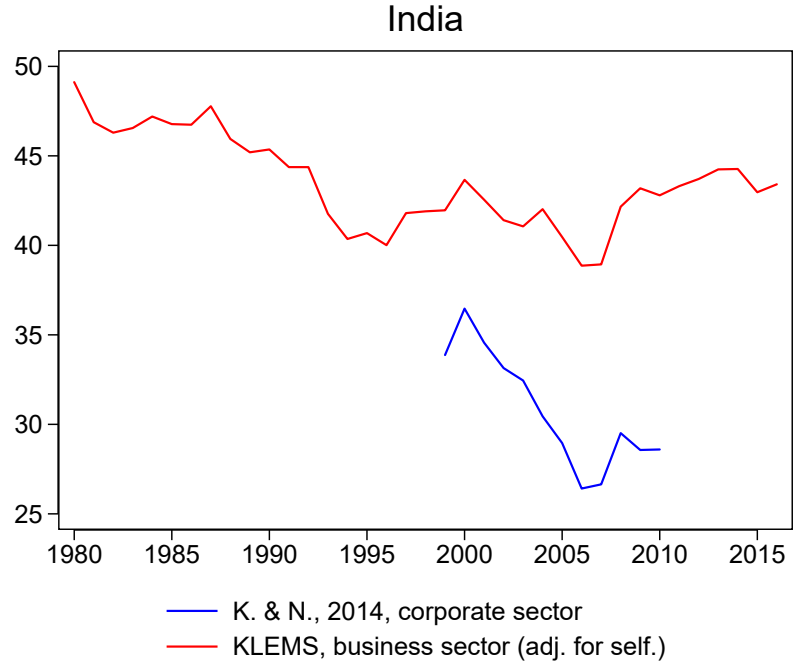


Figure C.4 – Corporate vs. business sector shares, comparison across data sources, China, 1970-2015, in %



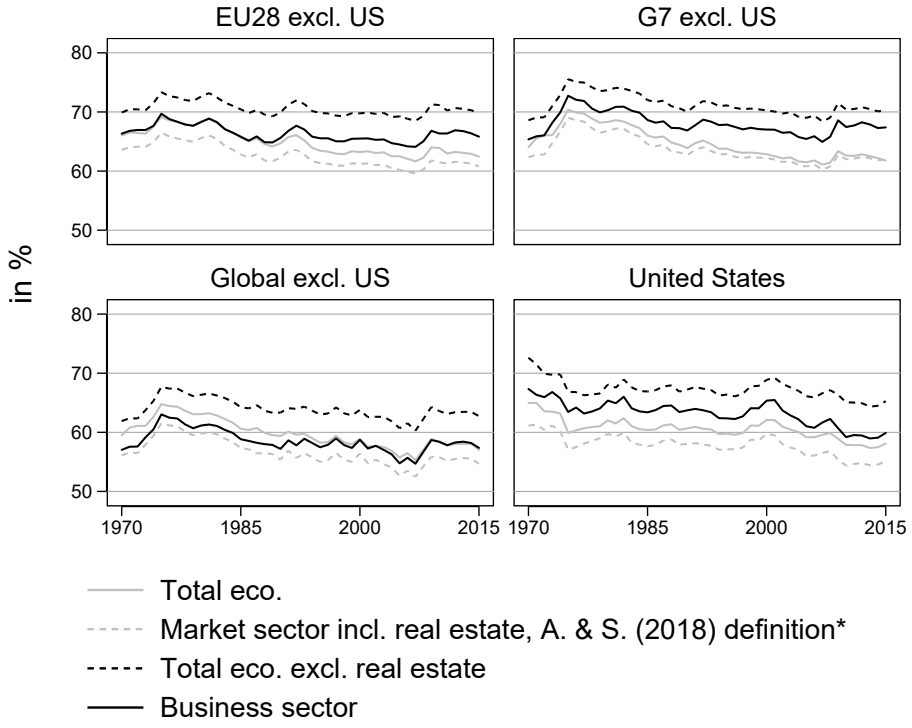
Source: authors' calculations. Share of total employee compensations in total GVA.

D. Robustness tests around measurement choices

This appendix presents two robustness tests on our measurement choices:

- Figure D.1 shows that global labor shares are stable so long as real estate is excluded (black lines), irrespective of which other industries are excluded.
- Figure D.2 contrasts net and gross labor shares using data on the consumption of fixed capital and KLEMS depreciation estimates. Given the rise in depreciation, net labor shares exhibit slightly more positive trends than gross shares.

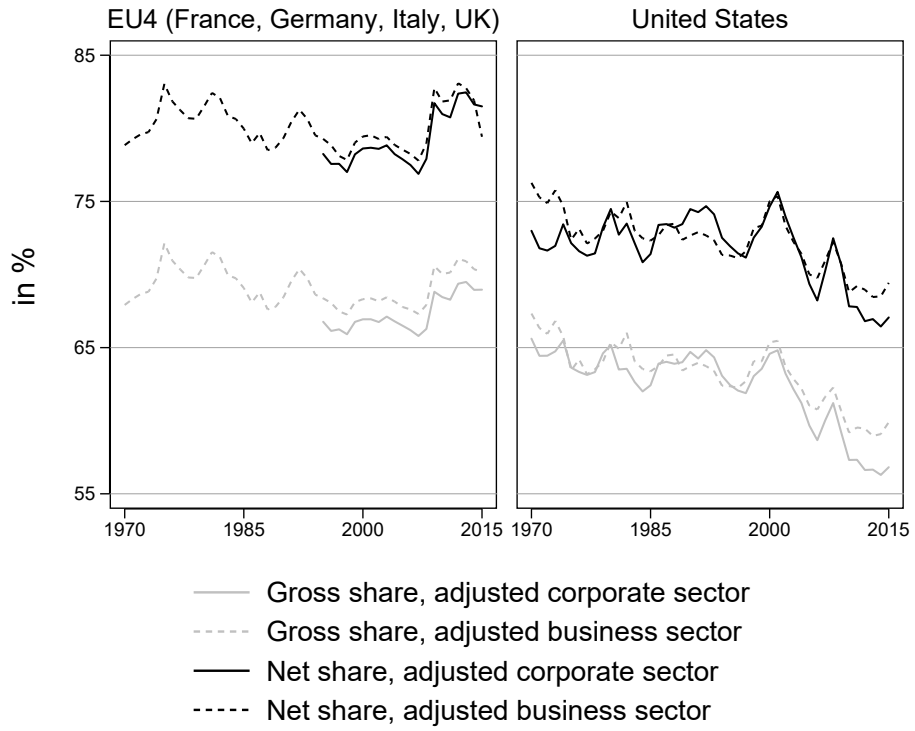
Figure D.1 – Gross domestic labor share, by sector,1970-2015, in %



Source: authors' calculation using EU KLEMS.

* Autor and Salomons (2018) include real estate but exclude farm, private households and public administration sectors. Series are adjusted for self-employment. Aggregates plot the year fixed effects from regressions of labor shares that also include country fixed effects, to account for entry and exit during the sample. The regressions are weighted by expenditure-side real GDP at chained PPPs from the Penn World Table version 9.1. The effects have been normalized to equal the average labor share in 1995.

Figure D.2 – Gross and net domestic labor share, EU4 and United States, 1970-2015, in %



Source: authors' calculation using EU KLEMS, Eurostat and OECD.
Note: Share of total labor compensations in GVA. Series are adjusted for self-employed and housing (see main text for details). Corporate sector net shares based on official estimates of the consumption of fixed capital. Business sector net shares based on KLEMS estimates of capital depreciation at the industry-asset level.

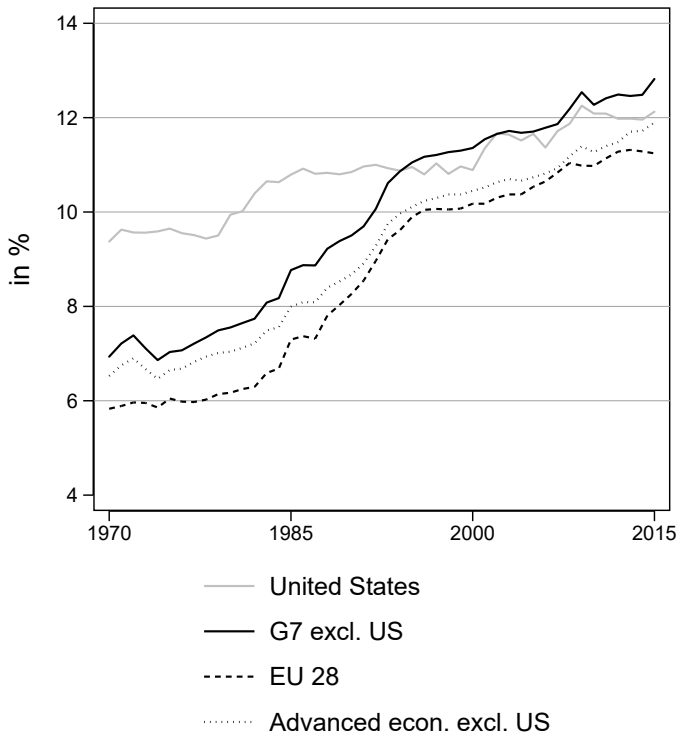
E. Additional details on Real Estate

E.1. The Treatment of Residential Real Estate

We begin by providing additional details on the contribution of real estate to GDP, and the inclusion of dwellings in the corporate sector:

- Figure E.1 shows the contribution of real estate to value added, which increased much faster in Europe and advanced economies than the US.
- Figure E.2 documents the important share of ownership of dwellings in corporate sectors.
- Figure E.3 to E.5 provide additional details on the ownership of dwellings for France, the US and the UK.

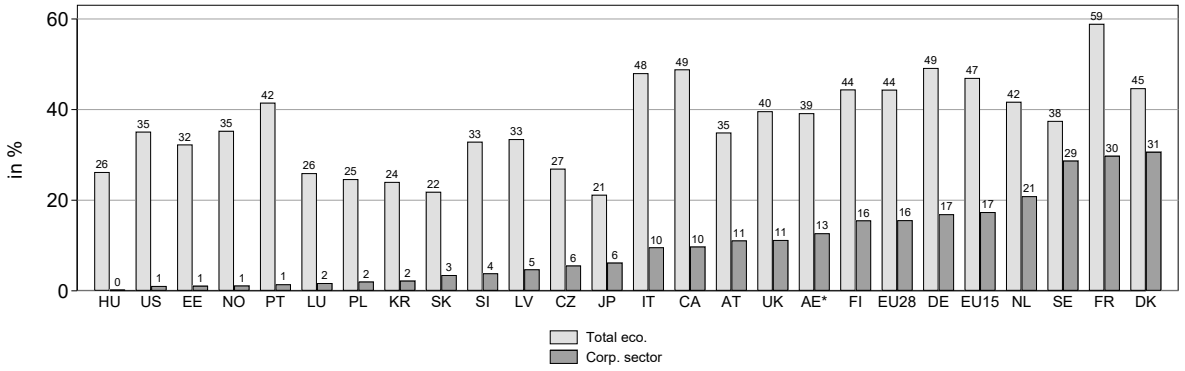
Figure E.1 – Share of the real estate sector in total GVA, 1970-2015, in %



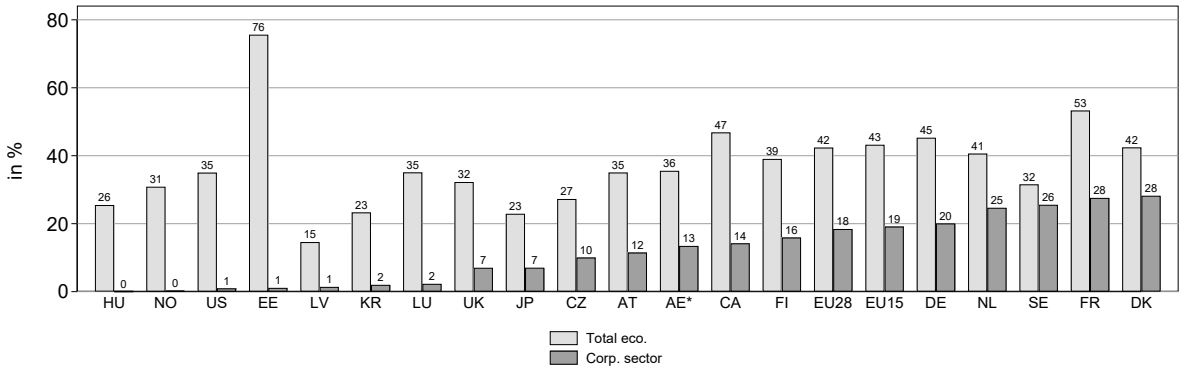
Source: authors' calculations using EU KLEMS. Real estate activities is sector L in ISIC rev. 4. Country aggregates plot the year fixed effects from regressions of the real estate share that also include country fixed effects, to account for entry and exit during the sample. The regressions are weighted by expenditure-side real GDP at chained PPPs from the Penn World Table version 9.1. The effects have been normalized to equal the average share in 1995.

Figure E.2 – Share of dwellings in the total stock of produced fixed assets, by sector and country

(a) 2015



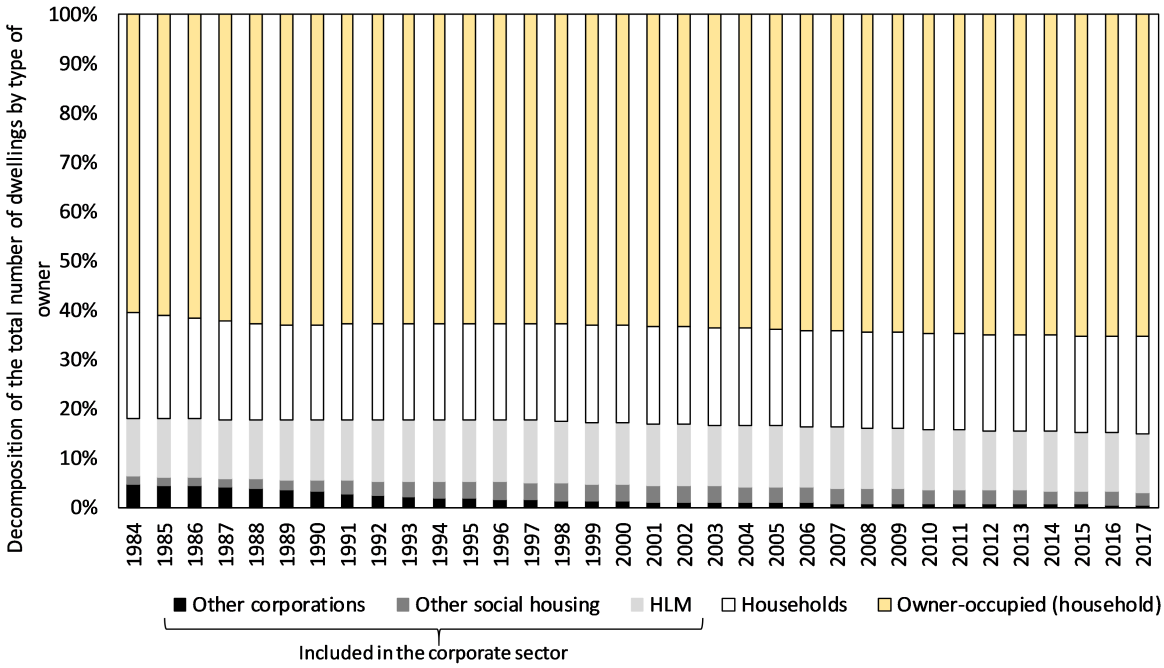
(b) 1995



Source: authors' calculations using OECD. See Table A.4 for a description of non-financial produced fixed assets.

*AE includes all advanced economies available in our dataset, except the US (33 countries).

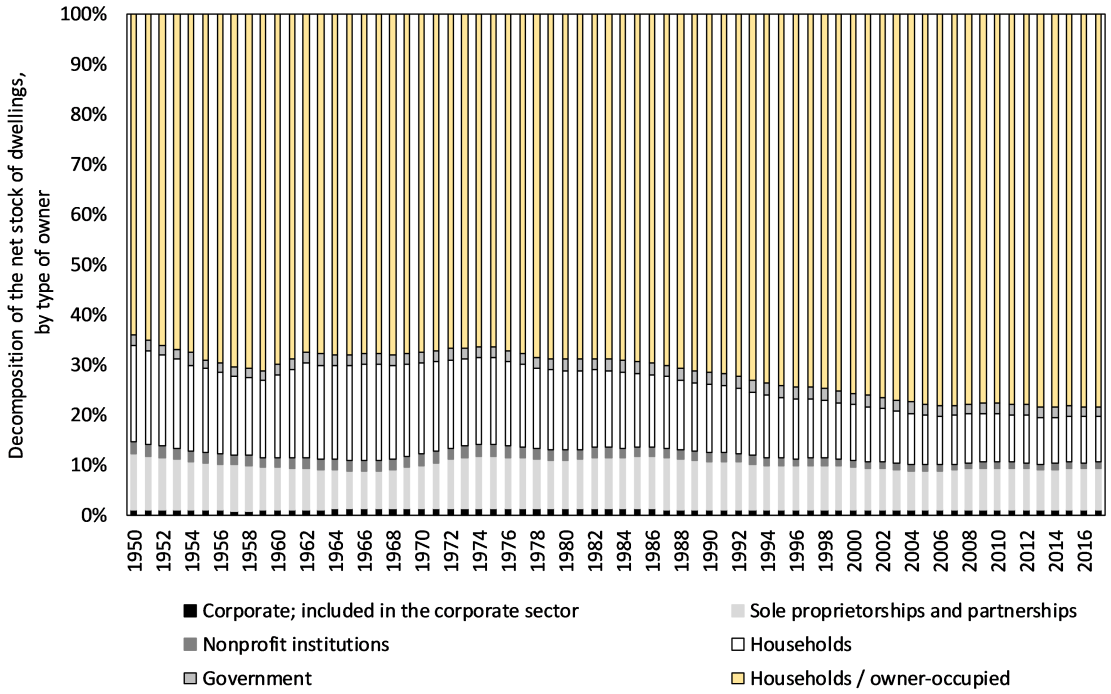
Figure E.3 – Housing stock, by type of owner, France, 1984-2017, in %



Source: authors' calculations using *Compte satellite du logement* from Ministère de la Cohésion des territoires (2020), 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.

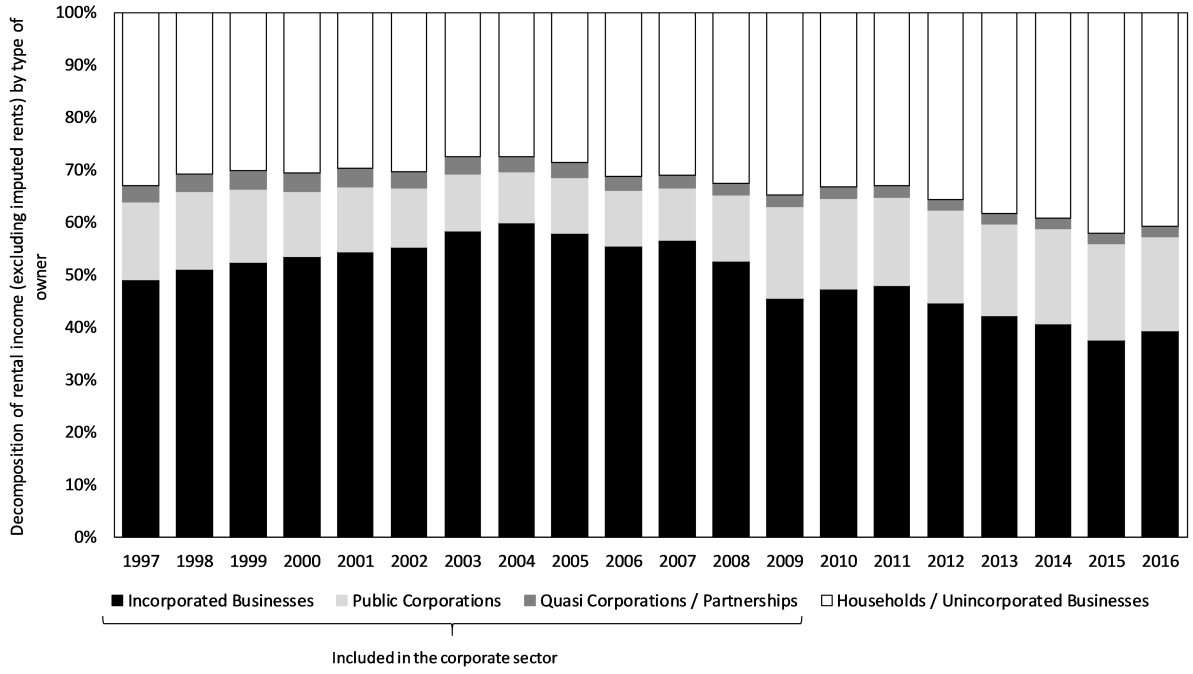
Note: HLM are rent-controlled dwellings.

Figure E.4 – Current-cost net housing stock, by type of owner, United-States, 1950-2017, in %



Source: authors' calculations using BEA (2020*a*).

Figure E.5 – Rental income by institutional sector, UK, 1997-2016, in %



Source: ONS (2018).

Note: rental income from both dwellings and other buildings.

E.2. Estimating the Housing Share of Corporate Value Added

Next we describe alternate methods for estimating the housing contribution of value added in the corporate sector.

National Accounts report housing income in three different ways:

- Y^{RE}: real estate value added from industry accounts (including all activities related to both residential and non residential real estate);
- $Rents$: total housing rents paid by households in their final expenditure accounts;
- GOS^h: 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 E.6 contrasts the three measures for France. As shown, the three series differ in levels. Household value added (GOS^h) is the lowest, since it includes only rents on dwellings owned by the household sector. $Rents$ are slightly larger since they cover all dwellings. Real estate value added (Y^{RE}) is the largest as it 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. Nonetheless, all measures evolve close to each other.

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

E.2.1. Four Approaches for Estimating Y_h^c

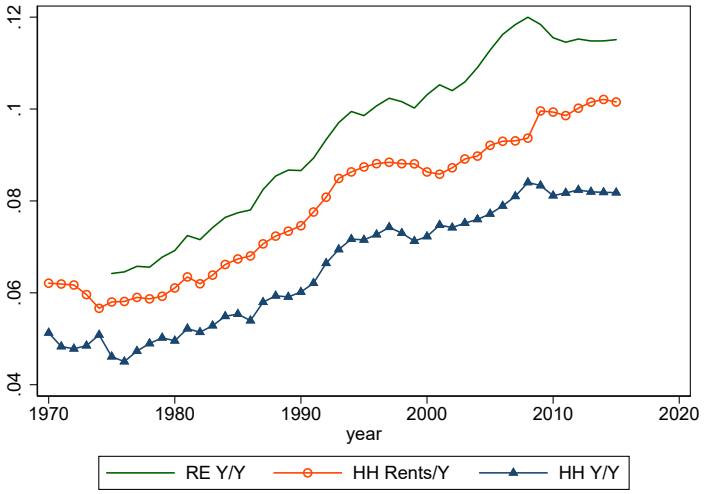
These definitions, combined with economic theory, provide at least four ways of estimating returns to housing R_h, which can then be used to estimate housing value added in the corporate sector through $Y_h^c = R_h \times K_h^c$, where K_h^c denotes the nominal stock of residential capital in the corporate sector.

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, $R^h = \frac{GOS^h}{K_h^h}$. Assuming that housing assets in the corporate sector attain the same return as in the household sector, we can estimate:

$$Y_h^c = \frac{GOS^h}{K_h^h} \times K_h^c$$

2. Allocating rental expenditures across sectors (Rents ex HH/Kstruc): Unfortunately, returns to dwellings in the overall economy may differ substantially from returns in the corporate sector

Figure E.6 – 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.

(e.g., if corporate sector 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^h), and allocate them across sectors:

$$Y_h^c = (Rents - GOS^h)\frac{K_h^c}{K_h - K_h^h}$$

Corporations own most of the dwellings outside the household sector, so this method is likely to closely capture housing income in the corporate 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):

$$R^{HJ} = r_f + \delta^h - g_{p^h}^e \tag{1}$$

where r_f denotes the risk-free rate, $g_{p^h}^e$ 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.[3] We set $\delta^h = 0.0114$, which is the assumed depreciation rate of housing

[3]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.

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.

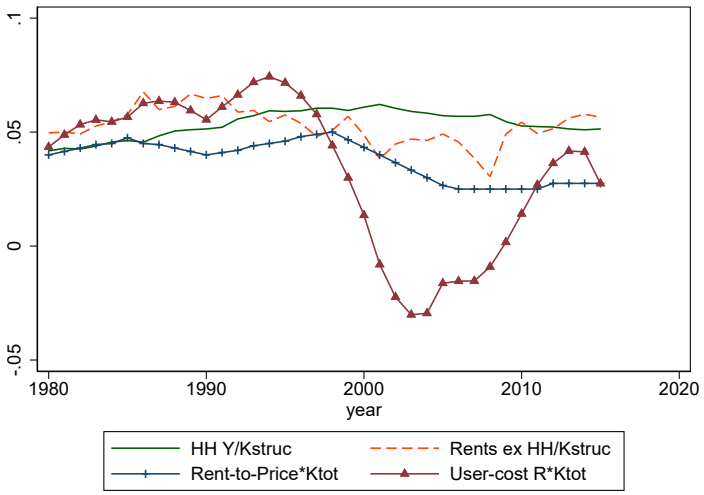
4. Using rent-to-price indices (Rent-to-Price*Ktot): Last, note that R^h under Hall and Jorgenson (1967) is the rental rate for a unit of capital. This is precisely what rent-to-price ratios aim to measure, so we can let R^h equal the rent-to-price ratio. Unfortunately, long time series are not widely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

E.2.2. 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.

Rates of return. Figure E.7 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 **??**, 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.

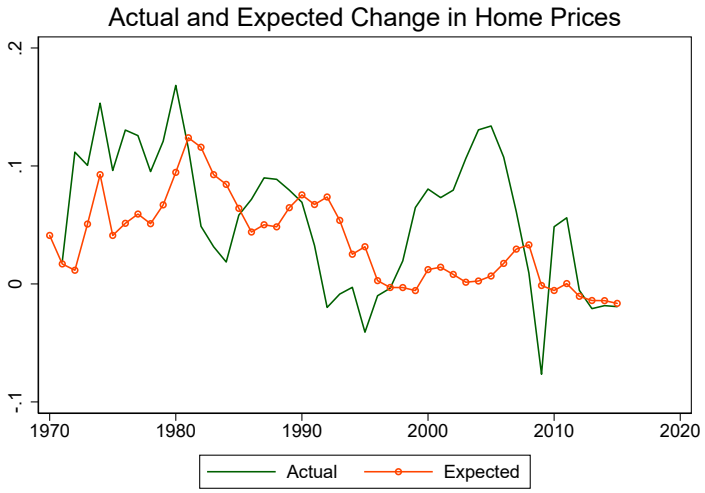
Figure E.7 – Four estimates of R for France



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 E.8, which shows the realized home price change against the expected home price change implied by rent-to-price indices, interest rates and depreciation (using equation 1 above). The expected series is more stable and lags realized changes slightly, consistent with agents updating their expectations over time. 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.

Figure E.8 – Explaining the difference between user-cost and rent-price indices for France



Housing share of corporate gross value added. Applying the required returns to the appropriate capital stock, we obtain estimates of housing value added in the corporate sector. Figure E.9 plots the results, as a share of total corporate value added. The share of housing in corporate 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 corporate labor share. Figure E.10 plots the change in raw (CB) and adjusted corporate labor shares, from 1979 to 2015, following each method. We include the KLEMS business sector series (NFME, non-farm market economy excluding real estate) for comparison. As shown, the corrected corporate series fall by 1 to 2 p.p less than the raw corporate series. This explains about half of the difference between the KLEMS NFME and the raw corporate 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).

Figure E.9 – Housing share of corporate gross value added for France

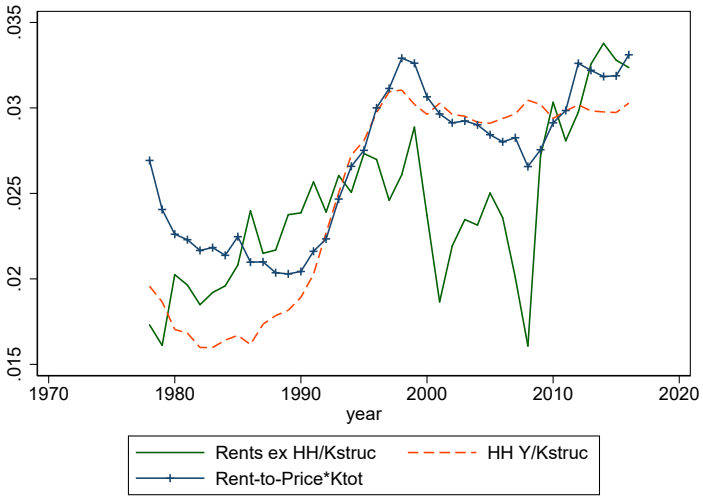
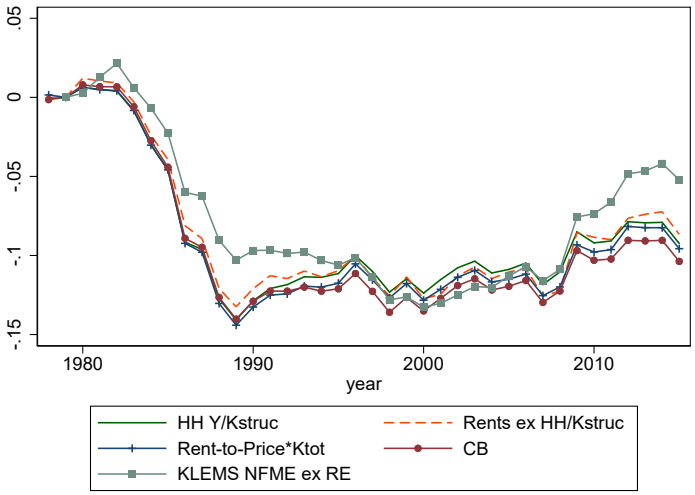


Figure E.10 – Raw and corrected labor shares for France (change from 1979)



E.2.3. All countries

Figure E.11 shows the share of dwellings owned by the corporate sector among the countries for which data are available. Figure E.12 shows the raw and corrected labor shares for the EU15 and the top 3 countries by corporate share of dwellings: Sweden, Denmark and Netherlands. As shown, most corrected series are closer to the KLEMS series than the 'raw' corporate labor shares. Figure E.13 plots the same data in changes since 1995. Again, the adjusted series behave closer to the KLEMS NFME series than the raw corporate series.

Figure E.11 – Corporate share of dwellings, by country, 2015

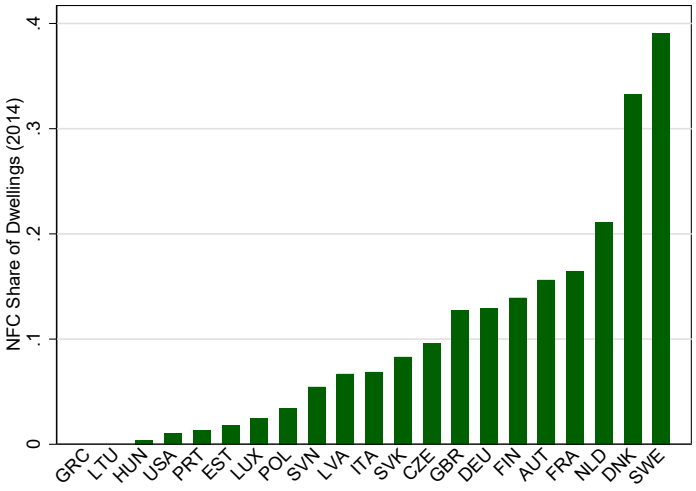


Figure E.12 – Raw and corrected labor shares

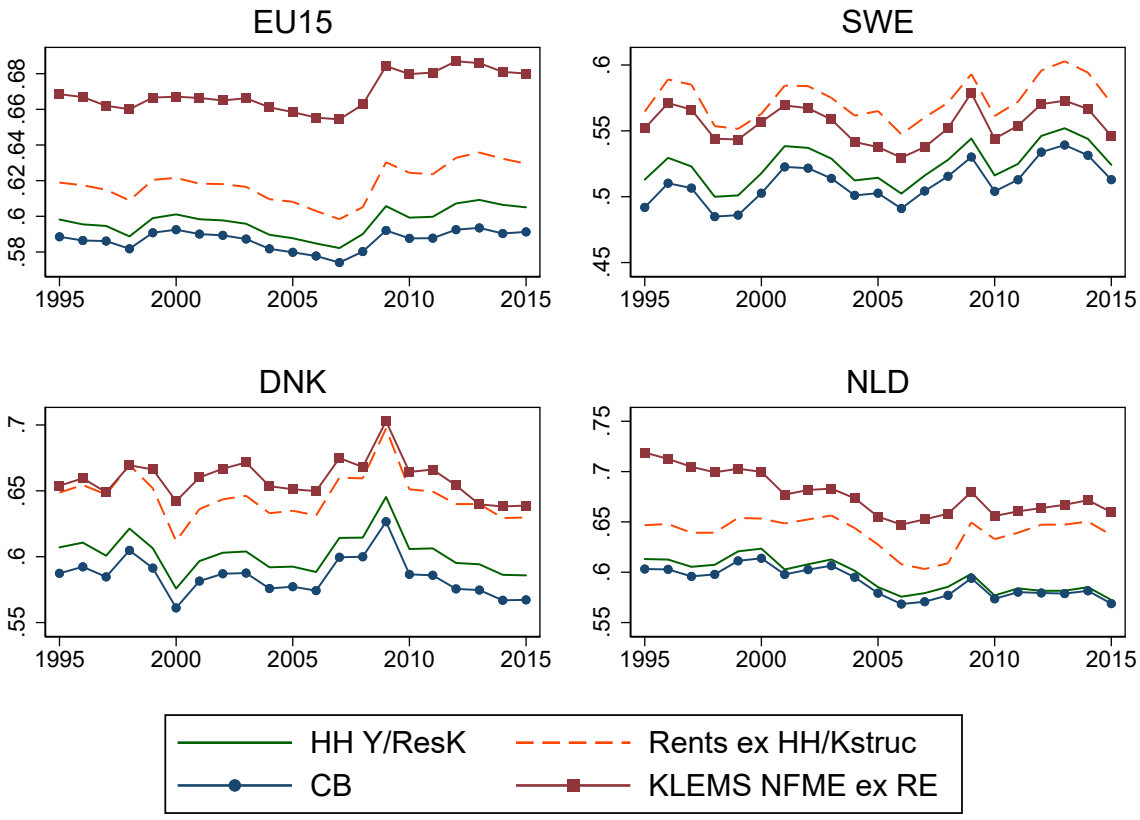
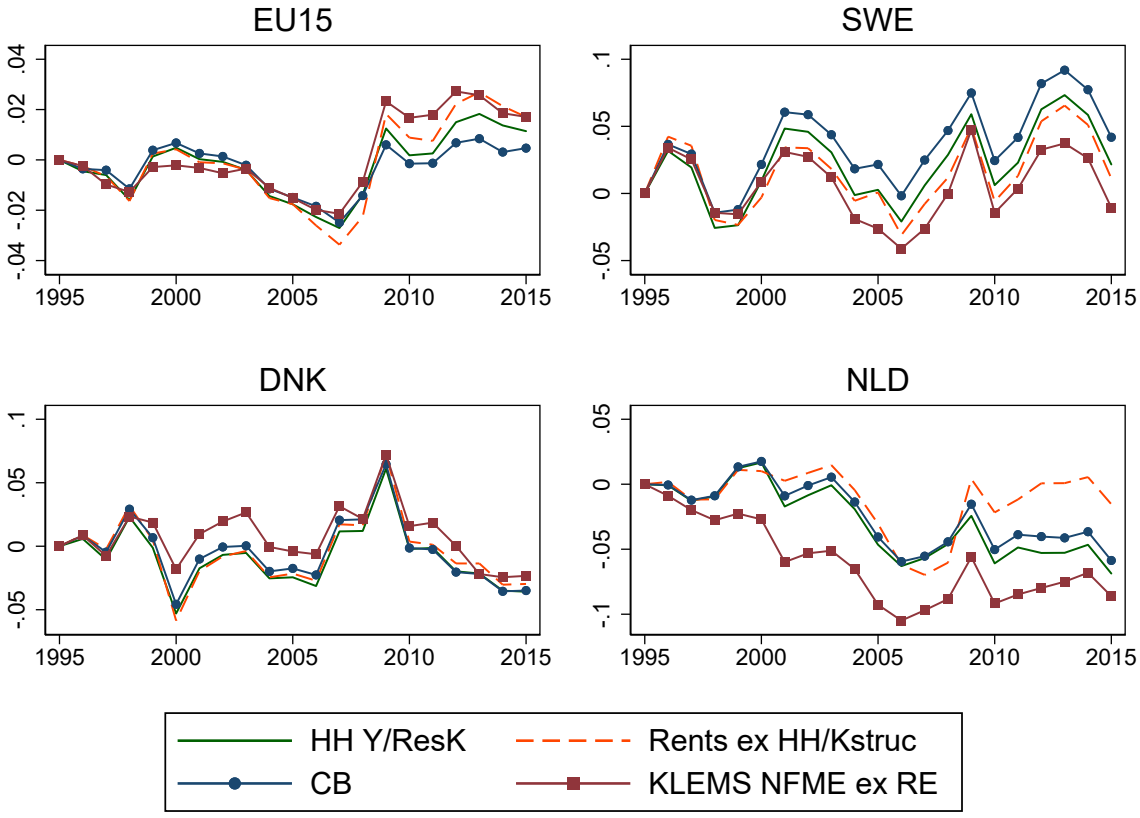


Figure E.13 – Change in raw and corrected labor shares since 1995



E.3. Composition of Real Estate Sector

Last, we provide additional details on the composition of 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 E.1 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 E.1 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.[4]

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

Table E.1 – Decomposition of the real estate (RE) share of gross value added (GVA), average 2005-2015, in %

	Composition of RE activities			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	Ratio of actual to imputed rents in housing
Country	(% of RE sector GVA)				
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	-	-	-	63	34
UK	63	35	1	73	35
SE	91	8	0	42	63
CA	-	-	-	66	34
US	-	-	-	59	32

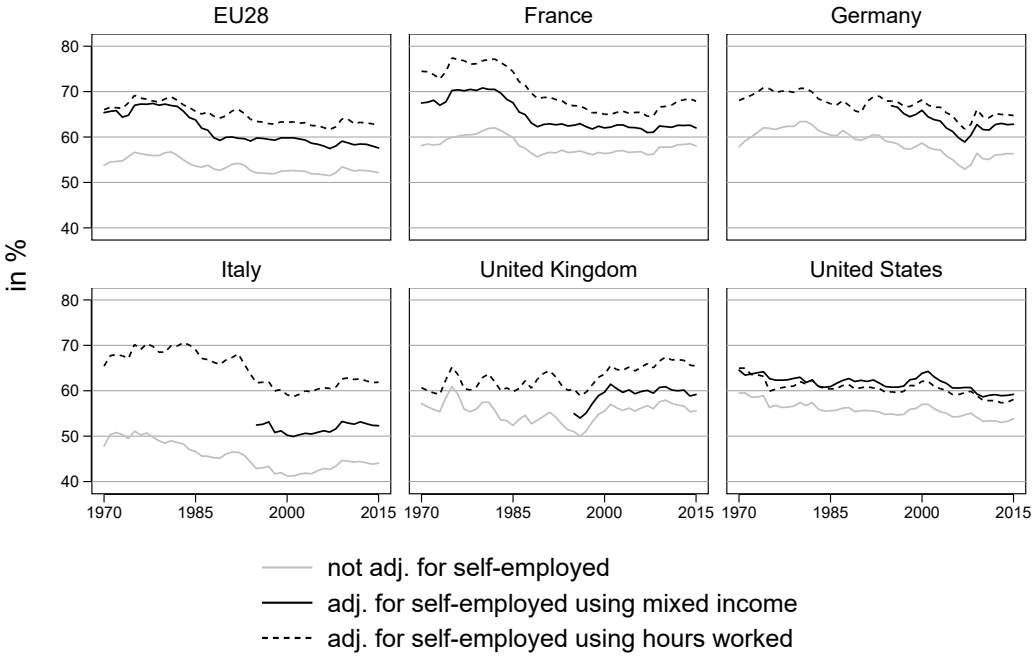
Notes: Table shows the average values from 2005 to 2015, when available. Columns 2-4 show the composition of real estate activities in European economies from Eurostat. Columns 5-6 show the housing share of real estate GVA and the ratio of household expenditures on actual and imputed rents for housing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

F. Additional details on self-employment

This appendix provides additional details on inclusion of self-employment in corporate sector accounts:

- Figure F.1 and Figure F.2 contrast the two main approaches for estimating wages of the self-employed: estimating the compensations of self-employed using (i) mixed income or (ii) the number of hours worked, respectively for the total economy and the business/corporate sector. The gap between the two is stable in the US, but increases in Europe over time, in line with an increasing share of self-employed not accounted for in the measure of mixed income.
- Figure F.3 and F.4 show the prevalence of self-employment in the corporate sectors of Italy and Finland. As shown, the share of total hours worked in the corporate sector are stable or growing, despite the fact that self-employment is declining across most advanced economies.

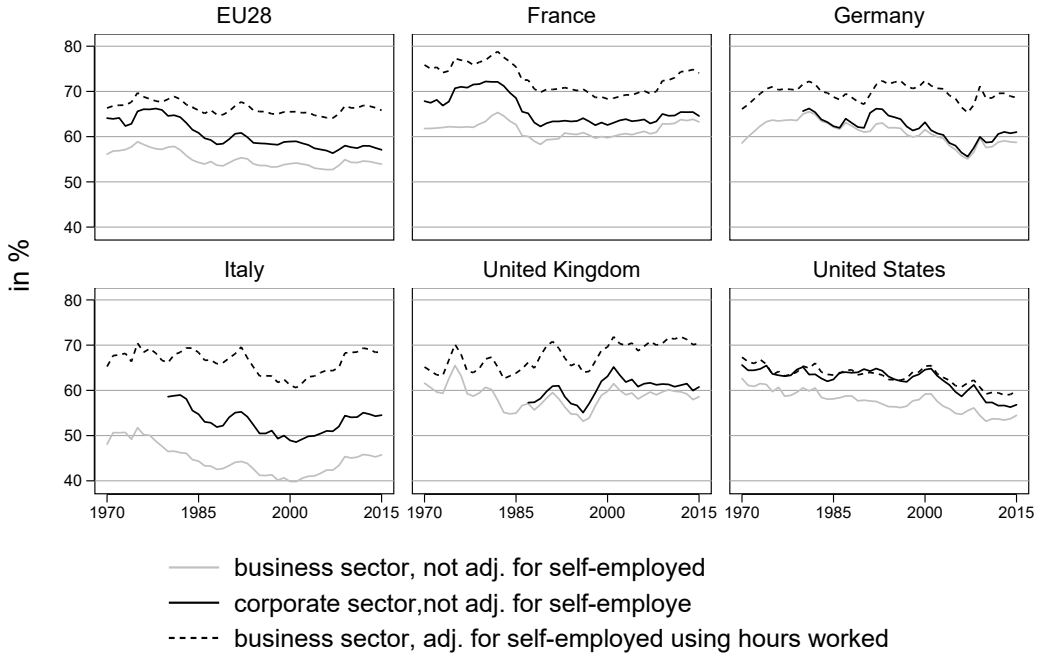
Figure F.1 – Domestic gross labor share adj. or not for self-employed, total economy, Europe and United States, 1970-2015, in %



Source: authors' calculation using OECD and EU KLEMS.

Note: EU28 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 expenditure-side real GDP at chained PPPs from the Penn World Table version 9.1. The effects have been normalized to equal the average labor share in 1995.

Figure F.2 – Domestic gross labor share adj. or not for self-employed, corporate and business sectors, Europe and United States, 1970-2015



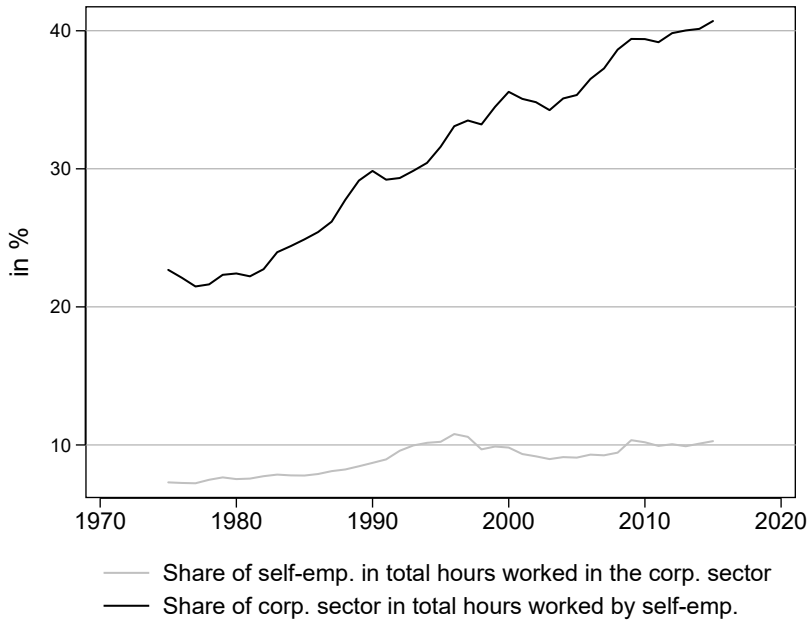
Source: authors' calculation using OECD and EU KLEMS.

Note: EU28 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 expenditure-side real GDP at chained PPPs from the Penn World Table version 9.1. The effects have been normalized to equal the average labor share in 1995.

Figure F.3 – Self-employed in the corporate sector, Italy, 1995-2015, in %

Source: authors' calculations using ISTAT (2020).

Figure F.4 – Self-employed in the corporate sector, Finland, 1975-2015, in %

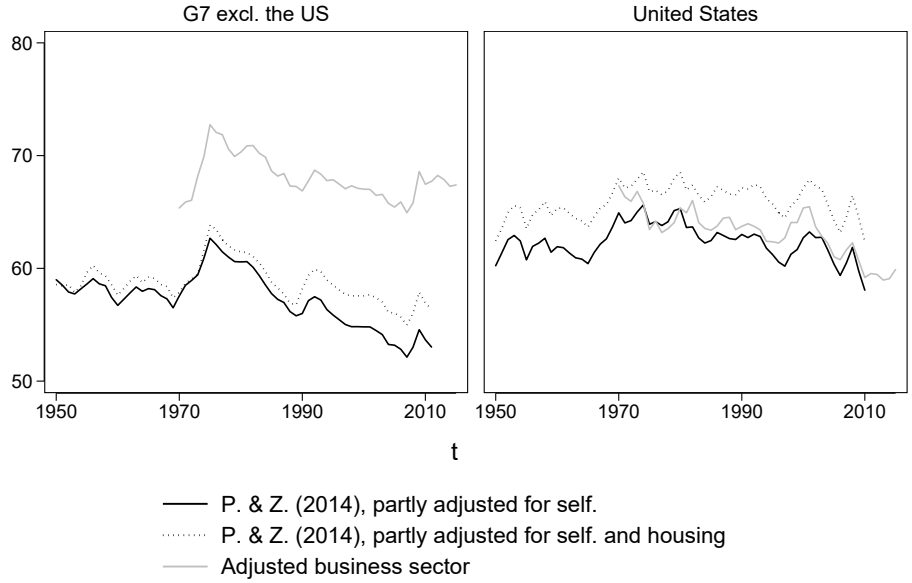


Source: authors' calculations using data from Statistics Finland (2020).

G. Additional details on Timing: The Global Stagflation Period

Given the low frequency movements of the labor share, the initial period of analysis is critical to the estimated trends in the labor share. This is highlighted in Figure G.1 which plots the longest time-series available – from Piketty and Zucman (2014*a*). As shown, the labor share is largely stable until 1970, then rises and falls, returning to it's initial level by 1990. Depending on how it is measured (gross vs. net, with vs. without housing, etc.), it then either remains stable or continues to fall.

Figure G.1 – Historical gross domestic labor share, G7, 1950-2015



Source: authors' calculations using Piketty and Zucman (2014*a*) where the self-employment adjustment uses mixed income and the housing adjustment excludes owner-occupied dwellings only. G7 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 expenditure-side real GDP at chained PPPs from the Penn World Table version 9.1. The effects have been normalized to equal the average labor share in 1995.

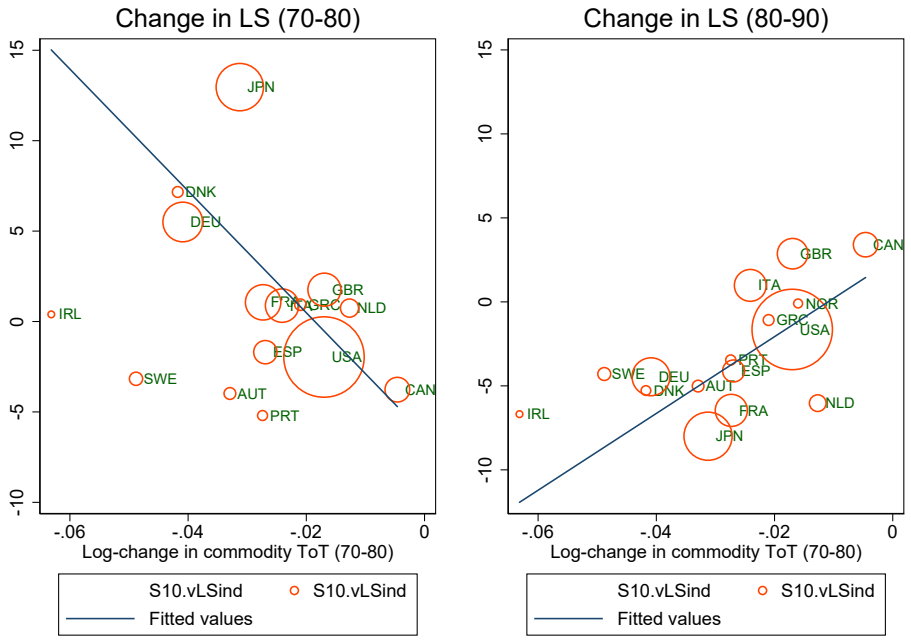
The literature has puzzled over the rise and fall of the labor share (e.g., the title of Rognlie (2015)'s paper is "Deciphering the Fall and Rise in the Net Capital Share:..."), but has largely focused on the post-1975 decline. In fact, several prominent papers that emphasize technological explanations begin their analyses after 1975 (e.g., Karabarbounis and Neiman (2014*a*) in 1975 and IMF (2017) in 1980).

The 1970s, however, coincide with the global stagflation period over which, as emphasized in Chapter 8 of Bruno and Sachs (1985), a combination of supply and demand shocks led to an

increase in both unemployment and the labor share. In particular, the oil shocks of the 1970s led to a substantial deterioration in the terms of trade of oil importers which, combined with a "real wage explosion (particularly in Europe and Japan) caused a major rise in the income distribution away from profits and towards labor" (Bruno and Sachs, 1985).

This section attempts to quantify the importance of the Global Stagflation period by studying the correlation between changes in the labor share and changes in commodity terms of trade. See Cette, Koehl and Philippon (2019) for related discussion. Figure G.2 begins by plotting a scatter plot of changes in the labor share from 1970 to 1980 (left) and 1980 to 1990 (right) against changes in commodity terms of trade from 1970 to 1980, which are mainly driven by oil prices. As shown, countries that experienced larger deteriorations in terms of trade during the oil shocks (e.g., Japan and Germany) experienced a sharp increase in the labor share, which was largely reversed in the 1980s.

Figure G.2 – Changes in Labor Share vs. Commodity Terms of Trade



Source: authors' calculations using changes in rolling-window commodity terms of trade from Gruss and Kebhaj (2019) and adjusted business sector labor shares. The regressions are weighted by expenditure-side real GDP at chained PPPs from the Penn World Table version 9.1.

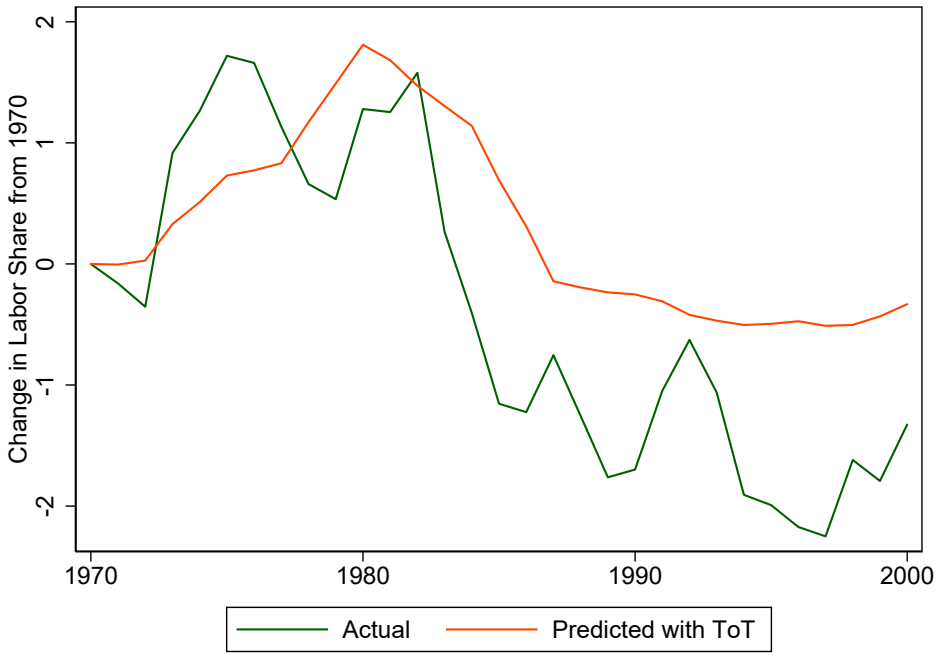
To quantify the portion of the rise and fall in the labor share that is explained by terms of trade, we estimate the following regression:

$$LS^{ex\,\mathrm{RE}} = \beta \log(cToT)_{MA3,t} + \alpha_j + \varepsilon_{jt},$$

where α_j denotes country fixed effects.

This regression yields a strongly significant coefficient of $\beta = -77$ (t-stat of 9.68). We then apply the coefficient to the weighted average change in commodity terms of trade. Figure G.2 plots the results, including the actual change in the labor share. As shown, terms of trade explain all of the rise and most of the fall of the labor share from 1970 to 1990 (2%), although we do see some overshooting (approximately 1%).

Figure G.3 – Changes in Labor Share explained by Commodity Terms of Trade



Source: authors' calculations using adjusted business sector labor shares and commodity terms of trade from Gruss and Kebhaj (2019). Figure restricts the sample to a common set of countries for which all required data are available. See text for details.

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