Labor share decline across US manufacturing sub-sectors: 1979-2019

Job market paper

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Abstract

This paper studies the sub-sectoral contributions to aggregate manufacturing labor share decline in the US between 1979 and 2019. Using the Log Mean Divisia index (LMDI) decomposition, the decline in the manufacturing sector's labor share is decomposed into contributions from real wage growth, labor productivity growth, changes in employment shares, and relative prices arising from the constituent subsectors across three business cycles. The primary findings of the paper suggest that the downward decoupling of real wages from labor productivity is the primary contributor to the labor share decline in manufacturing. Moreover, low labor share sub-sectors (especially *Chemical products*, *Food and Beverage and Tobacco products*, and *Petroleum and Coal products*) have experienced an increase in their employment shares, contributing negatively to aggregate manufacturing labor share. Despite some similarities between manufacturing sub-sectors, this paper emphasizes the heterogeneity across sub-sectors to understand the possible mechanisms behind the decline of labor share.

Keywords: labor share, manufacturing, subsectors, Divisia decomposition
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1 Introduction

This paper studies the subsectoral contributions to aggregate manufacturing labor share decline in the US between 1979 and 2019. Using the Log Mean Divisia index (LMDI) decomposition, changes in the manufacturing sector's labor share is decomposed into contributions from real wage growth, labor productivity growth, changes in employment shares, and changes in relative prices arising from the constituent sub-sectors across three business cycles from 1979-2019. Despite the common thread that ties manufacturing sub-sectors together, i.e., the shift of labor from manufacturing to services, the dynamics of employment, labor productivity, value-added shares, and prices at the subsectoral level expose critical dimensions of heterogeneity in manufacturing. Each of these components differs across business cycles in determining the labor share between 1979-2019, and there is considerable heterogeneity between sub-sectors for each component. The primary highlights of the paper suggest that:

1) Downward decoupling of real wage and labor productivity growth is the primary contributor to labor share decline in manufacturing across all three business cycles(1979-1997, 1998-2007 and 2007-2019).[1] *In the 1979-1997 period, productivity growth was primarily driven by the Machinery sub-sector. Post 1997, productivity growth in manufacturing sub-sectors has been modest and dominated by the Computer and electronic products sub-sector;*

2) Low labor share sectors (where labor share is below the average manufacturing labor share) have seen a relative employment gain. This is observed across the two business cycles (1998-2007 and 2007-2019) and has contributed negatively to the change in aggregate labor share in manufacturing[2]*;*

3) Product price inflation (Relative to manufacturing price level) has negatively affected aggregate labor share in the first business cycle (1979-1997) and has positively affected labor share in the last two business cycles. However, this price effect is sensitive to the inclusion

[1] While labor productivity growth has declined, real wage growth has consistently been lower than labor productivity growth for aggregate manufacturing. This is characterized as downward decoupling.

[2] This is discussed as a form of negative structural change within manufacturing.

of the Computer and Electronic products sub-sector (which has seen double-digit productivity growth and relatively steeper price decline);

4) While there are sub-sectors that have consistently led the decline in manufacturing labor share- namely, Chemical products manufacturing, Petroleum and coal products, and Food and beverage and tobacco products manufacturing, there is substantial heterogeneity across sub-sectors in terms of their productivity, employment, and price effects across the three business cycles.

In the United States, the shift of employment and output from agriculture and manufacturing to financial activities and service sectors (especially professional business services) has occurred alongside the declining income accruing to workers (labor share). The structural shift of employment from manufacturing to services and financial activities and downward decoupling has happened since the end of the Golden era of US capitalism. This suggests that there might be a linkage between the decline in manufacturing employment and the decoupling of real wage and labor productivity growth. The issue of labor share decline is especially relevant to the manufacturing sector for many reasons.

Primarily, manufacturing has been described as a dynamic sector with strong forward and backward linkages. It has been the engine of US growth for most of the 20th century and continues to employ a large working population.[3] It has also been the largest contributor to aggregate labor share decline at the national level, as documented in the burgeoning literature on labor share decline in manufacturing. Studies suggest that since the 1970s, the sector has undergone rapid decreases in unionization coverage and increasing outsourcing of key production activities to developing countries ((Elsby et al., 2013), (Milberg and Winkler, 2010),(Rowthorn and Ramaswamy, 1997)). An understudied aspect of manufacturing labor share decline is the contribution of the constituent subsectors, revealing the heterogeneity within manufacturing. Subsectoral-level analyses explore important variations that are often ignored in studies where the Manufacturing sector is treated as a single unit. For example,

[3]About 2496.80 bn USD came from manufacturing in 2021, and it employs close to 12 million workers, according to the Bureau of Labor Statistics.

production activities in Petroleum and Coal products cannot be offshored as easily as Apparel and Textile products. Offshored sub-sectors can purchase cheap intermediate inputs from developing nations, mainly providing managerial and other services domestically, which could affect income distribution in these subsectors. While the heterogeneity within manufacturing has been studied with respect to technology at the plant level (Essletzbichler and Rigby, 2005) and productivity growth (Jorgenson and Nomura, 2007), exploring this variety within manufacturing by focusing on labor share decline is still a relatively less explored area.

In this vein, this paper identifies contributions to the change in aggregate labor share in manufacturing arising from changes in compensation, productivity, employment, and relative price movements of sub-sectors. The paper is divided into the following parts: Section II provides a brief literature review on measurement and causes of labor share decline in US manufacturing. Section III describes the Log Mean Divisia index (LMDI) decomposition's conceptual framework and explains the decomposition components' interpretation. Section IV describes the Data and Methodology and the measurement of labor share in this context. Section V describes employment share, value-added share, labor share, and sub-sector price trends. Section VI describes the results of the Divisia decomposition and explores the primary contributors to the aggregate payroll share decline in manufacturing. I briefly discuss some mechanisms that can be explored further. Section VII provides concluding remarks.

2 Measurement and causes of labor share decline

2.1 Measurement of labor share and extent of decline

There is no dearth of literature on the decline of labor share in advanced capitalist economies at various levels of aggregation - firm, plant, industry, regional and national. The first point of contention in labor share research is the definition and measurement of what constitutes *labor income*. Mendieta-Muñoz et al. (2021) point out that using the payroll share (share of labor compensation in total income) is a relatively conservative measure of labor share, primarily

because it takes into account the incomes of ultra-rich workers such as CEOs but not those of self-employed workers.[4] Including non-corporate income muddles traditional labor share measures further since it is not easy to distinguish what proportion of non-corporate income is labor income and what is accounted as profits.[5] This implies that dividing income between labor and capital, as is done in many classical and post-Keynesian economic models, veils the inequality of incomes within the working class population (as explained further in Elsby et al. (2013)). In the Bureau of Economic Analysis' employment by industry accounts, non-corporate manufacturing employment is a much smaller workforce as compared to the overall workforce. The degree of rise in corporate gross operating profits is much larger than non-corporate gross operating profits, thus suggesting that the increase in non-corporate profits that might have contributed to the labor share decline in manufacturing is minimal. Despite that, the correct measurement of labor share should account for the proportion of income accruing to non-corporate entities that can be identified as labor income. The extent of the decline in labor share and its long-term movements largely depends on the measurement and sources used to calculate it.Oberfield and Raval (2021) report that over the last 40 years, the overall labor share declined by roughly 8 percentage points (using the Annual Survey of Manufacturers and the US Census of Manufacturers). Similarly, Kehrig and Vincent (2021) estimate that the labor share in manufacturing declined by about 4.5 percentage points per decade between 1967 and 2012.[6] Using the five-year surveys of the US Economic Census at the firm-level, Autor et al. (2020) shows that payroll share of value added in manufacturing declined by about 15 percentage points (from 1980-2012).Mendieta-Muñoz et al. (2020) study the US aggregate payroll share and find that from 1977-2017, there has been a decline of 3.1 percentage points. This decline has been studied at the regional level in Rada et al. (2021), where the authors find that "states with relatively high labor productivity feature relatively low payroll shares" since 2007. A common observation from these papers is that

[4]Income of this stratum of the working population can be characterized as rents rather than wage income.

[5]In this paper, non-corporate gross operating profits are treated as profits.

[6]The authors mention that the fall in labor has been more pronounced since 1980 and cast doubts on the "superstar firm" hypothesis coined by Autor et al. (2020).

the manufacturing sector has been the largest contributor to the decline in aggregate labor share. Moreover, it is suggested that the decoupling of wages and productivity within sectors has had a larger role than the simple structural reallocation of output and employment.

2.2 Determinants of labor share decline

Literature on the causes of the decline of labor share can be broadly categorized into two spheres: the technology sphere and the bargaining power sphere.[7] Within the "technology sphere", empirical evidence is divided on the crucial assumption of the elasticity of capital and labor($\epsilon_{k,l}$) being greater than one. This issue has been a primary feature in neoclassical debates where labor share can be shown to be technologically determined from a production function. Karabarbounis and Neiman (2014) for example, attribute the decline in labor share (at the aggregate national level) to the declining price of investment goods (leading to greater substitution of capital with-respect-to labor while assuming that capital-augmenting technological progress is orthogonal to the changes in the relative price of investment). Similarly, Bergholt et al. (2022) point out that while automation drives down labor share, the investment-specific technological change increases labor share, suggesting capital-labor complementarity. Bentolila and Saint-Paul (2003) find that changes in markups, total factor productivity (as a proxy for capital augmenting technological progress), labor adjustment costs, and labor market bargaining power shift the share-capital curve using a CES production function and allowing $\epsilon_{k,l}$ to differ across industries.[8] A series of IMF papers show that technological change captured via the routinization of jobs and changes in the capital-labor ratio ((Dao et al., 2017),(Abdih and Danninger, 2017))[9] explains about half of the labor share

[7]This is just for clarifying the primary channel through which labor share decline operates. Most papers consider several channels and come up with explanations on what are the most significant determinants of labor share decline. Some papers also highlight a link between bargaining power and technological change and how that affects income distribution, for e.g., the"superstar firm" hypothesis in Autor et al. (2020).

[8]The authors suggest that the share-capital curve technologically determines the relationship between labor share and capital-output ratio. In their econometric specification, the elasticity of substitution is allowed to differ across sectors with the use of dummy variables.

[9]In the Keynesian literature, however, changes in capital-labor ratios are not caused by changing technological change, although they might embody technological progress (Stockhammer, 2009).

decline across countries and industries. These papers, however, highlight the change in "supply of capital relative to labor" and do not specifically talk about the bias of technological change (which would alter the relative factor demand). Growing microeconomic evidence challenges this capital-labor substitution channel and the explanations for declining labor share which are based on capital accumulation and investment-specific technological change. Oberfield and Raval (2021) estimate $\epsilon_{k,l}$ at the firm, plant, and industry levels, respectively. They find that at the plant and industry level $\epsilon_{k,l} < 1$ and has been declining since 1970. They further show that it is not capital deepening but rather labor augmenting technical change that drives down labor share in aggregate manufacturing. The authors, however, suggest that the real wage decline explains a very small part of the aggregate labor share decline in manufacturing. At the manufacturing subsector level, Lawrence (2015) shows that labor share decline can occur even if capital-labor complementarity is assumed (provided that the effective capital-labor ratio declines). Lawrence (2015) also finds that Petroleum and coal, chemical products, and computer and electronic products have been the primary drivers of labor share decline in US manufacturing (about 68% of the decline) between 1987-2011. The results in this paper show that Chemical products and Petroleum and coal have indeed been the primary contributors to the labor share decline in manufacturing since 1998.

The "bargaining power" sphere moves beyond the regular capital-labor substitution argument and draws attention to the mechanisms which reduce labor's bargaining power. The "bargaining power" literature places emphasis on the weakening real wage growth, structural change, and the erosion of labor market institutions in the US. Within this literature, declining unionization, increasing import intensification, increasing market power of firms, and increased software investment and intangibles are cited as primary reasons behind the decline in labor share. Elsby et al. (2013) is one of the earliest papers which looks at the decline of labor share across sectors in the US, trying to look at the effects of declining unionization and increased offshoring of intermediate inputs. They find that between 1993-2010, increasing import exposure explains about 22% of the decline in labor share in a

cross-sectional framework. They do not see a significant role played by capital-deepening, which casts doubt on the canonical neoclassical production function. However, the authors do not find a strong significant impact of declining unionization on labor share. Cauvel and Pacitti (2022) places bargaining power as the primary channel through which technological progress and structural change affect labor share. Using the "cost of job loss" as an index of bargaining power, the authors find that an increase in the cost of job loss index and its increased sensitivity to business cycle fluctuations have been the primary determinant of labor share decline. Looking at sub-sectors within manufacturing Velasquez (2023), find that about 76% of the decline in labor share in manufacturing can be explained by increasing markups and product market monopoly in sub-sectors. Rent sharing with workers is another channel through which the declining bargaining power of workers has been studied. Stansbury and Summers (2020) point out that since 1980s, decrease in industry-rent sharing is a significant factor that explains labor share decline at the industry and national levels in the US. Using import-adjusted measures of markups, the former casts doubt on the "monopoly power" channel since, for manufacturing, these concentration ratios have only fallen or risen marginally since the 1980s. Manyika et al. (2019) use the Du-pont decomposition of profits and suggest that since 2000, a shift to intangibles (which increases depreciation of capital) and super-cycle booms and busts are the two primary reasons for the secular decline in labor share. They suggest that three subsectors: Motor vehicles, Pharmaceuticals, and chemicals and Computer, electronics, and optical, have been the primary drivers of aggregate labor share decline in manufacturing.[10]

Thus, while some studies have examined manufacturing labor share decline and highlighted its importance in the aggregate labor share decline literature, the jury is still out on the primary channels through which labor share decline occurs and the underlying subsectoral components that drive this decline in manufacturing. In this paper, wage-productivity decoupling, structural change, and relative terms of trade effects take center stage in explaining

[10]However, the authors only use select manufacturing subsectors.

the labor share decline in manufacturing. The methodology used in this paper closely follows Mendieta-Muñoz et al. (2021), where the authors decompose aggregate labor share across 14 major sectors and highlight the importance of duality in labor markets with stagnant and dynamic sectors. Stagnant sectors are labor-absorbing and feature low real wages and low productivity growth. Real wage growth lags behind in the dynamic sectors, with higher productivity growth, further pushing down aggregate labor share. In this spectrum, this paper stands out because of the sub-sectoral analysis, which complements the establishment-level and sector-level analysis performed in the literature cited above.[11] The analysis in this paper allows us to look at both within-sub-sectoral changes(in terms of wage productivity decoupling, relative price, and decline in employment contributing to labor share decline for a specific sub-sector) and the contribution of sub-sectors to aggregate manufacturing labor share. Moreover, the measure of productivity in this paper is based on average real labor productivity instead of total factor productivity or revenue productivity measures, as used in many of the existing literature. I use the aggregate value-added price index(VAPI) of manufacturing to deflate nominal wages instead of the consumer price index(CPI), which overcomes the problem of accounting for the difference between deflators (CPI and VAPI). In order to take into account the differences in prices of manufacturing sub-sectors, the price effects of subsectors are measured relative to the price index of manufacturing. Finally, by performing the Divisia decomposition across three business cycles (1979-1997, 1998-2007, and 2007-2019), I can also suggest how the contributions of the Divisia components change over time.

3 Conceptual Framework

I use the Log Mean Divisia decomposition which is one class of index decomposition analysis. A causal analysis of what drives down the labor share would possibly require us to explore the

[11](Specifically, I use the two-digit level of classification according to Standard Industrial Classification(SIC) until 1997 and the North American Industry Classification System(NAICS) from 1998-2019).

impact of technological change, globalization, labor market policies, and rising markups (not an exhaustive list of causes) which are not only difficult to measure but could be determined endogenously. Decomposition analysis is a descriptive tool focusing on the contribution to labor share decline rather than establishing a causal inference test. There are many neat advantages of using the Divisia decomposition which have been widely discussed in Choi and Ang (2012) and Diewert and Nakamura (2003).[12]

In order to use the Divisia decomposition, labor share has to be constructed as a Divisia index from two primary variables, which are measured in nominal terms: compensation of laborers in each sub-sector and value-added in each sub-sector. Value added is calculated by combining the gross operating profits and labor compensation. Following Mendieta-Muñoz et al. (2021), the labor share of income used in this paper focuses on private economic activity only, is based on gross value added, and excludes taxes on production and imports. Gross value added comprises again of gross operating profits, which contain both the corporate and non-corporate components and labor compensation. The non-corporate part of gross operating profits for the manufacturing sector is small. It shows a relatively nonincreasing trend in the period under consideration.[13] Since I am considering the income of the non-corporates as profits, it would be precise to say that I am calculating the payroll share of employees. All of the data for labor compensation and gross operating surplus is obtained on an annual basis from the Bureau of Economic Analysis NIPA tables. The relevant source for these are explained in section IV.

Labor share for the whole manufacturing sector given by :

$$Labor\ share\ (\psi_i) = \frac{\sum_{i=1} w_i * L_i}{\sum_{i=1} P_i * X_i} = \frac{\omega}{\epsilon} \tag{1}$$

[12]See (Mendieta-Muñoz et al., 2021), (Mendieta-Muñoz et al., 2020), (Rada et al., 2021) for application of Divisia decomposition in studying labor share decline.

[13]Non-corporate gross operating profits account for about 2.4% of value added when averaged from 1948-2019. There has been an increase in non-corporate shares since the 1970s, but the overall percentage has still been low, about 4% in 2019.

where "i" denotes sub-sector of manufacturing, P = Producer price index, L = Full-time equivalent employment and Y = Value added (which in this paper is labor compensation + gross operating surplus). ω and ϵ are the average real wage and productivity. These terms can be further disaggregated as:

$$\omega = \frac{\sum_{i=1} w_i L_i}{PL} = \sum_{i=1} \omega_i \lambda_i \tag{2}$$

$$\epsilon = \frac{\sum_{i=1} P_i X_i}{PL} = \sum_{i=1} p_i \epsilon_i \lambda_i \tag{3}$$

In equations 2 and 3, ω_i indicates the real compensation (deflated by the manufacturing price index), and λ_i shows the employment share. p_i denotes the relative price for the sub-sector(value-added price index of the sub-sector divided by the aggregate manufacturing value-added price index). ϵ_i indicates the average real labor productivity.

After defining these terms, the labor share of whole manufacturing ψ can be re-written as :

$$\psi = \frac{\sum_{i=1} \omega_i \lambda_i}{\sum_{i=1} p_i \epsilon_i \lambda_i} \tag{4}$$

Assuming that all variables are continuous, equation 4 can be differentiated with respect to time to yield :

$$\frac{dln(\psi)}{dt} = \sum(\phi_i)[\frac{dln(\omega_i)}{dt} + \frac{dln(\lambda_i)}{dt}] - \sum(\theta_i)[(\frac{dln(p_i)}{dt} + \frac{dln(\epsilon_i)}{dt} + \frac{dln(\lambda_i)}{dt}] \tag{5}$$

The weights, ϕ_i and θ_i, are the nominal share of sub-sector i's wage compensation and the subsector's share in nominal value added. Integrating equation 5, over the interval [t,t-n] (where "t" refers to the final period and "t-n" refers to the initial period in a business cycle)

and applying the exponential :

$$D_T = \frac{(D_\omega)(D_\lambda)}{(D_p)(D_\epsilon)} \tag{6}$$

where:

$D_T = \frac{\omega_{t+n}}{\omega_t}$ denotes Labor share as a Divisia index

D_ω =(compensation effect)

D_λ =(employment effect)

D_p =(price effect)

D_ϵ =(productivity effect).

Each of these component effects can be written in discrete terms (especially since the time series data used is discrete with a yearly frequency) as:

$$D_\omega = exp[\sum \frac{(\phi_{i,t} + \phi_{i,t-n})}{2} * ln\frac{\omega_{i,t}}{\omega_{i,t-n}}] \tag{7}$$

$$D_\lambda = exp[\sum (\frac{\phi_{i,t} + \phi_{i,t-n}}{2} - \frac{\theta_{i,t} + \theta_{i,t-n}}{2}) * ln\frac{\lambda_i i,t}{\lambda_{i,t-n}}] \tag{8}$$

$$D_p = exp[\sum \frac{(\theta_{i,t} + \theta_{i,t-n})}{2} * ln\frac{p_{i,t}}{p_{i,t-n}}] \tag{9}$$

$$D_\epsilon = exp[\sum \frac{(\theta_{i,t} + \theta_{i,t-n})}{2} * ln\frac{\epsilon_{i,t}}{\epsilon_{i,t-n}}] \tag{10}$$

Based on these four components, the aggregate labor share decline can be studied through the following components: Compensation-productivity decoupling (*comp* and *prod* terms), structural change effect (*empl*) and relative price or terms of trade effect (*price*). These labels are used in subsequent discussions of the results of the decomposition.

The left-hand term (i.e. D_T) in equation 6 captures our variable of interest, the labor share. Formally, $D_T = \frac{\psi_t}{\psi_{t-n}}$ where ψ_t is the labor share in the final year (1997 in the first business cycle) and ψ_{t-n} is the labor share in the initial year (1979 in the first business cycle).

One way of checking if the Divisia index decomposition returns a perfect decomposition (without any residuals) is by computing the value of D_T (or $log(D_T)$) directly from the labor share data for manufacturing and seeing if this matches the Divisia index decomposition terms computed in the right-hand side of the equation 6.

Equations 7 and 10 show the *comp* and *prod* components of corresponding to the Divisia index. These terms' differences highlight the decoupling of real wages from average labor productivity. A positive change in the real wage in sub-sector "i" raises the labor share, while a positive change in the sub-sector's labor productivity lowers the labor share. The real wage component is weighted by the sector's share in the wage bill (ϕ_i), while labor productivity has the sector's share in value added as the weight (θ_i).

Equation 8, which is the *empl* component is weighted by the difference of the sub-sector's wage bill share ϕ_i and the sub-sector's value added share component θ_i. Algebraically, $\phi_i - \theta_i = \frac{\psi_i}{\psi} - 1$, where ψ_i is sub-sector's labor share and ψ is manufacturing labor share. In other words, the weights are negative if a sub-sector has below than average labor share of manufacturing(LL sub-sectors) and positive if it has a higher labor share than manufacturing. For a sub-sector with lower than average manufacturing labor share, increases in employment ($\frac{\lambda_{i,t}}{\lambda_{i,t-n}}$), indicate negative contributions from structural change i.e relative employment has increased, which drives down overall labor share. Later in this paper, the sub-sectors with lower than average manufacturing labor share are identified for different business cycles.

Prices are crucial to the decomposition analysis, not only because they affect real wages but also at the aggregate level they affect nominal weights of the sub-sectors(i.e, the value of θ_i). The relative price $p_{i,t}$ is greater/less than 1, denoting that the sub-sector's price has grown faster than the price index for the average manufacturing industry. In other words, the ratio $\frac{p_{i,t}}{p_{i,t-n}} > 1$ implies that the producer price index for that sub-sector (relative to the manufacturing price index) has risen over time as computed from equation 9. The price component *price* exceeds unity and thus reduces the aggregate labor share if sectors with

relatively high labor productivity also experience rising relative prices.

Finally, the LMDI decomposition in this paper utilizes log mean weights of ϕ and θ i.e the weights used in equations 7 to 10 are $L(\phi_{i,t-n}, \phi_{i,t}) = (\phi_{i,t} - \phi_{i,t-n})/ln(\phi_{i,t}/\phi_{i,t-n})$ and $L(\theta_{i,t-n}, \theta_{i,t}) = (\theta_{i,t} - \theta_{i,t-n})/ln(\theta_{i,t}/\theta_{i,t-n})$ instead of the arithmetic averages. This ensures that there are no residuals from the decomposition. These weights are further normalized with the sum of the log mean weights of all sub-sectors since the sum of the weights is slightly below unity.

The decomposition analysis is divided into three business cycles- 1979-1997, 1998-2007 and 2007-2019. These business cycles are taken to account for NBER's business cycle peaks[14] and to account for changes in industrial classification that affect manufacturing subsectors. The starting year 1979 also marks a turning point for manufacturing labor share, changes in labor market policies, and de-unionization in labor markets (Mendieta-Muñoz et al., 2021). In the 1979-1997 period, there were 20 sub-sectors in BEA tables that corresponded to SIC classification (Instruments and related products have been excluded because the time series on price was not observable for them). In the period 1998-2019 there were 19 sub-sectors in BEA tables corresponding to the NAICS classification. A direct concordance between SIC and NAICS subsectors is not performed in this paper. Since I am using the BEA classification (which differs slightly from the Census classification), the 1979-1998 decomposition analysis is performed for 20 subsectors that closely resemble the SIC classification while the 1998-2007 and 2007-2019 decomposition analysis is performed for 19 subsectors that resemble the NAICS classification.[15]

[14] https://www.nber.org/research/data/us-business-cycle-expansions-and-contractions

[15] From 1998 onwards: Tobacco Products(SIC-20) and Food and kindred products (SIC-21) are no longer separate subsectors in the BEA tables. The Food and beverage and Tobacco products subsectors possibly combine NAICS-311 and NAICS-312. Apparel and leather and allied products in NAICS correspond (roughly) to the combination of Apparel products and Leather products subsectors in SIC. Computer and electronic products is treated as a separate subsector in NAICS-334 and was previously considered a part of the Machinery subsector (SIC 35). This reduces the number of subsectors in the last two business cycles to 19.

4 Data and Methodology

This section describes the data and methodology used in constructing the labor share Divisia and its decomposition for the three business cycle periods. The decomposition requires data on sectoral real wages, employment shares, labor productivity, prices, nominal value-added shares, and wage bill shares. The following time series data by sub-sectors were collected: compensation, gross operating profits, full-time-equivalent (FTE) employment, and chain-type Fisher price indexes for value added by industry.

In order to calculate labor productivity in each sub-sector, the sub-sectors real value added is deflated by the sub-sectors chained-type price index. Real consumption wage for each sector is calculated as the ratio of real total compensation (obtained by using the price deflator) to FTE in the sub-sector.

Table 1 provides the data source used to compile information for the whole period. Subsections below discuss the relevant calculations used to obtain the labor share and other variables used in decomposition.

[Table 1 about here.]

In the 1979-1997 time period, manufacturing sub-sectors are classified according the the SIC-87 and SIC-72 classification. There are 21 unique sub-sectors in the SIC classification. Out of these 21 sub-sectors, price data for this period is not available for *Instruments and related products*, which has been excluded from the decomposition analysis. For *Electric and Electronic products*, price data is available in the NAICS classification and is hence rebased to the SIC price index. While *Instruments and related products* employs a smaller share of total manufacturing workforce, *Electric and electronic products* employed about 1.6 mn workers in 1997 which is about 8 percent of the total manufacturing employment in 1997.[16] This subsector also saw a significant decline in employment (and prices if we look at the SIC price data from 1988 onwards sub-sector).

[16] *Instruments and related products* has a smaller share of employment, but employment increases for this sub-sector over the 1979-1997 period. Labor share also increases for this subsector between 1979-1997.

Data collected from BEA for this time period is based on the Historical Industry Accounts data, which were discontinued after the 2012 NAICS reclassification. Labor share is calculated as the ratio of Labor Compensation to Value added net of Taxes on production and imports and Subsidies. The calculation of labor share and value added is the same as before (labor compensation divided by value-added net of taxes and subsidies and value-added is the sum of labor compensation and gross operating profits). Further details on the calculation of value-added, price, and employment are provided in the first column of Table 1.

4.1 Value added components

BEA defines Labor Compensation as "total income—both wages and salaries and supplements to wages and salaries—earned by employees in return for contributing to production during an accounting period". Gross operating surplus is defined as "Value derived as a residual for most industries after subtracting total intermediate inputs, compensation of employees, and taxes on production and imports-less-subsidies from total industry output. Gross operating surplus includes consumption of fixed capital (CFC), proprietors' income, corporate profits, and business current transfer payments (net)". The SIC data does not distinguish between corporate and non-corporate items and hence, I calculate Gross operating profits using the items based on the BEA definition and the national accounting tables definitions. Calculating the gross operating profits of the corporate sector requires us to perform a summation of four components of gross operating profits, namely: 1) Net interest and miscellaneous payments, corporate(CNINT), 2) Corporate profits before tax without inventory valuation adjustment and capital consumption adjustment (PBT) 3) Corporate profits before tax inventory valuation adjustment(CIVA) 4) Capital consumption allowance, corporate(CCCA). A similar operation is done for the non-corporate sector.

From 1998 onwards, BEA provides gross operating profits of the corporate sector and non-corporate sector directly as "other gross operating surplus, corporate" and "other gross

operating surplus, non-corporate". BEA provides the following definition for these variables "gross operating surplus less business current transfer payments. This measure consists of corporate profits before tax without inventory valuation adjustment (IVA) and capital consumption adjustment (CCAdj); corporate IVA; corporate capital consumption allowance; and corporate net interest and miscellaneous payments." Therefore, it is equivalent to including the four components which were included in the calculation of gross operating profits in the 1979-1997 period (CNINT, CIVA, PBT, and CCCA).

4.2 Chained Price index

For the price index, the Chained-type price index for value-added (2000=100) (VAPI) for the 1979-1997 period and the Chained-type price index for value-added (2012=100) 1998 onwards is used. Value-added price indexes (2012 = 100) have been estimated by the BEA for the NAICS going back to 1948, however, these are not commensurate with the SIC classification which is used for decomposition in the 1979-97 period. BEA does not provide price data for many of the 3-digit manufacturing sub-sectors from the 1948-1977 time period in the SIC-72 and SIC-87 classifications. Hence I had to exclude this period from the decomposition analysis.[17] Relative prices are calculated based on the Price index for the whole manufacturing sector. Thus price movements are relative to the general price level of manufacturing.[18]

4.3 Full-time equivalent employment

The Full-time equivalent employees (FTE) which consists of a weighted average of full time and part time working employees (this is taken from the Historical industry account tables

[17]There is evidence that labor share increased from 1948-1979. Divisia decomposition of the manufacturing sub-sectors using the NAICS classification level for this period shows that real compensation growth was higher than labor productivity growth in this period, contributing to the increase. This is similar to observations made in Rada et al. (2021) and Mendieta-Muñoz et al. (2020) that labor share decline is primarily observed after the end of the Golden era of US capitalism.

[18]The manufacturing chained price index level grew sharply between 1975 and 1990 followed by a relative stagnation.

of BEA from 1979-1997 and from NIPA Table 6.5 D for the 1998-2019 period) is used as the employment series for sub-sectors. This is a slight departure from previous studies on labor share Divisia decomposition where the Full time permanent employment measure is adopted. BEA defines FTE as "Full-time equivalent employees equal the number of employees on full-time schedules plus the number of employees on part-time schedules converted to a full-time basis. The number of full-time equivalent employees in each industry is the product of the total number of employees and the ratio of average weekly hours per employee for all employees to average weekly hours per employee on full-time schedules". Hence FTE captures not just labor time of permanent but also temporary employees.

5 Descriptive analysis

There has been a shift of value-added activities from manufacturing and agriculture towards finance, insurance, leasing, real estate, professional business services and educational and health services as shown by Figure 1.

[Figure 1 about here.]

[Figure 2 about here.]

This shift towards financialization and servicification of the economy has occurred alongside a large decline in labor share in Manufacturing (see Figure 2). US manufacturing labor share peaked in 1974, with about 78% of total income accruing to workers. The 1948-late 1970s period was the only period in history where labor share increased. The end of this "Golden era" of US capitalism was followed by the shift from manufacturing to services and financial activities (termed as "late deindustrialization" period and increasing trade between the US and other countries, especially with China since the signing of the bilateral trade agreement in 1979 (termed as the Globalization period). The following subsection explores some of the possible effects of these changes on US manufacturing sub-sectors.

5.1 The changing composition of manufacturing value-added, employment, labor share, and relative prices

Alongside the decline in manufacturing employment, there has been a consistent change in the importance of its underlying sub-sectors. Tables 2 and 3 depict these changes in terms of value-added shares of manufacturing sub-sectors (the third and fourth columns). The increase in value-added shares of chemical products, machinery, electronic equipment, and motor vehicles shows the transition of US manufacturing towards more capital-intensive sectors, possibly driven by shifts in demand toward electronic goods used in households and industries. This is in line with much of the literature cited in Section 2.2. Since 1979, the impact of the Information and Communication Technology revolution (ICT) in manufacturing can be traced from the consistent rise in value-added shares of Electric and electronic equipment(from 5.85% of value added shares in 1948 to 12.41% in 1997). Machinery, except electrical (which included computer equipments), also saw a rise in their value-added share from 9.6% in 1948 to 1about 11% in 1997. After the NAICS revision, the sub-sector "Computer and electronic products" contributed to the lion's share of employment and value-added in manufacturing.[19]

In sharp contrast to these sub-sectors consumer goods sub-sectors such as *Food and kindred products*, *Apparel and Textile products*, and *Textile mill products* see a consistent decline in their value-added shares. Literature on the Apparel sector in the US suggests that since 1990, this sub-sector has increasingly been off-shored to Mexico, China, India, and Bangladesh ((Gereffi et al., 2005),(Berdine et al., 2008),(Şen, 2008)). What pushes these firms to engage in supply chain linkages is again increasing demand for cheap apparel and textiles by large retail chains and reduction of import quotas through various trade agreements.[20]

[19]In 1997, electric and electronic equipments, chemical products and Machinery had a total contribution of 30%) and in 2019, about 40% value added comes from chemical products, food and beverage and tobacco products manufacturing, and computer and electronic products.

[20]Şen (2008) suggests that preferential trade agreements under NAFTA and the elimination of quotas as required under the WTO Agreement on Textiles and Clothing have increased apparel imports to the US.

The changing composition of sub-sectors in terms of value-added shares is also mimicked by the increase in employment shares of these subsectors (employment share columns in Table 3) between 1948-1979. *Apparel, leather and textile products* which jointly employed about 19% of the manufacturing workforce in 1948, contributed to about 11% in 1979 and 5% in 1997. Some capital-intensive subsectors, such as *Machinery, except electrical* and *Electric and electronic equipment*, experienced an increase in employment shares between 1948-1979 and a subsequent decline between 1979-1997.

Table 4 presents labor shares by sub-sectors. The heterogeneous distribution of labor share across subsectors is observable across years. Even though most constituent subsectors have experienced declining labor shares since 1979, in each business cycle, the subsectors which see the largest declines in their labor shares differ substantially. *Apparel and other textile products*, *Electric and electronic equipment*, and *Other transportation equipment* are some of the subsectors with higher than average manufacturing labor share in 1948 and 1979. Aggregate labor share change was positive from the 1948-1979 period. Since the end of the Golden Age, manufacturing aggregate labor share has declined, with the 1979-1997 period representing the largest proportion of decline. Between 1979-1997, the highest decline in labor share occurred in the *Electric and electronic equipment*. In the subsequent business cycles, *Other Transportation equipment* and *Primary metals* observe large declines in their labor shares. Manufacturing labor share declined by about 10.73 percentage points between 1979-1997. [21], followed by a decline of 7.17 percentage points between 1998 to 2007 and 3.38 percentage points between 2007 and 2019.

In Table 5, I look at the movement in sub-sectors' price relative to the manufacturing price level. The first two columns (from 1979-2000) show the price index of a sub-sector relative to the aggregate manufacturing price index. The third column computes the difference of

The largest retailers of apparel- Walmart, Kmart, Dayton Hudson, and JC Penney accounted for about 68% of all publicly held outlets in the US in 1997.

[21]Note that this includes the Instruments and related products subsector which saw an increase in its labor share in this period. In the Divisia decomposition this subsector is not included which makes the fall in aggregate manufacturing labor share about 11.78 pct. points which is higher.

relative price ratio between the end and beginning years. Looking at the relative price ratios, the 1979-1998 period is characterized by relatively increasing prices in many sub-sectors. Abating these increases is the declining prices of *Apparel and other Textile products*, *Machinery*, and *Petroleum and coal*. The decline in the relative price of Machinery possibly reflects the productivity growth in this sub-sector.[22] From 1998 onwards, the decline in prices of *Computer and electronic products*, *Apparel and Textile* and *Motor vehicles, bodies and trailers, and parts* attenuate the overall price increase in other manufacturing subsectors. Strikingly, since 1998, the decline in prices of *Computer and electronic products* is unmatched by declining prices in any other sub-sector. Manufacturing sector productivity growth has largely been driven by the competitiveness in Computer and electronic products, which could be a possible reason behind the declining relative price. Both *Machinery* in the 1979-1997 period and the *Computer and electronic products* since 1998 have seen strong productivity growth and correspondingly large relative price declines. The net effect on their labor share is hence balanced to an extent by these two components, as we shall see in the decomposition exercise.[23]

These tables shed light on how sub-sectors have gained value-added and employment shares and experienced relative price increases alongside declining labor share[24]. However, it does not let us discern the sub-sectors contributions to the aggregate labor share decline in manufacturing. The next section identifies sectoral contributions to the change in the manufacturing aggregate payroll share following the Divisia index decomposition outlined in Section 3.

[Table 2 about here.]

[Table 3 about here.]

[22]Changes in *Petroleum and coal products* in 1979-2019 period reflect changes in the global price of gas, which was low in the 1980s and 1990s and increased rapidly in the 2000s.

[23]Houseman et al. (2015) discuss productivity growth in manufacturing being "computer-driven" post-1997.

[24]Figures 7 to 10 in Appendix section 8.1, plots value added shares, employment share, labor share, and price ratios for the different periods.

[Table 4 about here.]

[Table 5 about here.]

6 Decomposition Results

[Figure 3 about here.]

Figure 3 plots the components of the Divisia index of labor share across the three business cycles. The bar graphs show the *prod* and *price* components as negatively affecting labor share(hence shown negative of the origin) while *comp* and *empl* are shown on the positive side of the origin. The last two business cycles show that the large productivity gains in *Computer and electronic products* are unmatched by any other sub-sector. The underlying magnitude of these components are in Tables 6 to 8. These tables (6, 7 and 8) reflect the percentage point contributions from each of the four components. The aggregate change in manufacturing labor share in percentage points is reported in the last row of the *tot* columns for each business cycle.

Table 6 corresponds to the Divisia decomposition results for the 1979-1997 period. Each column represents the contribution of the components, namely - compensation (*comp*), employment(*empl*), price(*price*), and productivity(*prod*) as defined in Section 3. The bottom-most row shows the total effect of each of the components, and the leftmost column shows the contribution of each sub-sector on manufacturing labor share. The last cell on the table shows that the aggregate manufacturing labor share declined by about 11.78 pct. points (note that the Instruments and related products subsector is excluded from the decomposition analysis). The largest contributors to this decline were *Chemicals and allied products*, *Electric and electronic equipment*, and *Food and kindred products*. Downward decoupling of labor productivity growth and real wage growth is the largest contributor to labor share decline in this period (for e.g. in *Chemicals and allied products*, *prod* component is about -4.57 where the negative sign suggests that increasing productivity drives down labor share,

whereas *comp* is 3.49 where the positive sign indicates that compensation increases drive up the labor share). The increase in productivity outpaced real wage growth for fourteen out of the 20 sub-sectors, suggesting that downward decoupling played a major role in driving down labor share. However, there exists substantial heterogeneity among the subsectors even when downward decoupling is considered. *Machinery, except electrical*, which recorded the largest *prod* component and also the strongest downward decoupling (in terms of the difference between the *comp* and *prod* component), also records the strongest positive *price* effect(this suggests that relative to the manufacturing price index, price in this subsector declined. The price decline reduces the total contribution of *Machinery, except electrical* to the total manufacturing labor share decline.). The *empl* component is small (0.07) but positive, which suggests that there has been a relative employment gain in sub-sectors with higher than average labor share(based on equation 8 and the discussion in section 3). This lends evidence to the fact that within manufacturing, the structural change component (given by *empl*) contributed positively to aggregate manufacturing labor share in the 1979-1997 period.

[Table 6 about here.]

Apart from downward decoupling which is the largest contributor to labor share decline, what is notable when we look at these tables is the impact of the sum of *price* components,(which is negative overall as compared to the later two business cycles) i.e. on aggregate price components contributed negatively to labor share in manufacturing in this period. As discussed later, the aggregate positive price effect observed since 1998 in 7 and 8 are mostly driven by the declining prices of *Computer and electronic products*.

[Table 7 about here.]

[Table 8 about here.]

Moving to the 1998-2007 and the 2007-2019 cycle, three observations become clear from Tables 7 and 8: Firstly, relative employment increase in sub-sectors negatively affected labor's share of income(this is shown by the *empl* component, which is negative in the 1998

and 2007 business cycle). This suggests that relative employment shifts towards more low labor share sub-sectors, which has a negative impact on aggregate labor share in manufacturing. Secondly, compared to the previous business cycle, all sub-sectors experience modest productivity growth and compensation growth (shown by the relatively smaller *prod* and *comp* components for all subsectors, except Computer and electronic products). Thus, overall labor productivity growth and real wage growth in manufacturing has been modest since 1998 and is mainly driven by *Computer and electronic products*, possibly showcasing the impact of the information and communications technology era. Finally, a positive contribution from the sum of *price* components is seen in the second business cycle. However, this positive *price* effect is eliminated if *Computer and electronics products* is excluded from the decomposition. Thus, while increasing product prices contributed to declining labor share in manufacturing sub-sectors, the negative effect of prices on the aggregate labor share decline in manufacturing is relevant only in the 1979-1997 business cycle. Summing up these changes, aggregate manufacturing labor share declined by about 7.18 pct. points between 1998-2007 and 3.4 pct. points between 2007-2019.

The above discussions suggest that an important caveat to the discussions on the effects of the Divisia components (especially since 1998) is the inclusion of *Computer and electronic products*. The rapidly declining prices of computers and electronic products and the productivity growth in this sub-sector make it a complete outlier. Even in the Divisia decomposition, one can see that this sub-sector veils any underlying price, compensation, and productivity changes in other sub-sectors. The evidence of downward decoupling is also largely biased toward the inclusion of this sub-sector.[25] where productivity growth has outstripped real wage growth by a fair extent (see Table 8, where, the *prod* term for this sub-sector is -5.85 whereas *comp* is 1.46).

[25]In Section 8.2 in the Appendix (Figures 10 and tables 13 and 14), I perform the decomposition excluding *Computer and electronic products*, which shows how sensitive the Divisia components are to this sub-sector's inclusion. The aggregate price effect becomes negative and is much higher, and the decoupling of real wages and productivity is much smaller in magnitude.

6.1 Correlation across components

Based on the previous analysis, simple correlations between the components and their aggregate contribution to the change in manufacturing labor share are computed in Table 9. In the first cycle, it is *comp* and *prod* that seem to associate with total contributions *tot*(with productivity contributions being positively correlated and compensation contributions being negatively correlated with total contributions). This seems to highlight the role of downward decoupling being a dominant factor in deciding contributions to aggregate labor share in manufacturing. The *comp* and *tot* are negatively correlated, suggesting that increases in compensation share of sub-sectors are associated with increasing "negative" contributions to aggregate labor share.[26] The *prod* and *tot* components are positively correlated indicating that increases in productivity of sub-sectors are associated with increasing negative contributions to aggregate labor shares. In other words, sub-sectors with significant productivity gains have seen a higher contribution from compensation (since compensation also rises for these sub-sectors). However, because of strong downward decoupling, we see a negative correlation between *comp* and *tot*. Thus, strongly decoupled sectors contribute more to the aggregate manufacturing labor share decline. In the second cycle, the structural component *empl* is strongly positively correlated with *tot* contributions. Increasingly negative contributions from changes in employment are associated with negative contributions to labor share i.e., a sub-sector with a relatively lower labor share that sees a rise in its employment share is more likely to contribute negatively to the change in manufacturing payroll share. In the third cycle, only *comp* has a reasonable correlation coefficient and is negative as in the first cycle. This is again indicative of downward decoupling as in the first cycle. In all three cycles, *price* is positively associated with the *tot* contribution (with the correlation coefficient being significant in magnitude in the first and third cycles). This suggests that sub-sectors with relative price increases (and hence "negative" *price* components) are more likely to have smaller contributions to labor share decline in these two business cycles. Clear outliers

[26]Section 8.3 figures 11 to 13, in Appendix, plots these correlation coefficients.

here are *Machinery, except electrical*, in the 1979-1997 cycle and *Computer and electronic products* in the 1998-2019 cycle.

The correlation analysis allows us to see the effects of each component but does not allow us to find which sub-sectors have dominated these effects. Given these observations, I now highlight some primary sub-sectors dominating these correlations. In other words, I identify the sub-sectors in which downward decoupling, relative price change, and changes in relative employment have had the highest total contribution to labor share decline.

[Table 9 about here.]

6.2 Major contributors to labor share decline - Low labor share and High Labor share sub-sectors

[Table 10 about here.]

Based on the total contributions (*tot* component), I identify the sub-sectors that drive the aggregate labor share decline in manufacturing. The sub-sectors can be divided into two categories based on their average labor share in the business cycle.[27] Sub-sectors with lower than the average manufacturing labor share are termed low labor share sub-sectors or "LL" sub-sectors, while others are termed High labor share sub-sectors or "HL" sub-sectors. This distinction plays an important role in understanding the impact of relative employment change across sub-sectors and provides a way of classifying "structural change" within manufacturing as positive or negative. In Table 10, the first row shows the movement of relevant components for *Electric and Electronic equipments*. This LL sub-sector has experienced a decline in its employment share (the downward arrow indicates a decline in relative employment share). Such a movement is characterized as a positive structural change since, relative to manufacturing, employment has decreased in an LL sub-sector (the upward arrow

[27]Here, I calculate the average labor share as the average of the initial and final year's labor share of the sub-sector.

in the second column shows this effect). Price effect column shows that relative terms of trade have moved against this sub-sector (relative to manufacturing prices have increased, and this has driven down the labor share further, hence the downward arrow). Similarly, the downward decoupling effect suggests that real wage growth has been lower than labor productivity growth. Following this line of reasoning, many features across business cycles that are common to sub-sectors are identified. The primary contributors in terms of absolute values across the three business cycles are in Tables 10, 11, and 12. The observations from these tables suggest that:

- Some sub-sectors show up consistently as the primary drivers of aggregate labor share decline in manufacturing- namely, *Chemical products*, *Food and kindred products (Food and beverage and tobacco products since 1998)*, *Electronic products (Computer and electronic products since 1998)*, and *Petroleum and coal products*.

- The classification of LL sub-sectors has not changed in the last two business cycles. *Chemical products*, *Petroleum and coal products*, and *Food and beverage and tobacco products* continue to have labor shares below the average manufacturing level since 1998.

- In the last two business cycles, all LL sub-sectors have experienced an increase in their relative employment shares, suggesting that structural change within manufacturing has been negative.

- Except for *Petroleum and coal products*, all LL sub-sectors experience price increases (or negative price effect on labor share) in the three business cycles.

- Finally, downward decoupling occurs across HL and LL sub-sectors without any distinct pattern. In *Machinery* and *Computer and electronic products*, the strong downward decoupling is attenuated with the relative price decline, so their net contribution to aggregate labor share decline becomes smaller.

6.3 LL sub-sectors : A Discussion

The analysis so far reveals the importance of LL subsectors in driving labor share decline in aggregate manufacturing. It also reveals the underlying heterogeneity within manufacturing. In this section, I discuss some basic characteristics of LL sub-sectors and perform a counterfactual exercise to see the impact of all these sub-sectors on aggregate labor share decline. Although the classification of which subsectors have lower than average manufacturing labor share changed between 1948-1997 and 1998-2019, the employment share increase in LL subsectors started in the early 1980s and is observed at least till 2008.[28] Employment levels across all manufacturing subsectors declined, which conforms to the process of deindustrialization in the US. However, within manufacturing, the share of employment of LL subsectors has increased since the early 1980s. This is quite the opposite of the story at the national level, where employment shifted towards high labor share sectors since roughly the mid-1980s.[29] Apart from the downward decoupling of real wages and labor productivity, this "negative structural change" within manufacturing is an important determinant of labor share decline, despite the small *empl* components in the Divisia decomposition. Figure 4 shows the employment share of LL subsectors taken together, which fell from about 32% in 1948 to 27% in 1980 and increased to 30% in 1997. The increase since the early 1980s is mainly driven by Chemicals and allied products and Food and kindred products subsectors, which are primary contributors to aggregate manufacturing labor share decline in all the business cycles. Between 1998-2018, the employment share of LL subsectors increased from 16% to 22%. This highlights the idea of "negative structural change" in manufacturing.

[Figure 4 about here.]

[Figure 5 about here.]

[28] 1948-1979 has the following LL subsectors - *Chemicals and allied products*, *Food and kindred products*, *Electric and electronic equipment*, *Lumber and wood products*, *Miscellaneous manufacturing*, *Motor vehicles and equipment*, *Paper and allied products*, *Tobacco products*. 1998-2019 has the following LL subsectors - *Chemical products*, *Food and Beverage and Tobacco products* and *Petroleum and coal products*.

[29] This aspect of structural change towards high labor share but low real wage and low productivity sectors for the US is elaborated in Mendieta-Muñoz et al. (2021).

To assess the impact of low labor share subsectors on the aggregate labor share decline, I compute the aggregate manufacturing labor share excluding these subsectors. In Figure 5, the absolute difference in aggregate manufacturing labor share, including and excluding the LL subsectors, is plotted separately for the 1948-1997 period and the 1998-2019 period. An increase in this absolute difference would indicate that if we include the LL subsectors in our calculation of manufacturing labor share, the decline is much larger. Figure 5 shows that this is true since the early 1980s again and continued till 2008. In terms of percentage points, aggregate manufacturing labor share decline would have been about 3 percentage points lower between 1979-1997 and 4 percentage points lower between 1998-2019 if LL subsectors are excluded. Since 2008 however, this difference has become much smaller.

The above discussion possibly points to demand-side forces that have led to the movement of relative employment towards LL sub-sectors. At the same time, the downward decoupling of wages and productivity (which is not unique to LL sub-sectors) is the dominant driver of labor share decline in manufacturing. It would not be possible to look at what forces determine this adverse shift of demand ("adverse" in terms of its impact on payroll share) and the underlying downward decoupling without looking at other causal mechanisms that can affect decoupling and structural change. Here I only provide some discussion of the expected reasons behind the movement of output and employment towards LL sub-sectors and the overall decoupling in manufacturing.

Preliminary evidence suggests that LL sub-sectors (especially *Food and Beverage products* and *Chemical products*) are, on average more capital-intensive. This is possibly why they might be LL sub-sectors since they have, on average, a higher capital-to-labor ratio in their production process. The gradual movement of US manufacturing towards more capital-intensive sectors goes alongside the increasing offshoring of labor-intensive tasks. The decomposition components across the three business cycles *prod* show the modest productivity gains in Manufacturing. Despite the movement towards capital-intensive sub-sectors, manufacturing productivity growth has declined. Thus there is some evidence that both the

productivity growth and the pass-through from productivity to real wages since the end of the Golden age of US capitalism has been weak. This lends some support for the weakening real wage growth hypothesis that the literature on bargaining power supports. The story of downward decoupling would be incomplete if we do not consider the policies and institutions that have affected workers' bargaining power since the end of the Golden era of US capitalism. The decline in unionization, increasing corporate tax cuts, and reduced labor market intervention by the state in the early 1980s are some examples of the "disciplining mechanism" used to weaken real wage-productivity pass-through. Coupled with the threat of unemployment from offshoring, suppressing real wages became an easy neoliberal tool in the later periods. Offshoring of units also allows firms to keep prices low by purchasing cheaper inputs. But as some of the analysis here shows, the benefits of reduced prices might not be observed across all sub-sectors. Thus a form of low productivity growth and low real wage growth trap seems to be evolving which might be in line with the secular stagnation theory. These effects worsen in periods of crisis, such as the 2008 global financial crisis and the 2020 pandemic, which highlights the sensitivity of the manufacturing sector to recessionary episodes.[30] This paper has not discussed the causal effects that have led to such a transformation. But there is sufficient reason to pay attention to changes in policy at the sub-sectoral level and explore the reasons behind declining aggregate manufacturing labor share by taking due consideration of the underlying heterogeneity. Moreover, identifying the key subsectoral drivers of manufacturing labor share across the business cycles is also beneficial to designing policies to support specific subsectors in the aftermath of a recession.[31] Increasing evidence suggests that it is not simply technological change or capital accumulation that leads to reduced labor share of income, but an erosion of workers' bargaining power via reduced unionization, increasing cost of job loss, increased threat of offshoring,

[30]Between 2007 and 2009, nearly 2 million manufacturing job losses were reported and in 2020 nearly 578 thousand employment losses were reported(Barker, 2011),(Ansell and Mullins, 2021)

[31]Luo (2013) construct the "Power-of-Pull" rankings to highlight the strong linkages of the Motor Vehicles bodies and trailers and parts subsector and its ability to provide economy-wide stimulus, whereas the paper finds that the Computer and electronic products subsector has seen a continuous decline in these rankings.

increasing market power of firms, and lower profit-sharing. While the jury is still out on which of these factors plays a larger role in labor share decline, investigating these changes at the sub-sectoral level would provide more understanding of which production activities are more exposed to this form of change and how industrial policy can be made more flexible to address the heterogeneity of sub-sectors within manufacturing.

7 Conclusion

The decline of labor share in US has been well-documented at the national, state, and broad industry levels. This decline has been largely driven by the manufacturing sector, especially since the late 1970s. In this paper, I identify which of the manufacturing sub-sectors have primarily contributed to the decline and what mechanisms have contributed to the aggregate decline in manufacturing labor share. Using the Log-mean Divisia index decomposition method, I find that the aggregate manufacturing labor share declined by about 11.7 pct. points between 1979-1997, 7.18 pct. points between 1998-2008 and 3.4 pct. points between 2008-2019. Downward decoupling of real wage growth and labor productivity growth across three business cycles (1979-1997, 1998-2007, 2008-2019) has been the primary determinant of labor share decline. Relative to overall manufacturing, employment has moved towards low labor share sub-sectors since the early 1980s. This is characterized as a form of negative structural change within manufacturing. Lastly, the decomposition also shows the impact of the *Computer and electronic products*, which has seen the largest productivity growth and a rapid decline in its relative price ratio (similar to *Machinery* in the 1979-1997 business cycle). Further scrutiny into the causes behind this perverse movement towards low labor share sub-sectors will likely provide suggestions for how manufacturing sector heterogeneity should be considered while designing industrial policy.

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8 Figures and Tables and Appendix follows

Table 1: Sources and construction of variables

Variable	**NAICS**	**File name**
Employment (FTE)	https://apps.bea.gov/iTable/iTable.cfm?reqid=19&step=2 #reqid=19&step=2&isuri=1&1921=survey	
Gross operating profits (corporate and non corporate , net of taxes)	https://apps.bea.gov/iTable/iTable.cfm?isuri=1&reqid=151&step=1	Components of Value added
Labor compensation	https://apps.bea.gov/iTable/iTable.cfm?isuri=1&reqid=151&step=1	Components of Value added
Chained-type Price index	https://apps.bea.gov/iTable/?reqid=147&step=2&isuri=1	Chain-Type Price Indexes for Value Added by Industry
Variable	**SIC-87 and SIC 72**	**File name**
Employment (FTE)	https://www.bea.gov/industry/historical-industry-accounts-data	GDPbyInd_VA_SIC
Corporate: Net interest and miscellaneous payments (CNINT), Corporate profits before tax without inventory valuation adjustment and capital consumption adjustment(PBT),Corporate profits before tax inventory valuation adjustment (CIVA),Capital consumption allowance (CCA)	https://www.bea.gov/industry/historical-industry-accounts-data	GDPbyInd_VA_SIC
Non-corporate: Proprietors' income without inventory valuation adjustment and capital consumption adjustment(PROINC), Proprietors' income inventory valuation adjustment (PROIVA), Net interest and miscellaneous payments, noncorporate (NNINT) and Capital consumption allowance, noncorporate business, and Consumption of fixed capital, housing and nonprofit institutions serving households (NCCAFC)		
Gross operating profits (corporate and non corporate, net of taxes and business current transfer payments)	Calculated from items above	
Chained-type Price index (VAPI)	https://www.bea.gov/industry/historical-industry-accounts-data	

Table 2: Value added share : (1948-2019)

Value added share											
Subsectors (SIC based)	***1948***	***1979***	***1997***	***1948-1979***	***1979-1997***	***Subsectors(NAICS based)***	***1998***	***2007***	***2019***	***1998-2007***	***2007-2019***
Apparel and other textile products	5.33	3.09	2.00	-2.23	-1.10	Apparel and leather and allied products	1.67	0.65	0.40	-1.02	-0.25
Chemicals and allied products	6.23	8.08	11.59	1.84	3.51	Chemical products	12.70	14.41	16.10	1.71	1.70
Electric and electronic equipment	5.85	8.73	12.41	2.88	3.68	Computer and electronic products	13.59	12.49	13.21	-1.10	0.72
Fabricated metal products	7.08	7.90	7.31	0.82	-0.59	Electrical equipment, appliances, and components	2.89	2.77	2.83	-0.12	0.06
Food and kindred products	11.61	7.20	8.17	-4.41	0.98	Fabricated metal products	7.95	7.47	7.03	-0.48	-0.44
Furniture and fixtures	1.75	1.35	1.68	-0.40	0.33	Food and beverage and tobacco products	8.66	9.40	10.60	0.74	1.20
Instruments and related products	1.49	3.05	3.91	1.56	0.87	Furniture and related products	2.13	1.81	1.40	-0.32	-0.41
Leather and leather products	1.86	0.66	0.33	-1.21	-0.32	Machinery	8.07	7.13	7.23	-0.94	0.10
Lumber and wood products	4.39	3.87	2.93	-0.52	-0.93	Miscellaneous manufacturing	3.94	3.99	4.19	0.05	0.20
Machinery, except electrical	9.58	12.83	10.96	3.25	-1.88	Motor vehicles, bodies and trailers, and parts	8.86	6.88	6.84	-1.97	-0.04
Miscellaneous manufacturing industries	2.37	1.59	2.02	-0.78	0.43	Nonmetallic mineral products	2.89	2.76	2.81	-0.13	0.04
Motor vehicles and equipment	5.89	6.46	7.01	0.57	0.55	Other transportation equipment	4.74	6.33	7.19	1.58	0.87
Other transportation equipment	2.86	4.34	3.91	1.47	-0.43	Paper products	3.92	3.04	2.56	-0.87	-0.49
Paper and allied products	3.79	3.89	3.93	0.10	0.04	Petroleum and coal products	3.51	8.59	7.03	5.08	-1.56
Petroleum and coal products	2.48	3.65	2.05	1.17	-1.60	Plastics and rubber products	4.38	3.49	3.59	-0.89	0.10
Primary metal industries	8.77	7.98	3.92	-0.78	-4.06	Primary metals	3.39	3.52	2.81	0.13	-0.71
Printing and publishing	5.07	5.67	6.66	0.60	0.99	Printing and related support activities	2.82	2.64	1.78	-0.18	-0.86
Rubber and miscellaneous plastics products	1.95	2.96	3.82	1.01	0.86	Textile mills and textile product mills	1.98	1.05	0.71	-0.93	-0.34
Stone, clay, and glass products	3.45	3.34	2.84	-0.11	-0.50	Wood products	1.93	1.58	1.70	-0.35	0.12
Textile mill products	7.59	2.62	1.90	-4.97	-0.72						
Tobacco products	0.62	0.75	0.64	0.13	-0.11						

Table 3: Employment share (1948-2019)

Employment share											
Subsectors (SIC based)	***1948***	***1979***	***1997***	***1948-1979***	***1979-1997***	***Subsectors(NAICS based)***	***1998***	***2007***	***2019***	***1998-2007***	***2007-2019***
Apparel and other textile products	7.71	6.04	4.37	-1.67	-1.67	Apparel and leather and allied products	4.04	1.77	1.05	-2.27	-0.73
Chemicals and allied products	4.08	5.36	5.56	1.28	0.20	Chemical products	5.65	6.22	6.69	0.57	0.48
Electric and electronic equipment	6.28	10.19	9.15	3.91	-1.04	Computer and electronic products	10.48	9.22	8.46	-1.25	-0.77
Fabricated metal products	6.99	8.15	7.99	1.16	-0.16	Electrical equipment, appliances, and components	3.40	3.10	3.14	-0.31	0.04
Food and kindred products	11.49	8.07	9.01	-3.41	0.94	Fabricated metal products	10.00	11.23	11.60	1.23	0.37
Furniture and fixtures	2.15	2.33	2.74	0.18	0.41	Food and beverage and tobacco products	9.98	11.92	14.72	1.94	2.79
Instruments and related products	1.75	3.29	4.65	1.54	1.36	Furniture and related products	3.72	3.81	2.99	0.09	-0.82
Leather and leather products	2.62	1.17	0.48	-1.45	-0.69	Machinery	8.57	8.59	8.82	0.02	0.23
Lumber and wood products	5.55	3.68	4.25	-1.88	0.57	Miscellaneous manufacturing	4.19	4.60	4.81	0.41	0.22
Machinery, except electrical	8.92	11.97	11.65	3.05	-0.31	Motor vehicles, bodies and trailers, and parts	7.29	7.19	7.88	-0.10	0.69
Miscellaneous manufacturing industries	2.68	2.13	2.08	-0.55	-0.05	Nonmetallic mineral products	3.08	3.65	3.30	0.56	-0.35
Motor vehicles and equipment	4.88	4.82	5.32	-0.05	0.50	Other transportation equipment	4.64	5.21	5.80	0.57	0.58
Other transportation equipment	3.04	5.20	4.65	2.16	-0.54	Paper products	3.61	3.29	2.87	-0.32	-0.42
Paper and allied products	3.03	3.38	3.70	0.35	0.31	Petroleum and coal products	0.70	0.83	0.89	0.13	0.06
Petroleum and coal products	1.42	0.98	0.74	-0.44	-0.24	Plastics and rubber products	5.29	5.49	5.79	0.19	0.30
Primary metal industries	7.93	6.03	3.86	-1.91	-2.17	Primary metals	3.69	3.28	3.03	-0.41	-0.25
Printing and publishing	4.64	5.56	7.89	0.92	2.34	Printing and related support activities	4.48	4.50	3.29	0.02	-1.21
Rubber and miscellaneous plastics products	2.07	3.72	5.38	1.64	1.67	Textile mills and textile product mills	3.72	2.36	1.69	-1.36	-0.67
Stone, clay, and glass products	3.58	3.41	2.96	-0.17	-0.45	Wood products	3.46	3.73	3.18	0.27	-0.55
Textile mill products	8.56	4.20	3.33	-4.36	-0.87						
Tobacco products	0.64	0.33	0.22	-0.31	-0.11						

Table 4: Labor share (1948-2019)

Labor share											
Subsectors (SIC based)	***1948***	***1979***	***1997***	***1948-1979***	***1979-1997***	***Subsectors(NAICS based)***	***1998***	***2007***	***2019***	***1998-2007***	***2007-2019***
Apparel and other textile products	83.76	79.59	75.61	-4.17	-3.98	Apparel and leather and allied products	77.53	93.28	86.01	15.75	-7.27
Chemicals and allied products	53.73	60.32	44.95	6.60	-15.38	Chemical products	38.40	33.77	30.48	-4.63	-3.29
Electric and electronic equipment	81.87	83.69	52.41	1.81	-31.28	Computer and electronic products	63.40	59.89	54.24	-3.51	-5.65
Fabricated metal products	76.32	77.27	64.12	0.96	-13.15	Electrical equipment, appliances, and components	70.79	63.59	60.38	-7.21	-3.21
Food and kindred products	67.40	77.64	57.83	10.24	-19.80	Fabricated metal products	67.98	67.56	67.59	-0.42	0.03
Furniture and fixtures	80.45	91.47	73.63	11.02	-17.84	Food and beverage and tobacco products	55.99	50.87	50.46	-5.12	-0.41
Instruments and related products	89.00	78.33	92.45	-10.67	14.12	Furniture and related products	72.74	74.49	70.83	1.75	-3.66
Leather and leather products	79.91	78.37	62.36	-1.53	-16.01	Machinery	67.58	65.87	62.64	-1.71	-3.22
Lumber and wood products	67.40	58.14	65.40	-9.26	7.26	Miscellaneous manufacturing	63.00	64.06	61.43	1.05	-2.62
Machinery, except electrical	75.93	76.02	76.07	0.09	0.04	Motor vehicles, bodies and trailers, and parts	58.68	59.74	52.27	1.06	-7.46
Miscellaneous manufacturing industries	74.82	74.65	55.93	-0.16	-18.73	Nonmetallic mineral products	58.80	60.93	50.35	2.12	-10.57
Motor vehicles and equipment	66.01	79.66	62.67	13.66	-16.99	Other transportation equipment	76.66	59.00	54.22	-17.66	-4.78
Other transportation equipment*	91.22	110.51	92.43	19.29	-18.09	Paper products	59.27	58.52	55.44	-0.75	-3.07
Paper and allied products	60.79	70.03	63.75	9.24	-6.28	Petroleum and coal products	22.11	10.42	13.27	-11.69	2.85
Petroleum and coal products	63.80	35.65	38.41	-28.15	2.76	Plastics and rubber products	61.05	66.02	62.68	4.98	-3.34
Primary metal industries	72.85	75.19	69.75	2.34	-5.44	Primary metals	71.32	52.33	54.29	-18.99	1.96
Printing and publishing	75.18	67.16	71.42	-8.02	4.26	Printing and related support activities	86.20	71.56	66.63	-14.64	-4.92
Rubber and miscellaneous plastics products	81.40	82.96	73.60	1.56	-9.36	Textile mills and textile product mills	76.24	77.99	77.25	1.75	-0.74
Stone, clay, and glass products	72.27	75.99	61.53	3.72	-14.46	Wood products	77.05	84.80	64.34	7.75	-20.46
Textile mill products	68.57	80.22	74.68	11.65	-5.54	Manufacturing	60.71	53.54	50.16	-7.17	-3.38
Tobacco products	50.59	37.07	34.81	-13.52	-2.25						
Manufacturing	72.23	74.81	64.08	2.58	-10.73						
*For the years 1971-1981 Other Transportation equipment recorded negative gross operating income which leads the labor share to be higher than 1.											

Table 5: Relative price ratio (1948-2019)

Relative price ratios (p/p_manuf, Index 2000=100)				Relative price ratios (p/p_manuf, Index 2012=100)					
Subsectors (SIC based)	***1979***	***1997***	***1979-1997***	***Subsectors(NAICS based)***	***1998***	***2007***	***2019***	***1998-2007***	***2007-2019***
Apparel and other textile products	0.96	0.91	-0.05	Apparel and leather and allied products	1.14	1.11	1.08	-0.03	-0.03
Chemicals and allied products	0.69	0.94	0.24	Chemical products	0.71	0.80	1.14	0.09	0.34
Electric and electronic equipment	0.87	0.96	0.09	Computer and electronic products	5.42	1.52	0.85	-3.90	-0.67
Fabricated metal products	0.83	0.92	0.08	Electrical equipment, appliances, and components	0.90	0.99	1.04	0.09	0.05
Food and kindred products	0.72	0.88	0.16	Fabricated metal products	0.80	0.95	1.08	0.14	0.14
Furniture and fixtures	0.67	0.92	0.25	Food and beverage and tobacco products	0.65	0.85	1.04	0.20	0.19
Leather and leather products	0.85	0.96	0.11	Furniture and related products	0.83	1.00	1.07	0.17	0.07
Lumber and wood products	0.87	0.99	0.12	Machinery	0.89	1.01	1.12	0.12	0.12
Machinery, except electrical	2.88	1.22	-1.66	Miscellaneous manufacturing	1.02	1.08	1.03	0.07	-0.05
Miscellaneous manufacturing industries	0.82	0.95	0.13	Motor vehicles, bodies and trailers, and parts	1.41	1.09	1.06	-0.32	-0.04
Motor vehicles and equipment	0.61	0.94	0.33	Nonmetallic mineral products	0.87	1.13	1.24	0.26	0.10
Other transportation equipment	0.56	0.88	0.32	Other transportation equipment	0.70	1.02	1.05	0.32	0.03
Paper and allied products	0.62	0.79	0.17	Paper products	0.81	0.96	1.08	0.15	0.12
Petroleum and coal products	1.85	0.97	-0.87	Petroleum and coal products	0.26	0.68	0.63	0.42	-0.05
Primary metal industries	1.10	1.06	-0.04	Plastics and rubber products	0.97	0.95	1.00	-0.02	0.06
Printing and publishing	0.42	0.86	0.44	Primary metals	0.90	1.42	0.78	0.52	-0.63
Rubber and miscellaneous plastics products	1.38	0.97	-0.41	Printing and related support activities	1.15	1.23	1.03	0.08	-0.19
Stone, clay, and glass products	0.84	0.90	0.06	Textile mills and textile product mills	1.03	0.94	0.98	-0.09	0.04
Textile mill products	1.06	0.97	-0.09	Wood products	1.13	1.20	1.28	0.07	0.07
Tobacco products	0.06	0.32	0.26						

Table 6: Divisia decomposition results 1979-1997 (in pct. points)

sub-sectors(SIC based)	***comp***	***empl***	***price***	***prod***	***tot***
Apparel and other textile products	0.93	-0.07	0.09	-1.01	-0.06
Chemicals and allied products	3.49	-0.08	-2.11	-4.57	-3.27
Electric and electronic equipment	4.49	0.03	-0.72	-7.48	-3.68
Fabricated metal products	2.16	0.00	-0.51	-2.62	-0.97
Food and kindred products	1.90	-0.02	-1.11	-2.46	-1.69
Furniture and fixtures	0.61	0.04	-0.34	-0.40	-0.10
Leather and leather products	0.20	-0.01	-0.04	-0.23	-0.08
Lumber and wood products	0.69	-0.04	-0.31	-0.18	0.16
Machinery, except electrical	4.72	-0.01	7.28	-11.55	0.44
Miscellaneous manufacturing industries	0.72	0.00	-0.19	-0.95	-0.42
Motor vehicles and equipment	1.87	0.01	-2.06	-0.92	-1.09
Other transportation equipment	2.01	-0.14	-1.34	-0.56	-0.02
Paper and allied products	1.27	-0.01	-0.66	-0.91	-0.31
Petroleum and coal products	0.43	0.25	1.27	-1.94	0.02
Primary metal industries	1.26	-0.09	0.15	-1.66	-0.34
Printing and publishing	2.25	0.02	-3.19	1.25	0.32
Rubber and miscellaneous plastics products	1.10	0.13	0.84	-2.10	-0.03
Stone, clay, and glass products	0.88	0.00	-0.14	-1.21	-0.47
Textile mill products	0.85	-0.04	0.14	-1.01	-0.07
Tobacco products	0.21	0.10	-0.83	0.39	-0.13
Total	32.02	0.07	-3.77	-40.10	-11.78

Table 7: Divisia decomposition results 1998-2007 (Including Computer and Electronic products) (in pct. points)

subsectors(NAICS based)	***comp***	***empl***	***price***	***prod***	***tot***
Apparel and leather and allied products	0.57	-0.23	0.02	-0.29	0.06
Chemical products	2.28	-0.28	-0.92	-3.71	-2.63
Computer and electronic products	4.44	-0.07	9.52	-14.07	-0.19
Electrical equipment, appliances, and components	0.97	-0.03	-0.16	-0.85	-0.06
Fabricated metal products	1.99	0.09	-0.73	-0.98	0.37
Food and beverage and tobacco products	1.80	-0.06	-1.42	-1.02	-0.69
Furniture and related products	0.58	0.01	-0.21	-0.22	0.16
Machinery	2.10	0.00	-0.56	-1.36	0.19
Miscellaneous manufacturing	1.27	0.02	-0.15	-0.95	0.19
Motor vehicles, bodies and trailers, and parts	1.60	0.00	1.14	-2.61	0.13
Nonmetallic mineral products	0.66	0.01	-0.42	-0.15	0.10
Other transportation equipment	1.76	0.06	-1.17	-1.16	-0.51
Paper products	0.80	-0.01	-0.35	-0.46	-0.01
Petroleum and coal products	0.45	-0.41	-3.11	-1.10	-4.17
Plastics and rubber products	0.95	0.01	0.05	-0.73	0.28
Primary metals	0.87	-0.02	-0.91	-0.52	-0.58
Printing and related support activities	0.67	0.00	-0.11	-0.67	-0.11
Textile mills and textile product mills	0.46	-0.13	0.08	-0.41	0.01
Wood products	0.54	0.03	-0.06	-0.23	0.29
Total	24.75	-0.99	0.55	-31.48	-7.18

Table 8: Divisia decomposition results 2007-2019 (Including Computer and Electronic products) (in pct. points)

subsectors(NAICS based)	***comp***	***empl***	***price***	***prod***	***tot***
Apparel and leather and allied products	0.05	-0.10	0.01	-0.06	-0.10
Chemical products	0.44	-0.22	-2.80	1.28	-1.30
Computer and electronic products	1.46	-0.06	3.86	-5.85	-0.59
Electrical equipment, appliances, and components	0.19	0.00	-0.07	-0.16	-0.04
Fabricated metal products	0.31	0.04	-0.52	0.29	0.11
Food and beverage and tobacco products	0.28	-0.02	-1.05	0.72	-0.07
Furniture and related products	0.11	-0.08	-0.06	-0.06	-0.09
Machinery	0.42	0.02	-0.41	-0.12	-0.08
Miscellaneous manufacturing	0.30	0.02	0.10	-0.44	-0.02
Motor vehicles, bodies and trailers, and parts	-0.29	0.03	0.12	-0.32	-0.47
Nonmetallic mineral products	0.12	-0.01	-0.13	-0.26	-0.28
Other transportation equipment	0.35	0.03	-0.09	-0.53	-0.23
Paper products	0.10	-0.02	-0.17	0.00	-0.09
Petroleum and coal products	0.11	-0.23	0.32	0.16	0.37
Plastics and rubber products	0.18	0.02	-0.11	-0.13	-0.04
Primary metals	0.08	0.00	0.97	-0.99	0.06
Printing and related support activities	0.00	-0.12	0.20	-0.28	-0.20
Textile mills and textile product mills	0.06	-0.07	-0.02	-0.03	-0.06
Wood products	0.14	-0.06	-0.05	-0.28	-0.25
Total	4.40	-0.83	0.11	-7.05	-3.4

Table 9: Correlation across Divisia components

Correlation of Divisia components with D_T				
Period	comp	empl	price	prod
1979 business cycle	-0.557	0.137	0.340	0.388
1998 business cycle	0.002	0.828	0.312	0.083
2007 business cycle	-0.325	0.286	0.222	0.117

Table 10: Top 5 contributors : 1977-1997

1979-1997						
Top 5 contributors to labor share decline	**structural change**	**price effect**	**decoupling effect**	**employment share**	**lsh w.r.t manuf**	**% pt change in labor share**
Electric and electronic equipment	↑	↓	↓	↓	**low**	**-3.68**
Chemicals and allied products	↓	↓	↓	↑	**low**	**-3.27**
Food and kindred products	↓	↓	↓	↑	**low**	**-1.69**
Motor vehicles and equipment	↑	↓	↑	↑	**high**	**-1.09**
Fabricated metal products	↓	↓	↓	↓	**high**	**-0.97**

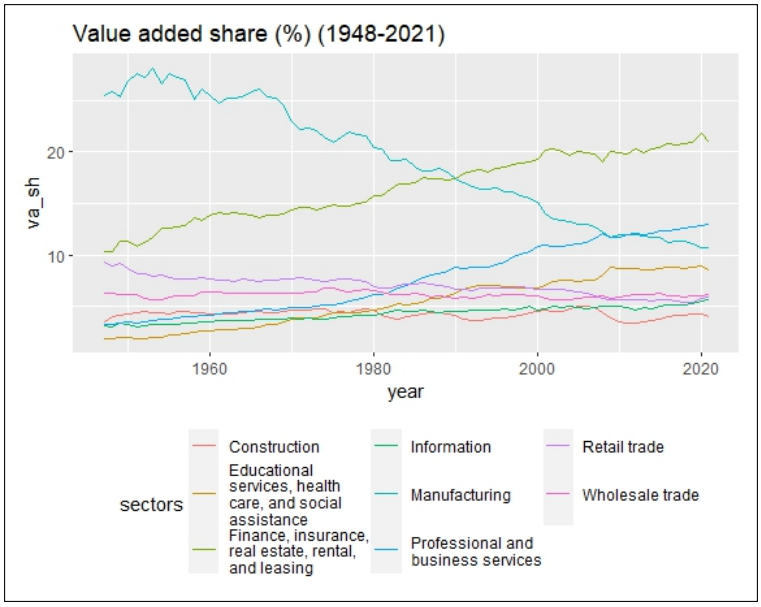
Table 11: Top 5 contributors : 1998-2007

1998-2007 (incl computer and electronic products)						
Top 5 contributors to labor share decline	**structural change**	**price effect**	**decoupling effect**	**employment share**	**lsh w.r.t manuf**	**% pt change in labor share**
Petroleum and coal products	↓	↓	↓	↑	**low**	**-4.17**
Chemical products	↓	↓	↓	↑	**low**	**-2.63**
Food and beverage and tobacco products	↓	↓	↑	↑	**low**	**-0.69**
Primary metals	↓	↓	↑	↓	**high**	**-0.58**
Other transportation equipment	↑	↓	↑	↑	**high**	**-0.51**

Table 12: Top 5 contributors : 2007-2019

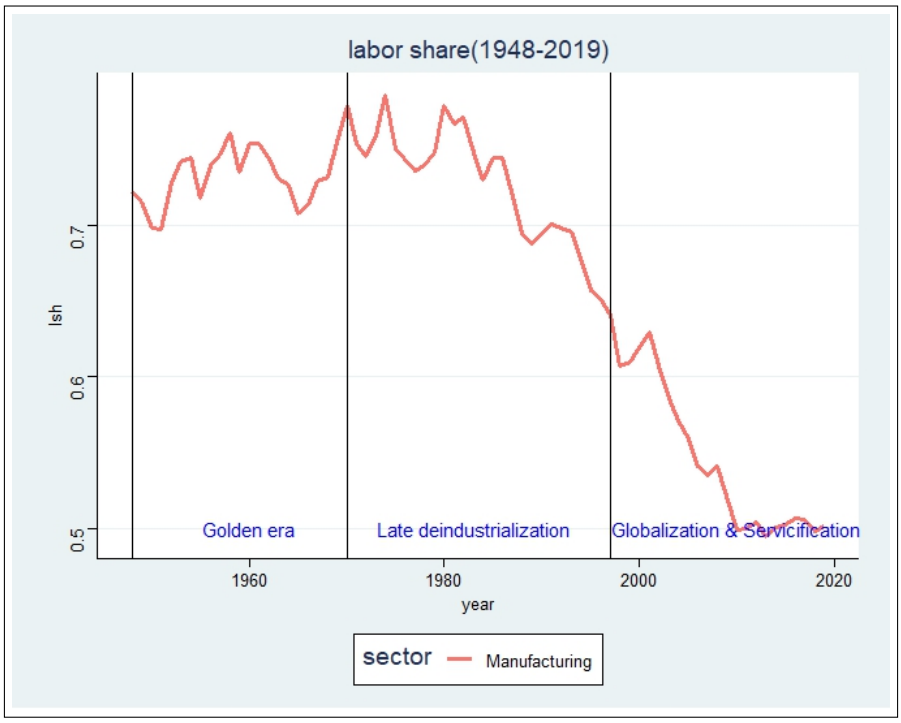
2007-2019 (incl computer and electronic products)						
Top 5 contributors to labor share decline	**structural change**	**price effect**	**decoupling effect**	**employment share**	**lsh w.r.t manuf**	**% pt change in labor share**
Chemical products	↓	↓	↑	↑	**low**	**-1.30**
Computer and electronic products	↓	↑	↓	↓	**high**	**-0.59**
Motor vehicles, bodies and trailers, and parts	↑	↑	↓	↑	**high**	**-0.47**
Petroleum and coal products	↓	↑	↑	↑	**low**	**0.37**
Nonmetallic mineral products	↓	↓	↓	↓	**high**	**-0.28**

Figure 1: Value added share - Major sectors



Calculations using U.S. Bureau of Economic Analysis, "Value Added by Industry"

Figure 2: Decline in labor share in manufacturing



Calculations using U.S Bureau of Economic Analysis historical industry accounts data (GDPbyInd VA SIC files) and "Components of Value Added by Industry"

Figure 3: Decomposition: 1979-1997, 1997-2007 , 2007-2019

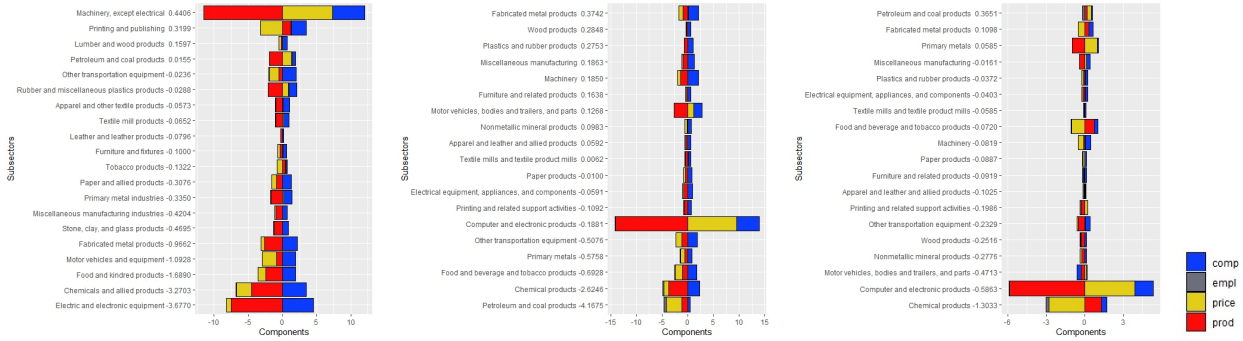


Figure 4: Employment share in LL sub-sectors

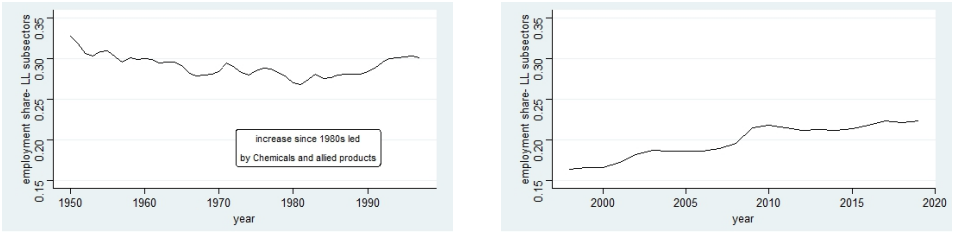
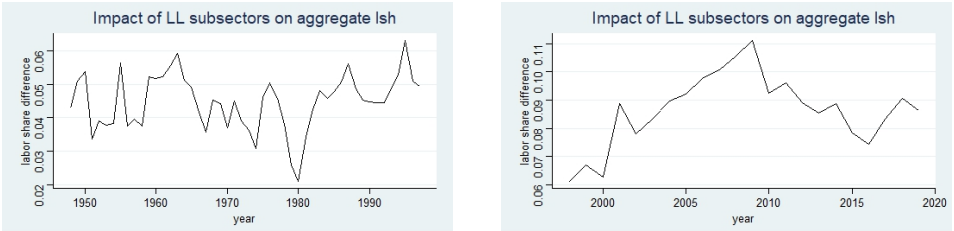


Figure 5: Difference in aggregate lsh (including and excluding LL subsectors)



Appendix

8.1 Prices, value added and employment shares

[Figure 6 about here.]

[Figure 7 about here.]

[Figure 8 about here.]

[Figure 9 about here.]

8.2 Excluding Computer and electronic products

Below tables and graphs show how much of an outlier the Computer and electronic products sub-sector is as compared to the rest of manufacturing. The Divisia components *price* and*prod* decrease substantially in comparison to Table 8 and Table 9. On aggregate there is no downward decoupling in these two business cycles as seen from the table *comp* has a higher magnitude than *prod* in both business cycles.

[Figure 10 about here.]

[Table 11 about here.]

[Table 12 about here.]

8.3 Correlation across Divisia components

[Figure 11 about here.]

[Figure 12 about here.]

[Figure 13 about here.]

Table 13: Divisia decomposition results 1998-2007(excluding Computer and electronic products) (in pct. points)

subsectors(NAICS based)	***comp***	***empl***	***price***	***prod***	***tot***
Apparel and leather and allied products	0.65	-0.28	0.02	-0.33	0.06
Chemical products	2.63	-0.26	-1.05	-4.22	-2.90
Electrical equipment, appliances, and components	1.12	-0.04	-0.18	-0.97	-0.06
Fabricated metal products	2.29	0.10	-0.83	-1.11	0.45
Food and beverage and tobacco products	2.07	-0.06	-1.61	-1.16	-0.75
Furniture and related products	0.67	0.00	-0.24	-0.25	0.19
Machinery	2.41	-0.01	-0.63	-1.55	0.23
Miscellaneous manufacturing	1.46	0.03	-0.17	-1.08	0.23
Motor vehicles, bodies and trailers, and parts	1.84	-0.01	1.30	-2.97	0.16
Nonmetallic mineral products	0.76	0.02	-0.48	-0.17	0.12
Other transportation equipment	2.02	0.07	-1.33	-1.32	-0.56
Paper products	0.93	-0.01	-0.40	-0.52	-0.01
Petroleum and coal products	0.52	-0.43	-3.54	-1.24	-4.69
Plastics and rubber products	1.09	0.01	0.06	-0.83	0.32
Primary metals	1.00	-0.02	-1.03	-0.60	-0.65
Printing and related support activities	0.77	-0.01	-0.12	-0.76	-0.13
Textile mills and textile product mills	0.53	-0.16	0.09	-0.46	0.00
Wood products	0.62	0.03	-0.07	-0.26	0.33
Total	23.37	-1.02	-10.20	-19.80	-7.66

Table 14: Divisia decomposition results 2007-2019(excl Computer and electronic products) (in pct. points)

subsectors(NAICS based)	***comp***	***empl***	***price***	***prod***	***tot***
Apparel and leather and allied products	0.06	-0.12	0.01	-0.07	-0.12
Chemical products	0.50	-0.22	-3.16	1.44	-1.43
Electrical equipment, appliances, and components	0.22	0.00	-0.08	-0.18	-0.05
Fabricated metal products	0.35	0.03	-0.59	0.32	0.12
Food and beverage and tobacco products	0.32	-0.01	-1.19	0.82	-0.06
Furniture and related products	0.12	-0.10	-0.06	-0.07	-0.11
Machinery	0.48	0.02	-0.46	-0.14	-0.09
Miscellaneous manufacturing	0.34	0.02	0.12	-0.49	-0.02
Motor vehicles, bodies and trailers, and parts	-0.34	0.03	0.13	-0.36	-0.54
Nonmetallic mineral products	0.14	-0.02	-0.15	-0.30	-0.32
Other transportation equipment	0.41	0.04	-0.10	-0.60	-0.25
Paper products	0.12	-0.03	-0.19	0.00	-0.10
Petroleum and coal products	0.13	-0.23	0.36	0.18	0.45
Plastics and rubber products	0.20	0.02	-0.12	-0.15	-0.04
Primary metals	0.09	-0.01	1.10	-1.11	0.06
Printing and related support activities	0.00	-0.15	0.22	-0.31	-0.24
Textile mills and textile product mills	0.07	-0.09	-0.02	-0.03	-0.07
Wood products	0.16	-0.07	-0.06	-0.32	-0.29
Total	3.38	-0.86	-4.25	-1.36	-3.09

Figure 6: Va and employment

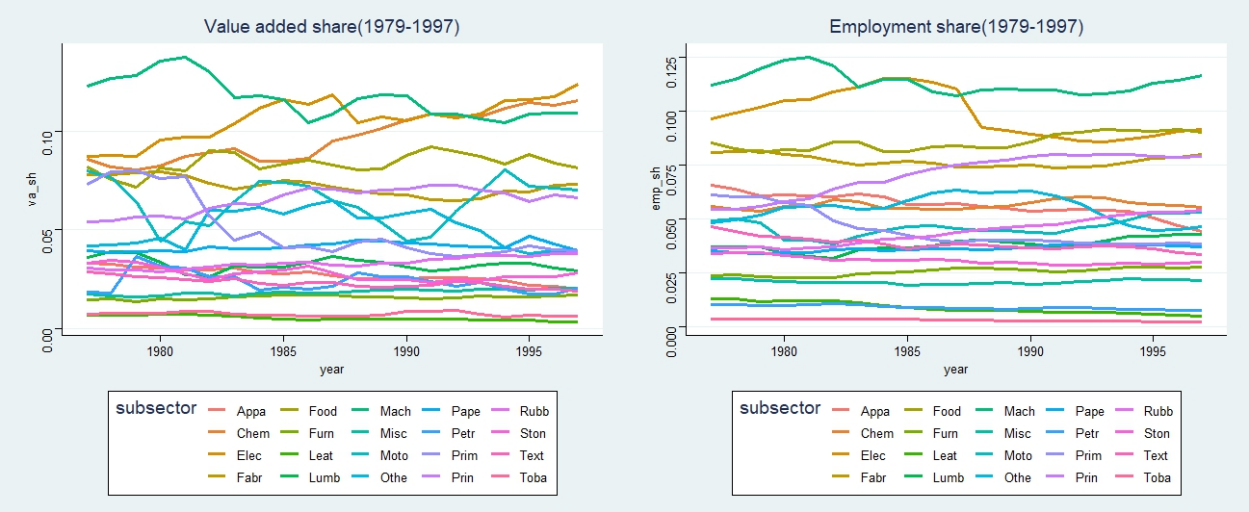


Figure 7: Va and employment

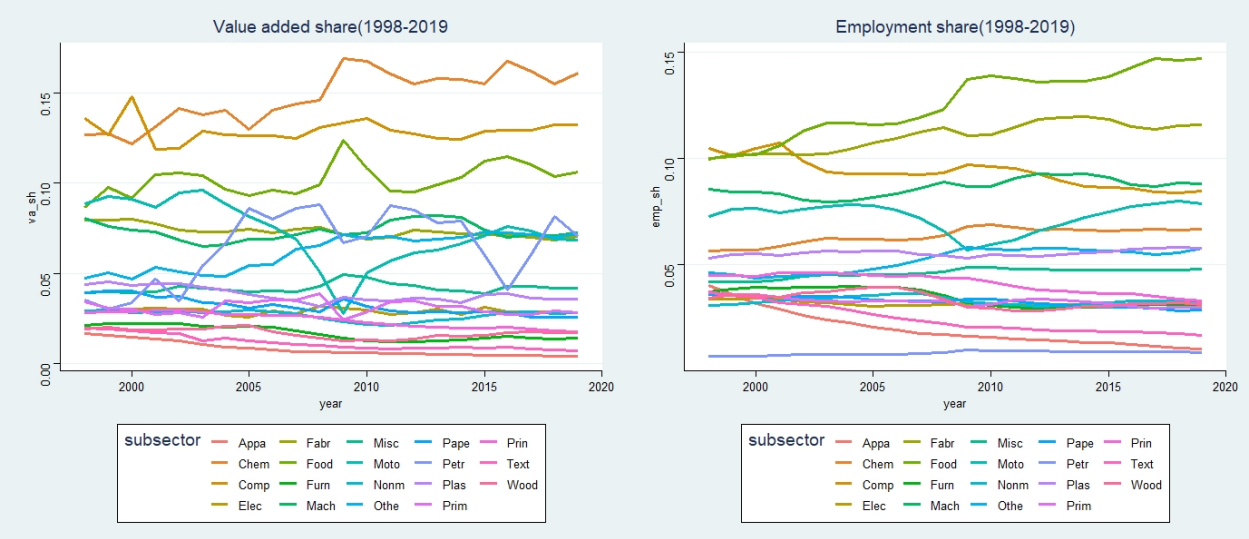


Figure 8: Price ratio and labor share

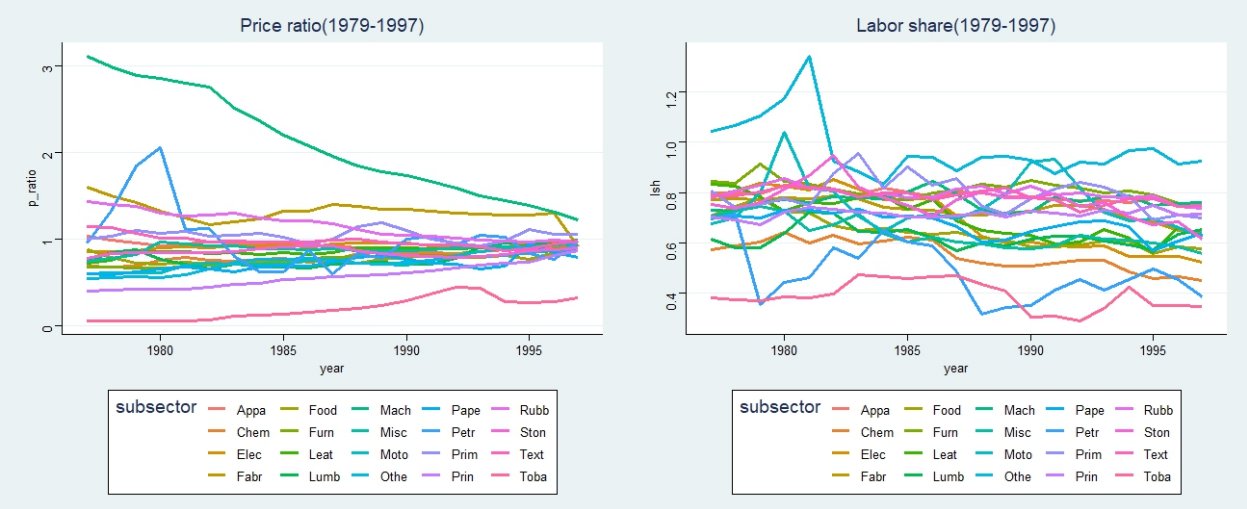


Figure 9: Price ratio and labor share

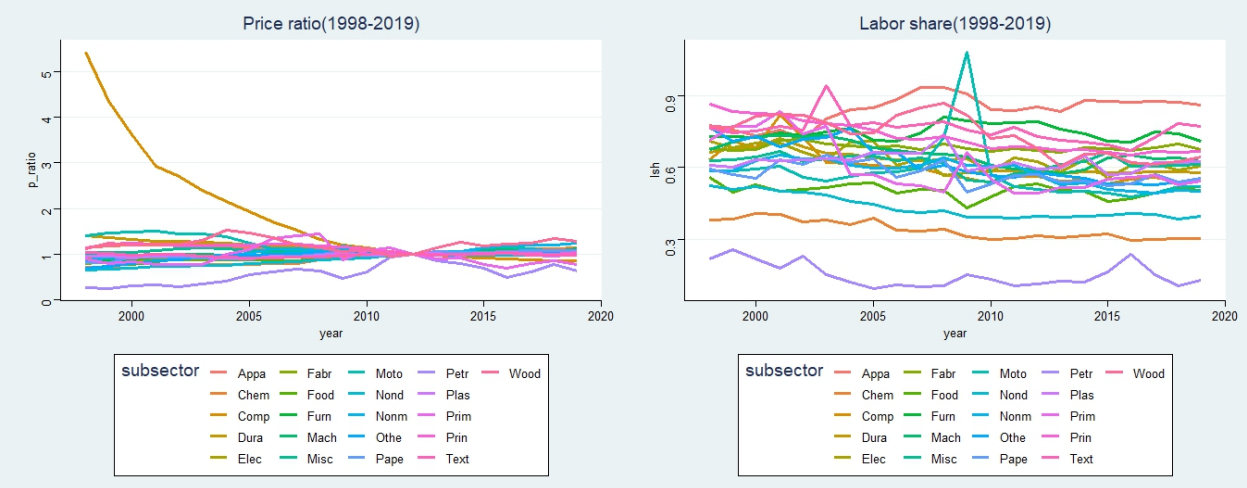


Figure 10: Divisia decomposition results 1998-2007 AND 2007-2019(excluding Computer and electronic products

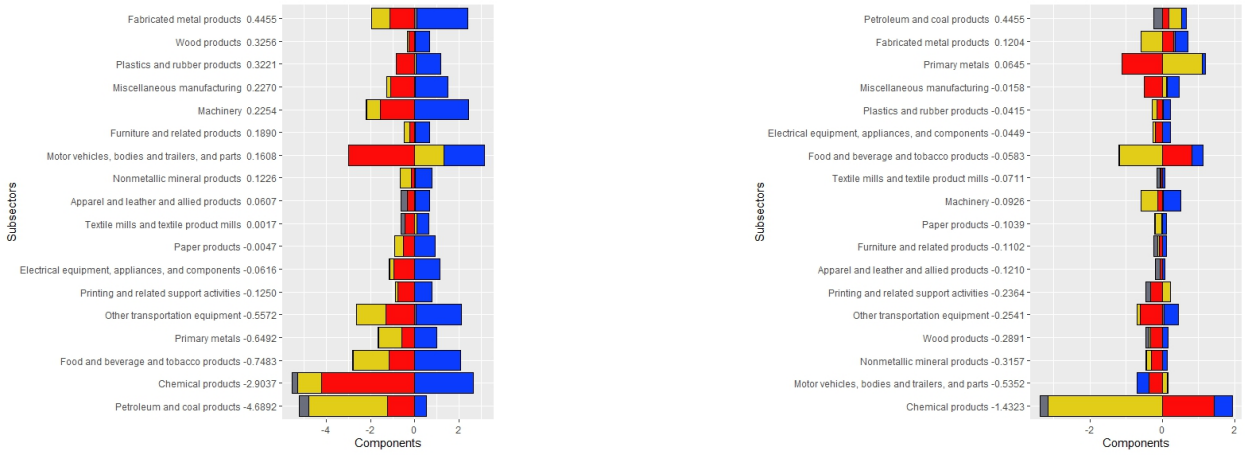


Figure 11: comp and tot contributions

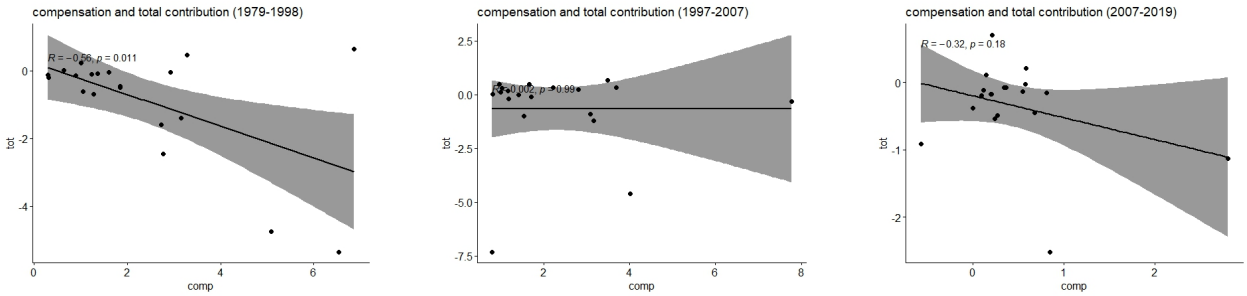


Figure 12: prod and tot contributions

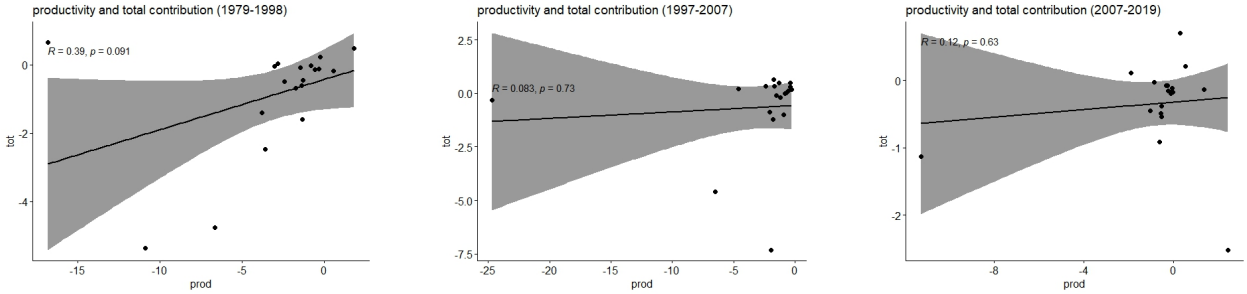


Figure 13: price and tot contributions