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Aggregate Trends and Industry-level Variation

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Long-Run Performance of the Organised Manufacturing Sector in India: Aggregate Trends and Industry-level Variation*

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Abstract

Despite its weak performance in terms of job creation in recent years, the organised manufacture sector remains vital to employment policy. This paper investigates the aggregate trends in this sector, in employment, output, labour-capital ratio, as well as wage share and wage rates at the three-digit NIC level over a long period from 1983 to 2016 using the Annual Survey of Industries data. We show that three distinct sub-periods can be identified within the overall period. Further, using shift-share decomposition we show that most of the decline in the L/K ratio can be explained by within industry changes. Finally, we analyse industries with respect to their capacity to deliver job growth as well as wage growth.

Keywords: India, organised manufacturing, ASI, jobless growth
JEL classification: E24, L6, O14,

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1 Introduction

The manufacturing sector has typically occupied a place of importance in development economics from the point of view of structural transformation as well as the creation of a modern industrial workforce. In particular the organised manufacturing consisting of relatively larger and profit-oriented firms is considered to be the engine of structural change and the source of "good jobs." In recent decades, however, it has become clear that many developing countries have failed to increase the share of manufacturing employment. Instead the workforce has been shifting from agriculture and other rural employment to the urban informal economy, particularly in construction and other services such as petty retail and domestic work. In this context, it becomes important to carefully scrutinize the performance of the manufacturing sector to identify periods as well as industries that have performed better or worse in terms of job creation as well as real wage growth. This papers attempts this task for India.

The manufacturing sector accounts for roughly 16 per cent of GDP and 11 per cent of empoyment in India. The sector is conventionally divded into the organised and unorganised sectors.[1] The share of the organised sector in the manufacturing workforce has gone up over time from 18 percent in 1994 to 27.5 percent in 2016. But its share in total manufacturing GDP has always been much higher due to higher levels of labour productivity. In 2011-12 this sector accounted for 26 percent of employment but 68 percent of value-added [Goldar and Sadhukhan, 2015; Thomas and Johny, 2018].

Until 2005 the sector displayed weak employment elasticity. Subsequently, there has been faster job creation but of the informal or precarious variety. The share of contract workers (i.e. workers on short-term contracts rather than in permanent jobs) in total workers in this sector increased from 14 per cent in 1989 to 34 per cent in 2010 [Papola and Sahu, 2012]. Jayadev and Narayan [2018] report that it has increased further since then. These are the informal workers within the organised sector. On the other hand, output and productivity have increased much faster than employment. In the popular as well as scholarly literature this phenomenon is known as "jobless growth."The failure of organised manufacturing to create decent jobs has attracted a lot of attention in the Indian context.[2] The causes for jobless growth identified in the literature are substitution of labour by capital, substitution

[1] Organised manufacturing consists of those establishments that are large enough to be registered under the Factories Act (1947). These are typically establishments that employ 10 or more workers with electricity or 20 or more workers without electricity, as per the official definition. The unorganised subsector is simply the residual sector consisting of establishments that are not registered under the Factories Act. The informal sector, on the other hand, is usually defined as consisting of all unincorporated enterprises that employ 10 workers or less. The related distinction between "formal" and "informal" employment (as opposed to enterprises) is used to distinguish workers whose jobs are subject to labour regulation alongside access to benefits or job security versus those who have no such access.

[2] See for example Bhalotra [1998]; Das et al. [2015]; Kannan and Raveendran [2009]; Kapoor [2015, 2016]; Kapoor and Krishnapriya [2017]; Mehrotra et al. [2014]; Papola and Sahu [2012]; Sen and Das [2015].

of regular workers by contract workers, and relatively faster growth of capital-intensive industries. Behind what may be called the proximal causes, lie deeper structural reasons driving them. Here the literature has identified labour regulation, cheapening of capital, trade openness, and inequality as the important factors behind jobless growth.

The present study is not concerned with identifying the causal forces behind "jobless growth." Rather, it attempts to trace the evolution of key parameters in this sector over a 33 year period from 1983 to 2016 to identify periods of better or worse performance and industries that have performed better or worse than average. In this respect we extend and build upon the analysis of Kannan and Raveendran [2009].

We show that the entire period can be divided into three clearly different sub-periods. Period One, from 1986 to 1996 is characterised by weak employment growth, rapid subsitution of capital for labour and rising wages and emoluments. The second period (1996 to 2006) displays the loss of employment, slower substitution of capital for labour, and stagnant wages alongside emerging divergence between wages and emoluments. The third period (2006 to 2016) shows strong employment growth as well as rising wages, despite a renewed decline in the labour capital ratio and a steadily growing divergence with wages and emoluments. This is also the only period during which the labour share of income stops falling and even shows a rise in nominal terms.

We also construct a typology of industries based on whether they have managed to deliver employment growth as well as wage growth. We find that industries such as apparel and knitwear have displayed the capacity to create jobs as well as deliver wage growth. On the other hand textiles, machinery, electrical equipment have failed on both fronts. Other industries show a more mixed profile, delivering on one dimension but not the other.

The remainder of the paper is organised as follows. The next section reviews the recent literature on Indian organised manufacturing. This is followed by a discussion of the Data and Methods. Subsequently, Section 4 presents the results. Section 5 discusses the implications of the results. Section 6 concludes.

2 Literature Review

Based on several recent studies the following stylized facts can be highighted in the Indian organised manufacturing sector:[3] rising capital intensity of production across all industries, low output elasticity of employment (around 0.5 or less), growing divergence between real

[3] Kapoor [2015]; Kapoor and Krishnapriya [2017]; Kapoor [2016]; Abraham and Sasikumar [2017]; Goldar and Sadhukhan [2015]; Sen and Das [2015]. The studies differ in the time periods under consideration with some focusing purely on the post-reform period and others reaching back to the early 1980s.

wages and labour productivity, falling labour share of income, and rising proportion of contract workers. We discuss each briefly.

The capital labour ratio has increased in capital intensive as well as labour intensive industries [Kapoor, 2015; Sen and Das, 2015]. Rising capital intensity is often attributed to inflexiblity in labour laws that raise the costs of hiring and firing labour. However, Sen and Das [2015] point out that the level of capital intensity could be explained by labour regulations but they cannot account for rising capital intensity. For this laws would have to become more pro-labour over time, which has not happened. The authors attribute increasing capital intensity to increases in the ratio of real wage rate to rental price of capital. They hypothesize that capital has become cheaper over time relative to labour due to trade liberalization as well as ease of borrowing in capital markets. While the hypothesis is plausible, the evidence present is only correlational. Along similar lines ILO [2009] argues that policy incentives such as capital investment subsidy, interest subsidy, export promotion capital goods scheme, and credit-linked capital subsidy for technology may have contributed to substitution of capital for labour.

The divergence between wages and productivity, driven by former growing much slower than the latter has been observed in OECD economies and attracted particular attention during the economic crisis of 2008. In the Indian case relatively less attention has been paid to this phenomenon, though several researchers have pointed it out. One of the first papers to point it out, in recent years is Kannan and Raveendran [2009]. But the authors do not discuss it much. Abraham and Sasikumar [2017] discuss it in the context of falling wage shares. Nagaraj [2018] also reports the same finding in the context of a discussion on the efficacy of labour laws. His point is that the divergence points to the weak position of Indian labour vis-a-vis capital even within the relatively privileged organised manufacturing working class.

The closely related trend of a fall in labour share of income has, once again, been reported across the globe. This literature is surveyed in Abraham and Sasikumar [2017]. This study shows that the share of total emoluments (wages plus benefits) to workers declined from 51.1 per cent in 1980 to 27.9 per cent in 2012 while the share of wages declined from 33 per cent to 13 per cent. They further perform a shift-share decomposition and find that of the decline in wage share of 25.6 percentage points, 75.6 per cent is explained by the shift component. That is, falling share of wages is mostly due to a fall within each industry rather than a faster growth of industries with lower wage shares. It should be noted that the trend of declining wage share goes back even to the 1960s [Basu and Das, 2015].

Two recent studies have taken a closer look at the falling wage share and tried to identify its determinants [Abraham and Sasikumar, 2017; Jayadev and Narayan, 2018]. The first study uses an industry-state-year panel and a first-difference regression model to show that contractualization, increasing female share in permanent workers, and intensification of work

(more days of work in place of more workers) are determinants of the falling wage share. The second study also identifies the rise of contract labour as an important determinant alongside trade openness.

The phenomenon of rising proportion of informal or contract workers in the organised manufacturing sector is linked to the much-debated issue of labour legislation. Das et al. [2015] summarize the general view when they note that the strict provisions of the Industrial Disputes Act regarding the hiring and firing of labour have, over the year, been increasingly circumvented by employers via the use of various forms of temporary and contract workers. The debate over whether labour legislation has been a cause of jobless growth is not directly relevant to the present study. We refer the interested reader to the above paper for a review of the literature. The relevant aspect for us is that growing capital intensity and a rise in the proportion of contract workers, who tend to be paid less, together can account for the falling labour share of income.

While the overall trends discussed above have been relatively well studied, the possibiity of distinct regimes that are sub-periods of a longer period (other than the obvious pre- and post-reform dichotomy) has received less attention. This is worth investigating because it can point to policy mixes as well as international contexts that produced a particular kind of a result. Some authors have alluded to such heterogeneity in trends over time. For example, Goldar [2011] reports that employment growth rate in organized manufacturing accelerated sharply after 2004-05 while in comparison between 1995-96 and 2003-04 employment in this sector fell at the rate of 1.5 per cent per annum. Das et al. [2017] find structural breaks within a two year wndow (1997-99) for employment, ouput, wage rate and labour productivity. Similarly for wage share, it has recently been noticed in the business press that there has been a reveral in the declining trend since 2008.[4]Finally, Basu and Das [2015] find that the profit rate in organised manufacturing shows two medium run regimes. 1983 to 2002 is a period of declining profitability while 2002 to 2013 is one of rising profitability.

This points to the need to look carefully at the trends across parameters such as the labour captial ratio, labour productivity, real wages, and the wage share to see if consistent periods can be identified. It is not necessary from a theoretical perspective that the same structural breaks will appear in every series. But it is nevertheless worth asking if there are consistent patterns. Post-hoc one can try to identify policy changes or changes in the global economy that could explain the breaks.

Another question that has been raised in the literature but not satisfactorily answered yet is to what extent the falling labour to capital ratio at the aggregate level is due to a fall in the ratio within each industry and to what extent it is due to the faster growth of relatively more capital intensive industries. The latter mechanism is suggested by both Kannan and

[4]For example see the following article from the Business Standard.

Raveendran [2009] and ILO [2009] as a mechanism for jobless growth. The argument is that rising inequality reuslts in greater demand for manufactured commodities that are products of relatively more capital intensive as well as more import intensive industries. For example metal and chemicals-based products, electronics, vehicles etc. Results presented by Kapoor [2015] certainly point to a greater contribution of within industry factors.

One final point should be noted. Industry level variation in key trends has been widely discussed in the literature. However, it is almost all at the two-digit NIC level. This study uses three-digit data because it gives a more fine-grained picture and because we have more data points to analyse cross-industry variation.

In the present study we extend the above literature in two ways. First, we inspect the aggregate trends to identify three distinct sub-periods in the Indian manufacturing experience. Second, we undertake a three-digit level analysis to determine the industry-level contribution to aggregate trends and to construct a typology of industries based on their performance in creating jobs as well as delivering wage growth.

3 Data and Methods

3.1 Annual Survey of Industries

This study is based on the Annual Survey of Industries (ASI). Conducted by the Central Statistics Office's (CSO) Industrial Wing, under the Ministry of Statistics and Programme Implementation (MOSPI), this is a voluntary survey that gathers information from factories that are covered by Sections 2m(i) and 2m(ii) of the 1948 Factories Act.[5] At the factory-level ASI data is only available from 2000 onwards. Older data is made available at the industry level only. We use data from the ASI concorded series of the Economic and Political Weekly Research Foundation's India Time Series database (henceforth, EPW-RFITS). This has been updated for the most recent two years (2014-2015 and 2015-2016) directly from the ASI website.[6]

Over the years the ASI sampling frame and method have changed somewhat with the most significant change being the exclusion of certain industries starting 1999. These are mostly publity utilities or service-type industries such as electricity, gas, steam, and water, storage

[5] That is, those establishments that use electricity and hire more than ten workers, and those that do not use electricity but nevertheless employ twenty or more workers. See http://mospi.nic.in/sites/default/files/publication_reports/all_about_asi_1.pdf

[6] Industries are classified according to MOSPI's National Industrial Classification (NIC) codes. The period from 1983 to 2016 covers five different NICs: NIC 1970, NIC 1987, NIC 1998, NIC 2004 and NIC 2008 . These are have concorded by EPWRFITS. Data from addiitonal years was obtained from http://mospi.nic.in/asi-summary-results and concorded.

and warehousing etc.[7] These industries have been omitted from the dataset in order to retain consistency across the entire period. Finally, we choose to start the analysis from 1983 because the earlier years lack data on certain key variables of interest. Our final dataset spans 33 years (1983 to 2016) and 55 industries.

3.2 Variables

We deflate nominal wages and salaries by the Consumer Price Index for Industrial Workers (CPI-IW, base 2005), nominal output and value added by the Wholesale Price Index for manufactured products (WPI-MP, base 2005) and nominal capital by the Wholesale Price Index for Machines and Machinery (WPI-MM, base 2005). These are obtained from the RBI Database on the Indian Economic, the RBI Handbook of Statistics on Indian Economy and the Office of the Economic Advisor.

The ASI provides the number of workers as well as number of employees for a given factory. The former refers to production line staff while the latter refers to workers as well as clerical, supervisory and mangerial staff. The variable total persons engaged includes all the above plus working proprietors. It is this variable that we use to measure employment trends. But the trends and results are not substantially altered by using production workers though the levels are of course different. There is also a distinction made between wages/salaries to workers and emoluments with the former refering to the basic wage and latter to wages plus bonuses and other benefits. Capital stock is provided at historical cost. Gross value added is the difference between receipts and non-labour expenses.

We define labour intensity or the labour capital ratio as the ratio of total persons engaged to real fixed capital. We have confirmed that substituting number of workers for persons engaged does not alter the trends and results. Labour productivity is defined as the ratio of real gross value added to number of workers or employees (once again the trends are similar for both). The wage share is defined as share of wages in an industry's real gross vaue added. Using gross output instead of gross value added does not substantially alter the productivity or wage share trends.

The average growth rate of a particular variable over the entire period is calculated by regressing the log of the variable over time. Elasticity is calculated by regressing log employment over log output.

[7] See Kannan and Raveendran [2009] for details.

3.3 Decomposition Analysis

The components of the shift-share decomposition for the labour-capital ratio are:[8]

$$l^{t+1} - l^t = l_i^t(s_i^{t+1} - s_i^t) + (l_i^{t+1} - l_i^t)s_i^t + (l_i^{t+1} - l_i^t)(s_i^{t+1} - s_i^t) \quad (1)$$

Where

$$l = L/K,\ s_i = K_i/K$$

The first term is the labour-capital ratio for a given industry multiplied by the change in the share of capital stock of that industry. The second term is the share of a given industry's capital stock multiplied by the change in labour intensity. The third term is an interaction term.

Thus the change in labour intensity at the aggregate level can be decomposed into an intra-industry component that accounts for the within industry changes in labour intensity, an inter-industry component that accounts for the changing importance of a given industry in terms of its share in total capital stock, and an interaction component.

The wage share is decomposed as follows:

$$(wL)/Y = L/K * (wL)/L * K/Y \quad (2)$$

Where w is the wage rate, L is number of workers, Y is output or value-added, and K is the capital stock. Thus the share of wages in output or value-added can be expressed as the product of the labour-capital ratio, the wage rate and the capital-output ratio. It follows that the growth rate of the wage share can be expressed as the sum of the growth rates of the other three ratios.

4 Results

4.1 Aggregate Analysis

We start with an analysis of the entire organised manufaturing sector at the aggregate level. In this section the focus is on the evolution of employment, output, labour intensity, real wages, and the wage share over the past three decades. Based on the observed trends we construct three distinct periods in Indian manufacturing.

[8] This is a modified version of code made available by Deepankar Basu.

4.1.1 Employment, Wage, and Labour Intensity Trends

Figure 1 shows the absolute levels of employment in organised manufacturing, in terms of production workers and total persons engaged (including managers, supervisors, clerical staff etc.). After an small initial fall in absolute employment till 1986 there was growth till the mid-1990s. The worst period for organised manufacturing employment, as has been noted in the literature, was between 1997 and 2002.[9] After 2006 employment in this sector grew again and the rise was faster in the 2000s compared to the early 1990s. However, it should be noted that there is wide variation across industries in employment trends. We discuss this issue in a latter section.

The overall growth in employment pales in significance compared to the rise in output in the same period indicating a large increase in labour productivity over the period. Figure 2 shows the both trends indexed to the first year (1983). While employment roughly doubles in this period, output goes up nearly 15 times. Figure 3 shows the annual growth rates in employment and output. Clearly the two are correlated, as one might expect, but also as expected, employment growth consistently lags behind output growth. Thus the growth elasticity of employment has been low in this sector. The average annual elasticity over the entire period 1983 to 2016, excluding two years of exceptionally low elasticity (2001, elasticity -5 and 2013, elasticity -10) is 0.1. Figure 4 show annual employment elasticities for the entire period, once again omitting the two outlying years.

While elasticity remains low on average there is substantial fluctuation as well. As expected from the employment and output trends seen earlier, the period from 1997 to 2005 stands out as disastrous from the employment perspective. While the period from 2006 to 2016 is much better in comparison. Based on these data one can identify three distinct regimes or sub-periods. The first from 1986 to 1996 when employment grew slowly. The second from 1996 to 2006 during which employment declined. And third from 2006 to 2016 when employment grew much faster than at any other time since the early 1980s.

Interestingly, the same sub-periods can be identified in the real wage rate series. Figure 5 shows that real wages per worker have increased around 1.4 times over the entire period. But the pace of growth is heterogenous. Wages grew from the early 1980s till about 1996. After which there was a period of stagnation and even decline, until 2007. Subsequently they have been increasing. Thus, interestingly we see that both employment and the wage per worker move together.

As discussed in the Literature Review, one important reason for low employment elasticity in the organised manufacturing sector is the falling labour to capital ratio or labour intensity of production. It has been widely noted that there is a secular decline in the aggregate labour

[9] This decline is not an artefact of the removal of certain industries from ASI coverage (see Data section).

to capital ratio in Indian manufacturing (Figure 6). This has occured in organised as well as unorganised sectors, though here we only discuss the former. For ease of interpretation the ratio is reported as number of people employed per one crore rupees of fixed capital invested (in 2005 rupees). After falling steadily from roughly 100 jobs per one crore of capital in the early 1980s to around 20 jobs in the 1998, there is a stagnation in the ratio until around 2007, after which it falls again till 2016.

Thus there is heterogeneity over time similar to the regimes we have identified for the employment and wage data. The rising employment-rising wages regimes are associated with a falling labour to capital ratio while the falling employment-stagnant wages regime is associated with a stagnant labour capital ratio. This counter-intuitive finding points to the importance of other factors such as overall output growth in explaining employment trends, and labour productivity growth in explaining wage trends.

On the basis of visual inspection of the timeseries, we focus on two years, 1996 and 2006, as break points in the time trend. These are not to be taken as precise points but rather a one or two year window around them should be kept in mind. The two chosen points are statistically significant in a Wald test for structural breaks in the employment, wage and labour-capital ratio data. We take up the discussion of the three regimes and their significance later in the paper.

4.1.2 The Wage-Productivity Gap and Wage Share

The general tendency for production to become more capital intensive has, as expected driven a large increase in labour productivity in organised manufacturing. Between 1983 and 2016, labour productivity, as measured by real gross value added per person engaged went up six times. The question that arises, from a quality of jobs perspective, is how were the productivity gains shared between labour and capital. For this we need to look at the relationship between wages and productivity. The growing dominance of capital in the production process suggests that a greater portion of value-added would acrue to capital owners as a result. The expected divergence between the real wage rate and real productivity per worker is indeed clearly observed in the ASI data (Figure 7a). On average the real wage rate grew at the rate of 1.4 percent per year while productivity grew at 5.5 percent per year in real terms. This points to a large shift in distribution in favour of capital.

There is another divergence visible in Figure 7a that has not received much attention in the literature, viz. that between wages per worker paid to production workers and emoluments per employee which include benefits and bonuses paid to managerial and supervisory staff. This can be seem more clearly in Figure 7b which shows indexed values and Figure 7c that shows the actual real rupee values in 2005 rupees. After growing in step with each other until

the late-1990s the two diverge. Subsequenty the real wage rate enters a period of stagnation that coincides with the absolute fall in employment discussed earlier, while emoluments rise steadily. The gap between the two has grown steadily since then, even after the wage rate started rising post 2006. The emoluments to wages ratio rose from 1.2 in 1983 to 1.7 in 2016. A possible factor contributing to this divergence is the rise in proportion of contract workers, or workers employed via contractors and not paid through the firm's payroll. As has been discussed by others, contract workers are paid a fraction of permanent worker wages, often for similar work [Nayanjyoti and Amit, 2018; Kapoor and Krishnapriya, 2017]. Of course it is also possible that production-line wages have increased far more slowly than salaries and bonuses of supervisory and mangerial staff. This shift is worth investigating further.

Taken together these trends, viz. rising capital intensity and growing divergence between productivity and wages/emoluments are expected to give rise to a falling share of labour in value-added. Figure 8a reports the share of wages as well as emoluments in gross value added in real as well as nominal terms. Note that, as indicated by Abraham and Sasikumar [2017], the nominal wage share is simply the real wage share multipled by relative prices (see eq. 4 in their paper). If the same deflator is used for both variables, the two shares will be identical

The authors note that the decline in real wage share is steeper than the nominal decline, due to the fact that the CPI has diverged from the WPI over time. Thus two things are to be noted regarding the declining labour share of income in organised manufacturing. First, that there is a large, secular decline till 2008 in both the nominal and real shares. Afterwards, the nominal share rises slighlty while the real share stagnates. In nominal terms, the share of wages in value-added fell from 27 percent in 1983 to a low of 9.3 percent in 2008. Subsequently it has increased to around 12.5 percent in 2016. Second, the divergence between the shares has to do with the fact that wages have not increased as much in real terms as has output, due faster rise in the CPI compared to WPI. As noted earlier the rise in nominal labour share since 2008 has received some attention in the business press. But note that in real terms there is no increase; rather a stagnation at the low level of around 8 percent. Emoluments share shows a similar trend though, of course, with higher values.

Here one can ask what part of the trend in labour share is attributable to changes in labour intensity of production, how much to wage trends and how much to capital productivity. As indicated in the Methods section, the wage share of value-added can be decomposed into these three ratios. Since the product of the three ratios, the labour-capital ratio (L/K), the wage rate (wL/L) and the inverse of capital productivity (K/GVA) is the wage share of value-added (wL/GVA), it follows that the sum of the three growth rates will be the growth rate of the wage share.

Figure 8b shows the results of the decomposition analysis. The yellow bars are annual growth in wage rate, the orange bars show growth rate of the capital-output ratio and the blue bars are growth rate of the L/K ratio. The two lines are the growth rate of the wage share and the sum of the three component growth rates. As expected they coincide exactly.

The real wage rate trend does not explain much of the decline. Though of course a higher rate of growth of real wages would have counteracted the pull-down effect of the other two variables. Most of the decline in wage-share is explained by the falling L/K ratio (blue) but falling capital productivity stems the decline. Importantly, in the period between 2002 and 2007 when L/K ratio does not fall as rapidly, capital productivity is growing, resulting once again in a fall in the wage share. Further, wage growth is close to zero during this period as well. Only after 2008 does the wage share flatten out. This is a result of contradictory trends: a falling L/K ratio counteracted by falling capital productivity and rising wage growth. We discuss the implications of this in the Discussion section.

4.2 Industry Analysis

The aggregate trends analysed thus far are useful in getting a sense of the overall dynamics of the key variables of interest. However, these trends hide substantial variation across industries. In this section we examine the industry-level variation in five key variables, viz. labour capital ratio, labour productivity, wage share, real wage rate, and employmen elasticity.[10] The table in the appendix provides industry names for each NIC code.

First we calculate growth rates and elasticities across industries as described in the Methods section. Second, in order to gain a sense of yearly variation at the industry level, we also analyse time trends for some selected industries. Third we perform a shift-share decomposition of the labour-capital ratio. Finally we use the growth rate data to construct a typology of industries based on their job creating capacity and their ability to deliver wage growth.

4.2.1 Labour Intensity, Labour Productivity and Wage Share

The question that arises is, how much of the secular decline in aggregate labour to capital ratio is a result of rising capital intensity of production within every industry and in what part is it a result of faster than average growth on relatively more capital intensive industries. This question has been raised in the literature but not adequately addressed thus far.

As noted in the Literature Review, we do know that labour intensity has declined in relatively more labour intensive as well as relatively more capital intensive industries. Figure 9a shows

[10] After exlcuding industries with no observations and industries that were dropped from ASI coverage in 1999, we have 55 industries at the 3-digit NIC level in our sample.

this phenomenon for a selection of industries. These industries have been chosen to represent a wide range of initial labour intensities from furniture and textiles to vehicles and petroleum products. As can be seen labour capital ratio falls for all industries and two distinct periods are observed. A robust decline in the 1980s and 1990s followed by a slower decline in the 2000s. Note that the textile industry is four times as labour intensive as appliances or vehicles, but it displays very similar dynamics.

Figure 9b shows the average annual decline in labour intensity over the entire period for all the industries in the sample. Strikingly, every industry but one has grown more capital intensive over time. But there is significant variation in the magnitude of the change from over -10 percent annually in the case of glass (NIC 261) to less than -3 percent for man-made fibres (NIC 243). Only one industry, reproduction of recorded media bucks the general trend by posting an increase in labour intensity on average.

We perform a shift share decomposition of the labour-capital ratio to estimate the relative contributions of the within and between industry components in the decline of the aggregate ratio (see Methods for details). The results of this analysis are presented in Figure 9c. The jagged lines show actual growth rates year on year (green) and the sum of the three components (brown). As expected the two lines coincide exactly. Each bar is split into three component, intra-industry change in labour-capital ratio (yellow), inter-industry change (blue), and the interaction term (red).

There are several things to be noted. First, note that three periods, consistent with the previous analysis, are visible. The labour capital ratio declines for most of the 1980s and 90s, is steady in the early 2000s and starts declining again after 2008. But more importantly we see that the fall in the intra-industry component dominates for almost every year in the sample. The inter-industry component is positive for several years, indicating that labour intensive indutries actually grew faster contrary to the hypothesis in the literature that falling labour intensity has to do with faster growth of relatively more capital intensive industries. Thus one can conclude from the decomposition analysis that the decline in the L/K ratio at the aggregate level is due to rising capital intensity within each industry rather than due to faster growth of more capital intensive industries.

As expected from growing mechanization, there have been large gains in labour productivty across all industries (except man-made fibres), from just over 1 percent per annum at the low end to 8 percent per annum at the high end. From the point of view of welfare it is important to know the division of these productivity gains between wages and profits. Figure 11 shows the annual growth of the real wage rate over the entire period. While wage growth has been positive for the vast majority of industries, there are 13 industries with negative or zero wage growth on average. In general it is clear that wage growth is much lower than productivity growth for all industries.

It is of interest to know which are the better performing industries with respect to translating productivity growth into wage growth. Figure 12 shows this relationship in a scatter plot along with a line of best fit (red) and a line of equality (blue). All the points except for NIC 182 (dressing and dyeing of fur, a very small industry) lie above the line of equality as expected. The line of best fit shows the average relationship between the two variables and the dispersion in both directions shows which industries are better or worse than average at translating productivity gains into wage gains.[11]

Some industries such as petroleum (232), tobacco (160), non-ferrous metals (272) and motor vehicles (341) lie far above the line indicating a worse performance in translating productivity increases into wage increases. Railway locomotives and rolling stock (NIC 352) and domestic appliances n.e.c (NIC 293) have posted impressive productivity gains alonside a decline in wages. On the other hand some big employers such as knitwear (173), leather (191) and footwear (192) lie below the line, indicating lower productivity growth but a better than average performance translating it into wage growth. Recorded media (NIC 223) and electric motors (NIC 311) are particularly impressive in this regard. But even apparel (NIC 181) which has posted lower productivity growth than most industries, has been able to translate this growth into wage gains to a larger extent than most others. Since apparel is also a large employer, this is even more significant. Other important employment-intensive industries like textiles (171) and food (151-154) lie very close to the line indicating an average performance.

The fact that nearly all industries lie above the line of equality means that wage gains have not kept pace with productivity gains anywhere in organised manufacturing. Thus it is not surprising that there is an almost universal decline in the wage share. Figure 13 shows the annual average growth rate in wage share for all industries in the sample. With the exception manmade fibres, electrical equipment n.e.c and recorded media (which as we saw earlier, has posted an increase in labour intensity), the wage share has fallen for every industry.

4.2.2 Employment Elasticity and Wages

Thus far we have seen that certain aggregate trends such as falling labour intensity, rising productivity and wages, and falling wage share are seen in almost every industry, albeit to varying degrees. Industries also differ widely in their employment growth over the data period. Figure 14 shows indexed change in employment for the same selected industries shown previously for labour capital ratio. Textiles (NIC 171) has done poorly while apparel (NIC 181) has done very well from the point of view of job creation. Both these are now comparable in terms of the level of employment with textiles employing around 800,000 and

[11] Two industries with negative values for productivity have been omitted for clarity.

apparel around 750,000 persons in 2016. Employment in apparel increased 14 times over the entire period, while employment in textiles as well as food actually fell. It is probably not a coincidence that these same two industries (food and textiles) are the largest employers in the informal sector. It should also be noted that apparel and footwear, two industries that have done well on the employment front are also the two least capital intensive industries in 2016 (see Figure 9a).

However, capital intensity is clearly only one determinant of employment because both textiles and plastics (NIC 252) are very similar in their capital intensities in 2016 and indeed throughout the period but are very different in their employment performances. Employment in plastics grew nine times over the period while, as noted before, employment in textiles has fallen. Note though that whereas textiles employed 800,000 persons in 2016, plastics employed half as many at 430,000. Clearly output growth is the relevant factor to consider here. Plastics grew 48 times over this period in real terms, while textiles only grew six times.

But even controlling for output, there is wide variation in employment generation capacity as seen in Figure 15 which shows average annual elasticity for the entire period across all industries. There is a large range from knitwear (NIC 173) with an elasticity of 0.7 to saw-milling and planing of wood (NIC 201) with a value of -0.5. Some important employers that have posted very lacklustre elasticities are textiles (NIC 171) and food (NIC 154) while large employers displaying robust elasticities are knitwear (NIC 173), other textiles (NIC 172), leather (NIC 191) and footwear (NIC 192).

Combining the elasticity and wage rate data, we can answer the question, which industries have been relatively better at both job creation and delivering wage growth. We do this analysis first for the entire period and subsequently for the three sub-periods. As will be seen, there are substantial differences across the three sub-periods.

Figure 16a shows a scatter plot of elasticity versus wage rate growth over the entire period. Each data point is an industry labeled with its 3-digit NIC and the size of the circle indicates the share of an industry in total employment in the beginning year (1983). The hortizontal and vertical lines are median values. Figure 16b shows the same data zooming in on the region near the median values for greater clarity.

Several points are worth noting. First, note that the majority of industries display postive elasticity and wage growth. Second, there is large variation in this overall patten. As we have seen already in the previous analysis, some important industries, such as apparel (NIC 181) and knitwear (NIC 173) have performed quite well on both fronts, placing them in or near the top-right quadrant. While other industries that had a big share of employment in 1983, such as textiles (NIC 171) have performed poorly on both fronts with zero wage growth and almost no employment generation capacity in the organised factory sector. And

then there are big employers such as food processing and products (NIC 153, 154) that perform better in terms of wage growth than employment generation.[12]

Figure 16b zooms in near the median region to make the point that several large employers (in 1983) such as machinery (NIC 291), paper (NIC 210) and chemicals (NIC 241) are underperformers on both fronts. And others such as processing of fruits, vegetables, meat (NIC 151), Iron and steel (NIC 271), and glass (NIC 261) have displayed low elasticities, albeit with above median growth in wages. Others, such as NIC 242 and 269 (other chemicals, non-mettalic minerals) have shown better than median elasticities but very low wage growth. We comment further on this typology in the next section.

As we have seen, the entire period really consists of three very different sub-periods. It is thus of interest to know how the above scenario changes over the three sub-periods. Figure 16c and 16d show average annual growth rate of wage growth and elasticity values only for sub-period one (1983 to 1996). 16e and **??** do the same for sub-period two (1996 to 2006) while 16g and 16h are for sub-period three (2006 to 2016). The size of the circles in each case is the share of a particular industry in employnent at the beginning of the sub-period. The overall differences between these periods with regard to wages and employment have already been discussed. Here we focus only on the inter-industry variation.

In Period 1, two largest employers, textiles (NIC 171) and food products (NIC 154) display negative or very low employment elasticity but the latter posted above median wage growth (over 4 percent per annum). Note that wage rate growth is generally slow during this sub-period compared to the entire period, and particularly so for textiles as well as basic iron and steel (NIC 271) another large employer in the organised manufacturing sector. Railway locomotives and rolling stock (NIC 352) as well as other chemical products (NIC 242) show better capacity for creating employment, but they also show low wage growth.

In Period 2, the general trend is towards negative employment elasticity driven by a fall in employment noted earlier. Many large employers in this period including tobacco (NIC 160), basic chemical (NIC 241), textiles (NIC 171), basic iron and steel (NIC 271), and paper (NIC 210) shrunk from an employment perspective. Some such as food products (NIC 154) posted negative employment as well as wage growth. With a median elasticity of 0.2 and a median wage growth rate of -0.5 percent per annum, this is truly the worst period of the three. The best performers of this period was structural metal products (NIC 281) and apparel (NIC 181), both posting above median wage growth and elasticity.

Period 3 is very different from Period 2. The median elasticity is 0.55 and the median rate of wage growth is 1.6 percent. A number of large employers such as non-mettalic mineral products (NIC 269), plastics (NIC 252), footwear (NIC 192), knitwear (NIC 173),

[12] Kannan and Raveendran [2009] discuss the impact of job losses in textiles and food on overall employment elasticity in organised manufacturing.

other chemicals (NIC 242), and basic iron and steel (NIC 271) posted strong employment elasticities as well as wage growth. Even textiles and apparel posted positive elasticities and wage growth, albeit weaker, in this period.

5 Discussion

The foregoing analysis is divided into two parts, aggregate time trends and industry-level variation. We now discuss the implications of each in turn.

5.1 Sub-periods in the aggregate trends

First, it is clear that the experience or performance of the organised manufacturing sector over the last three deacdes is not a singular one. Neither can it be cleanly divided into pre-reform and post-reform experience (if 1991 is taken as the reference year for reforms). Rather the analysis of aggregate trends reveals three distinct sub-periods in the entire period from 1983 to 2016. The initial few years in the data capture the absolute decline in employment discussed by Nagaraj [2000] as a possible after-effect of excess of employment growth over output growth in the 1970s.[13] Therefore we start our first period at 1986.

The first period till 1996 is characterised by employment growth (albeit weak), rapid subsitution of capital for labour, and rising wages and emoluments. The second period (1996 to 2006) displays the weakest employment generation, slower substitution of capital for labour, and stagnant wages alongside emerging divergence between wages and emoluments. The third period (2006 to 2016), in some way the best of the three, shows strong employment generation as well as rising wages, despite a renewed decline in the labour capital ratio and a steadily growing divergence with wages and emoluments as well as wages and productivity. This is also the only period during which the labour share of income stops falling and even shows a rise in nominal terms.

What factors may be relevant in explaining these differences? Here we can only offer some initial speculative remarks that need to be investigated further.

While it is true that the early 1980s was a period of declining employment and the subsequent increase in jobs was weak leading to the earliest discussion on "jobless growth" [Nagaraj, 2000], the transition that takes place in the mid 1990s is much larger. This decline in employment is not an artefact of the coverage changes in ASI around this time, because our analysis excludes the industries that were dropped from coverage and even industries such as apparel, that show strong employment growth over the entire period, stagnated during

[13] He also notes that there is no break in the employment trend in 1991.

this period. So far as we know there is no satisfactory explanation for this in the literature. Rani and Unni [2004] analysed output and employment trends in three sub-periods from 1984-85 to 1999-2000, viz. 1984-85 to 1989-90, 1989-90 to 1994-95 and 1994-95 to 1999-2000. They find employment growth to be small but positive in their final period. However, the periods are restricted to be what they are by availability of informal sector data. Hence it is possible that they miss the decline in employment due to averaging over a larger period rather than looking at annual data. The authors attribute weak employment growth in this period to labour law reforms that allowed firms with more than 100 workers to retrench more easily and to public sector downsizing. They also note that by the mid-1990s import tariffs had been reduced in most industries including consumer goods. Vashisht [2016] also discusses the gradually increasing nature of trade liberalization in the 1990s and notes that the manufacturing sector downturn became more pronounced when quotas on imported consumer goods were removed.

The improvement in performance starting 2005-06 has also been widely commented on in the literature. But once again, satisfactory explanations for it are lacking. It is true that the Indian ecoonmy itself went through a boom period around 2004-2008. Another intriguing fact is that the turnaround coincides with the introduction of MGNREGA (2005 to 2007). While many studies have attempted to quantify the effect of this program on rural and agricultural wages, it is worth asking whether there was a wage effect in the organised sector also. There was a large increase in rural wage rates as well during this period (until 2014).

Regarding the increase in the nominal wage share post 2008, the decomposition analysis shows that a decline in capital productivity is an important factor. If we take capital productivity to be in part capacity utilization and in pact technological change, we may note that there has been a tendency towards a build up of excess capacity in manufaturing since 2009.

Regarding the uptick the employment, the other factor to consider is the shift in the labour force from the unorganised to the organised sector. Thomas and Johny [2018] note that the pattern of employment growth in the manufacturing setor is very different in this recent period compared to the 1990s. Whereas earlier factory employment was comparatively stagnant and employment in the unorganised sector was increasing, the pattern was more or less reversed after 2005. While overall manufacturing employment grew more slowly compared to earlier, factory employment grew at a much faster rate. This indicates a redistribution of employment away from the unorganised to the organised sector.

This does not imply, however, that the new jobs were formal jobs. As we have noted earlier, this was a period of rising contract work in this sector. Thus it is possible that relaxation of labour laws resulted in a shift away from subcontracting work to small firms

in the unorganised sector to production in-house with contract workers. This raises an interesting and counter-intuitive possibility. Since many contract jobs are by definition short-term lasting a few years at most, is it possible that stable and long-term, albeit informal employment in the unorganised sector could have been substituted by precarious employment with high turnover in the formal sector? Finally it is also likely that over time incentives to hide workers have reduced and more factories are reporting data.

5.2 Industry-level analysis

Industry-level analysis corroborates that the aggregate trends for the labour capital ratio and the wage share are observed for the overwhelming majority of industries. Thus, the main lesson based on this study (labour capital ratio) and Abraham and Sasikumar [2017] (wage share) is that within industry factors are the main drivers of the decline in both cases. This suggests that policy variables that affect all industries equally, such as the national and international macroconomic climate, ease of borrowing or labour legislation may be more important factors than industry-specific variables such as technology or differential demand. However, there is some variation in the extent of decline of the labour capital ratio and it would be of interest to see how it is related to capital subsidies received by particular industries or the extent of exposure to the global market.

The across-industry variation is much larger for employment elasticity and wage rate. This observation prompted us to examine the relationship between growth in the wage rate and employment elasticity in order to construct the typology of industries shown in Table 1. Here we focus on the most recent ten year period though other periods may also hold interesting lessons for policy. Industries are categorized as Type A, B, C, or D as follows. Only industries with a relatively large employment share are discussed.

- A: Above median wage growth and elasticity
- B: Above median wage growth and below median elasticity
- C: Below median wage growth and above median elasticity
- D: Below median wage growth and below median elasticity

On the positive side, large employers such as leather, footwear, knitwear etc. have displayed good wage growth as well as employment growth in the organised sector in the past decade. It is possible that this has come at the expense of employment in the unorganised sector.

Table 1: A typology of industries

Type A	Type B	Type C	Type D
Leather	Meat, fish, fruits etc.	Gen. purp. machines	Tobacco
Footwear	Grain, mill products	Basic chemicals	Non-ferrous mtls
Plastics	Other food products	Elect. dist. app.	Mandmade fibres
Knitwear	Apparel	Motor vehicles	
Iron and Steel	Textiles	Pubishing	
Other chem. pdts.			

On a more mixed note, employment-intensive industries such as food processing, textiles, and apparel have shown weak capacity for employment generation while posting higher than median rates of wage growth. The opposite is the case for motor vehicles where job creation has been strong but wage growth has been low, possibly coming from a reliance on contract labour.

Interestingly, apparel and knitwear, leather and footwear were also the industries that performed better than average in translating productivity growth into wage growth. This result seems somewhat counter-intuitive given the reputation of these industries for sweatshop conditions.

6 Conclusion

Despite its poor performance on the employment front in the long-run, the organised manufacturing sector remains a sector of crucial importance for India's structural transformartion. The present study has attempted to characterise the overall performance of this sector at the aggregate and the 3-digit industry level in some detail.

The principal lessons that emerge from the study are the following. First, the differences between the three sub-periods identified here are worth exploring further, particularly from the point of view of the policy environment that prevailed at the time. The most recent sub-period, from 2006 to 2016 is the best in terms of delivering both employment growth and wage growth, alongside increases in productivity.

Second, industries differ widely in their ability to create jobs and deliver wage growth amidst productivity increases. Some stories, such as the decline of organised textile manufacturing and the rise of the informal powerloom sector are well known. But others such as the performance of apparel or food are less so. They deserve further investigation in order to identify the factors that contributed to job growth and wage growth simultaneously.

We hope that this study will stimulate efforts at addressing these concerns.

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Figures

Figure 1: Total employment in organised manufacturing (millions)

Figure 2: Indexed trends in gross real output and employment

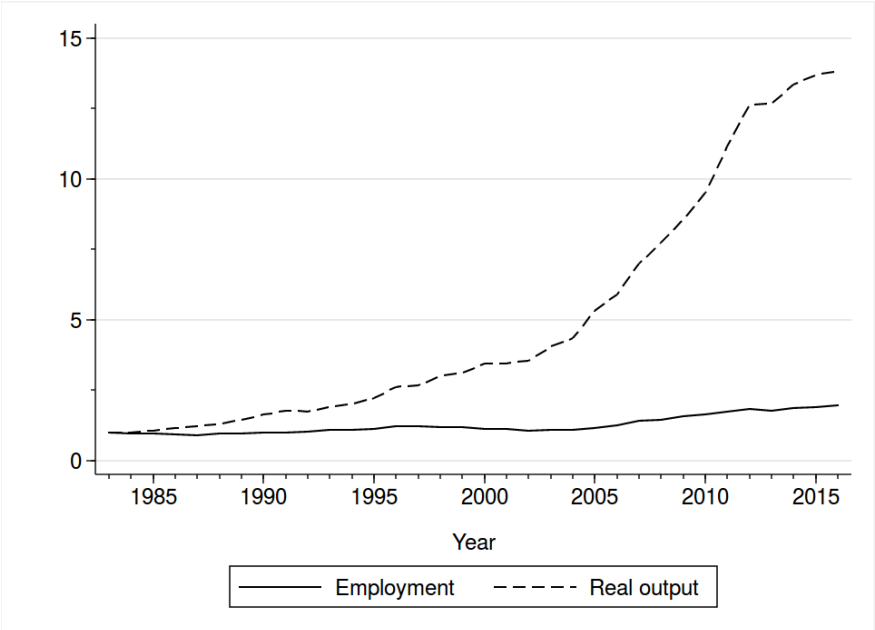


Figure 3: Annual Growth Rate of Employment and Real Output

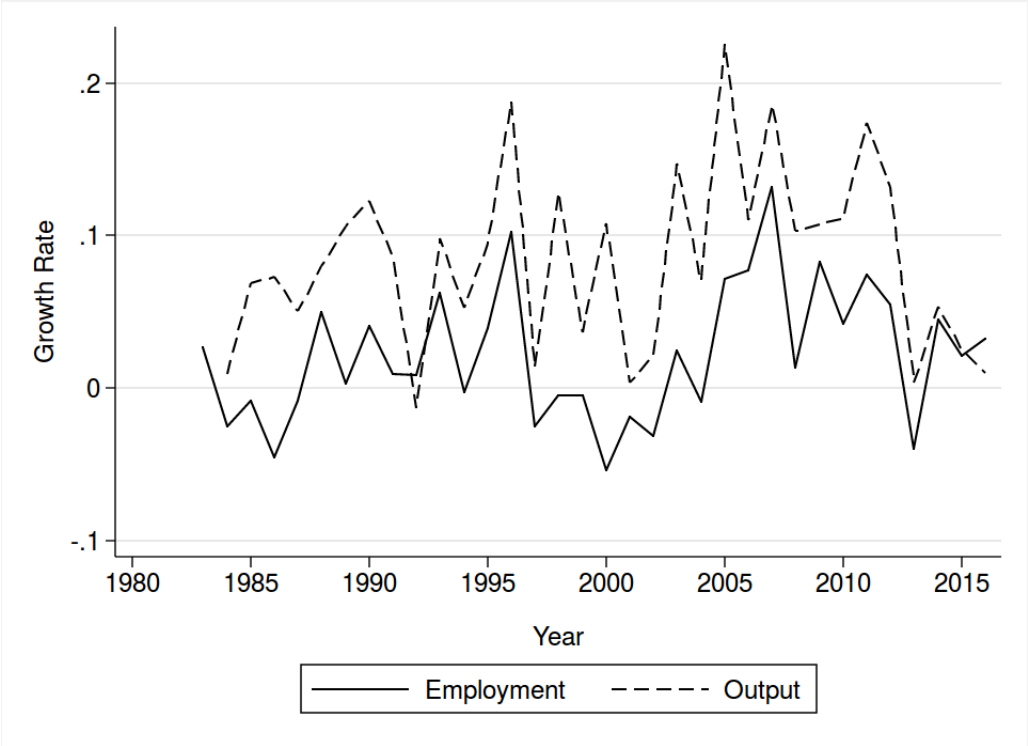


Figure 4: Employment Elasticity

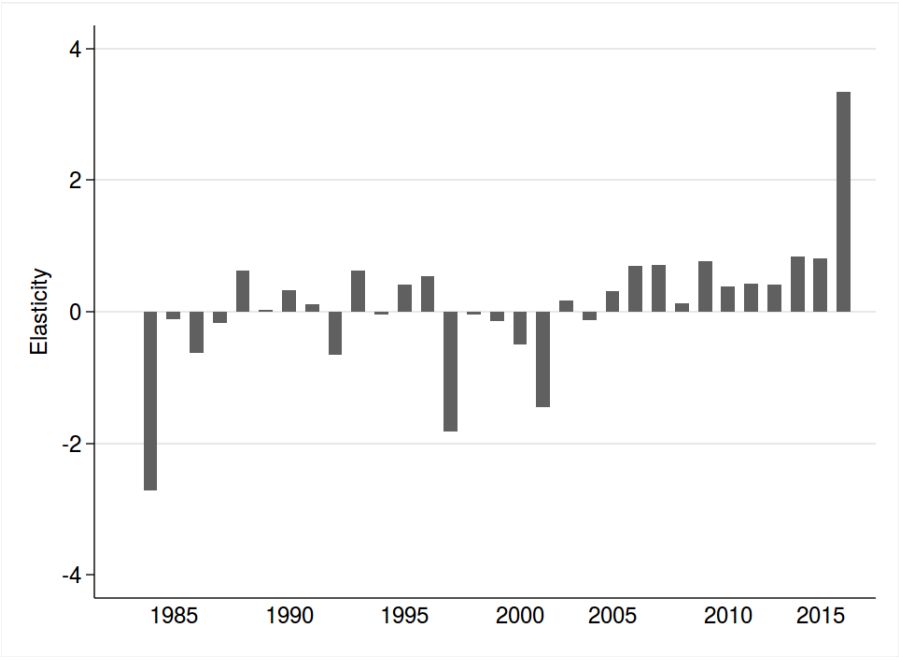


Figure 5: Real Wages Per Worker, Base-2005

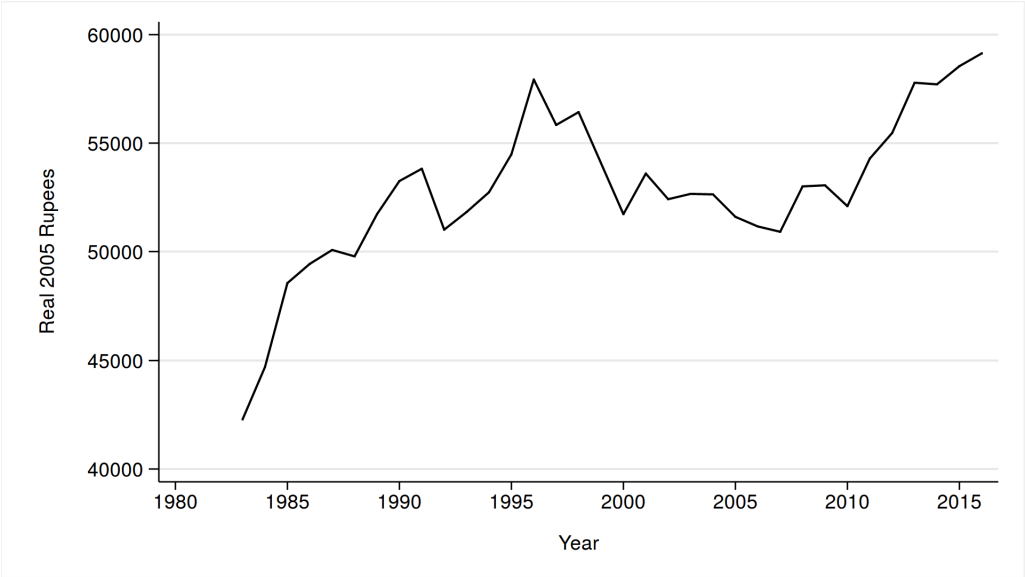


Figure 6: Decline in aggregate labour-capital ratio

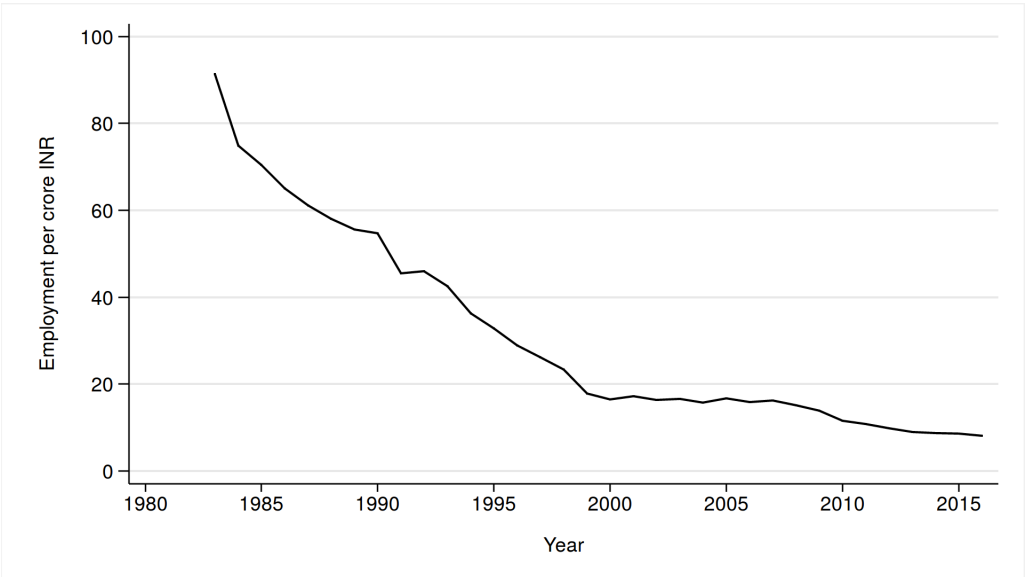


Figure 7a: Divergence between real wage rate, real emoluments, and productivity

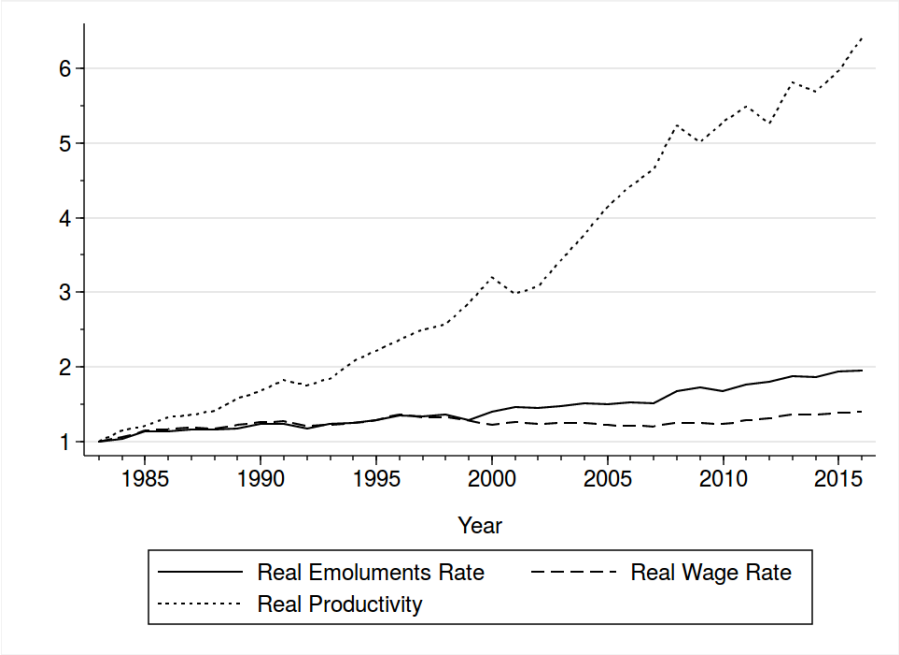


Figure 7b: Divergence between wages and emoluments

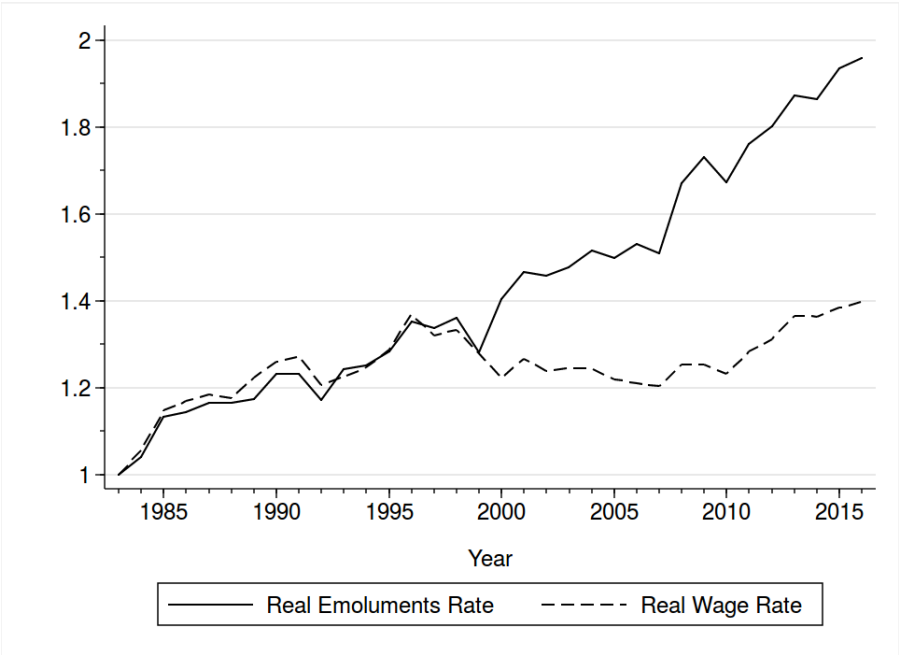


Figure 7c: Real Wages Per Worker and Emoluments Per Employee, Base-2005

Figure 8a: Decline in share of wages in gross value-added

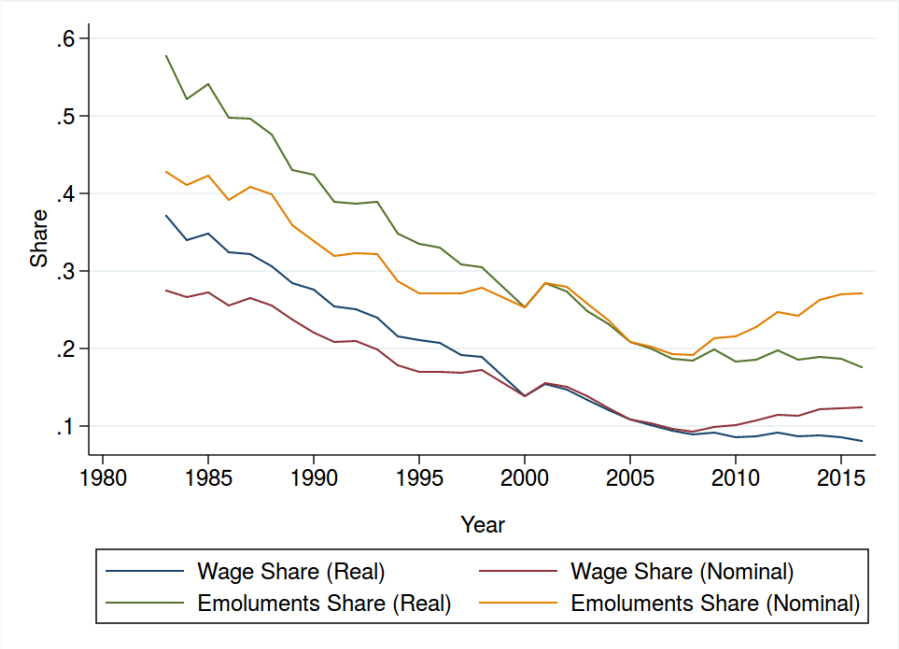


Figure 8b: Wage Share decomposition

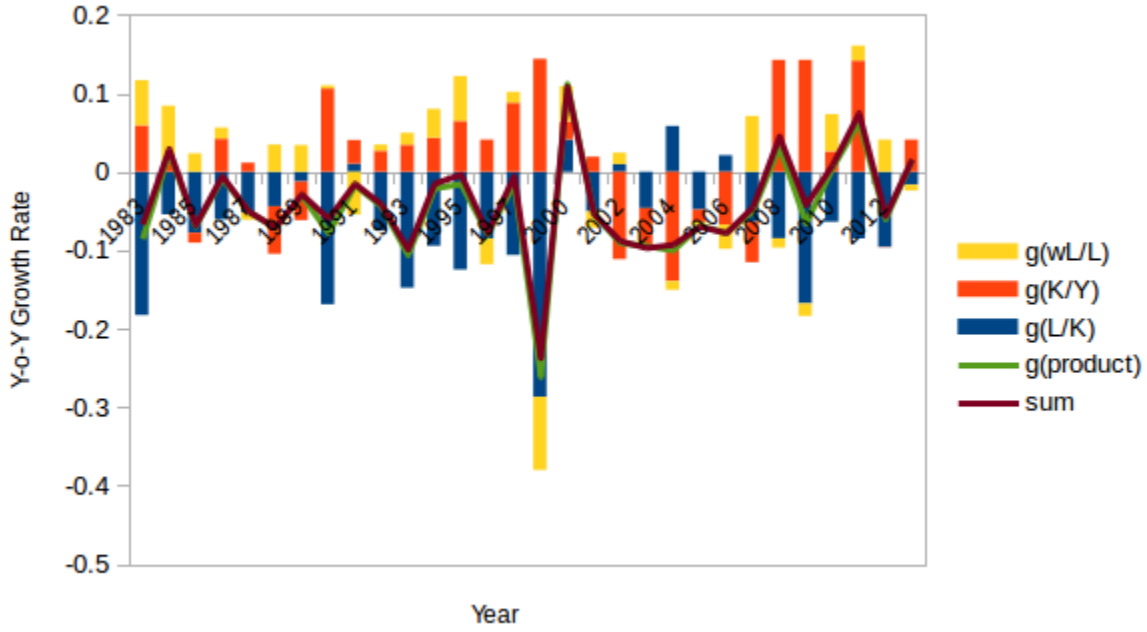


Figure 9a: Decline in labour-capital ratio for selected industries

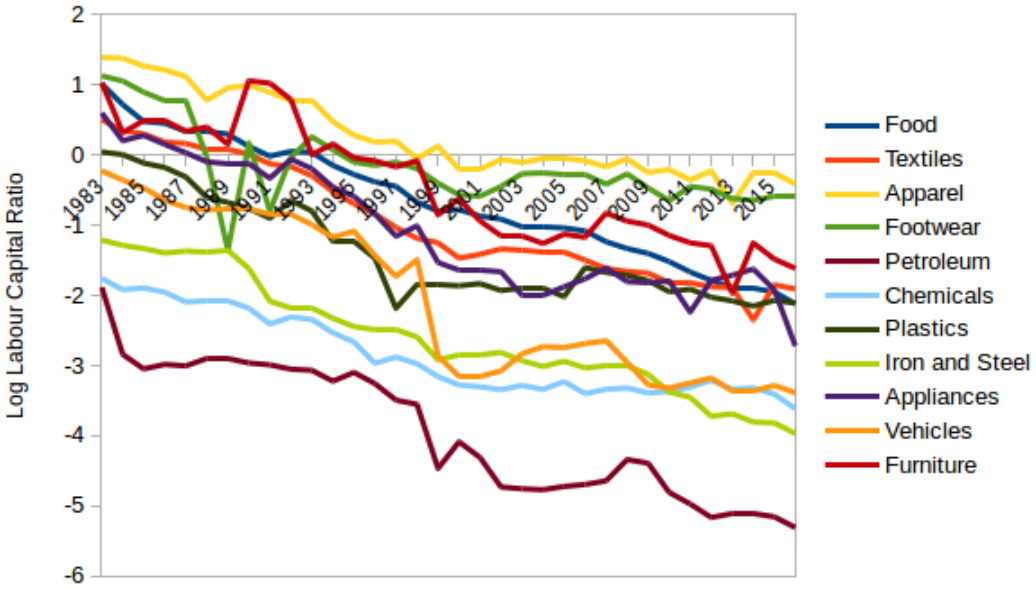


Figure 9b: Average Annual Growth in Labour Capital Ratio between 1983 and 2016 across all industries

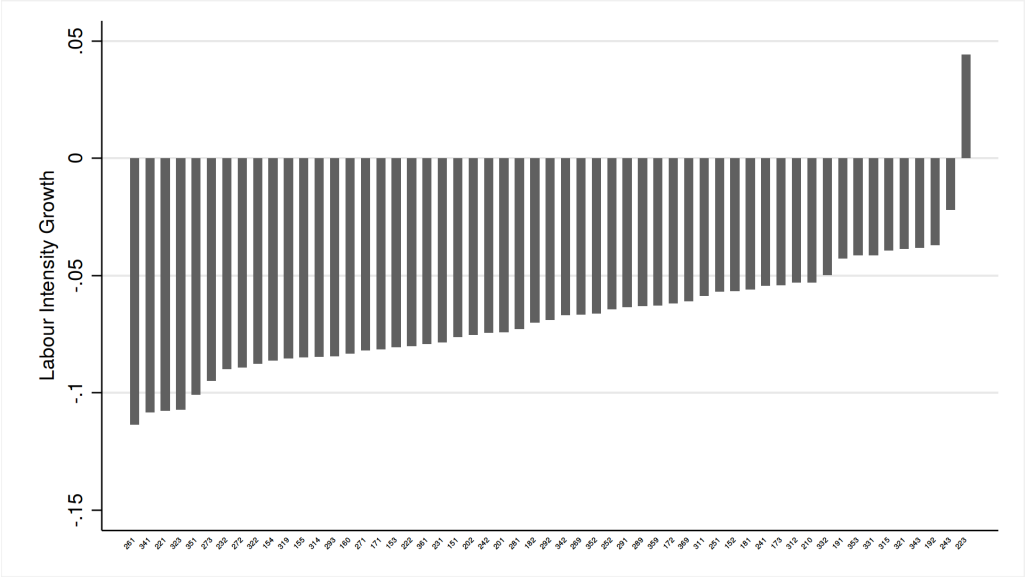


Figure 9c: Shift-share decomposition of aggregate labour-capital ratio

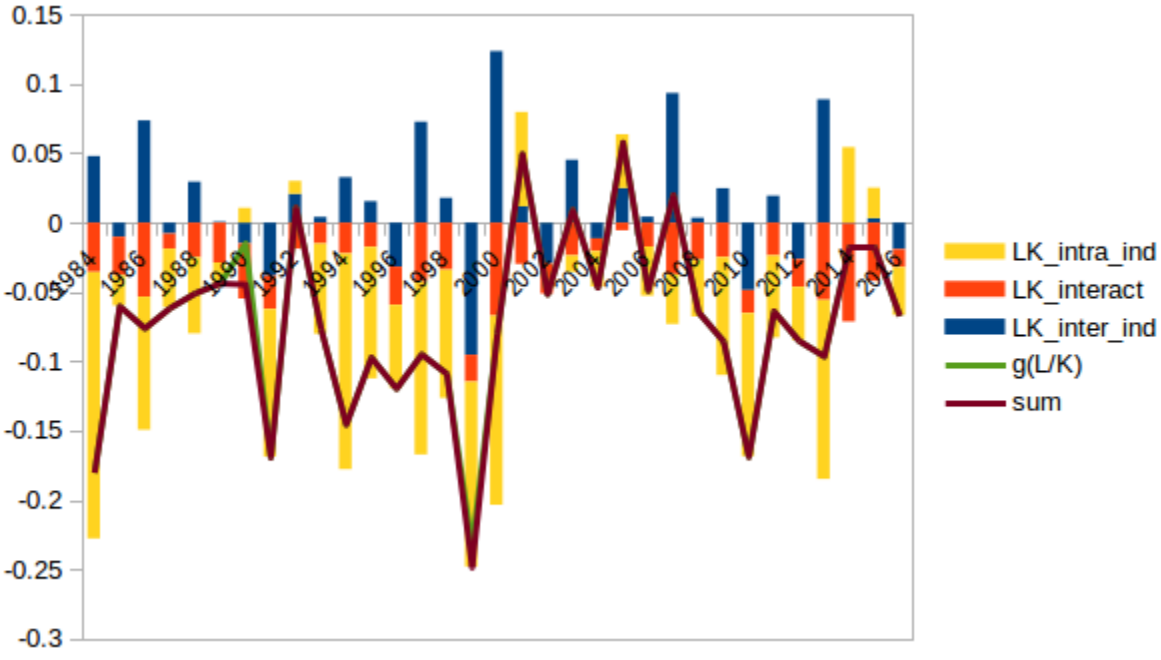


Figure 10: Average Annual Growth in Labour Productivity between 1983 and 2016 across all industries

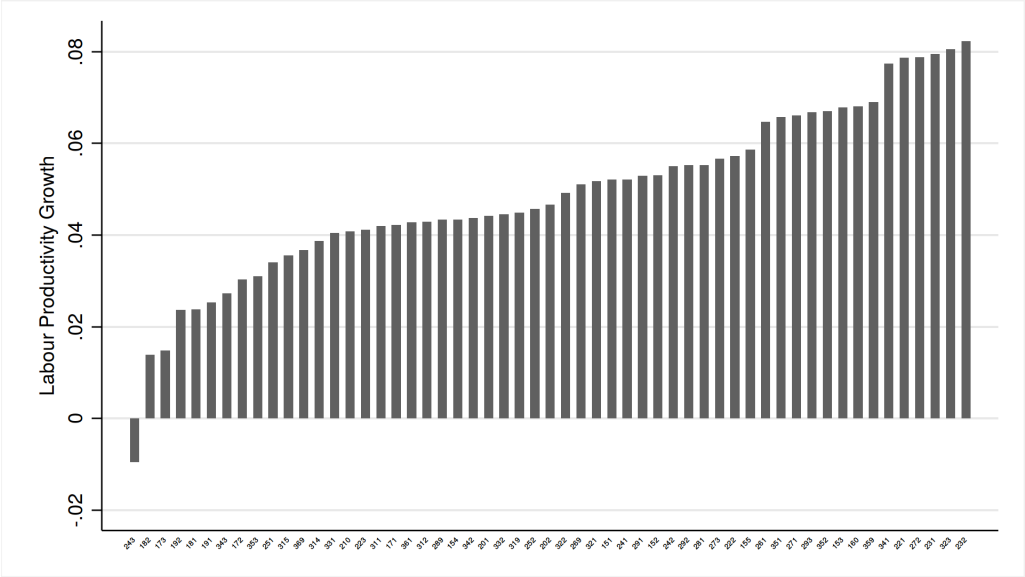


Figure 11: Average Annual Growth in Wage Rate between 1983 and 2016 across all industries

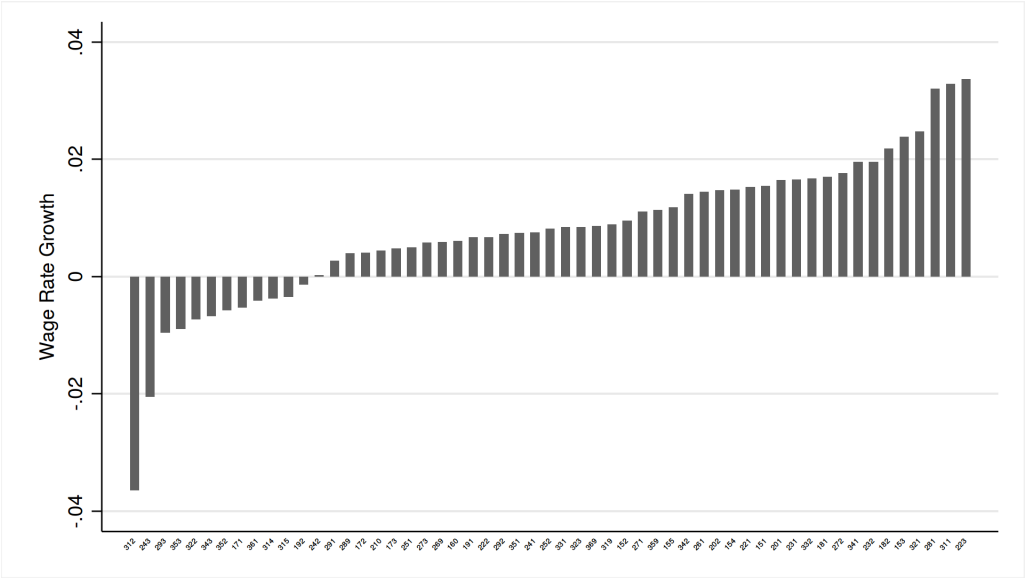


Figure 12: Growth rate of labour productivity versus growth rate of wage across industries

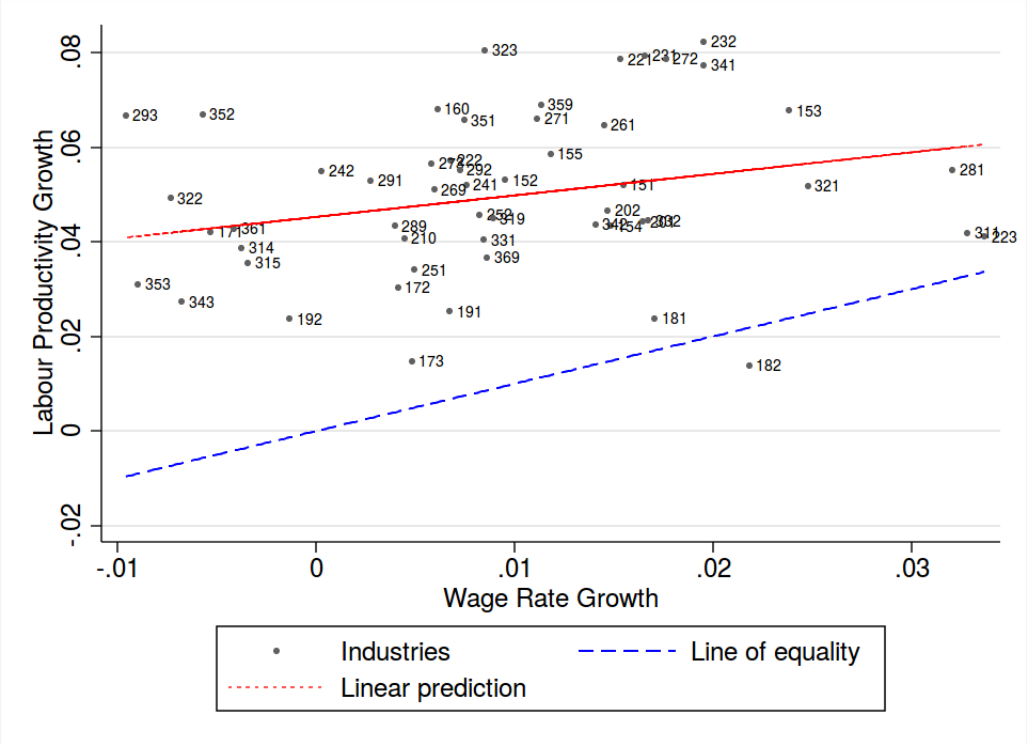


Figure 13: Average Annual Growth in Wage Share between 1983 and 2016 across all industries

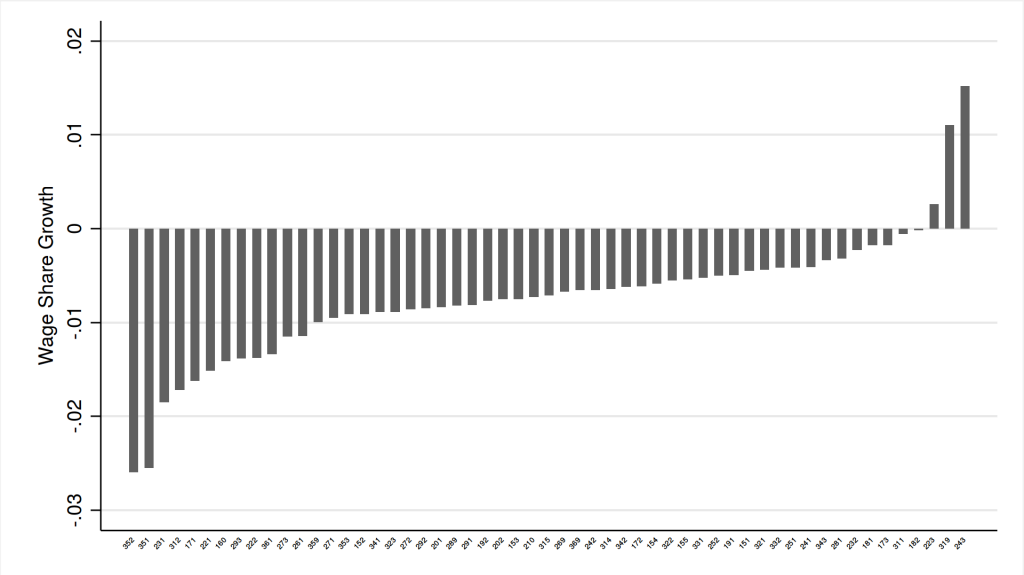


Figure 14: Change in employment for selected industries, 1983=1

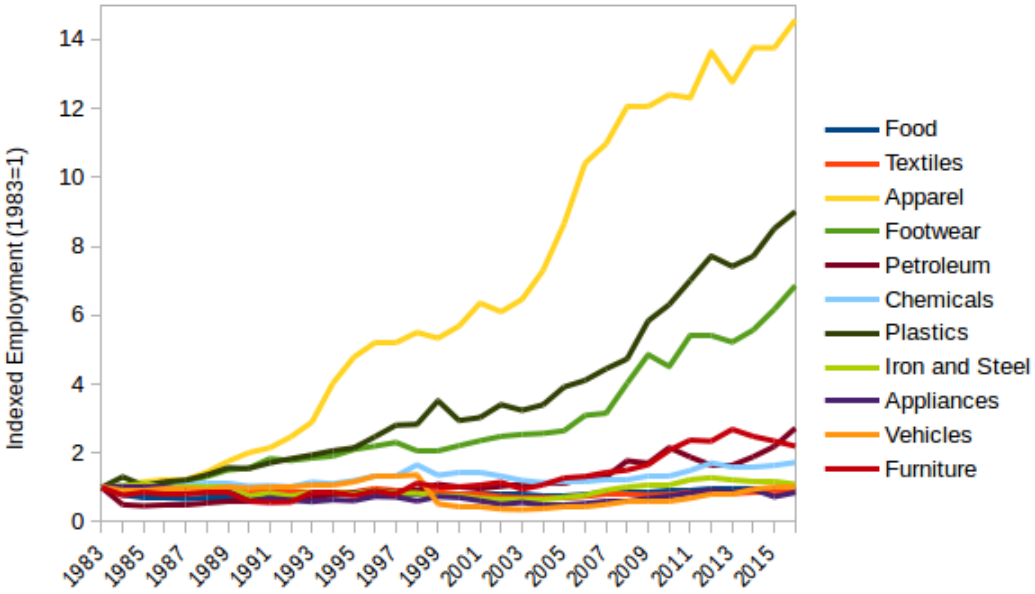


Figure 15: Average Annual Employment Elasticity between 1983 and 2016 across all industries

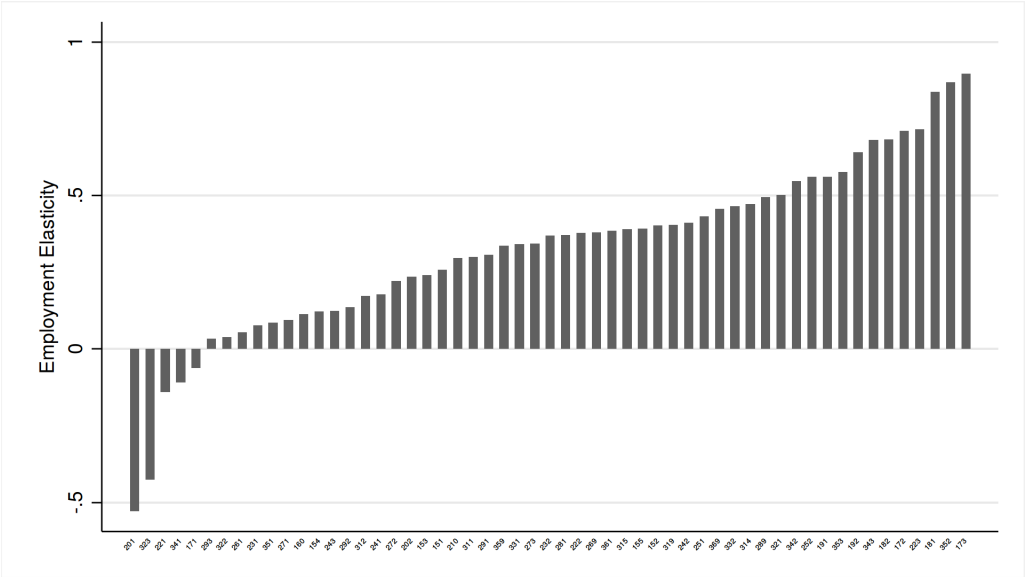


Figure 16a: Elasticity versus wage growth across industries

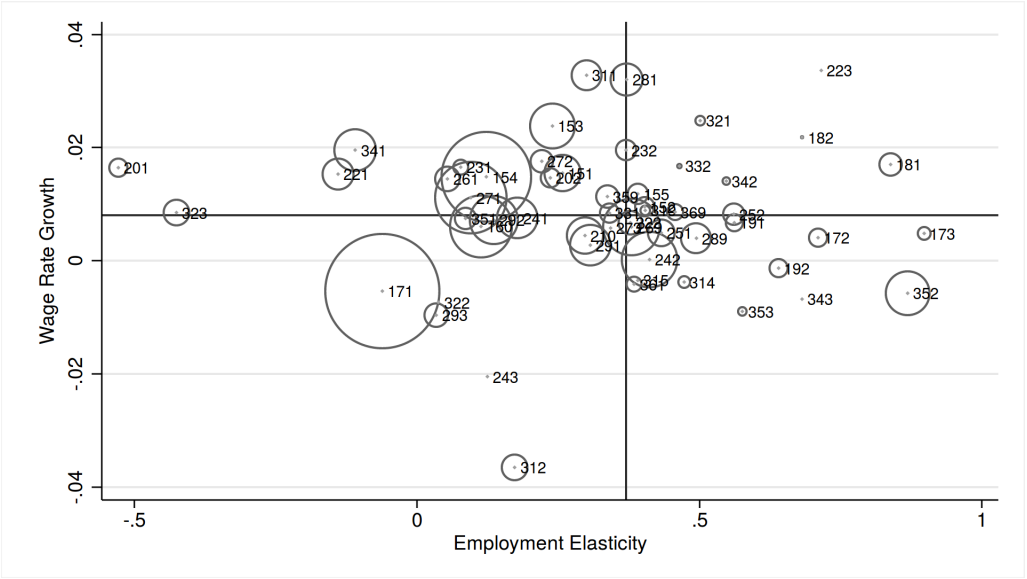


Figure 16b: Elasticity versus wage growth across industries (zoom)

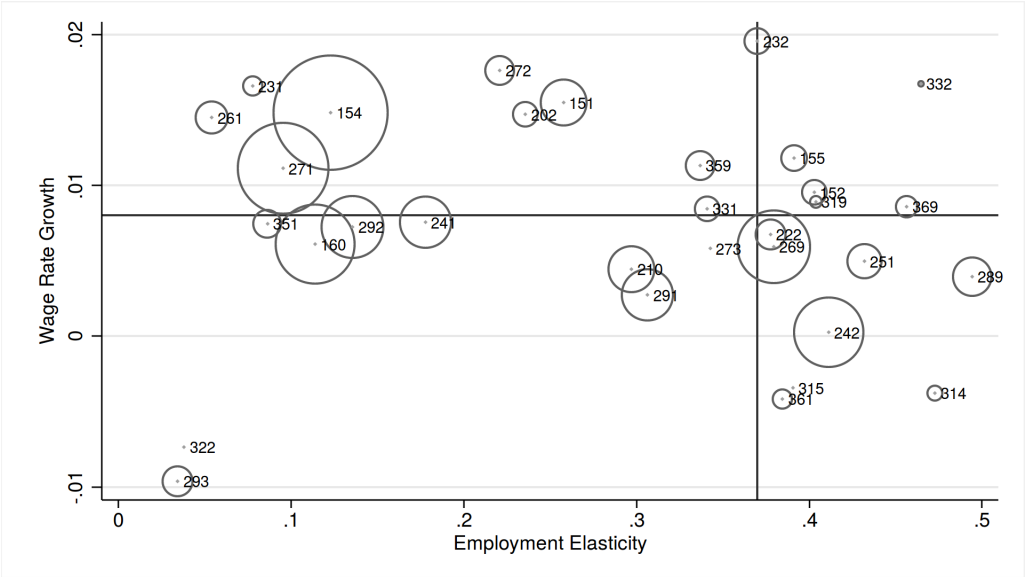


Figure 16c: Elasticity versus wage growth across industries in Period 1

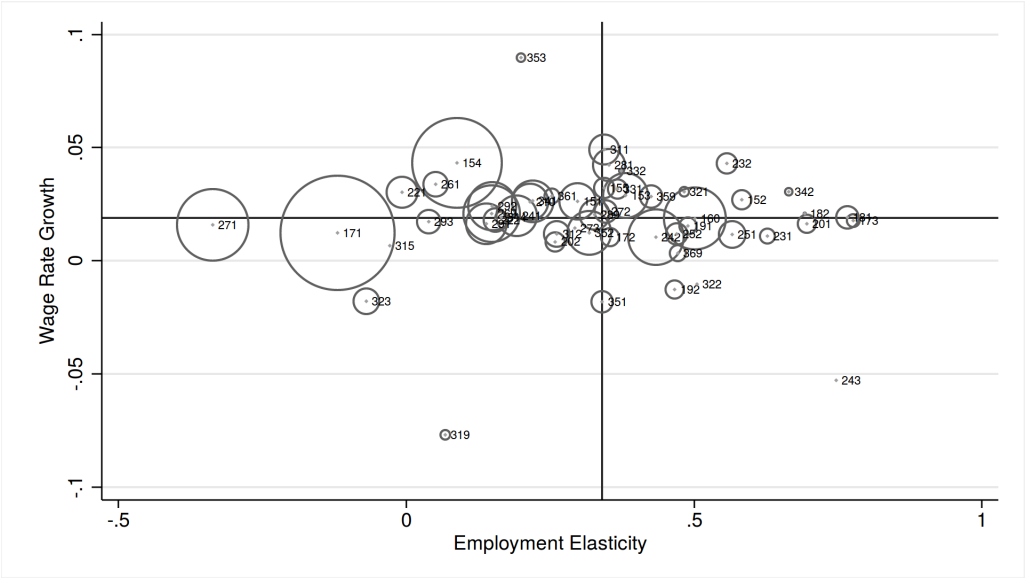


Figure 16d: Elasticity versus wage growth across industries in Period 1 (zoom)

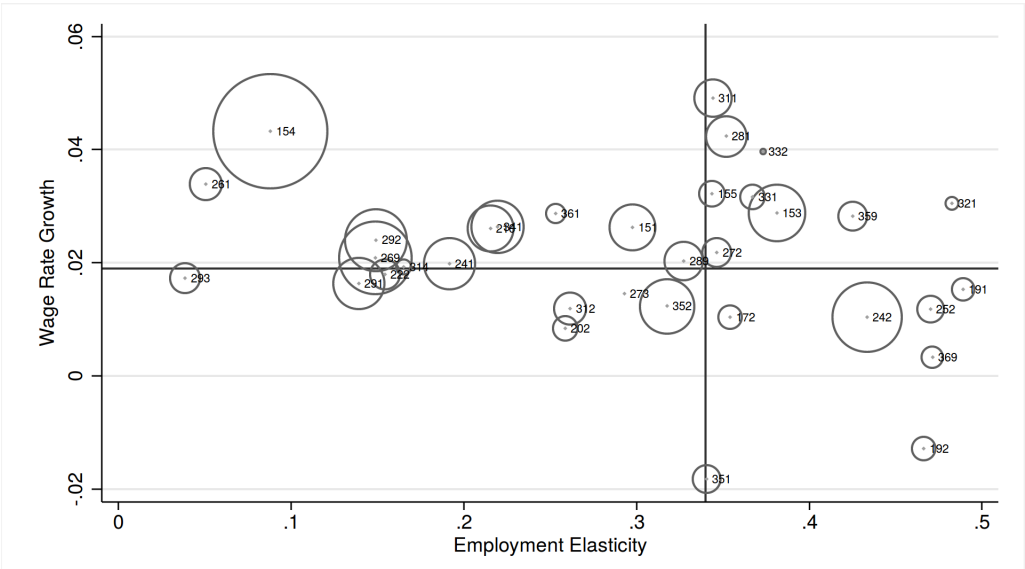


Figure 16e: Elasticity versus wage growth across industries in Period 2

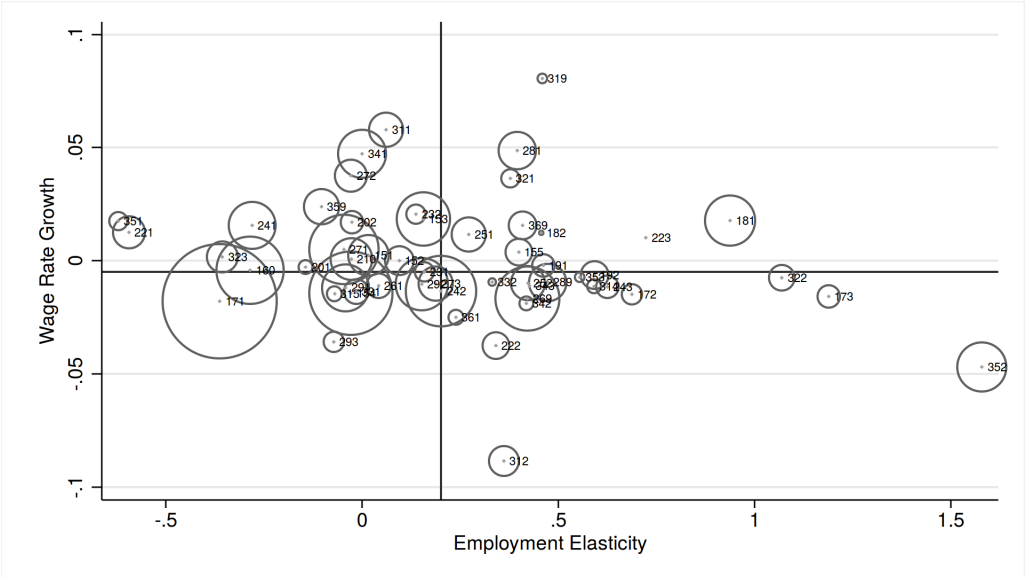


Figure 16f: Elasticity versus wage growth across industries in Period 2 (zoom)

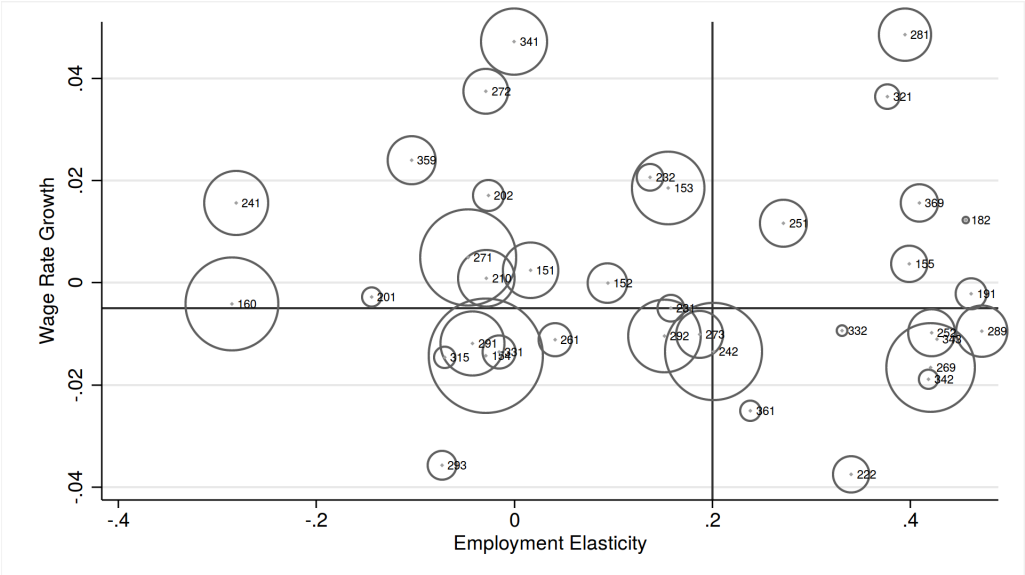


Figure 16g: Elasticity versus wage growth across industries in Period 3

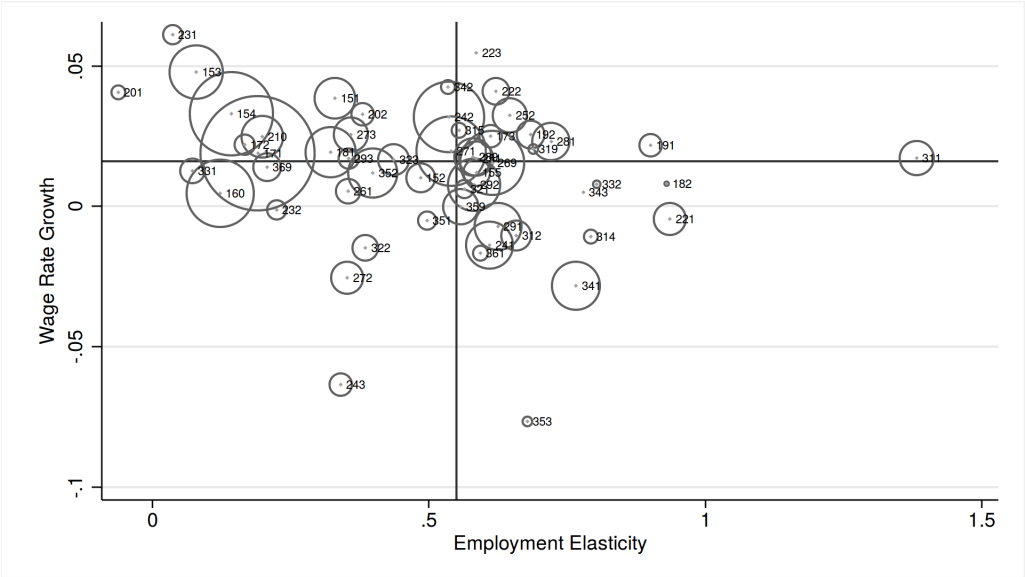
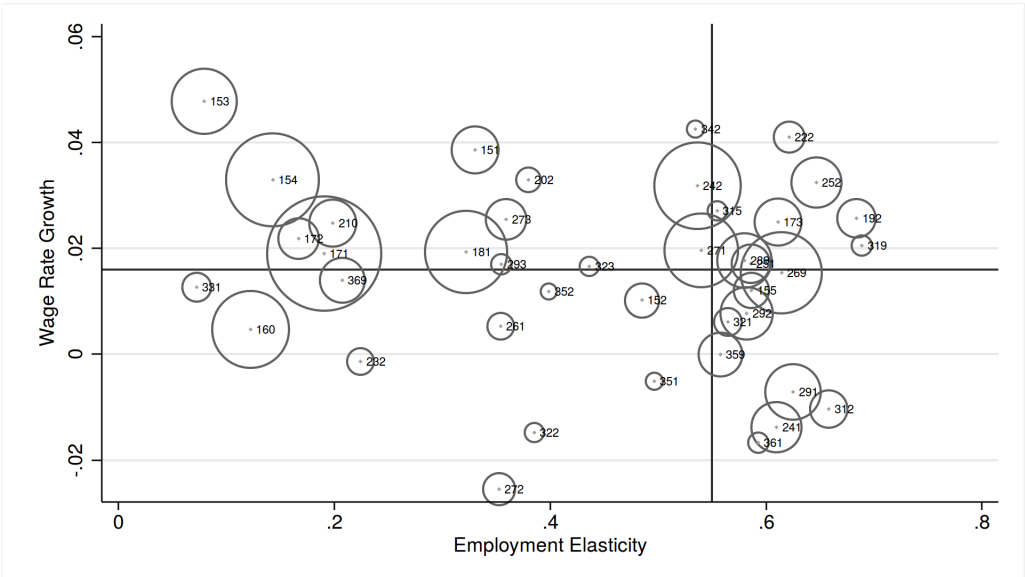


Figure 16h: Elasticity versus wage growth across industries in Period 3 (zoom)



Appendix: List of industries and NIC codes (EPWRFITS concorded list)

NIC Code	Industry
151	Production, processing and preservation of meat, fish, fruits, vegetables, oil and fat.
152	Dairy products
153	Grain, mill products, starches and starch products and animal feeds
154	Other food products
155	Beverages
160	Tobacco products
171	Textiles (spinning, weaving, and finishing)
172	Textiles (other)
173	Knitted and crocheted fabrics and articles
181	Wearing apparel
182	Fur (dressing, dyeing, and manufacture of articles)
191	Leather (tanning and dressing, and non-footwear products)
192	Footwear
201	Wood sawmilling and planing
202	Wood, cork, straw products
210	Paper and paper products
221	Publishing (whether or not connected with printing)
222	Printing and related service sector activities
223	Reproduction of Recorded media
231	Coke over products
232	Refined petroleum products
241+233	Basic chemicals and processing of nuclear fuel
242	Other chemical products
243	Manmade fibers
251	Rubber products
252	Plastic products
261	Glass and glass products
269	Non-metallic mineral products n.e.c
271	Basic iron and steel
272	Basic precious and non-ferrous metals
273	Casting of metals
281	Structural metal products, tanks, reservoirs, and steam generators
289	Other fabricated metal products, metal working service activities
291+300	General purpose machinery, office, accounting, and computing machinery
292	Special purpose machinery
293	Domestic appliances n.e.c
311	Electric motors, generators, and transformers
312+313	Electricity distribution and control apparatus
314	Accumulators, primary cells, and primary batteries
315	Electric lamps and lighting equipment
319	Other electrical equipment n.e.c
321	Electronic valves and tupeb and other components
322	TV and radio transmitters, line telephony and telegraphy apparatus
323	TV and radio receivers, sound or video recording apparatus and related goods.
331+333	Medical appliances and appliances for measuring, testing, etc plus watches and clocks
332	Optical instruments and photography equipment
341	Motor vehicles
342	Vehicle bodies, trailers, semi-trailers
343	Vehicle and engine parts and accessories
351	Ships and boats (building and repair)
352	Railway locomotives and rolling stock
353	Aircraft and spacecraft
359	Transport equipment n.e.c.
361	Furniture
369	Manufacturing n.e.c