<Finding The relationship between the Labour Share income and Market Concentration of the French market economy>

1 Introduction

1.1 Motivation

The aim of this research is to evaluate the relationship between labour share of income and market concentration in the context of the French economy.

Autor, Dorn, Patterson, and Van Reenen (2017) shows the evidence of how the increase in globalisation and technological improvement lead by productive firms can increase in the product market concentration. Their empirical evidence suggests that the firms with higher productivity who dominate their industries often lead to decrease in labour shares of income. In this paper, I aim to replicate their study to test the following two main hypothesis: 1) increase in globalisation and technological improvement will increase sales concentration across different industries; 2) increase in concentration will lead to a decline in labour share of income. Labour share of income is the part of national income allocated to labour compensation including wages, salaries, insurance, and benefits. One of the dominating theories to explain economic growths was Kaldor's(1961) six stylised facts of growth, which suggest that the labour share of income is expected to grow in parallel with the economic growth. This theory was proven valid, at least up to 1980s, by various researchers, the policymakers paid less attention to labour share of income. However, more recently, a number of researchers suggested that Kaldor's (1961) stylised facts of growth are no longer valid in explaining modern economy growth (Autor et al., 2017, Karabarbounis and Neiman, 2014, Elsby et al., 2013). As the result, there has been an increasing interest in the media and economic researchers regarding consequences and reasons for declining share of GDP going to labour. The OECD (2012) report shows that the share of labour compensation in national income has declined in 26 out of 30 advanced countries from the early 1990s to the late 2000s. The median labour share across these countries dropped from 66.1 percent to 61.7 percent. More recently, Dao et al. (2017) analysed data from 29 largest countries, whose sum of GDP accounts for two-thirds of world GDP in 2014, and shows that there was a decline in the labour share of income from 1992 to 2014.

A decline in labour share does not necessarily imply a decline in the workers' standard of living; however, the decline hides differences across the group. According to OECD (2012), while the labour `share of income of the top one percent increased by 20 percent, labour share at the bottom end, often those with less education, has slumped over the past two decades. OECD's (2012) report shows that the income distribution of the least skilled or educated has been deteriorating. Moreover, the evidence shows that the less wealthy people tend to have a higher propensity to consume. This suggests that the decline in income may also have a negative effect on the

aggregate demand level and recuperation from economic crises. Furthermore, Piketty (2014) showed that income inequality, especially capital income inequality, reinforces the impact of the decreasing trend of labour share since people at the bottom of the earnings distribution are not likely to gain much capital income.

Although the relationship between labour share and market concentration has been attracting researchers' interest, there are still relatively fewer studies conducted in this area. In this paper, I adopt Autor et al. (2017) approach presented in their working paper on the fall in labour share and the rise of *"superstar firms", to attempt to investigate this issue*. They analyse micro panel data from U.S Economic census to assess the relationship between the fall in the labour share and the rise of the *"superstar firm"*. Additionally, they propose the following two main hypothesis from their *"superstar firm"* model which I also adopt to analyse the case of French market economy with two hypotheses; 1) The concentration ratio of sales amongst firms within an industry is likely to rise across much of the private economy in France; 2) Industries with larger increases in concentration are likely to experience a larger decline in labour share of income.

1.2 Literature review

There have been many studies on the change in labour share related to technology improvement, globalisation, and other institutional factors. This section presents a review of relevant literature to provide theoretical backgrounds on technology improvement, globalisation and unionisation(de-unionisation) in the context of labour share of income.

A fall in labour share is often caused by a relatively higher increase in labour productivity than average labour compensation and return on capital. OECD (2012) estimate that about 80 percent of within-industry labour share of income declines are caused by *"total factor productivity(TFP) growth and capital deepening"* in OECD countries from 1990 to 2007.

Karabarbounis and Neiman (2014) found the decline in the labour share of income occurs not only in the United States but also across the world. They indicate that the cost of capital relative to labour has fallen, driven by the rapid decline in *"quality-adjusted equipment prices"* especially in Information and Communication Technologies (ICTs). They also show the advancement of ICTs has boosted productivity and provided opportunities to achieve innovations in the production process of new and/or existing capital goods. On the other hand, ICTs have begun to replace workers with sophisticated automated machines in various types of jobs and routine tasks (such as manufacturing, customer call centres, etc).

Capital that becomes cheaper and better thereby increases demand for itself and decreases demand for the workers. Thus, income is redistributed from the workers to capital. Therefore, the workers gain a smaller share of total output.

The advancement of technology has changed the demand for different skilled labours. For example, in manufacturing processes, fewer middle and/or lower-skilled labours are needed in a production line but the demand for high-skilled labours with higher wages, such as system engineers who can operate sophisticated machines, are increasing rapidly. This process is known as *"job polarisation"*. Job polarisation is a trend that *"the number of middle-pay, middle-skill jobs has declined relative to the number of low-pay and high-pay jobs."(OECD, 2017)*.

Goos et al. (2014) emphasise the importance of technological change and offshoring in job polarisation. It is pervasive across 16 Western European countries. Their research suggests that *"Routine-biased technological change (RBTC)"* and offshoring explain much of job polarisation and its within-industry and between-industry components. Furthermore, a decline in labour share by automation of routine tasks can occur even at full employment as a permanent change in equilibrium. The reasons are that capital rental rate is higher, income accruing to capital increases, but workers are less productive, so workers receive a smaller share of aggregate output (Autor and Dorn, 2013). This result applies to any level of skill amongst workers (Lawrence, 2015)

The advancement in technologies not only replaced lower skilled labours but also enhanced globalization processes. Globalisation comprises a deeper integration of factors of production across the world. Technological changes and its progress allow goods and capital to be traded easier. Modern ICTs allows efficient management of supply chain at a cheaper cost. For example, production sites and final markets no longer need to be located in same and/or similar geographical areas to ensure efficiency, e.g. call centres for English firms in India, such strategies are often referred to as international outsourcing or offshoring. OECD (2012) suggests that globalisation drives the decline in labour share; within-industry increases in offshoring tend to decrease labour share, and structural changes may be caused by competition from abroad in the domestic market. These changes also has a negative impact on the aggregate labour share. These effects account for at least 10 percent of the observed decline in national income captured by workers.

Elsby et al. (2013) discuss the importance of international trading and outsourcing activities in understanding the recent decline in labour shares of incomes. Their findings show evidence that highlights how labour share of income has been declining in the most of US industries due to increase in imported products and services. Also, partly because of vertical specialisation, which occurs when countries specialise in particular stages of a production process instead of producing

entire goods, there has been a substantial increase in imports into the USA. Firms (e.g. Apple) outsource the labour-intensive tasks or production stages to those countries where labour (or production) cost is cheaper (e.g. Foxconn in Taiwan). As the result, the domestic workers are being replaced by foreign workers so the demand for domestic labour declines, real wage falls, and labour share consequently falls.

Much empirical evidence shows that the trade with low-wage countries (e.g. China) puts downward pressure on wages and employment in industries that are exposed to import competition (Autor et al., 2013). In other words, increases in international competition level can often cause a decline in labour share of income. Foreign goods, both intermediate and final, that can compete with domestic goods can create pressure on pricing strategies of the domestic firms. For example, if steel imports increase, domestic production and demand for labour in the steel industry are likely to decrease. Hence, domestic workers will face competition from foreign workers, wages tend to fall, and domestic labour share will fall as a result. As such, globalisation can have a negative effect on labour share in high-income countries, due to intensified international competition and the replacement of domestic workers by workers from labour-abundant countries.

If offshore outsourcing and increases in intermediate and/or final goods imports are the main reasons for labour share decline, other service-intensive industries, such as finance, retail and wholesale etc, would not face the same trend as manufacturing industry. However, Autor et al. (2017) found similar patterns of a decline in labour share in the non-traded sector, e.g. wholesale trade, retail trade and utilities.

According to OECD (2015) *"The decline in union density – the number of trade union members as a percentage of total employees or as a percentage of total employment – in many developed economies has often been linked to the weakening of workers' bargaining power, negatively affecting their ability to negotiate a larger share of productivity growth as labour compensation."* In Employment Outlook 2017 from OECD (2017) collective bargaining functions are categorised into three functions: *"protective function", "inclusive function",* and *"conflict management function"*. First, the Protective function aims at ensuring adequate employment conditions, the Inclusive function concerns the allocation of a fair share of benefit, training, technology and productivity growth and finally, the conflict management function concerns social peace. Strong collective bargaining power also prevents firms from exploiting profit out of workers. Therefore, high levels of collective bargaining power and unionisation can have a positive impact on wage dispersion and the income inequalities.

OECD (2012) reported that the effect of workers bargaining power could also partly explain the reduction in labour share is correlated with increasing domestic and international competition and

a level of public ownership declining. Moreover, increased competitive pressures reduce the size of the total revenue gets shared among employers and labours. Also, the bargaining power of lower-skilled labours decreased relatively more, as their share is decreased. Trade union density has declined from about 40 percent to 29 percent on average in OECD countries from 1990 to 2010 (with variation in date depending on different countries' data provision) and the collective bargaining coverage rate also fell by almost ten percentage points from 70 percent over the same period of the time.

Although there have not been many studies on how and why unionization is important in decline in labour share, Abdih and Danninger (2017) show that unionisation contributes about 14 percent of the total decline using Autor's calculation. They also find that it ranks third after technology and combined international factors (i.e. globalisation, offshoring, and outsourcing).

There have not been many studies that explore the relationship between a decline in labour share and a rise in market concentration. Autor et al. (2017) began with an assumption that *"If globalization or technological changes advantage the most productive firms in each industry, product market concentration will rise as industries become increasingly dominated by superstar firms with high profits and a low share of labour in firm value-added and sales."* and introduced the *"superstar firm"* model emphasising the role of heterogeneity of firms in the dynamics of the total labour share. The hypothesis is that *"technology or market conditions have evolved to increasingly concentrate sales amongst firms with superior products or higher productivity, thereby enabling the most successful firms to occupy a larger market share.".* Since bigger firms are more productive thus they are more profitable, and their share of labour income in total sales and value-added will be smaller. As a result, the aggregate labour share of income will fall as the weight of bigger firms in the market increases (Autor et al., 2017).

Autor et al. (2017) find the decline occurs not only in the USA but also globally. OECD (2012) also shows the similar pattern of decline across the world. The median labour share of the whole economy fell by 5 percentage points from 66.1 percent from 1990 to 2010. The cross-country median labour share in the business sector of income in OECD countries also declined from 68.2 to 63.6 percent. During that time, the USA labour share was about 68 percent, and it declined by 4.5 percentage points, whereas French labour share increased by one percentage points although it is not statistically significant[1].

[1] OECD 2012. OECD Employment Outlook 2012. shows that the French labour share of whole economy declined from 1990 to 2009 by 3.5 percentage points, however, it increased by one percentage point in business sector.

The existing studies in this area provide different explanations for the decline in labour share, with mixed conclusions(Autor et al., 2017, Abdih and Danninger, 2017, OECD, 2015, Lawrence, 2015, Karabarbounis and Neiman, 2014, Elsby et al., 2013, OECD, 2012, Schneider, 2011). However, it is imperative to note that each study has shown the similar trend with different perspectives and has come up with justified explanations for the discoveries. Building up from Autor et al.'s (2017) paper, I intend to analyse French firm-level data to find the relationship labour share market concentration in different industries.

2 Data Construction

My analysis focuses on the 6 major sectors (Manufacturing(C), Financial and insurance activities(K), Wholesale and retail trade; repair of motor vehicles and motorcycles(G), Construction(F), Information and Communication(J), Professional, scientific, technical, administration and support service activities(MN)[2]) that account approximately 75 percent of aggregate employment and value-added in French market economy. To observe changes in the labour share of income over time, I use KLEMS[3] data that is an industry-level panel dataset. Labour share is calculated as a fraction of total compensation to value-added.

Figure 1 shows the trend of labour share for the six sectors combined. The combined labour share of those six sectors has been increased since 2008. The trend is also consistent with OECD (2015) found.

Figure 2 shows the changes of labour share in each sector. The changes vary by sectors. Manufacturing and Finance sectors show the decreasing trend over time whereas the other sectors (i.e., Information and Communication, Construction, Wholesale and Retail, MN) have an increasing trend.

I obtained firm-level data from AMADEUS, a database that contains yearly financial accounting information from detailed harmonized balance sheets, income statements, and profit and loss accounts of firms for the recent ten years. AMADEUS provides data for the last ten years for the same company but firms that did not report any information during the last five years are dropped.

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2 Within manufacturing(C), Financial and insurance activities(K), and Professional, scientific, technical, administration and support service activities(MN), sectors, some sub-sectors are excluded for regression analysis: M12(Manufacture of tobacco products), M19(Manufacture of coke and refined petroleum products), F65(Insurance, reinsurance and pension funding, except compulsory social security) M_N75(Veterinary activities) due to number of firms in each industry is too small to build concentration ratio (i.e., CR4, CR20). The numbers of firms in these sub-sectors are 2, 19, 0, and 3 respectively.

3 Detailed information regarding EU KLEMS dataset can be found at http://www.euklems.net/index.html

The advantage of using AMADEUS is that it is census-like nature and has a broad coverage and it allows subgroup analysis. Moreover, longitudinal panel data can be constructed since it collects firm-level information over a period of ten years. However, the quality of the dataset may not be as good as an official survey. It has been built over time thus it is less inclusive in the past once it passed. Furthermore, it is based on what firms report in their account so it is difficult to compare to the other counties' data.

For my analysis, I collected Cost of Employees, Value-added, Sales, and NACE[4] Rev 2 code from 2008 to 2016. AMADEUS defines that cost of employees is the sum of Wages and Salaries and Taxes on salaries; Value-added is the sum of Corporate income tax, Profit (Loss) for the period, Cost of employees, and Interest paid.

To analyse domestic economic activities only, I use unconsolidated financial data from AMADEUS. Because of a parent company of a group of firms is required to consolidate foreign and domestic subsidiaries.

Observations are constrained by what firms are required to report. So, there are missing observations. The complete-case analysis is the easiest way to deal with those missing observations is to delete all missing observations and analyse with complete data. The disadvantage of complete-case analysis is that it reduces sample size thus it may produce less precise and potentially biased as a result(Little and Little, 2002). Missing observations in the dataset are imputed if variables are missing less than or equal to two by taking the average of observations of neighbours ($\hat{y}_t = \frac{1}{2}(y_{t+1} + y_{t-1})$). The advantage of the method is simple to implement and interpret. Then I clean and build industry representing datasets from firm-level data based on the method of Gopinath et al. (2017).

Figure 3 plots the labour share and different measures of market concentration in the six major sectors of the French market economy. CR20, CR4 are concentration ratio of the largest 20, four firms in the industry. HHI is Herfindahl-Hirschman Index. LS is Labour share of income representing the ratio of cost of employees to value-added. Detailed definitions are in the next section. Most of the sectors are stable in terms of all measures except finance and MN[5]. Labour share seems to increase over time and it is consistent with KELMS dataset that is plotted in Figure 1. However, sectoral labour share trends that are in Figure 3 are different from Figure 2 that is

4 NACE is the "statistical classification of economic activities in the European Community" and it is the acronym for "Nomenclature statistique des activités économiques dans la Communauté européenne" (EUROSTAT 2008. NACE Rev. 2 Statistical classification of economic activites in the European Community.

5 Finance: Financial and Insurance activities & MN: Professional, scientific, technical, administration and support service activities

based on KLEMS. A possible explanation is that KLEMS uses all data available whereas I select only unconsolidated data from AMADEUS.

There are 24 groups within the Manufacturing sector, two of groups are excluded in the analysis (i.e., M12(Manufacture of tobacco products), M19(Manufacture of coke and refined petroleum products) contain two and 19 observations respectively). Additionally, one of the groups within Financial and Insurance activity(F65) and one of the groups within MN(MN65) are also excluded. There are 0 and 3 observations in F65(Insurance, reinsurance and pension funding, except compulsory social security) and MN65(Veterinary activities). These four groups are excluded in sub-sector analysis due to lack of numbers of observations to build concentration measures but these are included in the Sector-level analysis.

3 Illustrative model and methodology

I consider a production function $Y_i = A_i V_i^{1-\alpha} K_i^{\alpha}$, where Y_i is value-added, $V_i^{1-\alpha}$ is variable of labour, K_i^{α} is capital and A_i is Hicks-neutral efficiency (TFPQ) in firm i (Autor et al., 2017). A_i is assumed as a heterogeneous across firms and it is also assumed that higher A_i, more productive, firm will have higher level the s of factor inputs and greater sales (Melitz, 2003). According to Bartelsman, Haltiwanger and Scarpetta (2013), there is a fixed amount of overhead labour F is needed for production. Thus, Total labour is $L = V + F$. From the static first-order condition for labour with wage w and cost of capital r, the share of labour costs is wL_i and nominal value-added is $P_i Y_i$. So, the labour share of income can be written as

$$S_i \equiv \frac{wL_i}{P_i Y_i} = \frac{1-\alpha}{\mu_i} + \frac{wF}{P_i Y_i}$$

Where $\mu = (P_i / c_i)$ is the mark-up that is the ratio of production price to marginal costs. The labour share will be lower in a firm if the firm's mark-up is higher or the firm's share of fixed labour costs in total value-added is lower. So those firms with higher A will be larger as they become more productive and take a higher output share of an industry. Therefore, the industry will experience lower labour share on income.

There is a fixed cost of production to enter the market; firms with lower productivity will decide to exit. For those firms with higher productivity in the industry will employ more input and have a higher market share. Owing to the presence of fixed overhead costs, according to Bartelsman et al. (2013), *"the more productive firms will have higher revenue-based TFP"*. The more productive firms will tend to have a higher profit in value-added, therefore, the labour share will be lower. Furthermore, if consumers or buyers are more sensitive to the price then the more output from the

productive firms will be sold. The allocation will increase the concentration of the sales and will decrease the labour share.

Labour share of income S_{jt} is measured by as a ratio of cost of employees to value-added of industry j at time t.

$$\boldsymbol{Labour\ share}(S_{jt}) = {\boldsymbol{Cost\ of\ employees}(COE_{jt})}\Big/{\boldsymbol{Value\_added}(VA_{jt})}$$

Total sales of an industry j are calculated as a total sum of sales of each firm i in industry j at time t.

$$\boldsymbol{Total\ sales}_{jt} = \sum_{i}^{n} \boldsymbol{sales}_{ijt}$$

So, the market share MS of firm i in industry j at time t is derived as

$$\boldsymbol{MS}_{ijt} = {\boldsymbol{sales}_{it}}\Big/{\boldsymbol{Total\ sales}_{jt}}$$

I measure industry concentration ratio as CR4, CR20 using sales. CR4 and CR20 are the sums of the market shares of the largest four and 20 firms.

$$\boldsymbol{CR_4} = \sum_{i}^{4} \boldsymbol{MS_i}\ \&\ \boldsymbol{CR_{20}} = \sum_{i}^{20} \boldsymbol{MS_i}$$

The advantage of using concentration ratio (CR4, CR20) is easy to compute. It shows the percentage of market output produced by the largest four and 20 firms in the market. So, the larger the CR4 and CR20, the less competition exists in the market. The shortcoming of concentration ratio is the heterogeneity in market structure might not be considered. For example, the values of CR4 are the same when each of the largest four firms has 20 percent of market share as another market where the largest four firms have shares of 60, 10, 5, 5 percent respectively, i.e., 80 percent on the overall. Although the competition level is completely different.

Another measure for marker concentration is Herfindahl-Hirschman Index (HHI). This is also a widely used method for calculating the market concentration. The HHI is the sum of the squares of all the market shares.

$$\boldsymbol{HHI} = \sum_{i}^{n} \boldsymbol{MS_i}^2$$

The value of HHI can range from 0 to 1. When it is the maximum value which is 1 and it means monopoly exists. On the other hands, if it is closer to 0, theoretically, the market is purely competitive. U.S Department of Justice considers that if HHI of a market is less than 0.15 then the market is competitive if it is from 0.15 to 0.25, the market is considered the moderately concentrated market, and if it is greater than 0.25, the market is highly concentrated (Naldi and Flamini, 2014). The higher HHI is the higher concentration of the industry. HHI gives much heavier weight to firms with higher market shares than those firms have smaller market shares(Roberts, 2014).

Concentration measured based on employment fails to capture revenue-based intellectual property and human-capital-intensive firms such as Google and Facebook owing to those firms hire relatively fewer employees compared to revenue (Autor et al., 2017).

I estimate regression using fixed-effect for each of the six industries separately.

$$\boldsymbol{S_{jt} = \alpha CONC_{jt} + u_{jt}}$$

Where $\boldsymbol{S_{jt}}$ is the labour share of industry $\boldsymbol{j}$ at time $\boldsymbol{t}$, $\boldsymbol{CONC_{jt}}$ is a measure of sales concentration, and $\boldsymbol{u_{jt}}$ is an error term.

The reason for my choice of France for examining the application of Autor et al. (2017) research is first, collective bargaining power of French workers are a lot stronger than the one in the USA in spite of union density is almost identical. Secondly, I found that the French labour share in the market economy has increased from 2008 to 2015 and OECD (2015) also shows the French median labour share in business sector increased.

Two factors (Trade union density and collective bargaining coverage rates) are standard indicators for assessing the bargaining power of labour force and the extent of its bargaining power. Trade union density has declined since 1990 rather markedly except in Spain although the size of decline varied across countries. French collective bargaining coverage is much higher than that of the USA, although trade union density in both countries is lower than that of most of OECD countries(OECD, 2012). These statistics show that labour in France has stronger bargaining power than in the USA and this fact would have an impact on the size of the decline in labour share. The high levels of bargaining power and unionisation play a positive role in preventing labour share from declining in France. Also, OECD (2012) stated that French labour share increased from the early 1990s to 2010.

4 Results

The Table 2, and 3 show the results of regressing in the concentration ratio and the labour share of income for my samples from 2008 to 2016. I estimate using the regression model above for every 6 sectors separately. The results in Table 2 show estimates of α that is the relationship between labour share of income and concentration ratio from the equation.

Main sector result in row 1 of Table 2 indicates the relationship between labour share of income and different market concentration measures. The coefficients are all negative which means that industries, where concentration increased, are labour shares decreased. I pooled all labour share and concentration measures at sub-sectors level of each industry. The second row in Table 2 shows the similar pattern to the sector-level regression. Only HHI for group-level regression is statistically significant at 5 percent level. Most of the results are not statistically significant so, there is not enough evidence to confirm that the market concentration is related to labour share of income. Despite of the fact that most of results are not statistically significant, the result is consistent with the findings of Autor et al. (2017) that shows the changes in concentration is negatively related to labour share of income in the USA and France.

This paper focuses on finding the difference between sectors. First, I divided each sector into group-level based on NACE Rev.2 classification. Table 3 shows a summary of the regression results and as shown in the table, the coefficients for each industry varies from -7.324 to 2.859.Focusing on the coefficient values, the market concentration and labour share are positively related in Wholesale and retail (CR4: 0.330, CR20: 0.289, HHI: 2.859), and MN (CR4: 0.707,CR20: 0.551, HHI: 0.055), whereas Manufacturing (CR4: -0.395, CR20: -0.714 HHI: -1.621), Finance and Insurance activities (CR4: -0.320, CR20: -0.512, HHI: -0.444), Construction (CR4: -0.548, CR20: -0.435, HHI: -7.324), and Information and communication (CR4: -1.041, CR20: -2.196, HHI: -1.866) sectors are negatively related. The regression results of the Manufacturing and Information and Communication sectors are statistically significant at 5 to 1 percent level. The result of the manufacturing sector is consistent with Autor et al. (2017) findings, which shows the negative correlation between labour share and the marker concentration.

For Manufacturing sector, the results are striking. All the coefficients for CR4, CR20 and HHI are negative and CR20 and HHI are significant. These coefficients suggest that increase in market concentration will lead to a decrease in labour share of income. The results of my analysis are consistent with Autor et al. (2017) findings.

The coeffects in row 4 in Table 3, that is Information and Communication sector, clearly, show the negative correlation between concentration and labour share with significance at the one percent

level. Figure 4 shows detailed trends of each factor (i.e., Labour share, CR4, CR20, and HHI). Two groups are very concentrated whereas the others are not. Interestingly, the labour share of income in many sectors are above 1 or very close to 1 and high level of labour share is either the cost of employees is high or value-added is low. However, this could have been caused by the fact that there was the most number of reported losses in Information and Communication sector data that would have lowered the value-added for this sector. This can also explain the high level of labour share (Figure 2,4) and increasing trend of labour share over time (Figure 2,3 and,4).

Most of the coefficients of the other sectors are not statistically significant except for the coefficient of CR4 in MN sector. Except for the financial sector, the results cannot be compared to Autor et al. (2017) paper that shows the negative coefficients at 5 percent level of significance. There is not enough evidence of the relationship between two factors.

5 Conclusion

This study attempts to provide an empirical evidence for 1) the labour share of income has decreased over time; 2) the market concentration is related to labour share of income in French market economy. The analysis shows the changes in labour share of incomes in 6 major sectors from 2008 to 2015 using industry-level panel dataset from KLEMS. There are four sectors that experienced labour share increase (i.e., Construction, Information and Communication, Wholesale, and MN) whereas two sectors have shown negative trends (i.e., Manufacturing and Financial and Insurance activities). I analyse the six major sectors of the French market economy by building industry representing dataset using firm-level data over the period 2008-2016 from AMADEUS.

I hypothesise that markets have changed such that firms with better quality, lower costs, and/or higher productivity from innovation gain disproportionate rewards relative to the past. Because these larger firms have higher profit levels, they have a tendency to have a lower labour share of their sales and value-added. Therefore, as those larger firms obtain more market share, the aggregate labour share will fall. My study attempts to provide predictions based on analysis of firm-level data across of the French market economy. First, market concentration in sales rises across industries. Second, that industry where market concentration increased will face the decrease in labour share.

The levels of market concentration and the labour share of each industry in the French market economy are stable over the time as shown in Figure 3. There is no clear evidence that these two factors are related to each other except for the manufacturing and information sectors, only sectors with statistically significant coefficients. These two sectors are consistent with the finding of Autor et al. (2017). The possible explanation of experiencing the increase in concentration, especially in

the manufacturing sector, is the growth of patenting intensity and different growth rates of productivity. Patents, which are positively correlated with concentration growth, can prevent smaller firms from innovating and make monopolies existing (Boldrin and Levine, 2010). OECD (Andrews et al., 2015) found the widening of productivity between the top five percent of firms and the rest and the widening productivity can provide ways for leading firms to protect their advantages, therefore, aggregate productivity growth becomes slower.

A concern with the measure of market concentration is that it only captures domestic levels of concentration as results of that it may overemphasise market concentration for traded-goods industries. If a firm operates globally, domestic concentration does not follow the global trend, therefore, the result may mislead. It is not big concerns in other sectors such as service, since there are relatively fewer imports. Regardless of the concerns, the results are clear that concentration is negatively related to labour share.

I run regressions without considering the weight of each sector or group while Autor et al., (2017) runs weighted regressions by the share of sales of the industry in total sector sales. For instance, the manufacturing sector is the biggest sector in the market economy, and it has the strongest impact on the coefficients of main-sector analysis.

The analysis does not consider other factors such as the level of globalisation, trade union, collective bargaining coverage, etc. However, the relationship between labour share of income and the market concentration are clearly shown in the result of the analysis. As seen in the literature review, globalisation and technological improvement have the negative impact on labour share of income whereas the level of unionisation and bargaining power of labour can prevent decreases in labour share of income. These factors may not only affect the labour share of income but also the market concentration directly or indirectly as Dao et al. (2017) showed. For further research, using better and complete dataset (e.g., French Economic census data) and containing other factors (e.g., level of globalisation, trade union density, trading, etc) are highly recommended.

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Figures and Tables

Table 1 Summary Statistics

		Mean	Min	Max	SD
Manufacturing (6,624 firms, 24 Groups)	Sales	92.159	0.000	61138.044	877.538
	Value-added	20.466	0.000	4881.887	86.256
	Cost of employees	15.083	0.000	4003.747	68.517
	CR4	0.194	0.183	0.205	0.007
	CR20	0.310	0.297	0.319	0.007
	HHI	0.014	0.012	0.017	0.002
	Labour share	0.733	0.697	0.792	0.030
Construction (2,839 firms, 3 Groups)	Sales	36.454	0.000	2436.151	85.260
	Value-added	15.399	0.000	527.576	28.406
	Cost of employees	12.503	0.000	341.598	22.125
	CR4	0.066	0.063	0.073	0.004
	CR20	0.171	0.160	0.186	0.009
	HHI	0.003	0.003	0.003	0.000
	Labour share	0.833	0.743	0.885	0.046
Wholesale (12,319 firms, 3 Groups)	Sales	65.653	0.000	49816.889	444.969
	Value-added	12.492	0.002	2684.548	50.103
	Cost of employees	9.776	0.000	2240.529	34.473
	CR4	0.092	0.064	0.117	0.021
	CR20	0.205	0.172	0.235	0.024
	HHI	0.004	0.003	0.006	0.001
	Labour share	0.689	0.631	0.724	0.031
Information and Communication (1,508 firms, 6 Groups)	Sales	55.051	0.000	11997.718	269.656
	Value-added	30.385	0.000	4566.455	108.181
	Cost of employees	20.883	0.000	1255.000	51.361
	CR4	0.203	0.123	0.270	0.057
	CR20	0.378	0.307	0.440	0.051
	HHI	0.019	0.008	0.034	0.009
	Labour share	0.768	0.722	0.825	0.034
Financial and Insurace Activities (3,923 firms, 3 Groups)	Sales	29.542	0.000	19589.692	258.217
	Value-added	34.994	0.002	4036.450	103.905
	Cost of employees	18.242	0.000	566.947	28.995
	CR4	0.434	0.364	0.522	0.050
	CR20	0.594	0.531	0.670	0.049
	HHI	0.095	0.051	0.158	0.037
	Labour share	0.284	0.209	0.339	0.045
MN (4,608 firms, 13 Groups)	Sales	47.972	0.000	46311.788	514.752
	Value-added	30.766	0.001	10801.662	131.598
	Cost of employees	22.227	0.000	4091.974	92.306
	CR4	0.233	0.077	0.345	0.098
	CR20	0.342	0.190	0.454	0.096
	HHI	0.041	0.003	0.078	0.028
	Labour share	0.776	0.674	0.876	0.069

Note:
Wholesale: WHOLESALE AND RETAIL TRADE; REPAIR OF MOTOR VEHICLES AND MOTORCYCLES
MN: PROFESSIONAL, SCIENTIFIC AND TECHNICAL ACTIVITIES (M) & ADMINISTRATIVE AND SUPPORT SERVICE ACTIVITIES(N)
"CR4" ("CR20") is the share of sales in the largest four (twenty) firms in the sector-level and group-level industry. HHI is Herfindahl-Hirschman Index.
The values of Sales, Value-added, and Cost of employee are in million Euros.

Table 2 Sector and Group-level Regressions of Labour share on Concentration measures

	CR4	CR20	HHI
Sector-level	-0.113	-0.170	-0.015
n = 54	(0.113)	(0.118)	(0.310)
Sub-sector	-0.103	-0.334	-0.464**
n = 432	(0.151)	(0.213)	(0.224)

Note: *p<0.1; **p<0.05; ***p<0.01

Each cell displays the coefficient on a concentration measure from a separate regression. "CR4" ("CR20") is the share of sales in the largest four (twenty) firms in the sector-level and group-level industry. HHI is Herfindahl-Hirschman Index.
Sector-level and Sub-sector regressions are used sector-level and group-level data based on NACE Rev.2 classification.

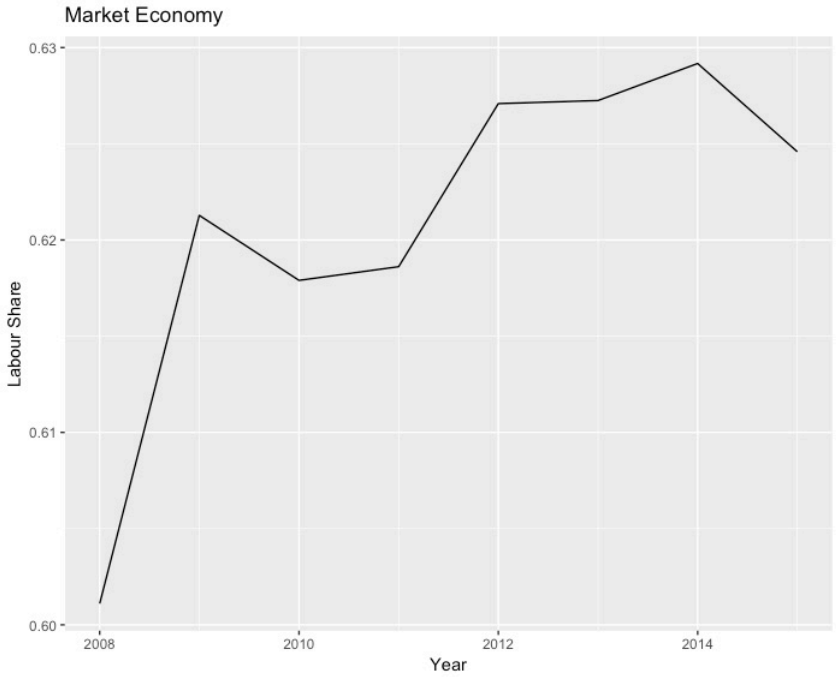
Table 3 Sub-sector level Regression of Labour share on Concentration measures, Different Sectors

	CR4	CR20	HHI
Manufacturing	-0.395	-0.714**	-1.621***
n = 198	(0.312)	(0.312)	(0.568)
Construction	-0.548	-0.435	-7.324
n = 27	(0.627)	(0.263)	(5.350)
Wholesale	0.341	0.284	2.870
n = 27	(0.223)	(0.273)	(2.104)
Information	-1.041***	-2.196***	-1.866***
n = 54	(0.295)	(0.650)	(0.675)
Finance	-0.320	-0.512	-0.444
n = 18	(0.339)	(0.432)	(0.340)
MN*	0.707*	0.551	0.055
n = 108	(0.370)	(0.533)	(0.494)

Note: *p<0.1; **p<0.05; ***p<0.01

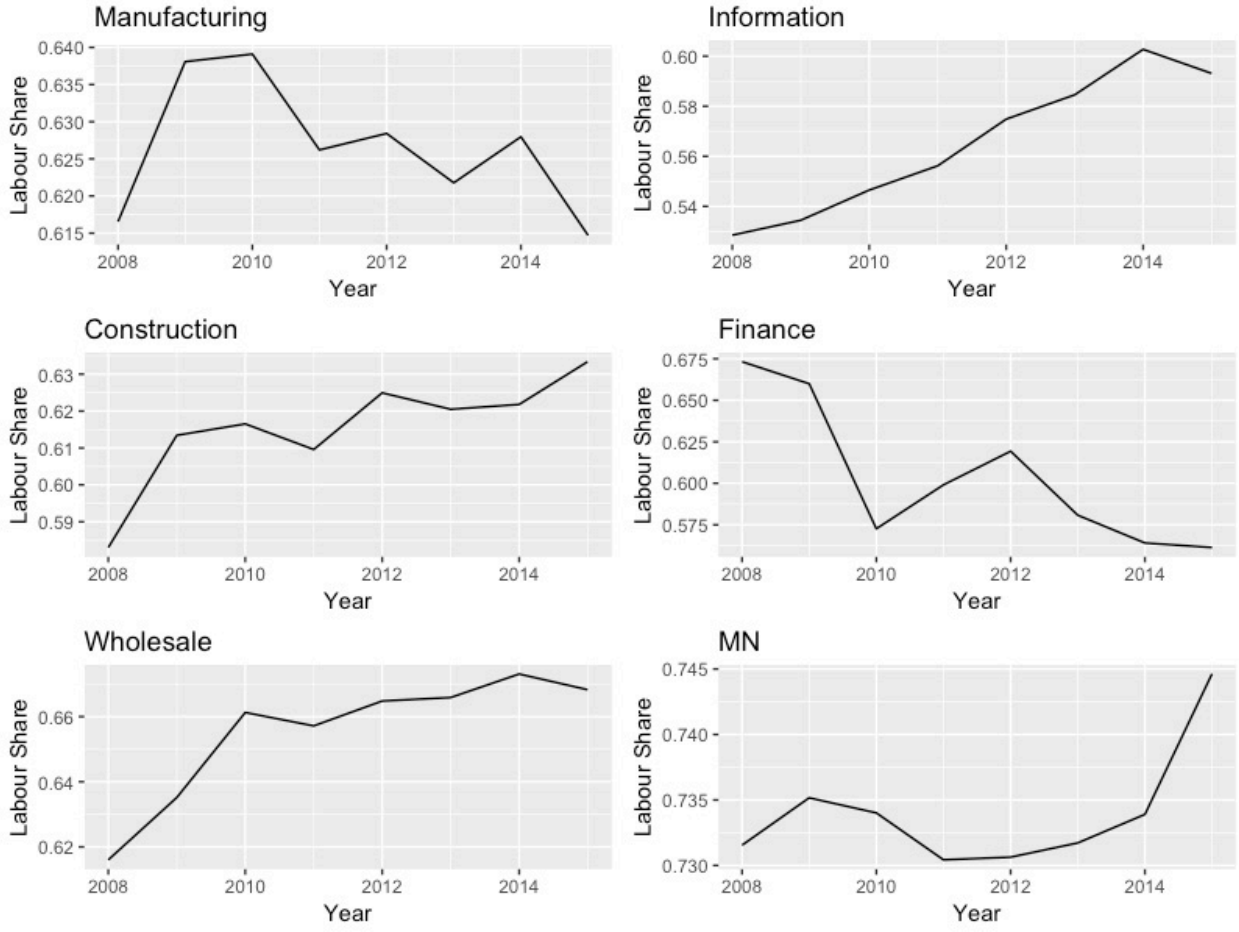
Each cell displays the coefficient on a concentration measure from a separate regression. "CR4" ("CR20") is the share of sales in the largest four (twenty) firms in the sector-level and group-level industry. HHI is Herfindahl-Hirschman Index.
*MN is Professional, scientific and technical activities & Administrative and support service activities.
N is the number of groups within a sector

Figure 1 Labour share trend of six-sectors combined



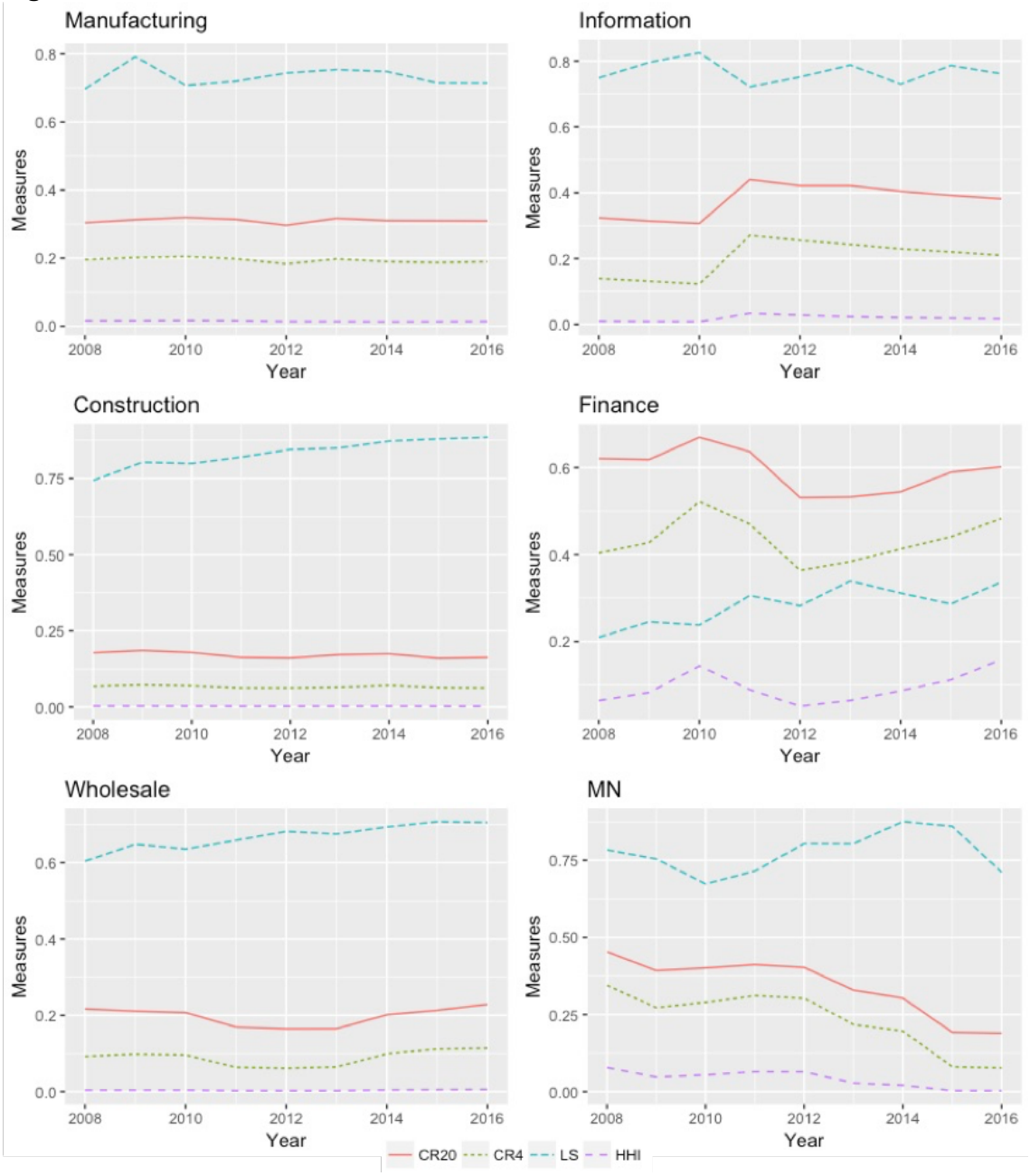
Note: the ratio of aggregate compensation over value-added of 6 major sectors in the French market economy based on KLEMS data

Figure 2 Labour share trend of six-sectors



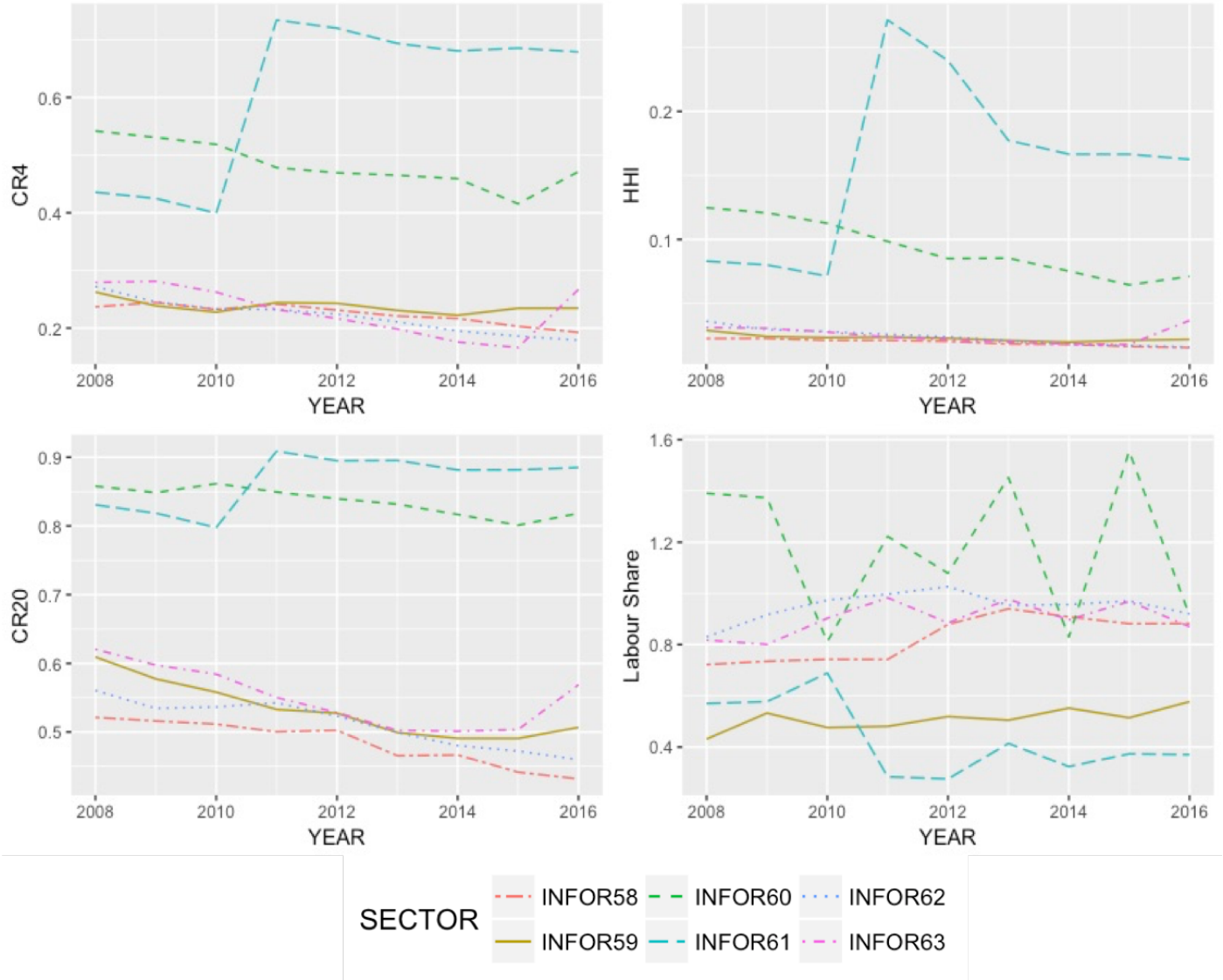
Note: Each panel plots the ratio of aggregate compensation over value-added of each sector based on KLEMS data

Figure 3 Labour share trend of six-sectors



Notes: The figure plots the labour share and different measures of market concentration in the six major sectors of the French market economy. CR20, CR4 are concentration ratio of the largest 20, four firms in the industry. HHI is Herfindahl-Hirschman Index. LS is Labour share of income representing the ratio of cost of employee to value-added. Full names of each sector are Wholesale(Wholesale and retail trade; repair of motor vehicles and motorcycles), Information(Information and communication), Finance(Financial and insurance activities), MN(Professional, scientific and technical activities & Administrative and support service activities).

Figure 4 Measures over time in Information and Communication sector



Notes: The figure plots the labour share and different measures of market concentration in Information and Communication sector. CR20, CR4 are concentration ratio of the largest 20, four firms in the industry. HHI is Herfindahl-Hirschman Index. LS is Labour share of income representing the ratio of cost of employee to value-added.

Appendix

A1. Broad Structure of NACE Rev. 2

Sector	Title	Division
C	Manufacturing	10 – 33
F	Construction	41 – 43
G	Wholesale and retail trade; repair of motor vehicles and motorcycles	45 – 47
J	Information and communication	58 – 63
K	Financial and insurance activities	64 – 66
M & N	Professional, scientific and technical activities & Administrative and support service activities	77 – 82

A2. Detailed Structure of NACE Rev. 2

Manufacturing (C)

Group	Title
10	Manufacture of food products
11	Manufacture of beverages
12	Manufacture of tobacco products
13	Manufacture of textiles
14	Manufacture of wearing apparel
15	Manufacture of leather and related products
16	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
17	Manufacture of paper and paper products
18	Printing and reproduction of recorded media
19	Manufacture of coke and refined petroleum products
20	Manufacture of chemicals and chemical products
21	Manufacture of basic pharmaceutical products and pharmaceutical preparations
22	Manufacture of rubber and plastic products
23	Manufacture of other non-metallic mineral products
24	Manufacture of basic metals
25	Manufacture of fabricated metal products, except machinery and equipment
26	Manufacture of computer, electronic and optical products
27	Manufacture of electrical equipment
28	Manufacture of machinery and equipment n.e.c.
29	Manufacture of motor vehicles, trailers and semi-trailers
30	Manufacture of other transport equipment
31	Manufacture of furniture
32	Other manufacturing
33	Repair and installation of machinery and equipment

Construction (F)

Group	Title
41	Construction of buildings
42	Civil engineering
43	Specialised construction activities

WHOLESALE AND RETAIL TRADE; REPAIR OF MOTOR VEHICLES AND MOTORCYCLES(G)

Group	Title
45	Wholesale and retail trade and repair of motor vehicles and motorcycles
46	Wholesale trade, except of motor vehicles and motorcycles
47	Retail trade, except of motor vehicles and motorcycles

INFORMATION AND COMMUNICATION (J)

Group	Title
58	Publishing activities
59	Motion picture, video and television programme and music publishing activities
60	Programming and broadcasting activities
61	Telecommunications
62	Computer programming, consultancy and related activities
63	Information service activities

FINANCIAL AND INSURANCE ACTIVITIES (K)

Group	Title
64	Financial service activities, except insurance and pension funding
65	Insurance, reinsurance and pension funding, except compulsory social security
66	Activities auxiliary to financial services and insurance activities

PROFESSIONAL, SCIENTIFIC AND TECHNICAL ACTIVITIES (M) & ADMINISTRATIVE AND SUPPORT SERVICE ACTIVITIES(N)

Group	Title
69	Legal and accounting activities
70	Activities of head offices; management consultancy activities
71	Architectural and engineering activities; technical testing and analysis
72	Scientific research and development
73	Advertising and market research
74	Other professional, scientific and technical activities
75	Veterinary activities
77	Rental and leasing activities
78	Employment activities
79	Travel agency, tour operator reservation service and related activities
80	Security and investigation activities
81	Services to buildings and landscape activities
82	Office administrative, office support and other business support activities