



A study on Transition from Labour to Capital Intensive Industry in Electrical, electronic and optical products activity

Emergence of technology through automation has taken over traditional working processes where it replaces human physical as well as enhances and equips labour with relevant skills. Application of this transformation will improve efficiency and productivity while assist industries to remain relevant and competitive in both domestic and global market. The aim of this study is to analyse the pattern of capital or labour usage in the production particularly in the Electrical, electronic and optical products activity. Based on the available data evidence, it is important to know whether the industry is on track for the transition from labour intensive to capital intensive. The variables used in this study are gross output, value added, intermediate input, number of persons engaged, salaries and wages and fixed asset from Economic Census and Annual Economic Statistics published by the Department of Statistics Malaysia (DOSM). Therefore, this study can be used as a yardstick to see the structural changes of this activity whether it has shift to capital intensive or remained as labour intensive for the period of 2009 onwards. Appropriate policies need to be implemented to move Malaysia towards application of the latest technological advances.

Keywords: Electrical, Electronic, Capital intensive, Labour intensive, Manufacturing, Malaysia

1. Introduction

Since the end of 1980s, Malaysia has transform and shifted from depending on a primary sector of agriculture and industries to reliance on the revolutionary industry which is manufacturing sector. Manufacturing sector requires a mixture of labour, capital, and management expertise. It complements agricultural production by introducing modern technology and gain economies of scale. This industry contributes significantly to research and development, exports, and productivity growth, making it a critical source of innovation and competitiveness.

The manufacturing sector is one of the major contributors to the national economy which drive the nation growth. For year 2020, manufacturing was one of the major components of Malaysia's economy and constituted 22.3 per cent to overall Gross Domestic Product (GDP)¹. This sector employed 2,551 thousand persons or 16.9 per cent from total employment². As at 2015, there are 47,698 companies categorised as small and medium enterprises (SMEs) while the remaining 1,403 establishments are large companies³. Due to the high demand of manufacturing production, the population of Malaysia, notably in the Klang Valley and Penang, has expanded fast. However, other economic activities namely agriculture, mining & quarrying, construction and services also contribute to the overall economy's growth and development.

During the Mid-term Review of Eleventh Malaysia Plan period, value added for the manufacturing sector is targeted to grow at an average rate of 4.8 per cent per annum for the period of 2016 to 2020⁴. However, the real growth for this sector was only at 3.0 per cent during the period. Technology and innovation driven industries are expected to contribute

¹ Department of Statistics, Malaysia, Quarterly National Account - Gross Domestic Product, Malaysia

² Department of Statistics, Malaysia, Quarterly Labour Productivity

³ Department of Statistics, Malaysia, Economic Census 2016 - Profile of Small and Medium Enterprises

⁴ Prime Minister Office, Eleventh Malaysia Plan 2016-2020

to the increase in exports, revenue, business sustainability, job creation as well as to retain the employees.

In this regards, this study focuses mainly on Electrical, electronic and optical products activity which is the major contributor to value added for manufacturing sector. It was the largest contributor with a share of 29.7 per cent to manufacturing value added in 2020⁵. During the year, this activity engaged 575 thousand persons or 22.5 per cent from overall manufacturing employment⁶. There are seventeen (17) sub-sectors under Electrical, electronic and optical products activity according to 3 digit Malaysia Standard Industrial Classification (MSIC) 2008. The highest gross output for this activity was manufacture of electronic components and boards which constituted 49.9 per cent from overall gross output followed by manufacture of consumer electronics and manufacture of computers and peripheral equipment. This input was based on latest survey conducted by Department of Statistics, Malaysia (DOSM) for year 2017⁷.

2. Literature Review

Labour intensive industry refers to industry that produce goods or services that requires a large number of labour (UN, 2020). Conventionally, this industry were determined by the amount of capital needed to produce the goods and services. On the contrary, (Cambridge University Press, 2021) defined capital intensive industry as an industry, business, or process that needs a lot of money to buy buildings and equipment in order to start operating. Similarly, (Erasmus, 2001) in his study stated that if an enterprise is labour intensive, more labour is needed while a large value of value added per employee indicates that relatively little labour is used and that the enterprise is capital intensive.

In the System of National Accounts, intermediate inputs are valued and recorded at the time they enter the production process, while outputs are recorded and valued as they emerge from the process⁸. In order to compute gross output, (Biesebroeck, 2015) stated that it is simply the physical output multiplied by the final good selling price for production units with a single output. If there are multiple outputs, gross output is the sum of the price times quantity over all goods produced. According to (Lim, 1976) the most common measure of capital intensive is the capital-labour ratio (K/L) where K is fixed assets valued at historical or replacement costs and L the total number of employed person. In addition, he mentioned the approach of value added per employee (VA/L) to measure the capital-intensity of the overall production process.

Another extent to measure capital is method approached by Burger and Hamman (1999), a closely related to the total assets to revenue measure, which is property, plant and equipment (PPE) to revenue. This approach excludes the investment in associates goodwill and other financial assets as well as the current assets, and only considers the amount of capital invested in PPE. (Lim, 1976) highlighted that in capital intensive enterprises, a large amount of capital is usually invested in PPE. A high value for this measure is therefore an indication of a high degree of capital intensity, while a lower value indicates labour intensity.

⁵ Department of Statistics, Malaysia, Quarterly National Account - Gross Domestic Product, Malaysia

⁶ Department of Statistics, Malaysia, Quarterly Labour Productivity

⁷ Department of Statistics, Malaysia, Annual Economic Statistics Manufacturing

⁸ System of National Accounts 2008

In terms of salaries paid and revenue, labour intensive industry has higher amount of salaries paid compared to capital intensive industry (Lim, 1976). Besides, (Hosamane, 2008) in his study that focusing on total factor productivity growth for selected capital intensive and labour intensive industries of India suggested that K/L ratio need to be calculated first. Industries are then ranked on the K/L values where five industries above the mean K/L of whole manufacturing sector are classified as capital intensive, and five from below mean value are called labour intensive industries.

3. Methodology

Data used related to this study is collected and published by Department of Statistics, Malaysia (DOSM) from various survey/ censuses particularly involved six (6) points of data for year 2009, 2010, 2012, 2014, 2015 and 2017. The statistics can be obtained from Economic Census (reference year 2010 dan 2015), Annual Economic Statistics (reference year 2017) and Annual Survey of Manufacturing (reference year 2009, 2012 and 2014) sector.

Mainly there are six (6) variables used in this study which can be found from those survey/ censuses as listed below:

- a. gross output;
- b. intermediate input;
- c. value added;
- d. number of persons engaged;
- e. salaries and wages paid; and
- f. fixed assets

In order to ensure the most reliable result, twenty (20) ratios have been carried out from the variables. Out of these ratios, three (3) findings will be shared through this paper:

- a. value added per number of persons engaged;
- b. intermediate input per gross output; and
- c. fixed assets per number of persons engaged

The classification for Electrical, electronic and optical products activity as capital intensive or labour intensive is by the following procedure. First, twenty (20) ratios were calculated for this activity. Next, sub-sectors are classified based on the basis of the ratio values. Sub-sectors which are above the mean of Electrical, electronic and optical products activity are classified as capital intensive, and below mean value is vice versa which is considered as labour intensive. This procedure varies depending on the variable used.

4. Result

This section identifies and provides the three (3) findings from the methodology stated earlier in the previous section.

Table 1: List of measure used in this study

Description	2009	2010	2012	2014	2015	2017
a. Ratio of value added per number of persons engaged (RM '000)	72	84	99	118	129	141
b. Ratio of intermediate input per gross output	0.82	0.81	0.75	0.74	0.79	0.78
c. Ratio of fixed assets per number of persons engaged (RM '000)	76	88	77	95	112	119

a. Value added per number of persons engaged (RM '000)

Value added per number of persons engaged shows the ratio of value added per number of persons engaged in Electrical, electronic and optical products activity. This measure focuses on the relationship between the amount of value added produced with the number of persons engaged which indicate how much value added has been produced by a worker. A high value for this measure implies that the sub-sector is capital intensive while a lower value implies a labour intensive.

The ratio of Electrical, electronic and optical products activity for this approach keep increasing from 2009 at RM72 thousand per person to RM141 thousand per person in 2017. An increase in this ratio consistently during the period of 2009 to 2017 indicates that this activity has shift towards capital intensive whereby this support the justification of transition from labour to capital intensive.

In overall, from the sub-sector point of view, manufacture of other electrical equipment showed a rapid transition from labour intensive towards capital intensive as well as manufacture of electronic components and boards. However, two (2) sub-sectors namely manufacture of consumer electronics and manufacture of electronic components and boards has a higher ratio values as compared to mean ratio value for this activity over the years. This implies that both sub-sectors are considered as capital intensive and constantly improve the progress of automation in production yield.

For year 2017, there are six (6) sub-sectors which have ratio values above the Electrical, electronic and optical products activity. The highest was manufacture of irradiation, electromedical and electrotherapeutic equipment, followed by manufacture of consumer electronics, manufacture of communication equipment, manufacture of electronic components and boards, manufacture of other electrical equipment and Manufacture of magnetic and optical media.

b. Intermediate input per gross output

Intermediate input per gross output highlights the ratio of intermediate input per gross output in Electrical, electronic and optical products activity. This approach focuses on the relationship between the amounts of intermediate input with gross output which measure how much intermediate input has been used to produce gross output. A high value for this approach implies that the sub-sector is labour intensive while a lower value could be seen as an indication of moving towards capital intensive. This is by reducing the cost incurred to cater demand from production.

The ratio of intermediate input per gross output for this activity posted the highest ratio value in 2009 at 0.82. From the period of 2009 to 2017, this activity showed a transition from labour to capital intensive where the ratio shift from 0.82 to 0.78 in the latest year. This signify that in every RM100 of gross output produced, RM82 of cost is needed to produce it in 2009 while RM78 is needed to produce in 2017.

In terms of sub-sector, most of the sub-sectors have ratio value above mean ratio value for year 2010, 2012 and 2014. Nevertheless, this situation changed in 2015 and 2017 where majority of sub-sectors had a transition from a higher ratio value to a lower ratio value as compared to ratio value of Electrical, electronic and optical products activity. On the contrary, two (2) sub-sectors outpaced the mean ratio value for the period of 2009 to 2017 which was manufacture of consumer electronics and manufacture of wiring and wiring devices. This signifies that both sub-sectors are labour intensive and most probably are using traditional equipment which need higher amount of intermediate input to produce output.

Furthermore, there are three (3) sub-sectors which always have a lower ratio value than the average ratio values. There are manufacture of irradiation, electromedical and electrotherapeutic equipment, manufacture of electric lighting equipment and manufacture of medical and dental instruments and supplies. These sub-sectors can be categorised as capital intensive whereby fewer used of intermediate inputs in optimizing the production capacity.

c. Fixed asset per number of persons engaged

Fixed asset per number of persons engaged illustrates the most common approach of labour and capital intensive, the ratio of fixed assets per number of persons engaged in Electrical, electronic and optical products activity. This approach emphasize on the relationship between the amounts of fixed assets with number of persons engaged that implies how much fixed assets has been allocated to help workers in the production. A high value for this approach implies that the sub-sector is capital intensive.

In overall, ratio of fixed assets per number of persons engaged for this activity keep on increasing at a range of 76 to 119. This signifies that this activity has shift from labour to capital intensive during the period. A lower value proved labour intensive which showed that less equipment were used during production process.

In 2009, most sub-sectors have a higher ratio value with eight (8) sub-sectors outpaced the average ratio value. This situation can be expressed as companies are using current equipment with compliance of maintenance schedule in order for the workers to fulfil the demand of the production. Likewise, during the period of 2009 to 2017, two (2) sub-sectors which were manufacture of electronic components and boards and manufacture of batteries and accumulators posted a high ratio values throughout the years. This situation indicates that the sub-sectors are shifting their labour intensive industry towards capital intensive.

5. Limitation

The availability of variables used in this study are based on the main principal statistics which has been published by DOSM.

6. Discussion and Conclusion

Malaysia's manufacturing sector particularly in Electrical, electronic and optical products activity showed a transition from labour to capital intensive. This was proven by a number of measure stated earlier in the methodology part. One of the main components for a transition from labour intensive to capital intensive was a push towards greater digital adoption as digital technologies prove to be a practical solution. All economic activity should shifted to digital platform as working from home, attending classes remotely and online shopping are now the norm. In addition, businesses should restructure their business operation through adaptation of digitalisation in order to improve resilience as well as optimising business processes. In this regards, strong technical infrastructures coupled with smart digital processes are critical components in maintaining productivity.

With adoption of technology, it will improve efficiency in production and subsequently escalate the productivity in the medium and long-term. An increase in production and productivity will drive profitability, and hence sustain businesses as well as retaining employment and creating job opportunities. Productivity with capital intensive industries drives the economic growth of the country. It indicates the output each worker can produce within a given amount of time depending on quality of human resources and technological progress. Thus, it highlights the ability of country to produce goods and services for every hour of a labour's time.

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