UNIVERSITI PUTRA MALAYSIA

EFFICIENCY AND PRODUCTIVITY OF MANUFACTURING SECTOR IN MALAYSIA

NURHIDAYAH ZAKARIA

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EFFICIENCY AND PRODUCTIVITY OF MANUFACTURING SECTOR IN MALAYSIA

By

NURHIDAYAH ZAKARIA

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirements for the Degree of Doctor of Philosophy

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DEDICATION

UMAR MUADZ BIN SAFRI

SYAFIA NAYLA BINTI SAFRI

This is for the time I spent away from you both.

Thank you so much for the sacrifices you have made for me, my love

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Doctor of Philosophy

EFFICIENCY AND PRODUCTIVITY OF MANUFACTURING SECTOR IN MALAYSIA

By

NURHIDAYAH ZAKARIA

October 2020

Chairman : Associate Professor. Abdul Rahim bin Abdul Samad @ Iammi, PhD
Faculty : School of Business and Economics

The substantial increment of gross domestic product (GDP) of the manufacturing sector from year to year and its contribution to the Malaysian economy is the evidence of the relevance for this sector to the impetus of the Malaysian economy. As it is known, efficiency and productivity growth are essential elements to guarantee that a sector is sustainable over the long haul. However, from 2006 until 2013, starting with the sixth Malaysian Plan (MP), labour productivity for Malaysia's manufacturing sector showed a weak growth compared to the other major sectors. The hindrances were due to the fragmentation of labour productivity, which is the capital intensity and total factor of productivity.

The study took a sample panel data from 1990 until 2015, where it started from the Sixth MP as it was a big stage for Malaysia to maintain the momentum of rapid economic growth. To identify the factors that influence labour productivity, the Pooled Mean Group (PMG) panel data estimation technique was executed. The study found that variables-wage and consumer price index are positively significant to labour productivity in the sector. However, a similar analysis was also performed for each state, and the outcome was varied.

Subsequently, to develop and increase the production of this sector, the degree of efficiency and productivity change by manufacturing sector in each state in Malaysia was measured by using Data Envelopment Analysis (DEA) and Malmquist Productivity Index (DEA-MPI) method. Based on the result of DEA, it is found that Selangor has genuinely achieved the 100% of technical efficiency score, and became the benchmark for the rest of inefficient states. Also, factors determining the level of technical efficiency have been analysed, and the outcomes indicated that investment and workers with primary education attainment are significant. The study was also done at each state level, and the findings are verity, wherein variables of interest affect various states.

Lastly, through DEA-MPI, almost all states experienced productivity growth. On a national scale over the period of research, Malaysia's manufacturing sector has experienced a productivity growth of 2.3%, with technological change as a dominant source of the productivity with 5%. An analysis to identify the influencing factors that affect the productivity change was conducted. At a national level, the result showed that only net capital and workers with primary education attainment were significant. Nevertheless, at the state level, all variables were significant in different states.

The manufacturing industries have consistently played a significant role in Malaysia in the context of competitiveness in order to promote its growth and economic development. The expanding cognizance in regards to the efficiencies and productivity of the manufacturing sector is the crucial element of feasible and long-term growth. Simultaneously, it was noticed that top to bottom research at the state level is likewise significant as a subject to scrutiny. The empirical estimates of the Malaysian manufacturing's efficiencies and productivities performances point to the fact that more considerable enhancement in terms of inputs is required. Based on this study, the policymakers, manufacturers, and workers are called for in order to be always well informed and play a role in endeavours to improve the high efficiency and productivity for the sector.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Doktor Falsafah

KECEKAPAN DAN PRODUKTIVITI BAGI SEKTOR PEMBUATAN DI MALAYSIA

Oleh

NURHIDAYAH ZAKARIA

Oktober 2020

Pengerusi : Profesor Madya Abdul Rahim bin Abdul Samad @ Iammi, PhD
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Kenaikan KDNK yang amat menggalakkan oleh sektor pembuatan dari tahun ke tahun, serta sumbangannya terhadap ekonomi Malaysia adalah bukti betapa relevennya sektor ini terhadap pemangkin ekonomi Malaysia. Seperti sedia maklum, daya kecekapan, serta perubahan produktiviti adalah elemen yang penting bagi memastikan sesebuah sektor itu berjalan secara lestari bagi jangka masa yang panjang. Bagaimanapun, pada tahun 2006 sehinggalah 2013, bermula pada Rancangan Malaysia keenam (RMK-6), produktiviti buruh dalam sektor ini menunjukkan pertumbuhan yang lemah, berbanding sektor-sektor utama yang lain. Kelemahan tersebut berpunca daripada pecahan produktiviti buruh, iaitu intensiti modal serta faktor produktiviti keseluruhan.

Kajian ini mengambil sampel data panel dari tahun 1990 hingga 2015, bermula dengan RMK ke-6 kerana ia merupakan fasa yang penting bagi Malaysia untuk mengekalkan momentum pertumbuhan ekonomi yang pesat. Bagi mengenal pasti faktor-faktor yang mempengaruhi kadar produktiviti buruh, kaedah penganggaran data panel *'Pooled Mean Group'* (PMG) telah dijalankan. Hasil kajian mendapati, pemboleh ubah upah dan index harga pengguna memberi kesan yang positif terhadap perubahan produktiviti buruh yang bekerja dalam sektor tersebut. Analisis yang sama juga turut dilakukan bagi peringkat setiap negeri, dan hasilnya pelbagai.

Setelah itu, bagi usaha untuk memajukan, dan meningkatkan hasil pengeluaran oleh sektor ini, tahap kecekapan dan perubahan produktiviti oleh kilang-kilang yang berfungsi di setiap negeri dalam Malaysia telah diukur menggunakan teknik Analisis Pengumpulan Data (DEA) dan Analisis Pengumpulan Data-Index Produktiviti Malmquist (DEA-MPI). Daripada hasil keputusan DEA mendapati, Selangor merupakan negeri yang benar-benar mancapai tahap kecekapan teknikal sebanyak skala 100% sekaligus menjadi penanda aras bagi negeri-negeri lain yang tidak efisyen. Selain itu, faktor penentu tahap kecekapan teknikal telah dilakukan dan hasilnya mendapati bahawa pelaburan serta pekerja yang mempunyai pencapaian pendidikan rendah adalah signifikan terhadap pemboleh ubah bersandar. Analisis juga dilakukan pada peringkat setiap negeri dan

hasilnya adalah dimana kesemua pemboleh ubah menunjukkan kesan signifikan terhadap negeri-negeri yang berbeza.

Akhir sekali, melalui teknik DEA-MPI pula mendapati, hampir kesemua negeri mengalami pertumbuhan produktiviti. Sepanjang tempoh kajian dijalankan pada peringkat nasional, sektor pembuatan di Malaysia telah mengalami pertumbuhan produktiviti sebanyak 2.3%, dan perubahan teknologikal merupakan sumber dominan bagi pertumbuhan ini sebanyak 5%. Justeru itu, analisis bagi mengenal pasti faktor-faktor yang mempengaruhi perubahan produktiviti bagi sector ini turut dilakukan. Hasil kajian mendapati, modal bersih dan pekerja yang mempunyai latar belakang pendidikan yang rendah pada sektor pembuatan sahaja yang signifikan.

Industri pembuatan secara konsistennya telah menjadi peranan penting bagi Malaysia dalam konteks daya saing untuk mendorong pertumbuhan dan perkembangan ekonominya. Kesedaran yang semakin meningkat berkaitan dengan kecekapan dan produktiviti sektor pembuatan adalah elemen utama yang dapat dilaksanakan bagi mengekalkan pertumbuhan pada jangka masa panjang. Pada masa yang sama, diperhatikan bahawa penyelidikan yang lebih mendalam pada peringkat negeri juga penting sebagai subjek untuk diteliti. Anggaran empirikal kecekapan dan produktiviti pembuatan Malaysia menunjukkan fakta bahawa peningkatan yang lebih baik dari segi input diperlukan. Berdasarkan kajian ini, para penggubal dasar, pengeluar, dan pekerja perlu sentiasa bersedia untuk mendapat informasi dan berperanan dalam usaha meningkatkan kecekapan dan produktiviti tinggi untuk sektor ini.

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To my two little hearts, Umar Muadz Safri and Syafia Nayla Safri, thank you for stick with me 24/7. Both of you are indeed my strength. We have been through a lot together, and I can say that you grew up together with this thesis.

Millions of thanks to all my dearest friends who have been together along this journey, whether directly or indirectly. Thank you for all the help, sharing, support, uplifting words, love, and willingness to keep me in your prayers. You know who you are.

And lastly, to my dear self. Remember how you have risen, fallen, and risen even stronger along this journey. The whole bumpy journey to complete this thesis is not only about producing a significant production of the thesis. It is more about the result of who you will be after this. I am so proud of you for not giving up, my dear self. Let's prepare of this ending for a new beginning.

This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Doctor of Philosophy. The members of the Supervisory Committee were as follows:

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LIST OF ABBREVIATIONS

ADF	Augmented Dickey-Fuller
BCC	Banker, Charnes, Cooper
BLS	Bureau of Labour Statistics
CCR	Charnes, Cooper, Rhodes
CPI	Consumer Price Index
CRS	Constant Return to Scale
CSLS	Centre for the Study of Living Standard
DEA	Data Envelopment Analysis
DFID	Department for International Development
DMU	Decision Making Unit
DOSM	Department of Statistics Malaysia
ECM	Error Correction Model
EPZ	Export Processing Zone
ETP	Economic Transformation Programme
E&E	Electrical and Electronics
FDH	Free Disposable Hull
FDI	Foreign Direct Investment
FTA	Free Trade Agreement
GA	Growth Accounting
GDP	Gross Domestic Product
GTP	Government Transformation Plan
ICT	Information and Communication Technology
IMP	Industrial Master Plan
IPS	Im, Pesaran and Shin
IT	Information and Technology
KL	Kuala Lumpur
KLCC	Kuala Lumpur Convention Centre
MEF	Malaysian Employers Federation
MFP	Multi Factor of Productivity
MG	Mean Group
MGE	Mean Group Estimator
MIDA	Malaysian Investment Development Agency
MNC	Multinational Corporation
MOHR	Ministry of Human Resource
MP	Malaysian Plan
MPB	Malaysian Productivity Blueprint
MPC	Malaysian Productivity Corporation
MPI	Malmquist Productivity Index
MSIC	Malaysia Standard Industrial Classification
NDP	National Development policy
NEP	New Economic Policy
NIC	Newly-Industrialized Country
NVP	National Vision Policy
OECD	Organization for Economic Cooperation and Development
OTE	Overall Technical Efficiency
PFP	Partial Factor of productivity

PMG	Pooled Mean Group
PMGE	Pooled Mean Group Estimator
PTE	Pure Technical Efficiency
PTECH	Pure Technical Efficiency Change
SE	Scale Efficiency
SECH	Scale Efficiency Change
TE	Technical Efficiency
TECH	Technical Efficiency Change
TECHCH	Technological Change
TFP	Total Factor of Productivity

CHAPTER 1

INTRODUCTION

1.1 Background of the Manufacturing Sector in Malaysia

Malaysia is one of the countries in Southeast Asia that is well-known for its uniqueness. In line with the worldwide marketing campaign 'Malaysia Truly Asia,' one of the familiar facts about Malaysia is the Malaysians live in harmony regardless of multiracialism and multi-religion. The geographical position of Malaysia is also located on the equator, where this country becomes a country with hot and humid weather. Hence, it comes with beautiful seashores, rainforests, and rambling green highlands. Apart from that, the strategic geographical position has made Malaysia blessed with an abundance of attractive flora and fauna. The skyscrapers like Kuala Lumpur Convention Centre (KLCC) or generally known as twin towers and Kuala Lumpur (KL) Tower are the most remarkable, emblematic, and landmark for the name of Malaysia.

Even though Britain once colonized Malaysia, however, through the time, age, and the era of globalization along with the leadership of the caliber leaders, Malaysia has become an independent nation. This multiracial nation has solid roots and influences from Malays, Chinese, and Indians, as well as a secure political, social, and economic system despite confronting some challenging phases. The fast speed of globalization also spurred some rapid changes in Malaysia's industrialization. As per Kaldor (1967), the fast paces of economic growth are perpetually connected with the quick pace of the secondary sector, which is manufacturing. This is an attribute of a transitional phase for the intermediate stage of development, from immaturity to maturity. In terms of the economic aspect, this study will be delved into one of the instigators of the country's economy, which is the manufacturing sector.

There are three main sectors in Malaysia, which are primary, secondary, and tertiary. They are agriculture, industry, and service sector, respectively. The first sector is comprised of agricultural activities, like fisheries, forestry, and mining. The industrialization sector is where the raw materials are processed into final goods, and it is divided into resource-based and non-resource based. At the same time, the subsectors for the service sector are tourism, trade, transportation, finances, and education.

Malaysia was once highly depended on natural resources like rubber and tin at first, and later got diversified into other natural resources like palm oil. After Malaysia had its independence in 1957, Malaysia has accomplished much remarkable progress, with the point of changing the economic structure and improving the lives of the people. Since the price of the natural resources' commodities was not stable, the government took steps to evolve the Malaysian economy to a more rapid and stable state. Since that time, a five-year Malaysian Plan (MP) was introduced.

Starting from the First MP, which covered from the year 1966 to 1970, the Malaysian government realized that increasing the speed of the agricultural sector alone is not sufficient to secure the income high rate and growth of employment. As the agricultural sector got exploited at that time, the secondary industry should be relied on to accomplish the above matters. During the First MP phase, the manufacturing sector was divided into three categories. There are processing agricultural products, manufacturing consumer and intermediate goods, and capital goods or intermediate goods, which employed the capital-intensive method. While developing the natural resources-based manufacturing industries like the palm oil industry, Malaysia also has developed into other non-resource based manufacturing like electrical and electronic, automobile, and steel industries (Chang, 2012).

The remarkable economic achievements have become even stronger with the incorporation of the New Economic Policy (NEP), which was introduced in the Second MP by Tunku Abdul Rahman. This policy is a socio-economic based program in which the vision is to achieve the national unity with a-20 years program. The main aim of NEP is to create national unity by diminishing financial, social, cultural, placement, and so on.

Continues with the phases of the nation's development, as the Sixth MP (1990-1995) was introduced, it was a phase where it has become the main thrust for the economic growth for Malaysia. The central core was to achieve sustainable economic growth at a high level. This is due to the increase in the Gross Domestic Product (GDP) during the Fifth MP, where the achievement of economic growth was beyond the expectation. The targeted GDP growth in only by 5%, however, Malaysia managed to achieved at 6.7% growth at that phase despite the growth rate was a bit sluggish at first. The GDP growth was slowing due to declining domestic commodity prices, as well as domestic demand for products for the manufacturing sector.

According to the Sixth MP, the government also put more accentuation for the automation or other production processes in order to save money on labour utilisation. Not only that, there was also a repositioning of the industrial sector especially to the areas which having the essential resources like labour supply. This matter was given encouragement and consolation as the government also provide financial aid for the infrastructure development in this particular sector.

The high venture development rate accomplished during the period of the Fifth MP also should be kept up in order to support the expected rapid growth of the manufacturing sector in the Sixth MP. Thus, the government was kept on guaranteeing that there will be a favourable environment for investment and re-investment. These investments were advised to be channelled into high quality with more value added and extensive chain high-tech industry.

Looking deeper into the three most important sectors for Malaysia during the phase of The Sixth MP, the growth of GDP for the manufacturing sector was the second highest with 52.06%, the services sector with 54.17%, and the agriculture sector with mild

decrement, -1.03%. From the perspective of GDP contribution by sector, the service sector was the one with the highest GDP compared to others. The GDP by kind of economic activity is shown in Figure 1.1 and Table 1.1. However, in terms of GDP growth, the manufacturing sector was the one with higher growth compared to the other two sectors. This at once has made the secondary sector the most significant GDP contributor to the economy, with 32.4%. The remarkable growth achieved by the manufacturing sector during the Sixth MP is shown in Figure 1.2 and Table 2.2, before it was declined during the Seventh MP, especially in 1998 where the Asian financial crisis was befallen. Besides that, the figure also portrays the growth of the three main sectors in Malaysia from 1990 to 2015, where the time range is starting from the Sixth MP up to the Tenth MP.

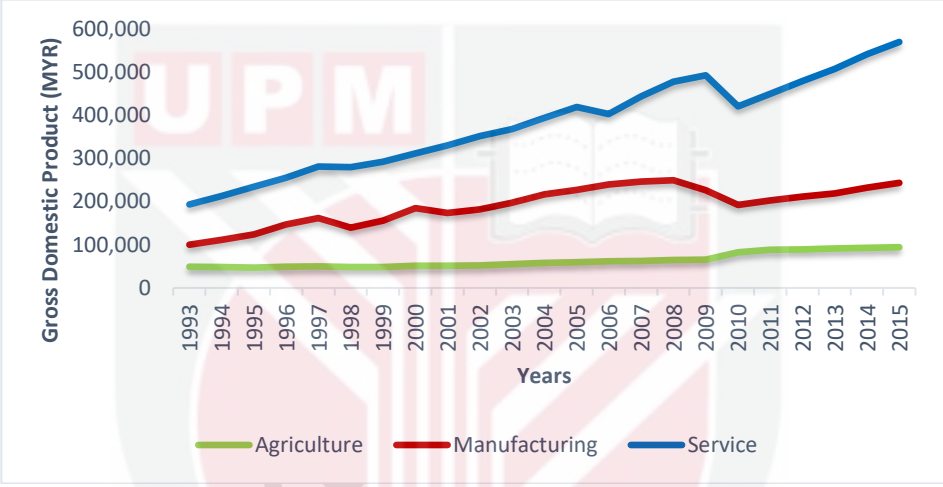

Figure 1.1: GDP of Agriculture, Manufacturing and Service Sector in Malaysia, (1990-2015)
(Source: Department of Statistics Malaysia, 2018)

Table 1.1: Gross Domestic Product (GDP) of Agriculture, Manufacturing and Services Sector in Malaysia, based on 2015 Constant Prices (MYR), 1990-2015

Sector / Year	Gross Domestic Product (GDP) at 2015 Constant Prices (MYR)		
	Agriculture	**Manufacturing**	**Service**
1990	47,597	71,665	136,452
1991	47,553	81,697	151,962
1992	50,815	87,417	169,540
1993	49,220	100,163	193,430
1994	48,287	111,557	212,941
1995	47,064	124,229	234,707
1996	49,198	146,814	255,646
1997	49,528	161,667	280,948
1998	48,158	139,972	279,821
1999	48,389	156,310	292,306
2000	51,321	184,938	311,872
2001	51,015	174,072	330,534
2002	52,426	181,552	351,909
2003	55,300	197,150	368,379
2004	58,044	216,541	394,103
2005	59,472	227,491	419,573
2006	61,453	239,861	402,771
2007	62,229	246,549	444,022
2008	64,915	249,517	477,707
2009	65,335	226,218	492,332
2010	82,882	192,493	420,382
2011	88,555	202,960	449,853
2012	89,406	211,921	479,299
2013	91,181	219,152	507,792
2014	93,048	232,527	541,411
2015	94,396	243,703	569,865

(Source: Department of Statistics Malaysia, 2018)

Table 1.2: The Growth of GDP for Agriculture, Manufacturing and Services Sector in Malaysia

Sector / Year	The Growth of GDP (%)		
	Agriculture	**Manufacturing**	**Services**
1990	-0.61	15.29	11.01
1991	-0.09	14.00	11.37
1992	6.86	7.00	11.57
1993	-3.14	14.58	14.09
1994	-1.89	11.37	10.09
1995	-2.53	11.36	10.22
1996	4.53	18.18	8.92
1997	0.67	10.12	9.90
1998	-2.77	-13.42	-0.40
1999	0.48	11.67	4.46
2000	6.06	18.31	6.69
2001	-0.59	-5.88	5.98
2002	2.77	4.30	6.47
2003	5.48	8.59	4.68
2004	4.96	9.84	6.98
2005	2.46	5.06	6.46
2006	3.33	5.44	-4.00
2007	1.26	2.79	10.24
2008	4.32	1.20	7.59
2009	0.65	-9.34	3.06
2010	26.86	-14.91	-14.61
2011	6.84	5.44	7.01
2012	0.96	4.42	6.55
2013	1.99	3.41	5.94
2014	2.05	6.10	6.62
2015	1.45	4.81	5.26

(Source: Department of Statistics Malaysia, 2018)

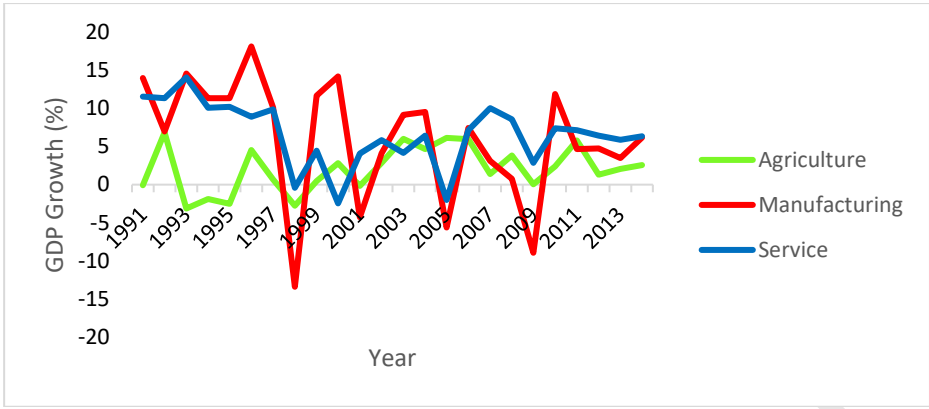

Figure 1.2: GDP Growth of Agriculture, Manufacturing and Service Sector in Malaysia, (1990-2014)
(Source: Department of Statistics Malaysia, 2018)

Therefore, to empower the achievement that was received during the Fifth MP so that the growth of the manufacturing sector could be sustained, the primary strategy on how to rise the growth of the manufacturing sector was by expanding and diversifying the fundamentals, creating strong links for traditional small sectors and emphasizing export-oriented goods. These strategies were employed in the Sixth MP.

As a means to reach these strategies, the human capital was the main driver for the particular sector to obtain a solid base of information and knowledge, as well as skills. From that, as the human capital rose, labour productivity also increased. Indirectly, the skilled labour can increase in line with the job application. Not only that, but it also can create more job opportunities and better prospects for the future. During the year 80s, the industrialization program developed with a greater emphasis on the heavy industry because the resource-based industry was weak. According to Mohamad Hanipah, Tin and Sulaiman (2012), by the 1990s, the manufacturing sector has recorded remarkable growth, and it has created job opportunities for the citizen.

Table 1.3: The Growth of Gross Domestic Product (GDP) for Agriculture, Manufacturing, and Services Sector in Malaysia, Based on 5-Year Malaysia Plan

Sector / Malaysia Plan	The Growth of GDP (%)		
	Agriculture	**Manufacturing**	**Services**
MP 5	3.38	36.09	22.40
MP 6	-1.03	52.06	54.45
MP 7	4.32	25.97	21.99
MP 8	16.58	30.69	26.94
MP 9	34.87	-19.75	4.37
MP 10	6.60	20.07	26.68

(Source: Department of Statistics Malaysia, 2018)

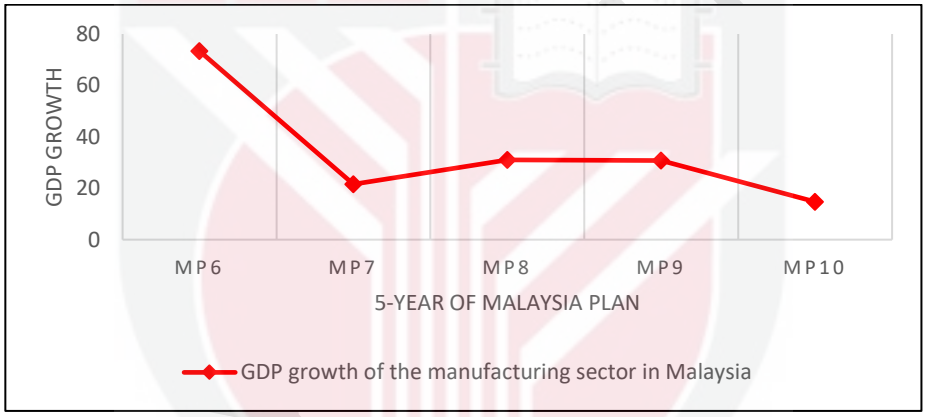

Figure 1.3: The GDP Growth of Manufacturing Sector in Malaysia Based on 5-Year Malaysia Plan (MP 6 - MP 10)
(Source: Department of Statistics Malaysia, 2018)

The achievement can be seen in Table 1.3 and Figure 1.3, where it displays the GDP growth of the manufacturing sector in terms of 5-year of Malaysia Plan phases. However, the growth was decreased tremendously from 73.35% in the Sixth MP to 21.62% on the Seventh MP.

The increasing number of employed persons working in the manufacturing sector since 1990 to 2015 is presented statistically in Table 1.4 and tabulated in Figure 1.4. Besides that, the labour surplus in the agricultural sector also got absorbed into the manufacturing sector, and it has made the per capita output and living standards increased.

Table 1.4: Number of Employed Person Working in the Manufacturing Sector in Malaysia (1990-2015)

Year	Number of Workers
1990	1 332 800
1991	1 486 200
1992	1 639 600
1993	1 726 900
1994	1 753 700
1995	1 780500
1996	1 912 100
1997	2 002 500
1998	1 907 800
1999	1 990 700
2000	2 174 200
2001	2 184 100
2002	2 068 900
2003	2 131 000
2004	2 023 000
2005	1 989 300
2006	2 082 800
2007	1 977 300
2008	1 944 700
2009	1 807 100
2010	2 108 500
2011	2 222 300
2012	2 227 900
2013	2 214 800
2014	2 266 000
2015	2 236 200

(Source: Department of Statistics Malaysia, 2018)

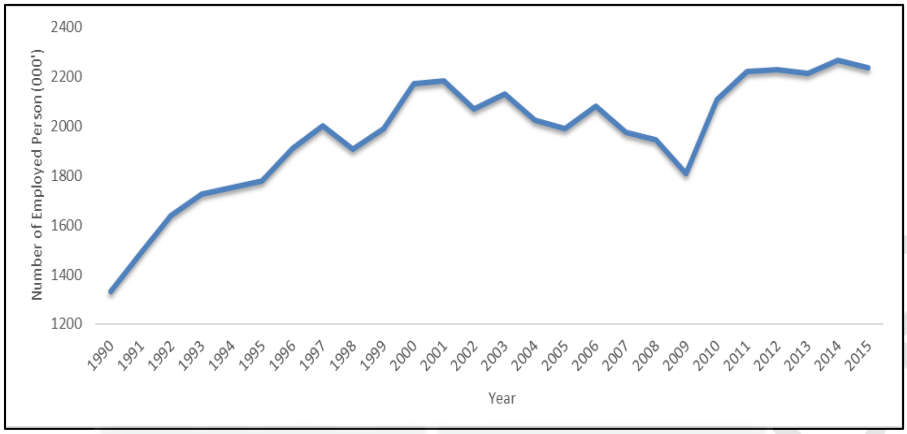

Figure 1.4: Number of Employed Person Working in the Manufacturing Sector in Malaysia, (1990-2015)
(Source: Department of Statistics Malaysia, 2018)

Meanwhile, by looking in the perspective of growth according to the 5-Year Malaysia Plan, Table 1.5 shows the descriptive data for the growth of employment and labour productivity in Malaysia's manufacturing sector. Also, Figure 1.5 tabulated the data in terms of graph for a better picture. Starting from the Sixth MP, the growth of labour productivity was quite high, with 33.6%. However, the growth was seen to decline until it reached a negative figure of -0.12% in the Eight MP phase. Indeed, the growth charts of employees working in this sector and its productivity have seen a slight increase during the Ninth MP and tenth Malaysian Plan, however, with a slower pace of 1.23 and 3.5 percent accordingly.

Table 1.5: The Growth of Labour Productivity and Employment of the Manufacturing Sector in Malaysia According to 5-Year of Malaysia Plan

Malaysia Plan (MP)	Growth of Labour Productivity (%)	Growth of Employment (%)
MP 6	0.34	19.8
MP 7	0.35	13.7
MP 8	-0.12	-8.91
MP 9	0.18	1.23
MP 10	0.04	3.5

(Source: Department of Statistics Malaysia, 2018)

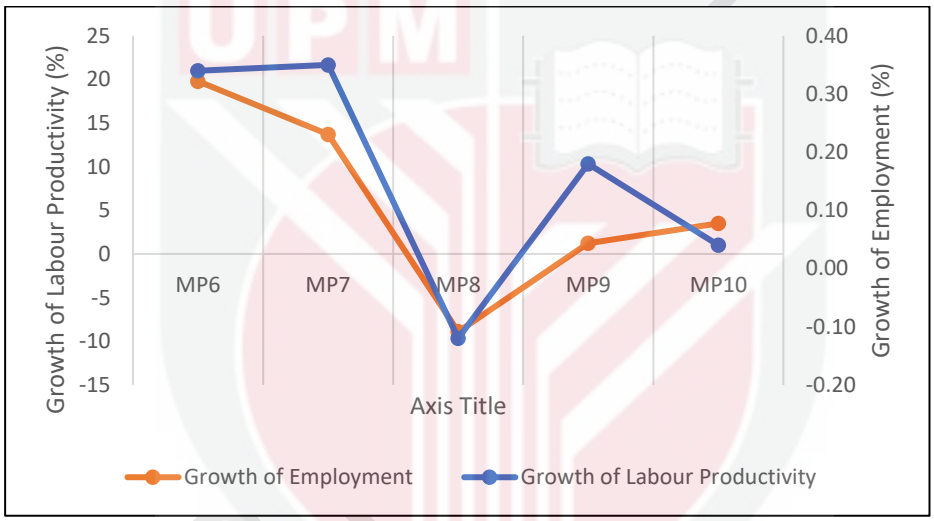

Figure 1.5: The Growth of Labour Productivity and Employment in Malaysia's Manufacturing Sector Based on 5-Year Malaysia Plan (MP 6 - MP 10)
(Source: Department of Statistics Malaysia, 2018)

As mentioned previously, the Sixth MP is a vital phase where the manufacturing sector is the backbone of Malaysia's economic strength. Hence its growth should be emphasized in order to accelerate the development and create strong links with other sectors. Starting with the Sixth MP, the strategy of strengthening the growth of the manufacturing sector merged with the Industrial Master Plan (IMP). The First IMP was implemented in 1986 to enhance private investment. Through the applied policy, there were seven resources based and five non-resource based sub-sectors which all together created 12 sub-sectors and were perceived as priority sectors to develop over 10-year time. The division for both resource and non-resource based sub-sectors of the manufacturing sector is shown in Table 1.6

Table 1.6: Resource-Based and Non-Resource Based Sub-Sector of the Manufacturing Sector in Malaysia

Resource-Based	Non-Resource Based
Food processing	Electrical & Electronics
Rubber	Transport Equipment
Palm Oil	Machinery & Engine Products
Wood-Based	Ferrous Metal
Chemical and Petrochemical	Textile & Apparel
Non-Ferrous Metal Products	
Non-Metallic Mineral Products	

(Source: Productivity Report, 2014/2015)

The industrialization strategies in the MP were incorporated with IMP, which focused on three main things; export-led growth through industrial diversification, provision of liberal investment, and promote intra-inter industry linkage. A technical efficiency study was done within the stipulated period as evidence from the First IMP. The Malaysian manufacturing industry was classified as input-driven, dominated mainly by labour and capital (Asid, 2010). As a result, the manufacturing sector achieves a high rate of output growth. Therefore, in order to sustain the growth, the government formulated policies and strategies in the Seventh MP to further the vision 2020 in which Malaysia has to become a high-income country. Besides that, the Seventh MP is seen as an essential phase for the manufacturing sector because it drives Malaysia to become a fully industrialized economy. The manufacturing sector transfers itself to a more dynamic sector with high value-added, capital-intensive, productivity growth, and competitiveness.

As mentioned previously, the term industrialization is the process where the raw materials are processed into finished goods. This is where the manufacturing sector takes place in this industry. According to the Malaysia Standard Industrial Classification (MSIC), 24 identified sub-sectors operate to meet the requirements and demands of the consumers. They are listed in Table 1.7.

Table 1.7: Sub-Sectors of the Manufacturing Sector in Malaysia

Division	Manufactures
Division 10	Manufacture of Food Product
Division 11	Manufacture of Beverage
Division 12	Manufacture of Tobacco Product
Division 13	Manufacture of Textiles
Division 14	Manufacture of Wearing Apparel
Division 15	Manufacture of Leather and Related Products
Division 16	Manufacture of Wood and Product of Wood and Cork, except Furniture; manufacture of Articles of Straw and Plaiting Materials
Division 17	Manufacture of Paper and Paper Products
Division 18	Manufacture of Printing and Reproduction of Recorded Media
Division 19	Manufacture of Coke and Refined Petroleum Products
Division 20	Manufacture of Chemical and Chemical Products
Division 21	Manufacture of Basic Pharmaceutical Product and Pharmaceutical Preparations
Division 22	Manufacture of Rubber and Plastic Products
Division 23	Manufacture of Other Non-Metallic Mineral Products
Division 24	Manufacture of Basic Metals
Division 25	Manufacture of Fabricated Metal Products, except Machinery and Equipment
Division 26	Manufacture of Computer, Electronic and Optical Products
Division 27	Manufacture of Electrical Equipment
Division 28	Manufacture of Machinery and Equipment N.E.C
Division 29	Manufacture of Motor Vehicles, Trailers and Semi-Trailers
Division 30	Manufacture of Other Transport Equipment
Division 31	Manufacture of Furniture
Division 32	Other Manufacturing
Division 33	Repair and Installation of Machinery and Equipment

(Source: The Malaysia Standard Industrial Classification 2008)

Besides that, subsectors in the manufacturing sector are divided into export and domestic-oriented. The lists are presented in Table 1.8.

Table 1. 8: Export and Domestic-Oriented Sub-Sectors of the Manufacturing Sector in Malaysia

Export Oriented Sub-sectors	Domestic Oriented Sub-sectors
Chemical and Chemical Products	Basic Metals
Refined Petroleum	Pharmaceuticals Products
Electricals and Electronics	Machinery Equipments
Textiles	Transport Equipments
Wearing Apparel	Food Products
Wood and Wood Products	Other Non-Metallic Mineral Products
Paper and Paper Products	Fabricated Metal Products
Rubber and Plastics Products	Beverages

(Source: Productivity Report, 2017)

In this present time, Malaysia is in the phase of the Eleventh MP for the year 2016 until 2020. Based on Malaysia's fourth Prime Minister, Tun Dr. Mahathir Mohamad, by the year 2020, Malaysia is targeted to become a high-income country, which includes the broad aspect of economics, politics, social, spiritual, psychological, as well as national and social unity. To achieve high-income economic status by 2020, to transform the growth strategy from the input-driven growth strategy to the productivity-driven strategy was very crucial (Mohamad Hanipah et al., 2012). One of the main related strategies is to strengthen the manufacturing sector as this sector is seen as one of the main contributors to bolster economic growth as foresee in the Seventh MP. Several efforts can be made by the government, such as boost foreign investment, provide excellent transport facilities, serve the employment, and improve the integrity of the citizen. In the Tenth MP, the manufacturing sector has achieved the average annual growth rate at 4.8% and contributed RM1, 111 billion to the GDP. The export-oriented sub-sectors of the manufacturing products remain the largest contributor to exports in Malaysia. Subsectors of Electrical and electronics (E&E) and chemical contributed the most to the growth of the manufacturing sector. Besides that, the strong demand from ASEAN and FTA is one of the impetuses to this growth.

By looking at the previous economic achievement, the development of the Malaysian economy was mostly by input-driven, primarily through investment, with capital accumulation contributing almost half of the potential output growth. However, due to limited resources and capacity in capital accumulation, as well as stiff competition in attracting foreign investments, the government decided to change the economic growth approach from input-driven to productivity-driven by enhancing the contribution of the

total factor of productivity (TFP) from 28.7% of GDP during the phase of the Sixth MP (1991-1995) to 41.3% in the Seventh MP (1996-2000) Fatimah & Saad (2004).

The TFP is expected to grow from 2.5% in the Sixth MP period to 3.3% in the Seventh MP period. However, the policy to shift to the productivity-driven strategy was severely affected by the East Asian financial crisis, which occurred at the end of 1997. As a result, during 1996-2000, TFP grew at only 1.2% and contributed only 24.8% of GDP growth, while the contributions of labour and capital were 25% and 50.2%, respectively. This indicates that Malaysian economic growth continued to be input-driven, particularly by capital.

The Malaysian government has set various policies to enable Malaysia to experience encouraging economic growth by elevating Malaysia to become a high-income The Malaysian government has set various policies to enable Malaysia to experience encouraging economic growth by elevating Malaysia to become a high-income country by 2020. Since the late 1970s, Malaysia's economic improvement procedure depends on three long-term policies: The NEP, 1970-1990, the National Development Policy (NDP), 1990-2000, and the National Vision Policy (NVP), 2001. By 1990 Malaysia had met the criteria as a Newly-Industrialized Country (NIC), which means 30 percent of exports consisting of manufactured goods (Hussin and Ching, 2013).

1.2 State Level Manufacturing Performance: An Overview

It is known that Malaysia comprises of 13 states and three federal territories. They are Johor, Kedah, Kelantan, Melaka, Negeri Sembilan, Pahang, Penang, Perak, Perlis, Selangor, Terengganu, Sabah, and Sarawak. In contrast, the federal territories comprise Kuala Lumpur, Putrajaya, and Labuan. Each state contributes to the growth of the manufacturing sector as each of them does not miss its industrial centres. For example, Shah Alam and Port Klang are among the famous industrialized region in Selangor. The growth of the share for each state's GDP for the manufacturing sector in Malaysia is presented in Table 1.9 and Figure 1.6.

Table 1. 9: The Growth of GDP Contribution for the Manufacturing Sector in 13 States of Malaysia According to 5-Year Malaysian Plan (MP 6- MP 10)

Malaysia Plan / States	MP 6	MP 7	MP 8	MP 9	MP 10
	The GDP Growth (%)				
Johor	73.33	21.61	32.89	17.23	16.77
Kedah	73.36	21.48	27.76	13.96	14.86
Kelantan	73.29	21.49	40.01	93.15	4.66
Melaka	73.35	21.65	29.25	22.85	15.37
Negeri Sembilan	73.35	21.62	29.22	14.89	6.32
Pahang	73.35	21.72	29.23	14.56	15.72
Penang	73.38	21.65	25.24	-0.53	15.70
Perak	73.36	21.69	27.31	20.99	20.71
Perlis	73.29	21.74	39.67	-6.95	12.94
Selangor	73.32	21.64	34.68	28.84	16.42
Terengganu	73.37	21.55	26.64	13.60	16.06
Sabah	73.33	21.65	32.67	45.79	11.15
Sarawak	73.36	21.53	28.25	38.82	8.25

(Source: Department of Statistics Malaysia, 2019)

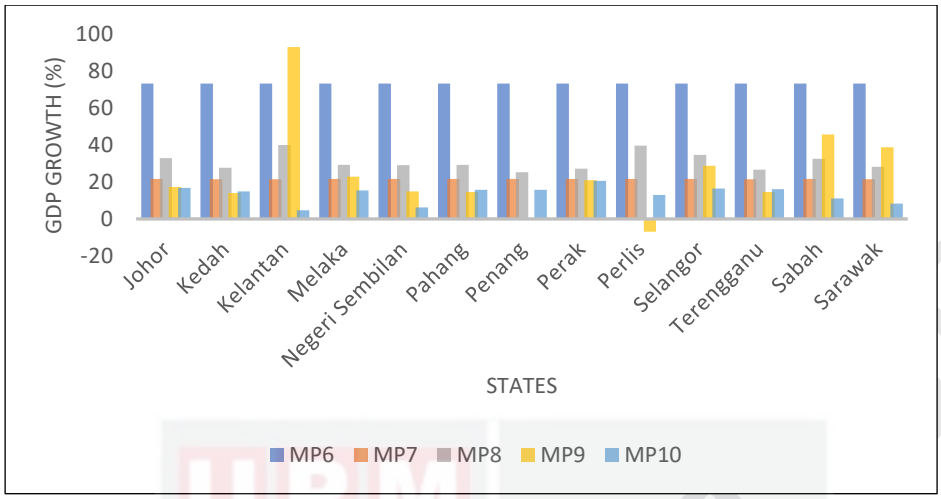

Figure 1.6: The GDP Growth of the Manufacturing Sector in 13 States in Malaysia Based on 5-Year Malaysia Plan (MP 6 - MP 10)
(Source: Department of Statistics Malaysia, 2019)

The growth of states' GDP for this sector has been divided into five years based on the phases of the Malaysian Plan. The beginning phase is on 1991, which indicates the Sixth MP, and so on. There are many perspectives in viewing the shares. It can be seen that the trend of the GDP is decreasing over the decade, and it was an almost similar situation happened to every state from 1991 to 2005. This can be referred in Figure 1.6. All state remains quite the same percentage in terms of GDP contribution during the Sixth MP. However, during the eighth MP (2001-2005), it can be regarded that the growth was started to go on a different path. Most of the state was having increment growth of GDP. During the Ninth MP on the other hand, most of the states were having sluggish growth. Some went into negative values like Perlis and Penang. This was probably due to the global financial crisis that happened around 2007 and 2008. Not only that, based on Figure 1.5, the growth of GDP and employment in the manufacturing sector also recorded a declined trend in the same period considered, respectively.

To provide further insight regarding the growth and spread of the manufacturing sector activity, the study also incorporates the efficiency and productivity matters. According to Mukherjee and Ray (2004), he indicated that improvement in technical efficiency and technical progress advancement have added to the speed of productivity growth.

1.3 Efficiency and Productivity. The Concept and Conditions in the Manufacturing Sector of Malaysia

The measurement of productivity growth and to explain its variability across industrial sectors, countries and over time are considered as two major challenges in the economics (Fecher and Parelman, 1992). The concept of efficiency and productivity is about attaining or improving the production in any organization in regards to whatever scale, including manufacturing. The thought of productivity is different from efficiency, although always be treated the same by many. The terms efficiency can be referred to as the quality of the work performed in the organizations or firms. Also, it is about how effectively the given technology and factors of production are used.

On the other hand, generally, productivity is the ratio of input to output. For instance, two mills having the same size as the factory and the same number of workers, but the different numbers of outputs. The one with more output is said to be more productive than the other one. That is the concept of productivity.

The topic of efficiency has been popular in theoretical and empirical research. The concept of economic efficiency is divided into two components; they are technical efficiency and allocative efficiency, respectively. Technical efficiency is about the ability to avoid waste, either the capacity to produce maximum possible output from a given set of inputs and technology (Heshmati, 2003) or utilize as little input as required by the technology and output. Hence, the analysis for the former technical efficiency can be output augmenting orientation, while the latter will be input augmenting orientation. Meanwhile, allocative efficiency refers to the ability to combine inputs and or outputs in optimal proportions in light of prevailing prices. Optimal proportions satisfy the first-order conditions for the optimization problem assigned to the production unit (Fried, Lovell, and Shelton, 2008).

Efficiency is a word that people regularly say. For example, the efficiency of a machine is considered to have diminished after five years of utilization by the plant. This is on the ground that, initially, the machine was able to produce ten units of output per day, while the following five years, only six units of outputs were produced. This means the effectiveness of items goes down with utilization and mileage over some time. This is the concept that efficiency implies.

Commonly, efficiency is measured by dividing output to input. There are many studies related to the field of the manufacturing sector that discuss the topic of technical efficiency since manufacturing is about manufacturing goods and products, the usage of plant and equipment, as well as mills. According to Alsaleh, Abdul-Rahim and Mohd-Shahwahid (2017), the level of efficiency is connected to the scale of a country's economic development. Moving to a clear view related to productivity, based on Malaysian Productivity Corporation (MPC), there are two methods to measure productivity. The first method is called Partial Factor Productivity (PFP), where it measures the ratio of output to only one input. The measures of outputs include GDP, value-added, and production value. Meanwhile, the inputs measure includes the total

number of employed workers, total working hours, capital or fixed asset, labour cost, energy, and bought-in materials and services. The example of PFP is labour productivity.

On the other hand, the second method to measure productivity is called Multi-Factor Productivity (MFP) or Total Factor Productivity (TFP), where it measures the ratio of output to more than one input. TFP takes into account the efficiency of the utilization of all inputs to produce outputs. The concept of TFP will be discussed in the next sub-section. In economic theory, productivity is defined as a ratio of output over input. In practice, it represents how efficiently input resources such as capital and labour are allocated to produce economic output. Productivity is mainly driven by four inter-related components: innovation, education, efficiency, and infrastructure.

The growth of productivity is ought likewise to be considered. The significance of productivity in growth is irrefutable either in the economics of a country, sector, and organization level, and in fact, it is ubiquitous. Productivity growth is a determinant of economic growth, and the level of input is achieved through the higher human capital, new technology, and entrepreneurial development to encourage innovation and creativity (Mohamad Hanipah et al., 2012). Malaysia is poised to achieve its target of a high-income economy and a 3.7% growth in productivity level as a whole to RM92, 300 by 2020.

Productivity is vital in a country because it is about combining existing resources like labour, capital, skills, and management capabilities to produce products and services. The production can be increased, value-added will be improved, and higher earnings can be achieved from every working hour if the combination is correct. When the level of productivity is high in a country, the living standard of the nations also will be higher indirectly. This will enhance better wellbeing for the whole city, and it covers various parts of living like health, education, infrastructure, and environment. Based on the Annual Productivity Report of Malaysian Productivity Corporation, the framework of productivity is presented in Figure 1.7.

Following the productivity framework below, the productivity context is based on Malaysia's shared values that drive to national development plans like the Economic Transformation Programme (ETP) and Government Transformation Plan (GTP). These kinds of initiatives constructed the policies, and regulatory foundation for businesses in terms of human capital and education, regulation, fiscal policies, access to finance as well as infrastructure, that is crucial to enhance the competitive business circumstances in the country.

A healthy competitive business environment is imperative to create the value-added for enterprises, creating new job opportunities, attract new investment openings, and indirectly create more revenues for the country. No less important, these foundations likewise urge the business to continue improving their products, process, and their system because these will lead them to go further, a more excellent business opportunity, through a procedure called innovation. The nature of innovation is gradual, where it requires a continual process in applying the new technique, abilities, and new technology

to guarantee the business continues onward, this way, the production cost could be lowered, and along these lines, the quality of the products is improved, in following the changes of the time and market trend. These innovations, too, are spread through the industry as contenders where they will emulate practices by high productivity's companies, and continue to contribute to the expansion of economic advancement in productivity. The result is what can be called substantial gain in productivity growth.
Innovation and dissemination are fundamental aspects of accelerating productivity. Fruitful innovation relies upon the basis of productivity, where support from government strategies and guidelines is significant in this regard. With these elements in place, Malaysia can prevail about maintaining prosperity and giving a better quality of life to all residents.

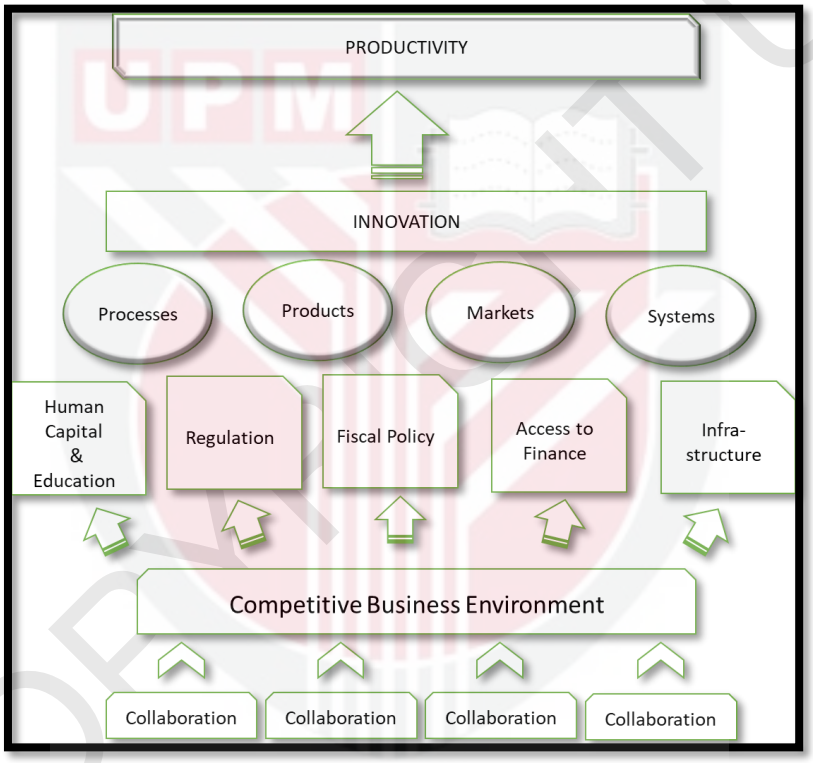

Figure 1.7: The Productivity Foundation
(Adapted from: Productivity Report, Malaysian Productivity Corporation, 2019)

The significance of productivity in a narrower context like sectoral growth is still cannot be disregard. The performance of productivity growth is determined by the three most important factors, which are the investment in machinery and equipment, human capital formation, and openness in trade and investment. As a critical determinant of long-term economic growth, productivity measures are an essential economic benchmark for a country.

Before the year 1990, the productivity growth of the manufacturing sector in Malaysia has recorded about 1.6% increase annually. Starting from the Sixth MP, which was incorporated with IMP, the productivity growth recorded a 4.5% increase per annum. This trend can be seen due to the empowering pattern of Malaysia's economic growth, where it was impacted more by productivity-driven growth in the 1990s as contrasted and 1980's, where the essential supporter of economic growth at that time was the growth from employment. According to Isa (2005), the significance of productivity was focused on a shift in policy starting from the Seventh MP, by which productivity will be the essential synergist for the future's development. Malaysia's approach to productivity will shift from the primarily government-driven initiatives at the national level to focus on activities over people in the general area, industry players, and individual ventures. Broad-based activities are being created and custom fitted for every area with targets set and observed.

As mentioned by Kim and Lau (1994), and emphasized by Idris and Rahmah (2006), the economic development which is based on input-driven and new investment, as well as accumulation of capital is exposed to diminishing return to scale, and cannot be sustained in the long haul. Thus, the government sought after the economic growth through productivity improvement and productivity-driven strategies that underscore on upgrading TFP development instead of investment-driven growth. However, based on the study of productivity growth of the manufacturing sector in Malaysia done by Ahmad. E.M, (2009), the productivity growth of Malaysia's manufacturing sector was still an input-driven rather than TFP-driven. This implies that the manufacturing sector in Malaysia is still not reaching the targeted strategy.

Productivity-linked incentives are being introduced, and regulatory reforms accelerated at the national level, as has been announced in Malaysia Productivity Blueprint (MPB). Figure 1.8 shows the productivity performance recorded by three main sectors in Malaysia starting from the year 2006, where the Ninth MP was implemented until the year 2015.

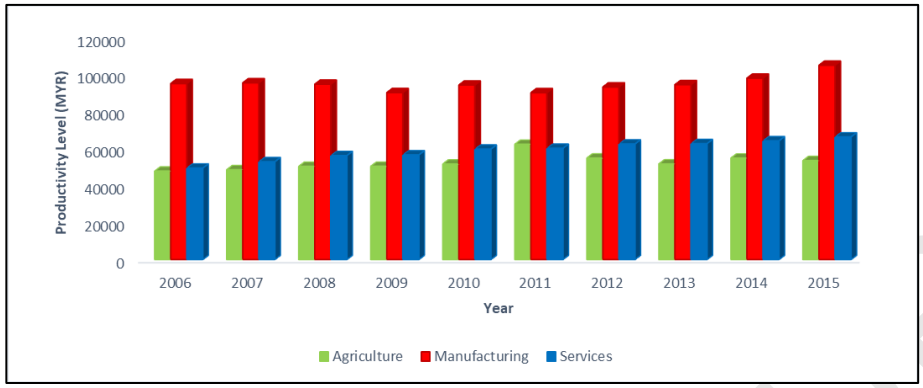

Figure 1.8: Productivity Performance of Agriculture, Manufacturing and Services Sector in Malaysia (2006-2015)
(Source: Malaysia Productivity Corporation, computed from Productivity Report, 2015/2016)

Based on the sectoral division of productivity performance during the Ninth and the Tenth MP, the manufacturing sector shows the highest productivity performance in terms of nominal value, compared to the service and agriculture sector. By any means, to ensure the productivity's sustainability of a sector, one must be capable enough to have more skilled labour, facilitating the capital shift, and other resources. Productivity growth for the past recent years (2011-2015) was driven by both export and domestic-oriented sub-sectors. At the same time, the excellent performance of export-oriented subsectors was primarily driven by the more robust growth in chemicals and E&E products.

1.3.1 Labour Productivity

As discussed earlier, labour productivity is the example of Partial Factor Productivity because it measures the ratio of output to only one input. Generally, labour productivity is calculated by dividing output to labour per unit. In comparison, TFP is related to the combined output of input factor utilization, like labour and capital. The TFP is then a part of an output growth that cannot be explained by a change in the quantity or quality of input factors. Instead, it shows a change in technology, knowledge, organization, and efficiency. Labour productivity, defined as gross value added divided per person (Babu and Natarajan, 2013).

According to Shalemy & Ahmad (2011), where the manufacturing sector in Malaysia can experience exponential growth if the labour productivity could be strengthened. Labour productivity is important since it is the determinant of a country's competitiveness in the global market. Keeping in mind the end goal to get a decent state of financial development, efficiency development is the principal thing to view. Along these lines, matters identified with human capital ought to be centred on since it is one of the critical basic to high economic development.

The performance of labour productivity in terms of nominal value for the manufacturing sector has recorded a tremendous increase starting in 2001. It also has considered the highest increment compared to the other two sectors, as statistically proven in Table 1.10 and as displays in Figure 1.9.

Table 1.10: Labour Productivity of Agriculture, Manufacturing, and Services Sector in Malaysia (in 2015 constant prices, MYR)

Year	Agriculture	Manufacturing	Services
1990	34,204	42,263	35,560
1991	40,029	49,014	46,515
1992	41,315	41,906	41,853
1993	39,433	45,589	45,146
1994	39,339	59,548	52,545
1995	38,491	54,840	52,223
1996	37,776	60,349	51,130
1997	41,750	63,455	54,283
1998	37,200	57,667	53,473
1999	37,213	61,716	53,834
2000	40,730	65,810	52,573
2001	44,496	62,597	53,007
2002	45,811	69,283	54,114
2003	49,198	73,520	53,906
2004	50,194	85,308	55,398
2005	51,429	91,632	59,314
2006	53,300	94,135	62,609
2007	52,184	102,328	65,509
2008	56,795	104,922	69,643
2009	57,372	102,607	67,521
2010	55,221	94,610	67,344
2011	65,009	97,632	68,346
2012	57,263	100,974	70,748
2013	54,028	102,009	71,039
2014	57,213	105,597	72,709
2015	51,984	110,305	79,095

(Source: Malaysia Productivity Corporation, 2019)

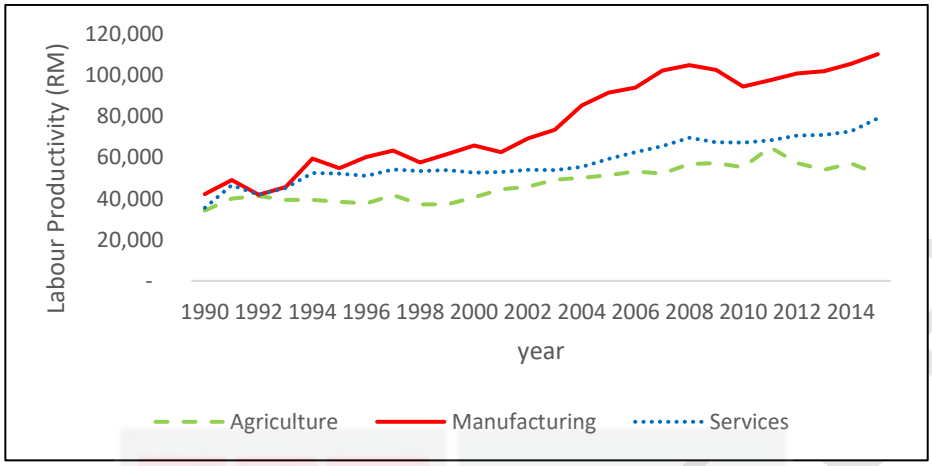

Figure 1.9: Labour Productivity of Agriculture, Manufacturing and Service Sector in Malaysia (1990-2015)
(Source: Malaysia Productivity Corporation, 2019)

However, the actual trend of labour productivity for these three sectors can be seen in terms of the performance by its growth. They were indeed in the form of fluctuation over the years, not really as an increasing trend of the nominal values, as depicted in Table 1.11 and Figure 1.10.

Table 1.11: The Growth of Labour Productivity for Agriculture, Manufacturing and Services Sector in Malaysia

Sector / Year	The Growth of Labour Productivity (%)		
	Agriculture	**Manufacturing**	**Service**
1991	17.03	15.97	30.81
1992	3.21	-14.50	-10.02
1993	-4.56	8.79	7.87
1994	-0.24	30.62	16.39
1995	-2.16	-7.91	-0.61
1996	-1.86	10.05	-2.09
1997	10.52	5.15	6.17
1998	-10.90	-9.12	-1.49
1999	0.03	7.02	0.67
2000	9.45	6.63	-2.34
2001	9.25	-4.88	0.82
2002	2.95	10.68	2.09
2003	7.39	6.11	-0.38

Table 1.11: continued

2004	2.02	16.03	2.77
2005	2.46	7.41	7.07
2006	3.64	2.73	5.55
2007	-2.09	8.70	4.63
2008	8.84	2.54	6.31
2009	1.02	-2.21	-3.05
2010	-3.75	-7.79	-0.26
2011	17.72	3.19	1.49
2012	-11.91	3.42	3.51
2013	-5.65	1.02	0.41
2014	5.89	3.52	2.35
2015	-9.14	4.46	8.78

(Source: Malaysia Productivity Corporation, 2019)

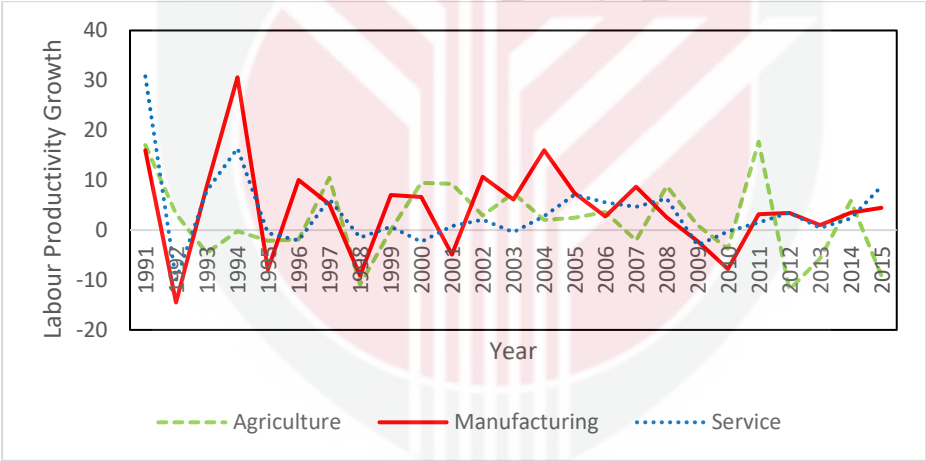

Figure 1.10: The Growth of Labour Productivity for Agriculture, Manufacturing and Service Sector in Malaysia (1990-2015)
(Source: Malaysia Productivity Corporation, 2019)

In the meantime, as this study also takes a gander along the period of Malaysia Plan, hence, the productivity of labour is likewise be seen for every five years. The growth of labour productivity for three main sectors in Malaysia based on 5-year of Malaysia Plan is tabulated in Table 1.12 and Figure 1.11.

Table 1. 12: The Growth of Labour Productivity for Agriculture, Manufacturing and Services Sector in Malaysia, Based on 5-Year of Malaysia Plan

Sector / Malaysia Plan	The Growth of Labour Productivity (%)		
	Agriculture	**Manufacturing**	**Services**
MP 6	12.53	29.76	46.86
MP 7	7.82	9.05	2.82
MP 8	15.58	46.38	11.90
MP 9	3.61	0.50	7.56
MP 10	-20.04	12.98	15.73

(Source: Malaysia Productivity Corporation, 2019)

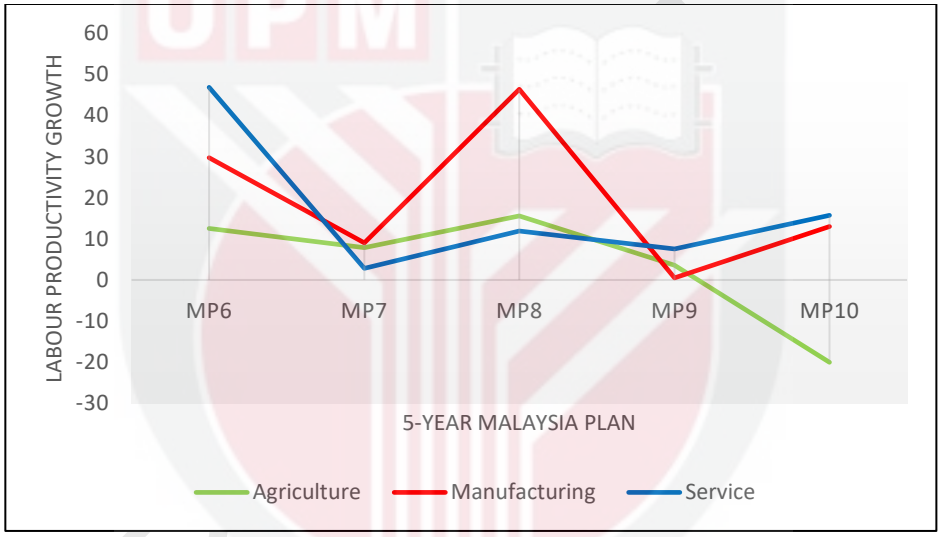

Figure 1.11: The Growth of Labour Productivity for Agriculture, Manufacturing and Services Sector in Malaysia, Based on 5-Year Malaysia Plan (MP 6 - MP 10)
(Source: Malaysia Productivity Corporation, 2019)

From the figure, it can be noted that during the phase of the eighth MP, the manufacturing sector appeared to be the most performing sector in terms of its labour productivity with 46.38%, compared to the agriculture and service sector with 15.58% and 11.9% respectively. However, the growth was dropped sharply to 0.5% on the Ninth MP, which was due to the world recession and had a slower growth on the Tenth MP with 12.98%. In addition, as reported in the annual productivity report by MPC, it was stated that the decline in labour productivity growth in recent years was due to the deficiency provided by TFP and CI, which appears as the breakdown of labour productivity, as illustrated in Figure 1.12.

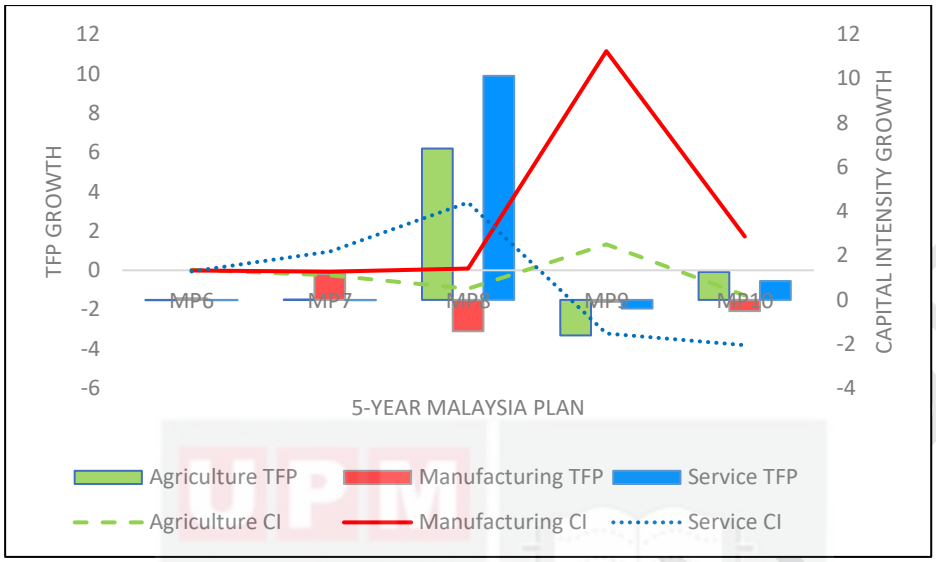

Figure 1.12: The Growth of Total Factor Productivity and Capital Intensity of Agriculture, Manufacturing and Service Sector in Malaysia, Based on 5-Year of Malaysia Plan (MP 6 - MP 10)
(Source: Malaysia Productivity Corporation, 2019)

Following Figure 1.12, the growth for total factor productivity and capital intensity for three major sectors in Malaysia is presented based on 5-year of Malaysia Plan. During the phase of the Ninth MP, the growth of capital intensity for the manufacturing sector experienced a significant increase with 11.15% compared to the agriculture and service sector, with 1.32% and -3.21% each. However, the sharp increment was faced with a sharp fall as well when it hit 1.71% during the next phase of MP. However, the growth of TFP for the manufacturing sector seemed to be at a slower pace on the three last phases of MP, wherein in the eighth MP, the growth was -1.42%, followed by -0.08% and -0.51% on the next following MP.

1.3.2 Capital Intensity

As mentioned above, the two keys determinants for labour productivity are capital intensity and total factor productivity. Capital Intensity sometimes is called a fixed asset per employee or capital-labour ratio. It is about the number of fixed assets allocated to each employee and is measured in terms of labour-intensive or capital-intensive. Continual investment in productive capital will turn into capital stock and typically will drive to higher productivity. Accordingly, capital intensity is measured by capital stock over employees is exceptionally attractive for delivering better efficiency. Capital intensity depends highly on capital investment, where the capital contributed is utilized to enhance labours' productivity and to aid the making of higher value-added products and services. Workers who are well-prepared with sufficient capital investment and supported by new technologies can work well and can increase their productivity level.

The vital role of capital input to encourage productivity performance for the main sectors in Malaysia is beyond doubt. Based on the facts and figures, it can be said that the capital intensity for the manufacturing and agriculture sectors was continually moving in stagnant from 1990 until 2000, as presents in Figure 1.14. Starting in 2001, all three sectors were moving fluctuated. All three sectors have experienced a decline in capital intensity in 2010. It was due to the world recession around the year 2007 to 2009, where it was all started from the financial crisis in the USA. This figure is supported with descriptive statistics in as in Table 1.13. However, in 2010, the manufacturing sector was the only one severely affected compared to the agricultural and services sectors where it was hit -10.6%, while agriculture and services sectors were only -1.3% and -2.7%, respectively. Though, there was a slow and slight increase from negative growth to positive for the manufacturing sector, which was due to the massive investment in high-end machinery for medical devices and aerospace. With the high capital investment, especially in new plants and up-to-date technologies, production capacity can be utilized better.

Anyhow, a vigilant view should be applied when utilizing labour productivity measures like changes in input extents can impact these measures. In a circumstance where capital-labour ratio follows an increasing pattern, the productivity of labour is overestimated, and the capital will underestimate. As reported by Babu and Natarajan (2013), for this kind of situation, an adjustment in labour productivity is only a reflection of substituting one factor to another and estimating complete TFP attempts to bypass the issue experienced in the translation of PFP estimates in the case of changing factor intensities.

Table 1.13: Capital Intensity of Agriculture, Manufacturing and Services Sector in Malaysia

Year	Agriculture	Manufacturing	Services
1990	4.96	4.52	-0.26
1991	4.94	4.52	-0.27
1992	4.98	4.51	-0.26
1993	4.97	4.53	-0.26
1994	4.88	4.53	-0.28
1995	5.09	4.46	-0.25
1996	4.94	4.61	-0.26
1997	4.62	4.52	-0.32
1998	5.71	4.26	-0.16
1999	4.49	5.04	-0.30
2000	3.67	4.25	-0.51
2001	8.97	3.48	0.33
2002	0.82	7.38	-0.71
2003	1.21	1.90	-1.15
2004	-2.79	8.74	-1.02

Table 1.13: continued

2005	0.49	3.82	1.47
2006	-0.55	-0.87	1.23
2007	-0.45	4.27	-0.65
2008	6.60	3.00	0.89
2009	3.64	4.10	-1.40
2010	-1.28	-10.64	-2.72
2011	13.43	1.01	-1.31
2012	-5.93	2.15	0.52
2013	-1.52	1.48	-0.47
2014	8.18	1.64	0.20
2015	-3.78	2.74	3.68

(Source: Malaysia Productivity Corporation, 2019)

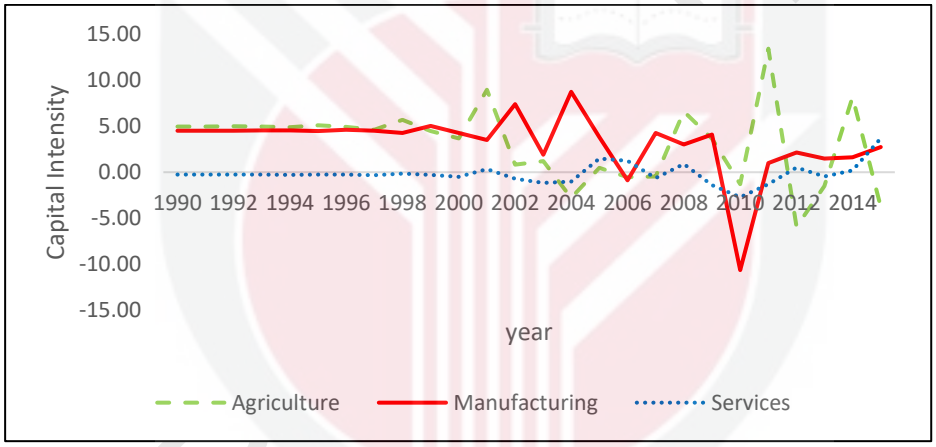

Figure 1.13: Capital Intensity of Agriculture, Manufacturing and Services Sectors in Malaysia (1990-2015)
(Source: Malaysia Productivity Corporation, 2019)

Apart of just showing the trend of capital intensity for these three major sectors in Malaysia, the growth of capital intensity for each sector also tabulated as in Table 1.14 and Figure 1.14.

Table 1.14: The Growth of Capital Intensity for Agriculture, Manufacturing and Services Sector in Malaysia

Sector / Year	The Growth of Capital Intensity (%)		
	Agriculture	**Manufacturing**	**Services**
1991	0.00	0.00	0.01
1992	0.01	0.00	-0.02
1993	0.00	0.01	0.00
1994	-0.02	0.00	0.06
1995	0.04	-0.01	-0.11
1996	-0.03	0.03	0.05
1997	-0.06	-0.02	0.24
1998	0.24	-0.06	-0.50
1999	-0.21	0.18	0.86
2000	-0.18	-0.16	0.72
2001	1.45	-0.18	-1.64
2002	-0.91	1.12	-3.16
2003	0.47	-0.74	0.62
2004	-3.30	3.61	-0.12
2005	-1.18	-0.56	-2.44
2006	-2.13	-1.23	-0.16
2007	-0.17	-5.88	-1.53
2008	-15.50	-0.30	-2.35
2009	-0.45	0.37	-2.58
2010	-1.35	-3.60	0.93
2011	-11.47	-1.09	-0.52
2012	-1.44	1.13	-1.40
2013	-0.74	-0.31	-1.90
2014	-6.38	0.10	-1.43
2015	-1.46	0.67	17.25

(Source: Malaysia Productivity Corporation, 2019)

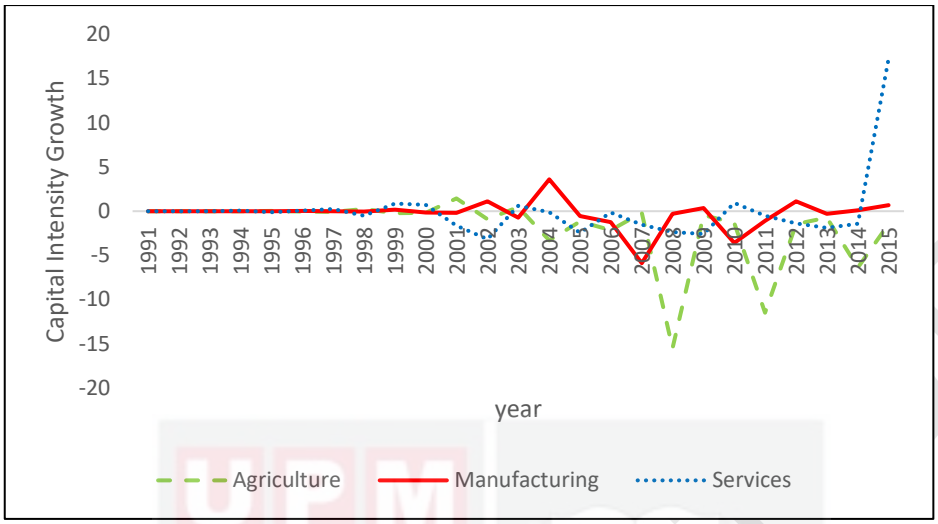

Figure 1.14: The Growth of Capital Intensity of Agriculture, Manufacturing and Service Sector in Malaysia, 1991-2015
(Source: Malaysia Productivity Corporation, 2019)

Figure 1.14 depicted the growth of capital intensity for three major sectors in Malaysia. Focusing on the manufacturing sector, its growth never reached too high. Instead, the growth showed more on the negative value, which indicates decrement. Same as the agriculture sector where its capital intensity growth was fallen twice in a negative value. Whereas, the growth of capital intensity for three major sectors in Malaysia are calculated based on 5-year according to MP phases, their growth is as in Table 1.15 and Figure 1.15 as follows.

Table 1.15: The Growth of Capital Intensity for Agriculture, Manufacturing and Services Sector in Malaysia According to 5-Year of Malaysia Plan

Sector / Malaysia Plan	The Growth of Capital Intensity (%)		
	Agriculture	**Manufacturing**	**Services**
MP 6	0.03	-0.01	-0.07
MP 7	-0.26	-0.08	0.96
MP 8	-0.95	0.10	3.46
MP 9	1.33	11.16	-3.21
MP 10	-1.28	1.71	-3.81

(Source: Malaysia Productivity Corporation, 2019)

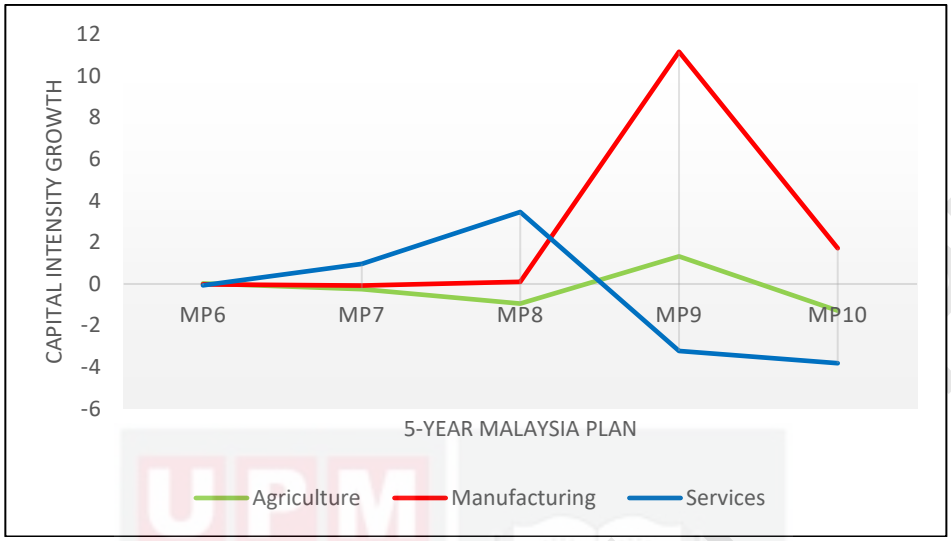

Figure 1.15: The Growth of Capital Intensity of Agriculture, Manufacturing and Service Sector Based on 5-Year of Malaysia Plan (MP 6-MP 10)
(Source: Malaysia Productivity Corporation, 2019)

When the growth is organised based on the phases of MP, it can be seen that during the Ninth MP, the capital intensity growth for the manufacturing sector experienced a sharp increase, compared to the other two major sectors.

1.3.3 Total Factor Productivity

Total factor productivity is a tool to measure efficiency in sum of all input factors used in the measurement. High quality inputs directly generate more production of output, primarily when inputs are used effectively and efficiently. In this context, inputs can be referred to as labour and capital. Capital input is classified as information and communications technology. Capital input is classified as information and communications technology (ICT) capital. ICT capital inputs include value-added goods and services, higher value-added concerning ICT. Simply, TFP can be defined as the ratio of output to a weighted sum of the inputs used in the production process (Babu and Natarajan, 2013).

There are two categories of labour input, which are known as the quality of labour and the quantity of labour. The growth in labour quantities represents the economic growth that originates from an adjustment of the total labour force. The change in labour quality demonstrates the change and growth of an economy that originates from the improvement in labour skills, where skilled labour can be enhanced through the investment in human capital, especially in education and health.

To implement a higher living standard in Malaysia, one of the expedient practical's that should be achieved is to get an excellent TFP contribution to economic growth. TFP is one of the sources for high labour productivity growth, and it covers the aspect as mentioned above of capital and labour. In meeting the desires of Malaysia to wind up noticeably a high-income country by 2020, future development strategies are adapted towards private-led sectors. This ought to make more value-added activities when TFP winds up plainly as one of the key factors.

Based on statistic as provided in Table 1.16 and the tabulated graph as in Figure 1.16, it can be seen that TFP for the manufacturing sector is often low at the beginning, compared to the other two major sectors. During the year 1990 to 2002, the TFP has been in a negative value. Then, in 2002, it was seen that TFP was positive at 3.1%, compared to -8.4% the previous year. Due to the financial crisis from 2007 to 2009 that affected the whole world, the TFP for all three major sectors were deteriorated. However, the manufacturing sector was one that profoundly impacted with -5.9%, compared to the agriculture and services sector with -2.6% and -1.7%, respectively.

Table 1.16: Total Factor Productivity (TFP) of Agriculture, Manufacturing and Services Sector in Malaysia

Year	Agriculture	Manufacturing	Services
1990	1.86	-2.44	1.36
1991	1.87	-2.41	1.37
1992	1.86	-2.46	1.36
1993	1.84	-2.46	1.37
1994	1.90	-2.32	1.38
1995	1.83	-2.62	1.33
1996	1.81	-2.43	1.40
1997	2.06	-1.90	1.40
1998	1.61	-3.53	1.18
1999	1.74	-1.86	1.62
2000	2.84	-0.31	1.41
2001	0.25	-8.40	0.51
2002	2.14	3.13	2.92
2003	6.11	4.34	0.80
2004	4.96	6.93	3.94
2005	2.00	3.53	5.67
2006	4.28	3.78	4.40
2007	-1.70	4.21	5.56
2008	2.14	-0.46	5.55
2009	-2.59	-5.86	-1.74
2010	-2.63	3.46	2.66

Table 1.16: continued

2011	3.90	2.23	2.95
2012	-6.86	1.29	3.08
2013	-4.46	-0.47	0.93
2014	-2.20	1.93	2.24
2015	-5.91	1.71	4.93

(Source: Malaysia Productivity Corporation, 2019)

Figure 1.16: Total Factor Productivity (TFP) of Agriculture, Manufacturing and Services Sector in Malaysia (1990-2015)
(Source: Malaysia Productivity Corporation, 2019)

The growth for TFP of three sectors also is observed by years and by the 5-year phases of Malaysia Plan. The growth of TFP by yeas is presented in Table 1.17 and Figure 1.17.

The TFP for the manufacturing sector seemed to recover by its value by a little increase in 2002. The increase in TFP value during the Eight MP as a result of investments made by the manufacturing sector to produce more complex and diversified products, high investment in advanced machinery and automation to fortify the competitiveness of industries in the global market. Also, the enhancement of labour skills and close collaboration with research institutions also contributes to the high value of TFP growth.

Table 1.17: The Growth of Total Factor Productivity (TFP) of Agriculture, Manufacturing and Services Sector in Malaysia

Year	The Growth of TFP (%)		
	Agriculture	**Manufacturing**	**Services**
1991	0.01	-0.01	0.00
1992	-0.01	0.02	-0.01
1993	-0.01	0.00	0.01
1994	0.03	-0.06	0.01
1995	-0.04	0.13	-0.04
1996	-0.01	-0.07	0.05
1997	0.14	-0.22	0.00
1998	-0.22	0.86	-0.16
1999	0.08	-0.47	0.37
2000	0.63	-0.83	-0.13
2001	-0.91	26.00	-0.64
2002	7.43	-1.37	4.74
2003	1.85	0.39	-0.73
2004	-0.19	0.59	3.90
2005	-0.60	-0.49	0.44
2006	1.15	0.07	-0.22
2007	-1.40	0.12	0.27
2008	-2.26	-1.11	0.00
2009	-2.21	11.82	-1.31
2010	0.01	-1.59	-2.53
2011	-2.48	-0.35	0.11
2012	-2.76	-0.42	0.04
2013	-0.35	-1.36	-0.70
2014	-0.51	-5.12	1.41
2015	1.69	-0.11	1.20

(Source: Malaysia Productivity Corporation, 2019)

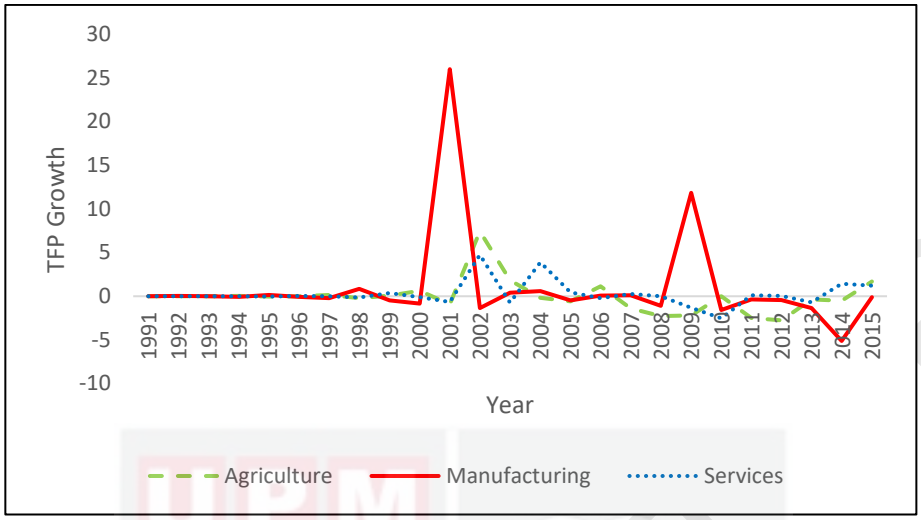

Figure 1.17: The TFP Growth of Agriculture, Manufacturing and Service Sector in Malaysia (1990-2015)
(Source: Malaysia Productivity Corporation, 2019)

As to see in the perspective of Malaysia Plan's phases, the growth of the three main sectors as per MP is presented in Table 1.18 and Figure 1.18. The manufacturing sector as concern, its TFP growth is seen to be the lowest compared with the other two sectors during the eights MP with -1.42%. In contrast, agriculture and service sectors were 6.84% and 10.12%, respectively.

Table 1.18: The TFP Growth of Agriculture, Manufacturing and Services Sector Based on 5- Year Malaysia Plan (MP 6 - MP 10)

Sector / Malaysia Plan	The Growth of TFP (%)		
	Agriculture	**Manufacturing**	**Services**
MP 6	-0.02	0.07	-0.03
MP 7	0.00	1.17	-0.01
MP 8	6.85	-1.42	10.12
MP 9	-1.61	-0.09	-0.40
MP 10	1.25	-0.51	0.85

(Source: Malaysia Productivity Corporation, 2019)

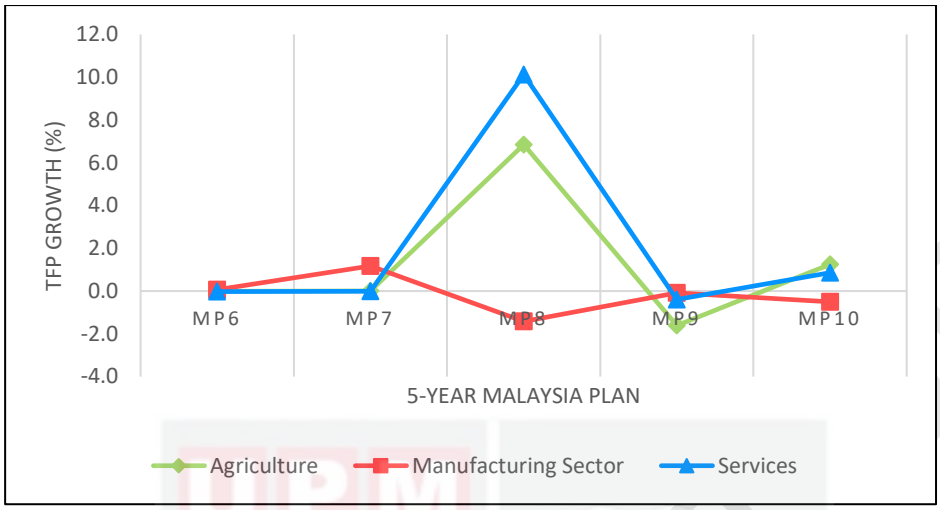

Figure 1.18: The Growth of TFP for Agriculture, Manufacturing and Service Sector Based on 5-Year Malaysia Plan (MP 6–MP 10)
(Source: Malaysia productivity Corporation, 2019)

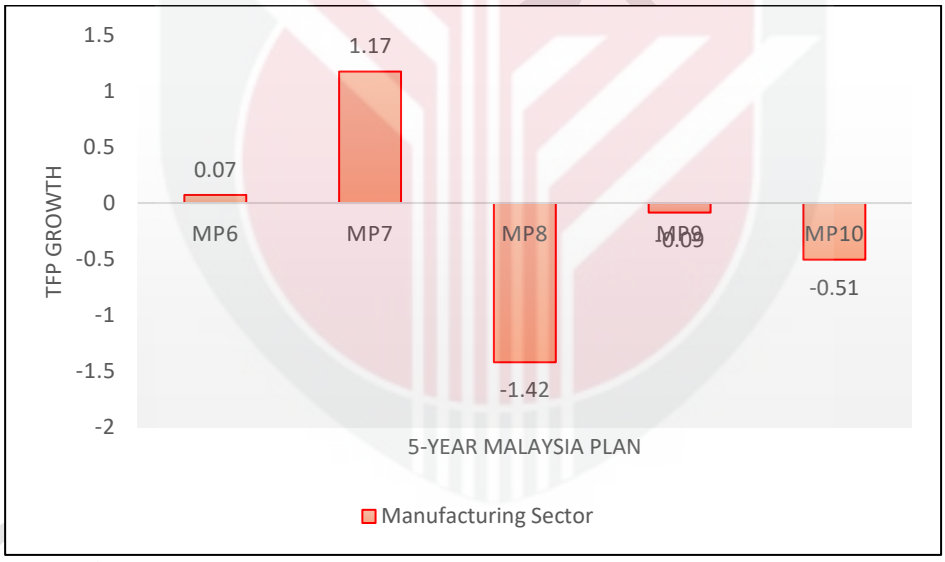

Figure 1.19: The Growth of TFP for Manufacturing Sector in Malaysia According to 5-Year Malaysia Plan (MP 6 – MP 10)
(Source: Malaysia Productivity Corporation, 2019)

Figure 1.19 displays the TFP growth for the manufacturing sector alone, according to the 5-year Malaysia Plan, as for clear insight. During the Seventh MP (1996-2000), the growth of TFP for the manufacturing sector was elevated from 0.07% to 1.17%. However, it marked down to -1.42% during the eighth MP (2001-2005). Nevertheless, it appeared that in the next following phase of MP, it remained at a decreasing trend, although the degrowth was slightly little compared to the previous MP.

1.4 Problem Statement

The impact of productivity and efficiency on economic performance in Malaysia has been a subject of scrutiny. Equal intense debate about productivity and the manufacturing sector in Malaysia also has been reviewed all over. In any case, most studies have contemplated this issue from the perspective of the economy as a whole, an industry, an individual sector at a national scale, or selected sub-sectors only. However, there is less attention given to the contributions of the manufacturing sector from the state level in a country's efficiency and productivity. In 1991, according to Vision 2020, Malaysia had declared to become a high-income nation by the year 2020, and the manufacturing sector marked as a core sector for sustainable growth. For Malaysia to become a globally competitive and high-income country, it is imperative to keep the TFP growth increased by adopting the innovation-based economy. According to Jajri and Ismail (2006), the government pursuing the economic growth through the productivity improvement and productivity-driven strategies that emphasized on enhancing TFP because of the previous input-driven strategy subjected to diminishing return to scale and unable to remain to sustain in the long-run.

By looking at the TFP growth by Malaysian Plan's phases from the Seventh MP to the Tenth MP, the manufacturing sector had a sharp declined of TFP growth from 1.17% during the Seventh MP, to -1.42% on the eighth MP as in Figure 1.20. Although the number of workers working in this sector was increasing, in terms of growth and on the side of every 5-year Malaysian Plan, the employment growth seemed to be increasing at a languid pace after the 8th MP, as illustrated in Figure 1.5. Also, based on 5-year MP, the growth for labour productivity of the manufacturing sector depicted a sharp fall during the Ninth MP after a tremendous increment during the eighth MP, from 40.38% to 0.5% as in Figure 1.5. This matter is proven by the breakdown of labour productivity growth, which is TFP and capital intensity. According to Productivity Report (2015/2016), all sectors of the economy experienced a growth in capital intensity for the period 2006-2015 except the manufacturing sector. Thus, it relates to the weak growth of TFP and capital intensity. Based on the statistics from MPC, productivity in the manufacturing sector recorded an increasing trend in terms of nominal value. However, productivity growth was not really in increasing trend. Moreover, the latest news mentioned that 50,000 Malaysians expected to be laid off this year (2018) and according to Malaysian Employers Federation (MEF) executive director, Datuk Shamsudin Bardan said the manufacturing sector is the primary sector to be affected, (The Sun Daily, 11 Jan, 2018).

Based on this issue, to look upon the determinants of labour productivity, technical efficiency and TFP in terms of national and state level can somehow improve the performance of the manufacturing sector. As the activities of the manufacturing sector in Malaysia are not restricted to only one area, in fact, they are more scattered in regions. It is believed that even small contribution from the state level may indirectly improve the level of efficiency and productivity of the manufacturing sector in a state. Therefore, there are good reasons why such analysis should be done for the particular interest, and state-level analysis is assumed to be important as well. In such a manner, the aspect of labour productivity, technical efficiency, technological change, and overall factor productivity growth is profoundly pertinent to each state. To support the preceding, as

indicated by Mohamaad Hanipah et al., (2012), to achieve high-income economy status by the year 2020, it is essential to transform the development strategies from input-driven growth strategies to productivity-driven strategies. Once the states with efficient performance are identified, it is much easier to allocate the practical and technical cost to those states and contribute to the growth of the manufacturing sector accordingly because it is strongly believed that each subsector available in Malaysia's manufacturing industry has its contribution to the economy.

1.5 Research Questions

Based on the research objective of this study, the following research questions are as follow:

1. What are the determinants of labour productivity in Malaysia's manufacturing sector?
2. What is the level of technical efficiency performance of Malaysia's manufacturing sector?
3. What is the level of productivity growth in Malaysia's manufacturing sector and its determinants?

1.6 Objectives of the Study

The general objective of the study is to analyse the technical efficiency and productivity of the manufacturing sector in Malaysia and go in-depth to each state level. By investigating the efficiency and productivity of the manufacturing sector in Malaysia, this thesis intends to fulfil the following three main objectives:

1. To examine the determinants of labour productivity in the manufacturing sector in Malaysia at national and state level.
2. To measure the technical efficiency performance of the manufacturing sector in Malaysia at state level, and ascertain its determinants.
3. To identify the total factor of productivity growth of the manufacturing sector in Malaysia at state level, and ascertain its determinants.

1.7 Significance of the Study

The findings of this study will contribute significantly to the current knowledge on the growth, efficiency, and productivity of the manufacturing sector. Although there has been extensive writing literature investigating the efficiency and productivity of the manufacturing sector, the study at the state level is as yet in its formative stage. This study includes a few matters on inputs and outputs used in the production of the manufacturing sector.

The theory of production by Cobb-Douglas was taken to construct the model as essential production work. By applying this theory, the model to measure the productivity of labour, technical efficiency could be developed. The focal point of this thesis is on the labour productivity, technical efficiency, and the growth of total factor of productivity of the manufacturing sector in Malaysia, including 13 states in it. Although there are various methods for estimating the efficiency and productivity, the impacts of the elective techniques to long term growth of this sector will contribute to the literature on TFP. The models applied in this study have permitted further exploration in this field, and simultaneously, the aftereffect gives a few alternatives for policy formation in terms of qualitative measures.

Firstly, by identifying the determinants of labour productivity, this study may identify the drivers on a national scale. Also, it will dive deeper into each state in Malaysia. By doing so, those affected states would know the strength and weaknesses of being the source of lower labour productivity all this time.

Secondly, the study will go through about the efficiency matter that revolves around the sector. Each state in Malaysia will be calculated in terms of their technical efficiency in performing manufacturing activities. By estimating the efficiency performance of all 13 states, this study can detect the cause of inefficiency in conducting the manufacturing activities by the efficiency estimation. Through the estimation, the higher authorities or manufacturers could improve the operating practice through benchmarking of efficient and inefficient manufacturing in each state. Besides that, by examining the influencing factors of technical efficiency, a proper aspect could be detected for each state in improving the manufacturing performance.

Other than that, the manufacturing sector also could improvise in terms of productivity performance. Through the productivity analysis, the source of productivity change could be detected at the national and state scale. Thus, the least productive state could enhance its performance by taking the most productive state as an example to fix its operation.

Therefore, in this study, an approach using panel data will be done. This is because, this study not only examines at the national level of Malaysia only, in fact, it covers every 13 states in Malaysia. To find out the level of efficiency and productivity for this manufacturing sector, several methods and techniques chosen will be conducted using panel data. This is due to the fact that this study uses the research period taken based on evidence from the Sixth MP, up to the Tenth MP. So, the results obtained are not only recorded for one static period only, but cover each phase in the MP, for Malaysia and 13 states.

1.8 Organization of the Study

This thesis is organized into five chapters in total. Chapter one provides the introduction part, where the background of the manufacturing sector in Malaysia is introduced. It includes the sub-section for the preface of efficiency and productivity issues in the particular sector. Chapter two presents the concept and literature review on theoretical and empirical frameworks related to this study. Chapter three describes the theoretical and methodology adopted to achieve the objectives. Chapter four consists of the results and discussions of the study. Lastly, chapter five concludes the whole study. It also elaborates on the implications, limitations, and suggestions for future study.

1.9 Summary

To wrap up chapter one, this chapter is about introducing the manufacturing sector in Malaysia as a whole, including its early history, how it incorporates with the IMP and MP until this recent year. In line with the topic of this study, this chapter also includes a description of how this sector handles productivity and efficiency in manufacturing activities. The overview of the manufacturing sector at the state level also was introduced. Issues that arise are also discussed in this chapter. Hence it is inculcating research questions and objectives of the study.

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