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# TITLE: DETERMINATION OF INDUSTRIAL PRODUCTION SECTOR MALAYSIA

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# DECLARATION

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## ABSTRAK

Sektor pengeluaran perindustrian (IPS) telah memainkan peranan penting dalam menyumbang kepada keluaran dalam negara kasar (KDNK) di sesebuah negara. Daripada kajian lepas, kajian mengenai IPS Malaysia adalah jarang dan belum cukup dikaji pada tahun kebelakangan ini. Oleh itu, kajian ini cuba menyiasat faktor-faktor yang mempengaruhi IPS Malaysia dari tempoh 1970 hingga 2020 dengan menggunakan pendekatan ARDL dan ujian kausaliti Toda Yamamoto. Objektif kajian ini adalah untuk mengkaji hubungan pembolehubah makroekonomi terhadap IPS dan untuk menyiasat kewujudan hubungan keseimbangan jangka panjang antara IPS dan pembolehubah makroekonomi yang dipilih. Daripada hasil model jangka panjang, pembangunan kewangan (FD), aliran masuk pelaburan langsung asing (IFDI), beban cukai (TB), kestabilan ekonomi (ES) dan eksport (X) mempunyai hubungan jangka panjang dengan IPS. Tambahan pula, pembolehubah FD, IFDI dan ES mempunyai kesan negatif terhadap IPS, manakala TB dan X mempunyai kesan positif terhadap IPS dalam jangka masa panjang. Sebaliknya, daripada anggaran jangka pendek menunjukkan bahawa pembolehubah FD mempunyai kesan negatif yang signifikasi terhadap IPS. Manakala IFDI, TB, X dan ES mempunyai pengaruh positif yang signifikasi terhadap IPS dalam tempoh pendek pertama, kedua dan ketiga pada aras keertian 5%. Walau bagaimanapun, ES bertukar menjadi kesan ketara negatif pada IPS dalam tempoh pendek kelima. Hasil kajian ini mencadangkan pembolehubah yang dicadangkan mampu memacu magnitud dan prestasi IPS di Malaysia dalam jangka panjang dan jangka pendek. Ujian ECT berikut menunjukkan bahawa pelarasan jangka pendek kepada keseimbangan jangka panjang adalah pantas untuk mencapai keseimbangan jangka panjang. Dalam keputusan ujian kausaliti Toda Yamamoto menunjukkan bahawa semua pembolehubah bebas mempunyai hubungan satu arah dengan IPS, kecuali X mempunyai hubungan dua hala. Secara keseluruhannya, hubungan jangka panjang dan signifikasi dalam penentuan IPS membayangkan bahawa kerajaan harus merancang pembangunan sosioekonomi yang komprehensif dengan memantau dasar ekonomi dan program pembangunan untuk mencapai matlamat sosioekonomi negara. Oleh itu, kertas kerja ini amat penting kepada pembuat dasar untuk mereka membentuk dasar perindustrian dan menggalakkan pertumbuhan pengeluaran.

## ABSTRACT

The industrial production sector (IPS) has played a crucial role in contributing into the gross domestic product (GDP) in a country. From the previous study, the studies on the Malaysian IPS are rarely and did not yet sufficiently studied in the recent year. Therefore, this research attempts to investigate the factors that affect IPS Malaysia from the period of 1970 to 2020 by using ARDL approach and Toda Yamamoto causality test. The objective of this study is to examine the causality relationship and to investigate the existence of long run equilibrium relationship between IPS and the selected macroeconomic variables. From the result of long run model, financial development (FD), inflows of foreign direct investment (IFDI), tax burden (TB), economic stability (ES) and export (X) have long run relationship with IPS. Furthermore, variable of FD, IFDI and ES have negative effect on IPS, while TB and X have positive impact on IPS in the long run. In contrast, from the short run estimates show that the FD variable have a negative significant effect on the IPS at most of the lags. While IFDI, TB, X and ES have a significant positive influence on the IPS at the first, second and the third lags at the 5% significance level. However, ES turns into a negative significant effect on the IPS at the fifth lag. These findings suggest that the proposed variables drive the magnitude and performance of the IPS in Malaysia in both the long run and short run. The following ECT test shows that the adjustments of short run to long run equilibrium is fast to achieve the long run equilibrium. In Toda Yamamoto causality test result indicates that all independent variables has an unidirectional relationship with IPS, except X has bidirectional relationship. Overall, the long run and significant relationship in determination of IPS imply that government should plan a comprehensive socioeconomic development by monitoring economy policy and development programs to achieving the nation's socioeconomic goals and outcomes. Hence, this paper is important to policymakers for the design of industrial policies and promote production growth.

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| | |
|---|---|
| ADF | Augmented Dickey–Fuller |
| AIC | Akaike Information Criterion |
| ARCH | Autoregressive Conditional Heteroskedasticity |
| ARDL | Autoregressive Distributed Lag |

| | |
|---|---|
| COVID-19 | Coronavirus Disease 2019 |
| CPTPP | Comprehensive and Progressive Agreement for Trans-Pacific Partnership |
| CUSUM | Cumulative Sum of Recursive Residuals |
| CUSUM SQ | Cumulative Sum of Recursive Residuals Squares |
| ECM | Error Correction Model |
| ECT | Error Correction Term |
| ES | Economic Stability |
| GDP | Gross Domestic Product |
| IPS | Industrial Production Index |
| IFDI | Inflows of Foreign Direct Investment |
| FD | Financial Development |
| LM | Lagrange Multiplier |
| RCEP | Regional Comprehensive Economic Partnership |
| TB | Tax Burden |
| X | Export |

# CHAPTER 1

# INTRODUCTION



## 1.1 Research Background

The industrial production sector (IPS) has played a significant and crucial role in contributing into the gross domestic product (GDP) in each country (Awad, Yussof & Khalid, 2016). The contribution may depend on several factors that may make its magnitude to be different over countries (Sankaran, Vadivel & Jamal, 2020). The growth for the IPS mirrors the development of the economy and its performance, which differs from country to another (Öztürk & Agan, 2017).

Malaysia's IPS has been transformed since 1970 from one based raw material as primary export to a major export-oriented manufacturing, producer of rubber and palm oil, petroleum and natural gas (Lee, 2019). The target was to undeniably increasing the nation's IPS and gross domestic output (Bachtiar, Fahmy & Ismail, 2015). With the comparative

advantages of undervalued currency and relatively cheaper export products, Malaysia has attracted lots of foreign investment into the country, especially from Japan and the United States (Choong & Khalifah, 2019). Since the early 1970s, the government has established an economic restructuring strategy, namely New Economic Policy (NEP) and later as the New Development Policy (NDP) (Thillainathan, Ramasamy & Cheong, 2016). Strategies aimed to develop economic and IPS within the training programs in order to collect the management and entrepreneurship skills (Thillainathan, et al., 2016). However, Lee (2021) states that the NEP policy needs to be reformed to address current political, economic and social situations, because NEP has covered over a 20 years period and should not last for more than 20 years. Hence, it is clear that IPS growth is often essential for economic growth and alleviating poverty rate in a country (Ivanica & Martin, 2018). When domestic demand increases, labor demand rises as well (Lee, 2019; Chan, Puah & Wong, 2019). Therefore, the increasing IPS would increase the economic returns to the productive factors in the economy (Kniivilä, 2007).

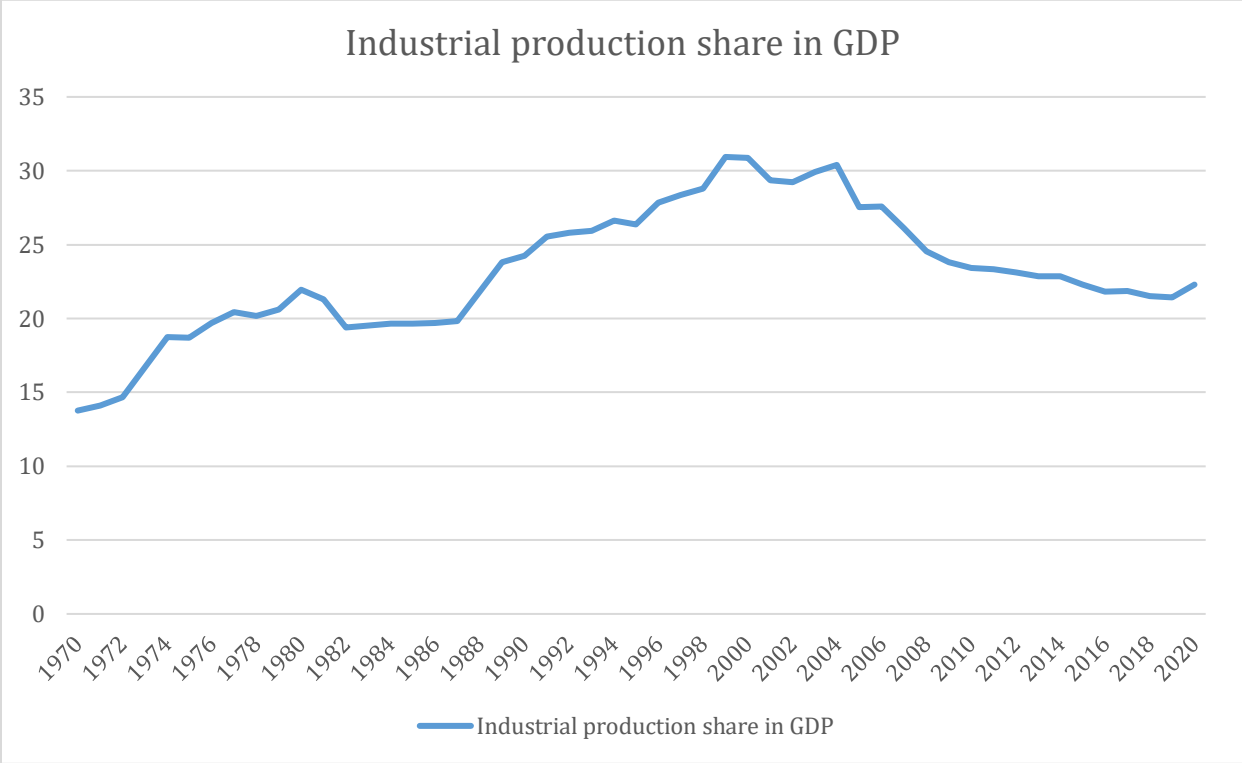


**Figure 1. IPS share in GDP Malaysia: 1970-2020.**

**Data Source:** World Bank (2020).

Based on figure 1, the IPS is gradually increase started from 1970. It can be seen that the manufacturing industry boom in the early 1970s with established policy NEP and NDP, has been attracting the largest number of foreign investors to invest in manufacturing industry development Malaysia, to enhance industrial product quality and competitiveness (Chin & Teh, 2017). Since the late nineteenth century, Malaysia has achieved a transition to a developing country from a major supplier of primary products to one of most open economic country (Bachtiar, et al., 2015). When the New Economic Policy (NEP) was announced in 1970 to eradicate poverty and build national unity, since then the poverty in Malaysia has gone down substantially (Lee, 2021). Based on Fourth Malaysia Plan 1981-1985, as a means to alleviate poverty, Malaysia started to embrace export orientation and

industrialization in order to create new opportunities for people to work and obtain their own salaries to survive (Molla, Murad & Alam, 2015). According to the Molla, et al. (2015), Malaysia was designated as one of the 'East Asian Miracles' owing to its robust and boom economy during the period of 1970 to 1990, and it caught a lot of attention around the world. From the figure 1, IPS share of GDP grew from 10.26% in 1970 to 24.22% share in GDP 1997. During that time, inflows of foreign direct investment (IFDI) has significantly influenced IPS in Malaysia (Thaker, Tan & Narayanan, 2017). For instance, it carried IFDI 2.23% of gross domestic product from 1985 rose to 8.76% in 1992 (World Bank, 2020). With the faster growth of IFDI has indirectly raised the IPS of Malaysia, thus IFDI generally plays a critical role in the economy of Malaysia and carries a heavy weightage in Malaysia's IPS (Masron & Hassan, 2016).

In 1997, Malaysia was entangled in an economic crisis due to Asian financial crisis (Karim, Karim & Shukri, 2017). Most private sectors such as industries have low financial backbone, and thus they depend heavily on loans for their operations (Yoshino & Hesary, 2016). Based on World Bank data (2020), the IPS share in GDP grew slowly during Asian financial crisis in 1997, rose from 27.84% to 28.78% in 1998. This happened caused by many industry sector opting to use up their old inventories instead of producing more production in order to cut down their cost, plus the trade was hampered by the global export demand fell (Karim, et al., 2017). Based on Bank Negara data (2021), non-performing loans rose substantially and domestic credit to the private sector, which represent as financial development, increased from 138% of gross domestic product in 1996 to 154% in 1997. In 1997, the economy of Malaysia was in recession, the currency value shrank by 50%, from 2.5 RM/USD in 1996 to 3.9 RM/USD in 1998, while the stock market

contracted at 60%, IFDI fell from 5.14% in 1997 to 2.99% in 1998. The composite index (CI) of the Kuala Lumpur Stock Ex- change (KLSE), the third largest stock exchange, fell substantially from 1,077.3 points in June to 262.7 points in September 1997 (World Bank, 2020; Yoshino & Hesary, 2016). The situation had its impact on the sector performance.

The continuity growth in IPS started until 2007 after the Asian financial crisis (Karim, et al., 2017). However, the Global Financial Crisis happened in 2007 and the service sector started to boom in the 20th century, the IPS share in GDP contribution was affected, decreasing from 27.56% in 2006 to 22.29% in 2015 (World Bank, 2021). This can be viewed by the Economic Development 2009 report, the export of many regional economies experienced a sharp contraction and economies in advanced country also deteriorated sharply in 2008 (Heng, 2015). In 2009, Malaysia had eased Malays ethics equity requirements in 27 service sub-sectors to further increase contribution economy of service sector in GDP (Alejandro, Powell, Brady & Whol, 2010). Apart from that, the 10$^{th}$ Malaysia Plan from 2011 to 2015 was introduced, namely Modernising Business Regulation, which aims to drive up real annual growth of the service sector and higher investment in the service sector, as it can be seen that the contribution of total services industry to GDP is increasing substantially from 51.2% in 2010 to 53.8% in 2015 (Alejandro, et al., 2010). The Tenth Malaysia Plan houses the Government Transformation Programme and New Economic Model aspiration to produce a sustain economic development and structural transformation (Varghese & Gomez, 2018). Therefore, this transformation plan has resulted in reduction of IPS share in GDP.

Nevertheless, there is a slight increase in IPS share to GDP in 2017, where IPS rose from 21.79% in 2016 to 21.84% in 2017, this is owing to manufacturing output

escalated substantially as the number of new industry entry increase about 4.2% in 2017 (Department of Statistic Malaysia, 2021). Furthermore, various multinational corporations (MNCs) invested directly in the manufacturing sector in Malaysia and the MNCs have instilled various business experience, knowledge and advanced technologies into Malaysia (Fahmy, Ismail, Sulaiman & Talib, 2017). Based on Malaysian Investment Development Authority (MIDA) (2019), the majority of foreign investments came from Singapore, Japan and Hong Kong direct investment in manufacturing, mining and insurance activities in Malaysia. Besides, Federal government of Malaysia has provided incentives to attract foreign direct investment activities in industry sectors, agriculture and tourism sector (Nezakati, 2011). Additionally, the government also established the National Committee on Investment, chaired by the Minister of Finance and Minister of International Trade and Industry (Oluwatoyin, Dorothy, Oluwasogo, Romanus, Esther & Tomike, 2019). The aim of establishing the National Committee on Investment and incentives offering is to encourage new investments and boost IPS in order to recover or develop the economy (Lee, 2019).

Another key thing to focus is there is many possible factors contribute to the IPS growth. Liew and Chan (2018) stated that taxes are a good tool in supporting IPS by creating a competitive environment for multinationals companies and incentivizing research and development (R&D). Next, Öztürk and Agan (2017) stated that the tax deductibility of debt interest payments would favour the industry sector to increase their capital equity in financed projects, while the R&D tax credits help industry sector in reducing the price of investing in research to stimulate IPS growth. Besides, Malaysia levies higher tariff rates to goods that already existed locally and tariff exemption on scarce

raw materials for local manufacturing purposes in order to protect local industry sector and reduce competitiveness between local IPS with imported foreign products (Law, 2016).

Furthermore, Lubis, Karim, Gan and Ramli (2017) stated that exchange rate, which reflect the economic stability, when depreciation would stimulate IPS and GDP to increase due to cheaper Ringgit Malaysia compared to the foreign countries, therefore ringgit Malaysia depreciation would fulfil the foreign markets demand. The Malaysian floating exchange rate system stated by the Central banks, whereby the value of a currency is determined by supply and demand in foreign exchange market (Umezaki, 2019). The central bank regulates, supervises financial institutions and oversees foreign exchange markets to promote financial or currency stability (Lubis, et al.,,2017). Hence, the IPS movement is vital to Central Banks, as they closely monitor the IPS changes to look for signs of inflation and economic stability determination in the market (Umezaki, 2019). In addition, Sunday and Olajide (2018) reveal that a currency of a country's depreciation would induce the IPS globally demand increase, due to the cheaper production compared to other countries.

Likewise, export has been one of the most crucial factors driving IPS and GDP Malaysia (Lee, 2019). According to the Hashim and Masih (2014), Malaysia's main exports are electrical or electronic products, chemical, petroleum, natural gas, palm oil and rubber. Based on the MATRADE (2020) report, the main export partners with Malaysia are Singapore, China, Japan, Thailand, European Union, and United States. Rubber products are the top 10 export categories, not only the rubber product, but animal or vegetable fats, oil and waxes are included in the top 10 exports Malaysia (Hashim & Masih, 2014). Malaysia exports a lot of iron and steel materials to other countries due to higher

demand in the global market (Yip & Nambiar, 2021). Apart from that, Malaysia's weaker local currency has contributed to higher demand in export products Malaysia, relatively less expensive for international buyers (Lee, Har, Tee, Lee & Khoo, 2016). Therefore, a higher export demand is beyond doubt that can drive up Malaysia's IPS and gross domestic product.

Then again, there is covid-19 pandemic in 2019, household debt increased 82.9% in 2020 (Ducanes & Bautista, 2019). Additionally, non-performing loans rose significantly and total financial development escalated from 120% to 134% of gross domestic product because many companies had begun to borrow more money to support their higher production cost (Abubakar & Kassim, 2016); International Monetary Fund, 2021). In 2020, it was observed the crude oil price fall affecting the revenue of Malaysia and along with the budget was offered to help citizens, therefore the nation's fiscal deficit has increased to 5% (Lee, 2019). During pandemic in 2020, IPS share in GDP Malaysia started to grow from 21.44% in 2019 to 22.3% in 2020, while IFDI fell from 2.49% in 2019 to 1.5% of gross domestic product in 2020 (World bank, 2020). This is due to many foreign investors withdrew their investment from Malaysia and caused a higher outflow of foreign direct investment to flew out from Malaysia (Mariadas, Murthy, Subramaniam, Selvanathan & Lun, 2021). Nevertheless, at the same time, during pandemic 2019, Malaysia had offered a wide range of tax incentives and exemptions to enhanced tax deduction in 2020 due to economic recession, the tax deduction allows IPS to rise again and secure gross domestic product (Tapas, 2021).

Based on the previous studies (Baharudin, 2018; Lee, 2019; Anjola, Kehinde, Oluwatobi, Timilehin & Osabohien, 2018; Öztürk & Agan, 2017; Sankaran *et al*.,2020),

the studies on the Malaysian IPS are rarely and did not yet sufficiently studied. According to Baharudin (2018) study on analysis of price and IPS on the Malaysian economy, he employs Bayesian Vector Autoregressive analysis to examine the relationship between them from the first quarter of 1991 up to the last quarter of 2014. Next, Awad, et al. (2016) studied IPS growth in Malaysia by employing three econometric technique, which is mean group, dynamic fixed effect and the pooled mean group to examine the impact of migrant workers on the IPS growth in Malaysia during the period 1990–2008. Meanwhile, this is similar to a study from Lee (2019) about IPS growth in Malaysia by using statistic method such as mean, standard deviation, minimum and maximum to analyze the IPS performance in Malaysia from 1990 to 2015.

In light of some previous study about IPS in Malaysia, the ARDL and Toda Yamamoto are rarely used as a methodology in a study. Additionally, the independent variables such as financial development, foreign direct investment, economic stability, tax burden and export are not further study in-depth as an aspect to influence IPS in Malaysia. Therefore, this research attempts to investigate the factors that affect IPS Malaysia in a recent year from the period of 1970 to 2020. The objective of this study is to examine the existence of a causality relationship between IPS and the selected macroeconomic variables and to investigate the existence of long run equilibrium relationship between IPS and the selected macroeconomic variables.

## 1.2 Problem Statement

From an economic perspective, IPS provides important input in a nation's economy (Asid, Razi, Mulok, Kogid & Lily, 2014). In spite of that, there is a series of recent research highlighting the fundamentals of IPS growth represents a backbone of many countries, a crucial sector to sustainable growth (Herman, 2015). IPS is vital to investors as they monitor closely on IPS flows of a country, a sharp and sustained movement direction could indicate a change in one country's economy. IPS contributes a large share of GDP of a country, which is often essential for economic growth and alleviating the poverty rate in a country (Ivanica & Martin, 2018). The increasing IPS would increase the economic returns to the productive factors, which may response to its performance (Herman, 2015). Hence, it can be seen that the determinants of IPS should be examined.



According to Soleymani and Chua (2014) stated that IPS in Malaysia has both direct and significant contribution to the economy growth, job creation and significant to the investment of a country. According to SME Annual Report (2018), the small medium enterprise (SMEs) industry sector are indeed the catalysts to economic development Malaysia, as it contributes 38.3% to overall GDP, 17.3% to total exports and 66.2% to employment Malaysia in 2018. Based on the Department of Statistic Malaysia (2020), nearly half of jobs (42.9%) were created in the industry sector in 2020. Thus, IPS growth is beyond doubt vital to the employment rate, economic growth and remains the backbone of the economy in a country (Herman, 2016).

On the other hand, IPS Malaysia faces lot of challenges and problem, Landserve Sdn Bhd Managing Director Chen noted that industry Malaysia is facing digital or

technological challenges and stated that Malaysia companies need to adapt to the technologies changes in order to stay competitive (Lee, 2019). In view of this challenges, the Prime Minister Mahathir launched Industry 4.0 in 2018 to encourage industry sector to embrace new technology in their IPS for productivity growth (Naidu, Pandaram & Chand, 2017). Next, the Minister of Higher Education and the chairman of the Malaysia REIT Managers Association (MRMA) noted that Malaysia face a challenge shortage of people skilled in science, technology, engineering and mathematics (STEM). Not only that, IPS Malaysia are less focus on digital innovation and thus resulted in incomparable in the competitive market (Lee, 2019). Based on Sana, Poddar and Paul (2020), the holding back of productivity of small medium enterprise is often affected by several factors, such as lack of scale, technological skills, finance and innovation. Moreover, SME Corporation Malaysia (2020) noted that SME are dependent on foreign workers as 39.9%, and practical students from Technical and Vocational Education and Training (TVET) as 41.4%. However, SMEs responded that most graduates from TVET do not meet the industry demand due to lack of technical skills and knowledge in technology (Mee, 2021).

In addition, based on Sana, et al. (2020), most manufacturers generally are risk-adverseness that resistant to change their current operations in view of causing disruption of their current production operations. Lee (2021) explained that research and development or innovation product are important in all business by reason of constantly changing environment and customer needs. Another key thing is that some industry are passive about innovation, as they wait till their customers change their demand to specification, only then the companies would apply research and development or innovation to boost their productivity growth (Shaari, Karim & Basri, 2016). Additionally, Fahmy, et al. (2017)

stated that an absolute risk aversion industry would undermines their ability to learn and innovate, this attitude fails to respond to demand or surrounding changes and would undermine their corporation as a result. Awad, et al. (2016) express that many innovation experts industry lack of vision and strategies when facing innovation, causes a waste of money and ineffective productivity. In addition, product innovation involves high risk, high cost and take a long duration to boost the industry production growth, thus many industry does not interested and unaffordable to involve research and development in their production (Lee, 2021).

Furthermore, Koen, Asada, Nixon, Rahuman & Arif (2017) affirm that Malaysia has a growing reliance on external markets and thus Malaysia is easier to be hampered by economic external shocks. Moody's vice president-senior analyst of Sovereign Risk Group, Guzman explained that Philippines and Indonesia had seriously more exposure to foreign debt, almost 40% of their government debt, however, this could have impact to local currency Malaysia depreciation (Koen, et al., 2017). Next, China's economy slowdown can affect Malaysia IPS growth, this is because China is the largest trading Malaysia's partner and a second world's largest global economy to be depended on (Tham, Kam & Tee, 2019). The director of the economic studies at Sunway University, Professor Yeah disclosed that Malaysia is an export-oriented country and thus with higher trade exposure to larger economy country (Azhar, 2019). Hence, the United Stated and China trade war happened in 2009, it is not only caused disrupted economy in United States or China, but also lead to a drastic drop in exports Malaysia and deteriorated IPS growth (Tham, et. al., 2019).

Above all, the relationship between IPS with financial development, foreign direct investment, economic stability, tax burden and export have become a controversial issue over the decades, and thus they are selected from overall previous literature research to further study in this research. This study will mainly focus on IPS, a dependent variable, on how it is affected by independent variables in the period of 1970 to 2020 in Malaysia. Likewise, this study aims to enhance the existing literature review from previous researchers related to all variables. Apart from that, the methodology used in this research is Toda-Yamamoto test developed by Toda and Yamamoto (1995), and Autoregressive Distributed Lag (ARDL) bound tests developed by Pesaran, Shin, & Smith (2001). The aim of using Toda Yamamoto is to test for robust causality relationship between the dependent and independent variables, and to determine whether they have unidirectional, bidirectional or no causality relationship between them, whilst the Autoregressive Distributed Lag (ARDL) is used to study the cointegration long-run equilibrium relationship between IPS with other independent variables.

In sum, the advantage or motivation of this study is to give clear information and robust evidence to industry sector and government about the rationale or causes to influence IPS Malaysia growth, and thus reduce dependency on exports to drive up IPS growth. Another motivation of this research could give some strategies and solutions to industry sectors and countries by looking into any possible structural breaks in the future and stimulate their IPS growth. All in all, it can be seen that this research is crucial and useful for the Malaysia government to notice the issues and interests to establish the best strategy to enhance the policies for the economy such as the recovery regime for Malaysia to overcome the unexpected crisis or shock in the economy. To summarize, this research

could assist governments to achieve a comprehensive socioeconomic development and as well to elevate industrial competitiveness among the global trading nations.

Alternatively, there are some previous research about IPS that have been done in Malaysia. For instance, Ibrahim and Amin (2005) study about the effect of economy stability and monetary policy on IPS in Malaysia from 1978 to 1999. In their study, they employ VAR methodology to examine the dynamic response of IPS to economy stability and monetary policy shocks in the case of Malaysia. To capture these responses, they used Augmented Dickey-Fuller (ADF) as well as the Kwiatkowski-Phillips-Schmidt-Shin (KPSS) for unit root tests as a preliminary step to determine the stationarity of data. While for the cointegration test, they apply Johansen Juselius cointegration method introduced by Johansen and Juselius (1990). The purpose of Johansen Juselius method is to determine the number of cointegration vectors in the equation system and capable for producing a more robust estimator than Engle Grangers's cointegration method (Naidu, et al., 2017). In Johansen Juselius method, a long-term relationship can be proved when there is a non-zero vector. Literally, the Johansen-Juselius cointegration test is based on maximum likelihood estimation of a VAR system as VAR approach helps in predicting the lag for Johansen Juselius test by running from lag 2 to 12 in order to get the optimum lag length. According to their studies, their series data are I(0) and thus suitable used for VAR approach to analyzes the effect of economy stability and monetary policy on IPS Malaysia.

Based on Baharudin (2018) study on analysis of price and IPS shocks on the Malaysian economy from the first quarter of 1991 up to the last quarter of 2014. Baharudin (2018) applied the consumer prices (CPI) and producer prices (PPI) as a proxy to the analysis of price. Another variable used in his study is industrial production index (IPI) to

represent the IPS Malaysia. The IPI measures output in the mining, manufacturing, electric and gas industries, and he used IPI data with a base year of 2010. Conforming to precedence in the literature, Bayesian Vector Autoregressive analysis was performed on the detrended series in his study in order to analysis the impact of domestic price and industrial output shocks on Malaysia's GDP. Literally, Bayesian VAR is used to address the problem of omitted variable bias and plus his model is statistically stationarity data, therefore it is fitted to employ VAR method in his study. Based on his findings, he found innovations in CPI and real GDP induce positive response in IPI, but followed by mild negative response, and he ascribe this observation to inventory overshooting.

On top of that, Awad, et al. (2016) have done a research regarding to an IPS growth in Malaysia by employing statistic econometric techniques such as mean group, dynamic fixed effect and the pooled mean group on extended form for Cobb–Douglas production function. They studied on the impact of the productivity workers on the IPS growth in Malaysia during the period 1990 to 2008. In their findings, they found out the inflow of low skills of workers would reduce productivity and cause a marginal decline in IPS growth in the long run. Based on their research mainly focus on the impact of labor productivity on the IPS growth in Malaysia, and thus the statistic method is fitted used for their methodology. Simultaneously, this research is similar to a study done by Lee (2019) about the impact of labor productivity on IPS performance in Malaysia from 2010 to 2015. Lee (2019) employs statistic method as well such as mean, standard deviation, minimum and maximum to examine the average value-added output growth per worker and average R&D expenditure per worker in Malaysia.

Commensurable to this method, Chan, et al. (2019) have done a similar study on the dynamic relationship among macroeconomic stability and IPS performance in Malaysia from 2005 to 2008. Macro variables they use are IPS, economy stability (RM/USD), monetary aggregates and interest rate. Based on Chan, et al. (2019) study, they employ VECM approach as well to analyze the long- and short-run relationships and as a result they found out that the macroeconomic variables have same significant effects even with shock adjustment. In addition, the VECM specification reveal that the long run equilibrium adjustments of production function were slow, which is more than 6 years to reach long run equilibrium.

Overall, the research they studied on IPS using different methodology from each other, however, the determination of the methodology is based on the time series data, whether either they are I(0) or I(1), each type of stationary data represent the methodology to be used in a study. Nevertheless, in this study, the methodology used is ARDL or Bound Testing of Pesaran and Shin (1999) and Pesaran et al. (2001), which can be used with a mixture of I(0) and I(1) time series data. It involves just a single-equation step-up, and thus it is easy to implement and interpret. Moreover, different variables encounter with different lag-lengths when they are entering the model. Coupled with ARDL model can be used to test for cointegration and estimate long-run and short-run dynamic even when the variables contain a mixture of stationary and non-stationary time-series. Therefore, it is no doubt that ARDL is a robust methodology to test for both I(0) and I(1) data and test for long-run cointegration in a research.

Apart from that, this study employs Toda Yamamoto methodology as welll developed by Toda and Yamamoto (1995), to analyze the causality relationship between

dependent variable and independent variables. Based on previous study, Nezakati, Fakhreddin and Vaighan (2011) use Granger Causality, however, Granger Causality methodology is not a total robust approach and may cause a spurious result in a finding, because the lag length used in a Granger Causality is not determined, and could cause the varied results (Stokes & Purdon, 2017). In contrast, the lag length in a Toda Yamamoto is determined by adding with the highest order of integration (dmax) and regardless of the variables co-integrated or not co-integrated (Ekeke, 2020).

In addition, the independent variables that are chosen to study are financial development (FD) as a proxy to domestic credit to the private sector, inflows of foreign direct investment (IFDI), economic stability (ES) as a proxy to exchange rate, tax burden (TB) and export (X). Whilst for dependent variable is IPS (Y) in Malaysia and it is literally sum up of total manufacturing output, mining output and electrical production in Malaysia. This topic is construct to further study in-depth in Malaysia region and annual data time period from 1970 to 2020. Conforming to precedence in the literature, the ARDL method and Toda Yamamoto are chosen, as the ARDL model is appropriate in serving this paper's aim of analyzing and study the impacts of macroeconomic variables on IPS. Additionally, this paper fills a gap in the literature where there is no ARDL model that examines the dynamics between financial development, foreign direct investment, economic stability, tax burden, export and IPS for the Malaysian economy in a recent year.

## 1.3 Research Questions

There have two questions to focusing in this research as followed:

(1) Is there a long run equilibrium relationship between the selected macroeconomic variables and IPS?

(2) Is there a causal relationship between the selected macroeconomic variables and IPS?

## 1.4 Research Objectives

The main objectives of this research are as follow:

i) To investigate the long run equilibrium relationship between IPS and the selected macroeconomic variables.

ii) To examine the existence of a causality relationships between IPS and the selected macroeconomic variables

## 1.5 Research Hypothesis

Based on research questions, the prediction of hypotheses are developed as:

Null Hypothesis ($H_0$): There is not a long run equilibrium relationship between IPS and its explanatory variables of financial development, foreign direct investment, economic stability, tax burden and export.

Alternative Hypothesis ($H_1$): There is a long run equilibrium relationship between IPS and its explanatory variables of financial development, foreign direct investment, economic stability, tax burden and export.

Null Hypothesis ($H_0$): There is no causality between IPS and its interpreted factors.

Alternative Hypothesis ($H_1$): There is a causality between IPS and its interpreted factors.

**1.6 Significant of Study**

The growth of IPS is vital to a country as it is not only provides job opportunity, but also a key to trade deficit reduction (Nezakati, et al., 2011). Based on Ivanica and Martin (2018), industry Malaysia has contributed 42.9% of employment to the citizen Malaysia in 2020. It is obvious that the IPS is one of the most productive per worker in term of output, and thus Malaysia should focus more and invest in IPS to develop economic growth. Further, investment on industry sector training, technology, education and human capital would strengthened the IPS productivity and quality through skilled labours, technicians and managers (Sankaran *et al*.,2020). This is certain that when the productivity and quality of IPS improve, the production demand will be increase domestically and internationally (Neill, 2021). Hence, it can be seen that an increased IPS would drive international trade and provide trade surplus of a country (Sana, et al., 2020).

Besides, this study of IPS is essential to maintain a continuous economic growth, as an acceleration in IPS would lead to increase in GDP of a country (Masron & Hassan, 2016). Malaysia is an export-oriented country, and thus increased IPS would raise

international trade export and increase competitive level in IPS (Lee, 2019). The acceleration in IPS growth of a country would develop economic growth by stimulate private investment, as the government has opened opportunities to foreign companies implement business to invest in Malaysia by offering various tax incentives through Penjana National (Masron & Hassan, 2016).

Next, this study of determinant IPS is crucial for building a standard quality of life in a country (Sankaran *et al*.,2020). Since the boosting IPS started, the infrastructure or health facilities were built spontaneously to make easier for the transportation of IPS (Azolibe & Okonkwo, 2020). According to Chan, et al. (2019), an inclusive industrialization country drives sustained economic growth of a country and increase the standard quality of life, through creation of jobs and raising income. It is undeniable that increase in IPS would reduce poverty and inequalities, improving health and education in a country (Ivanica & Martin, 2018). Therefore, an escalated IPS in a country, citizen can enjoy a comfortable living quality, a good healthcare and medical facilities to keep a good health well-being in a country (Sankaran *et al*.,2020).

From the previous studies (Anjola, et al., 2018; Öztürk & Agan, 2017; Sankaran *et al*.,2020), it is true that the studies on the Malaysian IPS is rarely and did not yet sufficiently studied. Therefore, this research further research the determinant of IPS in Malaysia from 1970 to 2020. Additionally, the independent variables are selected from overall previous study that affect IPS. The independent variables are financial development, foreign direct investment, economic stability, tax burden and export Malaysia. This study will mainly focus on IPS, a dependent variable, on how it is affected by independent variables in the

period of 1970 to 2020 in Malaysia. Likewise, this study aims to enhance the existing literature review from previous researchers related to all variables. Apart from that, the methodology used in this research is Toda-Yamamoto test developed by Toda and Yamamoto (1995), and Autoregressive Distributed Lag (ARDL) bound tests developed by Pesaran et al. (2001). The aim of using Toda Yamamoto is to test for robust causality relationship between the dependent and independent variables, and to determine whether they have unidirectional, bidirectional or no causality relationship between them, whilst the Autoregressive Distributed Lag (ARDL) is used to study the cointegration long-run equilibrium relationship between IPS with other independent variables.



## 1.7 Research Scope and the Limitation of Study

The scope of this research is to study the impact of financial development, foreign direct investment, economic stability, tax burden and export on the development of IPS in Malaysia. The span of this study covers annual data from 1970 to 2020. The research is mainly focused on IPS in Malaysia, observing its yearly IPS flow in Malaysia and studying how it is affected by mentioned variables. In this study, the production of the IPS is considered as the dependent variable while the other variables are independent variables.

This research mainly analyzes the long run performance of IPS of Malaysia and its essential role in enhancing the economy accounting for the regime changes between the world Asian financial crisis in 1997, global financial crisis 2008 and pandemic covid-19 in 2019. The attributes are proposed to have an entire reaction to the performance of the IPS

that affected its production in the country for the study period. This research applies ARDL bound test approach methodology to test the cointegrating long run effect of proposed variables on the sector, while Toda Yamamoto test is applied to check the causality exists between dependent variable and its explanatory variables.

This study is limited to the Malaysian economy, and it may not consider the sensitive factors that may affect the production and the contribution of this sector into the GDP of Malaysia such as the shadow economy, corruption or labor market policy' changes, which may be considered with a deep research in the future.

Additionally, not much research has been made yet on IPS and study causality relationship between all possible and potential indicators has an impact on IPS in the long period that include all local and global financial crises occurred and not far from Malaysia's structural change.



Besides, many researchers used granger causality to investigate the relationships between the relevant variables and IPS, but the problem found with the former test is that to identify the cause-effect relations with constant conjunctions, if the indicator variable are tested with different lags, it might remain to accept the alternative hypothesis of granger causality. To drop this drawback, this study will use Toda Yamamoto causality procedure which is more reliable, where lag length is actual order of the system (k) added with the highest order of integration (dmax) and regardless of the variables co-integrated or not co-integrated (Ekeke, 2020). Moreover, linear ARDL is used to investigate the symmetric short run and long run effect between dependent variable and its determinants. Hence, conducting this study with a non-linearity will may have a huge contribution to the

potential researchers by using its outcome as a reference and guide them in their future research study.

## 1.8 Organization of the Thesis

This thesis will consist of five main chapters, which are organized as follows: Chapter 1 will explain the research topic from an alternative view. This chapter consists of research background of domestic credit to the private sector, foreign direct investment, economy stability, tax burden, export and IPS in Malaysia. Not only that, this chapter also brings the problem statement, research questions, research objectives, hypothesis, research scope and limitation of study. In chapter 2 further discussions will be made to provide a better understanding on IPS in Malaysia. Literature review will be presented in chapter 2, which summarizes journals that are related to dependent variables and each independent variable and show the relationship between them from previous research in further detail. Further in chapter 3 will focus on data and methodology which is being used to carry out the research. It will describe the model specification, theoretical consideration, econometric techniques used and data findings description. Next, chapter 4 will explain the result obtained from processed data. Detailed analyses will be discussed by aid of graphs, tables and charts for a clearer view of results. Lastly, chapter 5 will be the last chapter in this research. It will summarise the major findings of this research, discuss implication, limitations and recommendations for future study on this research topic.