



**ECONOMIC IMPACTS OF THE INDUSTRIAL COLLABORATION
PROGRAM IN MALAYSIA**

By

BORHAN BIN HAIDIR

**Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia,
in Fulfilment of the Requirements for the Degree of Master of Science**

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Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfilment of the requirement for the degree of Master of Science

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Industrial Collaboration Program (ICP) has long become part of the growth driver of Malaysia's economy. However, the actual impacts of ICP on macroeconomic variables are hard to be assessed due to data limitations. Based on the current practice, the data that reflects the overall ecosystem of the ICP are only available at the Technology Depository Agency (TDA) and subject to the confidentiality policy. The impacts of expenditure investment vary across economic sectors, depending on the inter-industry interdependencies. In response to the issues, this study generally aims to provide a comprehensive assessment of the economic impacts of the Industrial Collaboration Program (ICP) in Malaysia. Altogether, this study adopts the input-output modelling technique as the primary methodological approach, with the assessment, are made on three completed ICP procurements, namely; Malaysia Rail Transit Corporation (MRT), TNB Manjung Five, and Sistem Bisnes Utama (SBU ICT).

Findings reveal that MRT procurement brings the most significant economic impacts because it dominates the largest share of total investment. However, its contribution per Ringgit of investment is relatively lower than TNB Manjung Five and SBU ICT procurements. It does not mean that future procurements need to focus on procurements other than MRT because investments in developing public transportation systems are essential for supporting economic growth. Two key areas for future research stand out. First, we need a better database. This database should track investments over time, such as quarterly or yearly. This will allow us to monitor the impact of these investments more frequently and compare them to national economic trends. Second, we need to develop a more sophisticated impact assessment model. This model should consider long-term effects, productivity improvements, and how changes in prices can influence the economy. To do this, we'll need to collect more detailed data and resource. The results of the study are useful and relevant to the problem statement for several reasons. First, it provides a quantitative analysis of the ICP's impact on the economy, including GDP, employment, and income. This addresses the limitations of previous studies that relied

on qualitative assessments. Second, the study examines specific projects like the MRT and TNB Manjung Five to understand their economic benefits. This information can guide future investment decisions. Third, the study recommends improving data collection and creating a better model for assessing the impact of future ICP projects. This is crucial for policymakers and industry leaders to make informed decisions.

Overall, the results of the study are relevant and useful to policymakers, industry stakeholders, and researchers who are interested in understanding the economic impacts of the Industrial Collaboration Program (ICP) and improving the methodology for evaluating these impacts. The study provides a foundation for future research and policymaking in this area, and the recommendations can help to improve the effectiveness and efficiency of the ICP program.

Keywords: Input-output analysis; impact assessment; industry development; transfer technology; Industrial Collaboration Program (ICP);

SDG 9: Industry, Innovation, and Infrastructure

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Program Kolaborasi Industri (PKI) telah lama menjadi salah satu pendorong pertumbuhan ekonomi Malaysia. Namun, impak sebenar PKI terhadap pembolehubah makroekonomi sukar dinilai kerana kekangan data. Berdasarkan amalan semasa, data yang mencerminkan keseluruhan ekosistem PKI hanya tersedia di *Technology Depository Agency* (TDA) dan tertakluk kepada dasar kerahsiaan. Impak pelaburan perbelanjaan berbeza-beza di seluruh sektor ekonomi, bergantung pada saling ketergantungan antara industri. Sebagai tindak balas kepada isu-isu tersebut, kajian ini secara umumnya bertujuan untuk memberikan penilaian menyeluruh terhadap impak ekonomi Program Kolaborasi Industri (PKI) di Malaysia. Secara keseluruhan, kajian ini menggunakan teknik pemodelan input-output sebagai pendekatan metodologi utama, dengan penilaian dibuat terhadap tiga perolehan PKI yang telah selesai, iaitu; Malaysia Rail Transit (MRT), TNB Manjung Lima, dan Sistem Bisnes Utama (SBU ICT).

Dapatan menunjukkan bahawa perolehan MRT membawa impak ekonomi yang paling signifikan kerana ia mendominasi bahagian terbesar daripada jumlah pelaburan. Bagaimanapun, sumbangannya bagi setiap Ringgit pelaburan adalah agak rendah berbanding dengan perolehan TNB Manjung Lima dan SBU ICT. Ini tidak bermakna bahawa perolehan masa depan perlu memberi tumpuan kepada perolehan selain daripada MRT kerana pelaburan dalam membangunkan sistem pengangkutan awam adalah penting untuk menyokong pertumbuhan ekonomi. Dua bidang utama untuk penyelidikan masa depan menonjol. Pertama, kita memerlukan pangkalan data yang lebih baik. Pangkalan data ini perlu menjejaki pelaburan dari masa ke masa, seperti suku tahunan atau tahunan. Ini akan membolehkan kita memantau impak pelaburan ini dengan lebih kerap dan membandingkannya dengan trend ekonomi negara. Kedua, kita perlu membangunkan model penilaian impak yang lebih canggih. Model ini perlu mengambil kira kesan jangka panjang, peningkatan produktiviti, dan bagaimana perubahan harga boleh mempengaruhi ekonomi. Untuk melakukan ini, kita perlu mengumpul data dan sumber yang lebih terperinci. Dapatan kajian ini berguna dan relevan dengan penyataan masalah atas beberapa asbab. Pertama, ia menyediakan analisis kuantitatif terhadap

impak PKI terhadap ekonomi, termasuk KDNK, pekerjaan, dan pendapatan. Ini menangani kelemahan kajian terdahulu yang bergantung pada penilaian kualitatif. Kedua, kajian ini mengkaji projek-projek khusus seperti MRT dan TNB Manjung Lima untuk memahami manfaat ekonomi mereka. Maklumat ini boleh membimbing keputusan pelaburan masa depan. Ketiga, kajian ini mengesyorkan penambahbaikan pengumpulan data dan penciptaan model yang lebih baik untuk menilai impak projek PKI masa depan. Ini adalah penting bagi pembuat dasar dan pemimpin industri untuk membuat keputusan yang tepat.

Secara keseluruhan, dapatan kajian ini relevan dan berguna kepada pembuat dasar, pihak berkepentingan industri, dan penyelidik yang berminat untuk memahami impak ekonomi Program Kolaborasi Industri (PKI) dan memperbaiki metodologi untuk menilai impak tersebut. Kajian ini menyediakan asas untuk penyelidikan dan dasar masa depan dalam bidang ini, dan cadangan-cadangan tersebut dapat membantu meningkatkan keberkesanan dan kecekapan program PKI.

Kata Kunci: Analisis input-output; penilaian impak; pembangunan industri; pemindahan teknologi; Program Kolaborasi Industri (PKI);

SDG 9: Industri, Inovasi, dan Infrastruktur

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LIST OF ABBREVIATIONS

CIT	Composite Index of Telecommunication
COE	Compensation of Employee
EEP	Economy Enhancement Programme
GDP	Gross Domestic Product
ICP	Industrial Collaboration Programme
ICT	Information and Communications Technology
ICV	ICP Credit Value
MOF	Ministry of Finance
MRO	Maintenance, Repair and Overhaul
MRT	Malaysia Rail Transit Corporation
SBU ICT	Sistem Bisnes Utama
TDA	Technology Depository Agency

CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter provides the background of the study by focusing on the explanation regarding the Industrial Collaboration Program (ICP) and its role in maximizing investment on the economy. This chapter also provides the limitations of the multiplier method used at this point in evaluating the impact of the ICP program. This constraint is the main motivation for this study to be carried out with details provided in the problem statements, research questions and research objectives.

1.1.1 Industrial Collaboration Program

The Industrial Collaboration Program (ICP) is the window of opportunities for local industry players to participate actively in the domestic supply chains. The implementation of ICP aims at the procurements made by the government through value-added activities. As the guidance for ICP providers, the government, through the Technology Depository Agency (TDA), has categorised the programs into three categories: Economic Enhancement Program (EEP), Offset and Counter Trade. Thus, ICP serves as a monitoring program for the government to maximise the potential impacts on the whole economy.

The ICP is an economic tool to develop knowledge-based economic activities such as technology transfer, commercialisation, and relevant development. Secondly, it creates a competitive national economy by positioning local players and products into global supply chains and leveraging foreign suppliers' platforms faster than the usual commercialisation method. Thirdly, to distribute the benefits from significant government procurement programs to local industry players through the EEP. Lastly, to increase job creation and contract manufacturing opportunities by leveraging government networks.

Based on the current list of ICP, three procurements are completed, 81 are in progress, and 10 are new programs. The programs are procured by various government agencies such as the Ministry of Transport, Ministry of Defence, Ministry of Home Affairs, Ministry of Science, Technology and Innovation, Ministry of Urban Wellbeing, Housing and Local Government, Malaysian Maritime Enforcement Affairs, Prasarana Malaysia Berhad and Mass Rapid Transit Corporation. Among the programs involved are the development and upgrading of the railway system, acquisition of military and law enforcer assets, development of strategic satellite technology, and construction of a power supply and distribution system.

As underlined by the National ICP Policy (Ministry of Finance, 2014), the policy emphasizes the need for ICP providers to propose short, medium, and long-term programs aimed at supporting local industry growth and economic development. To optimize the benefits of government procurement, ICP providers must offer programs that focus on technology transfer and human capital development. Despite these requirements, no impact assessments have been conducted, especially in Malaysia, to quantify the effect of ICP on national macroeconomic variables such as employment creation and gross domestic product (GDP), specifically compensation of employees (COE) and operating surplus. This is because both COE and operating surplus are the key component of GDP (see Figure 1.1). The lack of such assessments makes it challenging for policymakers to evaluate the effectiveness and sustainability of the program. Therefore, conducting an impact assessment would enable policymakers to determine the extent to which ICP affects the economy, and subsequently justify the importance of each ICP.

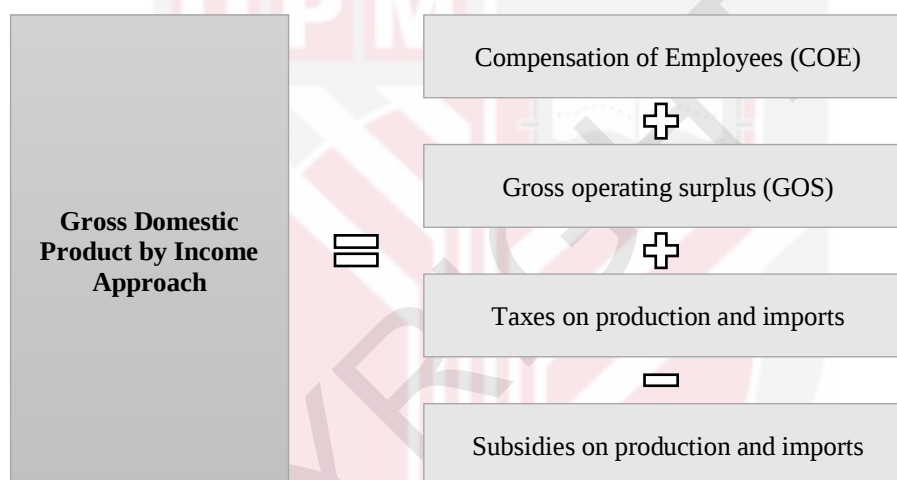


Figure 1.1 : Gross Domestic Product by Income Approach, GDP(I)
(Source: Illustrated based on Department of Statistics Malaysia, n.d.)

Scientifically, measuring the economic impacts of ICP would significantly contribute to the literature. Several countries have been practising ICP, including Turkey, South Korea, Taiwan, Japan, United Arab Emirates, Kuwait and South Africa. However, a review of previous literature reveals that the lack of detailed information on the economic transactions of ICP severely restricts its microeconomic and macroeconomic analysis (Taylor, 2012). In another study by Matthews (2014), the author raised a similar issue while noting several principal concerns related to economic inefficiency and the economic risk level of ICP. Thus, an urgent need arises to assess the economic impacts of ICP, primarily to address the principal concerns mentioned by Matthews (2014).

1.1.2 List of Programs and Number of Projects by Procurement

As previously mentioned, there are only three procurements that have been completed. These include (i) Malaysia Rail Transit Corporation (MRT), (ii) TNB Manjung Five, (iii) and Sistem Bisnes Utama (SBU ICT). In total, the procurements cover eight programs and 48 projects. Figure 1.2 presents the list of programs and the number of projects for each procurement.

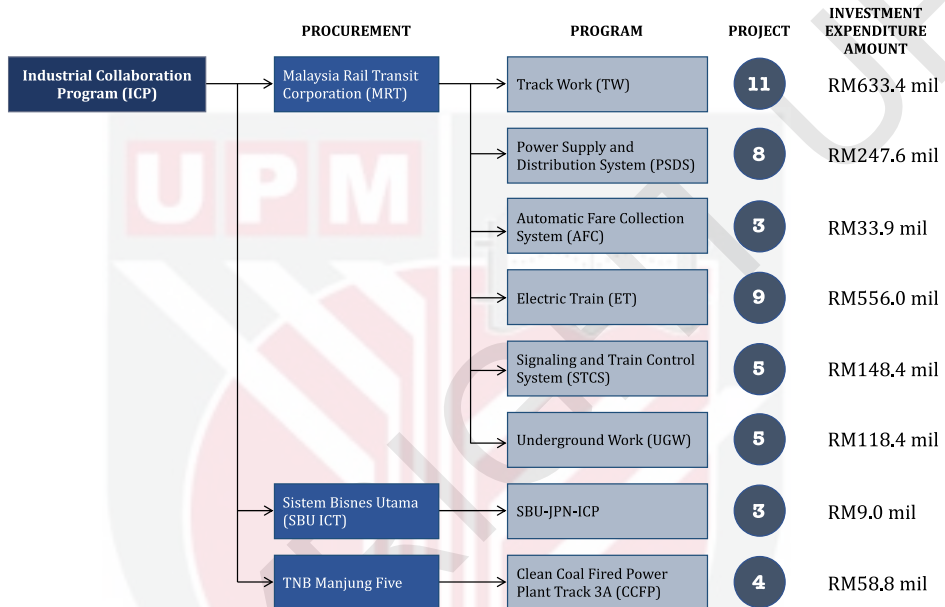


Figure 1.2 : List of Programs and Number of Projects by Procurement

Notes: detailed list and descriptions of projects for each program are given in Appendix 1.1. (Source: Technology Depository Agency, 2018)

MRT procurement involves the most significant number of programs (six) and projects (41). TNB Manjung Five and SBU ICT procurement only apply to three and four projects, respectively. Several obligors are spearheading the endeavour to accomplish the projects listed. The list of obligors and the kind of activities included in each procurement shows in Table 1.1.

Table 1.1 : List of Obligors and Type of Activities Involves in Procurement

Obligor	Type of activities
Panel A. Malaysia Rail Transit Corporation (MRT)	
• Siemens (M) Sdn. Bhd. • Meidensha Malaysia Sdn. Bhd. • Bombardier • Mitsubishi Heavy Industries Ltd (MHI) • MMC Gamuda KVMRT (T) Sdn. Bhd. (MGKT) • Xerox Business Solutions	• Human capital development • Localisation of manufacturing activities • Investment in a joint venture company • Transfer of technology • Improve market access
Panel B. TNB Manjung Five	
• GSE Power Systems Inc.	• Human capital development • Transfer of technology
Panel C. Sistem Bisnes Utama (SBU) ICT	
• Heitech Padu Berhad	• Human capital development • Localisation • Collaboration

(Source: Technology Depository Agency, 2018)

Based on TDA's database, the total amount for all three ICP procurements is RM1.8 billion. 94.4% (RM1.7 billion) of the amount is attributed to MRT procurement, 0.5% (RM9.0 million) to TNB Manjung Five and 3.3% (RM58.8 million) to SBU ICT procurement. The investment expenditure for these three procurements is significant and thus expected to impact the Malaysian economy considerably.

1.2 Problem Statements

Malaysia has been using an offset program since 1987 to benefit from its defence asset procurement. The offset program has evolved into the Industrial Collaboration Program (ICP) and has become an important tool for Malaysia's economic growth. ICP has played a crucial role in propelling the economic growth of Malaysia. Despite its importance, there exists a significant challenge in assessing the actual impacts of ICP on macroeconomic variables. The root cause of this challenge is the scarcity of data that adequately reflects the overall ecosystem of the ICP. The lack of comprehensive data on ICP's economic impacts is due to the confidentiality policies of the Technology Depository Agency. Thus, it explains why the availability of documents that report the detailed economic impacts of ICP is highly lacking. This issue brings forward two significant problems that this study shall address.

First, to enable the assessment of the economic impacts of ICP, an economy-wide model that link the investment expenditure flows in ICP and economic analysis is required. Based on the current practice, the impact of ICP is generally assessed using the qualitative measure. Specifically, the so-called "multiplier" approach is used to indicate

the impacts of a program (Global Offset and Countertrade Association, 2018). However, this technique is not directly related to the basic economic principle since the multiplier, which ranges between 1 and 7.5, does not reflect the actual consequences of the ICP. The use of multipliers can lead to inaccurate and misleading results, particularly when the multipliers are based on assumptions rather than empirical evidence and can mask important differences in the distribution of economic impacts across different sectors of the economy (Miller and Blair, 2009). Therefore, a more comprehensive and accurate approach is required to assess the economic impacts of the ICP.

Second, it relates to the extent of the ICP's contribution to various macroeconomic variables such as output, GDP, COE, operating surplus and employment creation. ICPs can lead to increased investment in R&D, which can result in the creation of new products and services, increased productivity, and ultimately, higher GDP (Kang and Park, 2015). By promoting collaboration and investment, ICPs can create new jobs and increase wages as companies compete to attract and retain workers (Mina and Lahr, 2017). Assessing the impacts of ICP on these indicators is essential to indicate the success of ICP. Although ICPs are claimed to be cost-free, it is apparent that transaction costs need to be considered in the overall cost of procurement. This issue has been the subject of constant debate, but empirical data to substantiate the effects of transaction costs are lacking.

To address the issues of capturing the full extent of multipliers and inter-industry linkages in the economy and to effectively prioritize and allocate resources for infrastructure investment, developing an economy-wide model such as the Input-Output Model is a potential solution. This model has been widely used to analyse the economic impact of infrastructure investments, and it can provide valuable insights into the sectoral-level economic impacts using the multipliers analysis approach. Through this approach, the model can incorporate all relevant economic variables such as output, GDP, COE, operating surplus, and employment creation. Thus, utilizing the Input-Output Model in infrastructure investment analysis can yield valuable insights for policymakers and other stakeholders.

1.3 Research Questions

There are two main research questions that can be derived based on the issue descriptions provided in the preceding section.

1. How can the link between the ICP investment expenditure and economic analysis be established?
2. To what extent does the ICP investment expenditure contribute to macroeconomic variables such as output, GDP, COE, operating surplus and employment creation?

1.4 Research Objectives

The general objective of this study is to provide a comprehensive assessment of the economic impacts of the Industrial Collaboration Program (ICP) in Malaysia. In response to the research questions, this study aims to achieve the following specific objectives:

1. To develop an economy-wide model that establishes a link between ICP investment expenditure flows and economic analysis.
2. To assess the impacts of ICP investment expenditure on macroeconomic variables such as output, GDP, COE, operating surplus, and employment creation, including at sectoral level.

The first objective is established to address the problem statement related to the missing link of the current multiplier concept used by TDA in evaluating and assessing the economic impacts of ICP programs. Using input-output model, the use of multipliers can be linked directly to the GDP and thus offers an accurate and empirical-based assessment.

The second objective is formed to address the problem statement related to the extent of the ICP's contribution to various macroeconomic variables such as output, GDP, COE, operating surplus and employment creation. Assessing the impacts of ICP on these indicators is essential to indicate the success of ICP.

1.5 Significance of the Study

The study yields two significant implications from both scientific and policy perspectives. In terms of the scientific perspective, the study presents an economy-wide model that links investment expenditure flows in ICP and economic analysis. This model's development provides valuable policy guidance for assessing ICP's economic impacts on various macroeconomic variables. To date, there has been no model developed for this purpose by the Department of Statistics Malaysia (DOSM) or any other relevant agencies in Malaysia, making the model development a significant novelty of this study.

From a policy perspective, the model's development enables policymakers to assess the extent to which ICP investment expenditure contributes to macroeconomic variables such as output, GDP, COE, operating surplus, and employment creation. Assessing ICP's impacts is crucial because detailed information about its impacts in Malaysia is currently lacking, as confirmed by a review of existing literature for various countries, which arrived at a similar conclusion (Taylor, 2012). Thus, the analysis represents the study's second novelty aspect.

1.6 Organization of the Study

This thesis constructs into five chapters. Chapter 1 is the introduction of the study. Next, Chapter 2 presents past literature related to this study. The chapter divides into two parts. The first part of the chapter gives the introduction. Meanwhile, the second part reviews the past literature. For a better understanding, this part divides into five themes: (i) overview on industrial collaboration program (ICP) and offset program, (ii) infrastructure in Malaysia Action Plan, (iii) theoretical review, (iv) empirical review, and (v) summary and gaps in the literature. Chapter 3 describes the methodological approach undertaken. The chapter started with a brief introduction. Then a section is provided for methodological benchmarking to detail the current method used in assessing the impacts of ICP. Based on the limitation of the present method, the following section develops the input-output model for ICP. The chapter is ended by describing the data sources. Chapter 4 presents the significant findings from the analyses conducted. The first part of this chapter gives a brief introduction to the chapter. The detailed results discuss in three sections: (i) procurement-based impacts, (ii) program-based impacts, and (iii) sectoral impacts. Finally, Chapter 5 concludes the whole study by summarising the overall findings, outlining the policy recommendation and addressing the study's limitations.

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