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The Extent to Which Improving Inter-Linkages between the SME and Large Enterprises Bring Economic Benefits

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Abstract

Motivation and aim: Weak inter-linkages between small and medium enterprises (SMEs) and large firms is a long-standing structural issue in Malaysia. While much emphasis has been given to addressing the issue, it is still strongly evident and does not seem to be removed from the economy, thus exposing SMEs to a greater economic threat amid the outbreak of the Coronavirus Disease 2019 (COVID-19). However, opportunities for economic reform arise, particularly during the post-COVID-19 periods, offering businesses with opportunities to strengthen their inter-linkages with large firms. Therefore, this paper is structured to simulate the impacts of improving the inter-linkages as a measure of economic reform.

Method and material: This study utilizes the input-output modeling technique as the primary methodological approach in simulating the impacts of improving the inter-linkages between SMEs and large firms. Simulations are conducted on 14 large resource based and non-resource based manufacturing sectors by shifting the input supplies for the selected large sectors from their clusters to SMEs. The simulations are all performed using the SME-IO.

Key findings: The simulations provide three important findings. First, shifting the production inputs from large manufacturing sectors to SMEs might not improve production inter-linkages in all sectors. Second, priority must be set on the type of improvement desired in the economy based on the leading macroeconomic indicators. Third, considering the first and second findings, the efforts to improve the production inter-linkages must prioritize sectors that would bring maximum impacts to output and value-added.

Policy implications: The simulations highlighted that improving production inter-linkages might not necessarily improve the total macroeconomic outcomes. From a policy perspective, intervention measures to improve the inter-linkages between SMEs and large firms should be selective, depending on the targeted macroeconomic indicators (whether the improvement in output, value-added or both) and other structural considerations.

JEL Classification:
C67, D57, P41

Keywords:
COVID-19; small and medium enterprises (SMEs); input-output analysis; manufacturing sector; production inter-linkages

The Extent to Which Improving Inter-Linkages between the SME and Large Enterprises Bring Economic Benefits

1. INTRODUCTION

Weak inter-linkages between small and medium enterprises (SMEs) and large firms in Malaysia's economy is a long-standing structural issue that has gained serious policy attention since the 1990s. This issue emerges as the dependency of SMEs to acquire inputs for their production activities from large firms is ineffective as the large firms are more dependent on their clusters and imports (see, for example, Khazanah Research Institute, 2018; SME Corporation Malaysia, 2018). In addressing the issue, various policy documents have highlighted the importance of improving the inter-linkages aspect in the economy (see, for example, Bank Negara Malaysia, 2006 and 2008; SME Corporation Malaysia, 2012).

While much emphasis has been given to addressing the issue, it is still evident and does not seem to be removed from the economy. The impacts from the inter-linkages issue are most apparent in the contribution of SMEs towards the gross domestic product (GDP). That is, despite representing 98.5% of the total business establishments in 2015, SMEs are only able to create 37.0% of GDP (Department of Statistics Malaysia, 2017 and 2014). In contrast, the SMEs in the ASEAN community such as Indonesia, Singapore, Vietnam, and Thailand can generate more than 40% of GDP based on their share of establishment that ranges between 98.0%-99.7% (OECD/ERIA, 2018). Among these countries, Indonesia tops the chart with 61% of GDP contribution with 99% share of total establishment.

With the outbreak of the novel Coronavirus Disease 2019 (COVID-19), the issue has exposed SMEs to a greater economic threat. Recent studies that focus on the impacts of COVID-19 on SMEs have reached a similar consensus in which most of the economic losses are generated through the operational and financial aspects (Cowling et al., 2020; Juergensen et al.,

2020; Omar et al., 2020; Ratnasingam et al., 2020; Shafi et al., 2020)[1]. Concerning the operational aspect, the subsequent movement control orders (MCOs) to contain the spread of COVID-19 have caused disruptions in the supply chain order as most of the SMEs are operating well below their capacity. The disruption further affects the financial position of the SMEs as they experience a rapid decline in sales volume. Coupled with the lack of savings and retained earnings, the COVID-19 pandemic has placed SMEs at particular economic risk.

Despite the severity of COVID-19 impacts on the economy, opportunities for economic reform to help economies emerge strongly arise (Song and Zhou, 2020). In the context of SMEs, post-COVID-19 periods offer the business with opportunities to strengthen their inter-linkages with large firms. The strengthening of inter-linkages is possible through the increased supply of intermediate inputs from the SMEs to the large firms. Two scenarios enable this situation. First, large firms themselves are unable to improve their production level further as many are still in the business recovery phase. Second, imports may no longer be able to fulfill the demands of large firms for intermediate inputs as most of Malaysia's major trade partners are still battling the growing COVID-19 infection rates.

Therefore, this paper simulates the impact of improving the inter-linkages between SMEs and large firms as a measure to reform the economy in the post-COVID-19 periods. The simulation focused on shifting the input supplies for large firms from their clusters to SMEs. Through the shifting, it is assumed that a certain proportion of intermediate inputs produced by large firms are now being manufactured by SMEs. With respect to the simulation, this paper conducts sectoral simulations on 14 large sectors, covering the resource based and non-resource based manufacturing sectors. Overall, the methodological approach that enables the simulation is based on the input-output modeling technique. This approach is utilized due to its capability in conducting economic-wide analyses. Empirically,

[1] These observations are recorded in the United Kingdom (Cowling et al., 2020), Europe (Juergensen et al., 2020), Malaysia (Omar et al., 2020; Ratnasingam et al., 2020), and Pakistan (Shafi et al., 2020).

this approach has been widely used in SMEs studies in various countries (see, for example, USITC, 2010; Tang et al., 2016; Khazanah Research Institute, 2018; SME Corporation Malaysia, 2018; Chong et al., 2019).

It is important to note that our work offers two novelty aspects. First, in relation to scientific knowledge, this paper addresses the inter-linkages issue between COVID-19 and among various production sectors, which is absent in the current literature. Second, this paper offers relevant policy analysis that informs policymakers on the importance of improving inter-linkages between SMEs and large firms as part of the economic reforms in post-COVID-19 periods. Besides, reviews on existing literature show a considerable amount of studies that focus on the impact of COVID-19 on SMEs, but to the best of our knowledge, none found to discuss the economic reforms from the perspective of inter-linkages.

The presentation of this paper is structured into five sections. Section 2 discusses the literature gaps to justify our contribution to the literature. Section 3 explains the methodological approach for the production inter-linkages simulations. Section 4 presents the main findings obtained from the simulations, and section 5 provides the concluding remarks of this study.

2. CONTRIBUTION TO THE LITERATURE

Reviews on the existing literature on the topic of the economic downturn due to the outbreak of the COVID-19 pandemic provides two major research gaps. First, the list of studies that link the outbreak of COVID-19 to the structural issues in SMEs via the inter-linkages aspect is unavailable. Past studies have primarily focused on analyzing the total economic impact of this pandemic. However, less attention has been given to SMEs and none to their structural issue. Second, past studies have also emphasized identifying the measures for mitigating the impact of COVID-19 on SMEs through the issuance of economic stimulus packages. However, as the impact of the pandemic outbreak is expected to last for an unspecified duration, it demands a more sustainable policy decision. The economic

reforms from the perspective of inter-linkages improvement between SMEs and large firms would be among the potential areas to be prioritized in the current economic situation. Thus, our paper provides empirical contributions to the literature by addressing the specified gaps.

Empirically, a rich body of literature that discusses the structural issues in SMEs is widely available, especially studies that involve the inter-linkages aspect. Essentially, large firms are less dependent on SMEs as intermediate input suppliers due to their dependency on their group of sectors and imports. In Malaysia, this issue is well documented in the studies by Khazanah Research Institute (2018) and SME Corporation Malaysia (2018). Globally, this issue has also garnered the interest of researchers from different parts of the world. For example, there are studies conducted in Asian countries by Cho (1997), Rehman (2016) and Canare et al. (2017), in Oceania (Rothkegel et al., 2006), in Africa (Hussain, 2000; Ndemo and Smallbone, 2015), in America (Alvarez and Barney, 2001) and Europe (Sulej et al., 2001). In some of these studies, the inter-linkages issue is viewed from the perspective of partnership and alliances between SMEs and large firms.

Various policy documents in Malaysia have underlined the measures to improve inter-linkages between SMEs and large firms since the 1990s, but the issue persists. One of the policy interventions is the Second Industrial Master Plan (IMP2, 1996-2015). This policy introduces the Industrial Linkage Programme (ILP), which aims to create dynamic and efficient support as well as ancillary industries to forge stronger industry linkages (Bank Negara Malaysia, 2006). By the end of the IMP2 period, the Third Outline Perspective Plan (OPP3, 2001-2010) is launched with specific sectoral thrusts to strengthen inter-linkages (Bank Negara Malaysia, 2006). The priority in addressing the inter-linkages issue is then further reiterated in the Third Industrial Master Plan (IMP3, 2006-2020), SME Masterplan (2012-2020) and various Malaysian Plans (Bank Negara Malaysia, 2008; SME Corporation Malaysia, 2012).

Concerning the impacts of the outbreak of COVID-19 on SMEs, the number of studies that focuses on this aspect is small (see, for example, Juergensen et al., 2020; Omar et al., 2020; Ratnasingam et al., 2020; Cowling et al., 2020; Shafi et al., 2020). Furthermore, none of the studies seems to link the issue to their structural counterparts. Although a complete economic impact of the pandemic on SMEs is hard to predict, it is apparent that it brings unprecedented shock on the demand and supply aspects (Juergensen et al., 2020). For instance, on the demand side, SMEs have experienced a substantial decline in demand from consumers due to the lockdown measures and the shutting down of affected industries, while on the supply side, SMEs have to deal with logistics issues due to the disruption in transportation activities and labour shortages.

In Malaysia, the immediate impacts of the COVID-19 outbreak on SMEs can be characterized by operational and financial related problems (Omar et al., 2020; Ratnasingam et al., 2020). Operational problems are commonly defined as supply chain disruptions and issues in planning for future business directions. For financial related problems, it includes issues on cash flow, access to stimulus packages and risk of bankruptcy. The study by Cowling et al. (2020) in the United Kingdom has also presented a similar finding that asserts the COVID-19-induced economic lockdown measures have put a large number of SMEs at severe risk of insufficient cash flow. The risk is mainly caused by their over-reliance on internally generated funds to capitalize their operations.

In addressing the economic impact of the pandemic outbreak, many countries have opted for a short-term mitigation option by issuing various economic stimulus packages to both businesses and households. It is unfortunate to find that many have missed out the economic reform opportunities. In Malaysia, the government has issued two economic stimulus packages worth RM290 billion for various institutions and households (Ministry of Finance, 2020a and 2020b). In Europe, Germany has provided a €500 billion rescue package, while in the United Kingdom, the rescue package has amounted to €350 billion. A sum of €345 billion has been allocated in France, €200 billion in Spain and €25 billion in Italy

(Nicola et al., 2020). In the United States, the Trump administration announced that they managed to secure a $2 trillion ‘virus-aid package’ (Nicola et al., 2020). On the other hand, in China and Japan, the People's Bank of China (PBoC) and the Bank of Japan (BoJ) provided $240 billion and $43 billion of rescue packages specifically to maintain bank liquidity (Nicola et al., 2020).

The failure to acknowledge the link between the COVID-19 pandemic and structural issue in SMEs in economic studies might result in the lack of information that can affect policymaking processes. Structural issues such as the inter-linkages have been a long-standing issue that disrupts SMEs' contribution to the economy. Thus, it becomes an important research gap that needs to be addressed. Additionally, the short-term measure for mitigating the impact of COVID-19 on SMEs is seen as less sustainable because the crisis may have worsened the state of existing structural issues in SMEs. In the long run, the government also needs to consider potential economic reform opportunities by improving inter-linkages between SMEs and large firms. To fulfill both of the identified research gaps, the following section outlines the relevant methodological approach used in this study.

3. METHODOLOGY AND DATA SOURCES

This study utilizes the input-output modeling technique as the primary methodological approach in simulating the impact of improving the inter-linkages between SMEs and large firms to improve the economy in the post-COVID-19 periods. Simulations are conducted on 14 large sectors in the resource based and non-resource based manufacturing sectors. The simulation procedure involves shifting the input supplies for the selected large sectors from their clusters to SMEs. Then the outcomes from the simulations are further observed to see whether the improvement in inter-linkages level has impacted the macroeconomic outcomes. To describe the technique in detail, the description is structured into two parts. The first part describes the framework of the SME-IO table as well as the model

developed for the simulations, while the second part describes the data source and classification.

Modeling for Input Shifting from Large Sectors to SMEs

Empirically, the input-output modeling technique is widely used for economic analysis due to its capability in capturing the economic inter-linkages (for some basic expositions on input-output analysis, see Miller and Blair, 2009). Specifically, this ability allows the input-output analysts to account for a sector's purchase of intermediate inputs from other sectors to produce its output. From the perspective of SMEs, the inter-linkages allow us to observe the relationship between and within sectors of different sizes.

Before exploring the technical part, it is important to discuss the framework of the SME-IO table that serves as the primary dataset in this study. In general, the table provided a complete picture of flows of goods and services sold (supply) and bought (demand) in an economy for a given calendar year. Specifically, it illustrates the inter-linkages between sectors of different sizes and their relationship with final consumers.

The simplified structure of the SME-IO table is shown in Table 1. The columns of the table show the consumption of intermediate inputs, imports and value-added (labour and capital) of SMEs and large sectors in the economy. The rows of the table reflect the amount of output sold by SMEs and large sectors as intermediate inputs and also to the final demand components. Overall, this table consists of three main components. First, matrix **Z** denotes the intermediate deliveries among the production sectors. The matrix is separated into four quadrants to present the flows of intermediate deliveries between SMEs and large sectors. Second, vector **f** represents the final demand components for SMEs and large sectors. The components include private consumption (**c**), investment (**i**), government consumption (**g**) and exports (**e**). Third, primary input components denoted by vector **m** represents imports, and vector **v** refers to the amount of value-added generated for SMEs and large sectors, respectively. Vector

$\mathbf{x}'$ is the total amount of input which equals to total output that is represented by $\mathbf{x}$.

Table 1: Framework of SME-IO table

			Intermediate deliveries		Final demand (**f**)	Total output **(x)**
			SMEs (S) 1, 2, …., n	Large (L) 1, 2, …., n		
Intermediate inputs	SMEs (S)	1 2 : n	$\mathbf{Z^{SS}}$	$\mathbf{Z^{SL}}$	$\mathbf{f^S}$	$\mathbf{x^S}$
	Large (L)	1 2 : n	$\mathbf{Z^{LS}}$	$\mathbf{Z^{LL}}$	$\mathbf{f^L}$	$\mathbf{x^L}$
Imports			$\mathbf{m^S}$	$\mathbf{m^L}$		
Value-added			$\mathbf{v^S}$	$\mathbf{v^L}$		
Total input			$\mathbf{x'^S}$	$\mathbf{x'^L}$		

Source: Based on the authors' illustration.

Based on Table 1, the relationship between output, intermediate inputs and final demand in the economy can be described using the following equation.

$$\mathbf{x^S = Z^{SS} + Z^{SL} + f^S} \quad \text{for SMEs} \quad (1a)$$

$$\mathbf{x^L = Z^{LS} + Z^{LL} + f^L} \quad \text{for large sectors} \quad (1b)$$

For the total economy, equations (1a) and (1b) can be summarized into equation (2). To simplify the discussion in this section, we express the information available in Table 1 into the whole economic perspective:

$$\mathbf{x = Zi + f} \quad (2)$$

where $\mathbf{x}$ is the total output, $\mathbf{Z}$ is the intermediate deliveries in which $\mathbf{i}$ represents a column vector of sector *n*, and $\mathbf{f}$ is the final demand vector. Thus, equation (2) implies that the total output equals the summation of intermediate inputs and final demand. This equation is based on the

demand-driven model, and commonly, it is referred to as the Leontief model. The model treated intermediate inputs as endogenous variables while the final demands are exogenous. Equation (2) can be rewritten into a standard Leontief input-output model as the following.

$$\mathbf{x} = \mathbf{A}\mathbf{x} + \mathbf{f} \tag{3}$$

where **A** is the input-output coefficient matrix that shows the input amount that a sector purchased from other sectors per unit of its output. The input-output coefficient matrix can be expanded by considering an *n*-sector economy with intersectoral transaction matrix (**Z**) and sectoral total output vector (**x**) as follows:

$$\mathbf{A} = \mathbf{Z}\hat{\mathbf{x}}^{-\mathbf{1}} \tag{4}$$

where $\hat{\mathbf{x}}$ is the diagonalized matrix of **x** that reflects the intermediate purchase of sector *j* from sector *i*. Equation (3) can be solved as follows:

$$\mathbf{x} = (\mathbf{I} - \mathbf{A})^{-1}\mathbf{f} \tag{5}$$

where **I** is the identity matrix, and $(\mathbf{I} - \mathbf{A})^{-1}$ stands for the Leontief inverse matrix. Specifically, the elements in this matrix show the total output effects for any sector *j* to satisfy each unit of final demand, **f**.

Attending to the simulation process, equations (4) and (5) are adjusted as follows:

$$\widetilde{\mathbf{A}} = \tilde{\mathbf{Z}}\hat{\mathbf{x}}^{-\mathbf{1}} \tag{6}$$
$$\tilde{\mathbf{x}} = (\mathbf{I} - \widetilde{\mathbf{A}})^{-1} \tag{7}$$

Equation (7) can be expanded to reflect the sizes of the sector based on the following equation.

$$\begin{bmatrix} \tilde{\mathbf{x}}^{\mathbf{S}} \\ \tilde{\mathbf{x}}^{\mathbf{L}} \end{bmatrix} = \begin{bmatrix} \mathbf{A}^{\mathbf{SS}} & \widetilde{\mathbf{A}}^{\mathbf{SL}} \\ \mathbf{A}^{\mathbf{LS}} & \widetilde{\mathbf{A}}^{\mathbf{LL}} \end{bmatrix} \begin{bmatrix} \mathbf{f}^{\mathbf{S}} \\ \mathbf{f}^{\mathbf{L}} \end{bmatrix} \tag{8}$$

For the simulation purposes, 1% worth of intermediate input bought by a large sector from its cluster, $\widetilde{\mathbf{A}}^{\mathbf{LL}}$ are shifted to the relevant SMEs, $\widetilde{\mathbf{A}}^{\mathbf{SL}}$. For example, the amount of inputs bought by large manufacturing sectors from large agriculture, mining and quarrying, manufacturing, construction and services are shifted to the SMEs that operate in similar sectors. However, it is important to note that we do not provide any specific analysis for mechanisms that could be of use in shifting the intermediate inputs from large sectors to SMEs. In practice, the ILP is among the mechanisms that are likely to shift the intermediate inputs. Measuring this mechanism requires different modeling approaches and data requirements, and thus it is beyond the scope of this paper.

In total, the level of intermediate inputs acquired by SMEs and large sectors in the economy remain unchanged as it only shifted from large sectors to SMEs. For example, suppose 1% input bought by a large manufacturing sector from a large agriculture sector equals RM100 million, then a similar amount must be shifted from large agriculture sectors to SMEs that are operating under the agriculture sector. The shifting, however, will affect the changes in the output level, $\tilde{\mathbf{x}}$ which consequently affect the level of imports requirement and value-added creation.

To evaluate the sectoral effectiveness of this measure, two criteria must be fulfilled. First, the level of output and value-added produced by the large sectors must be higher than their baseline values. Second, the values of imports are preferably lower than the baseline as they represent the leakages of the economy.

Data Source and Classification

The dataset used in this paper is the SME-IO table for the base year 2010[2]. This dataset was developed by Utit et al. (2016) through their attempt to address duality in Malaysia's economic structure. Precisely, the study breaks SMEs from the aggregate economic sectors to provide empirical evidence for their roles in economic growth and validate the existence of production inter-linkages issue. In total, the table consists of 405 sectors, detailed into micro, small, medium and large sectors (93 sectors for each size and 33 unclassified sectors[3]). However, for our simulation, the data for micro, small and medium sectors are aggregated into a single category of SMEs, and the unclassified sectors are aggregated into the rest of the sectors (RoS). Then the list of remaining sectors, particularly manufacturing, is reclassified into 14 resource based and non-resource based manufacturing sectors for better comparison. Thus, the total number of remaining sectors in our SME-IO table stands at 31 sectors for each size, with a single category of RoS. Appendix 1 presents the list of sectors available in the SME-IO table.

SMEs in the SME-IO are classified according to the latest classification endorsed by the National Entrepreneur and SME Development Council (NESDC). The classification is separated into two sections covering the manufacturing and non-manufacturing sectors, as shown in Table 2. The criteria that differentiate the classification for manufacturing and non-manufacturing sectors lie solely on the cut-off ranges for sales turnover and the number of full-time employees. For example, in terms of full-time employees for the manufacturing sector, the amount ranges between 75

[2] Although the use of the 2010 table has resulted in time-lag issue, the database still provides a reliable information. From macro-level policy perspective, the issue is negligible because there is strong evidence that indicates only marginal changes in the economic structure over a period of five to 10 years (see Khazanah Research Institute, 2018).

[3] Unclassified sectors in SME-IO table refer to the sectors that are unable to be disaggregated due to confidentiality policy. Confidentiality governed in the Statistics Act does not allow DOSM to release disaggregated firm level data when the number of samples in a particular sector is small.

and not exceeding 200, while non-manufacturing ranges between 30 and not exceeding 75.

Table 2: Classification of SMEs

Category	Small		Medium	
	Sales turnover	Full-time employees	Sales turnover	Full-time employees
Manufacturing	From RM300 thousand to less than RM15 million	From 5 to less than 75	From RM15 million to not exceeding RM50 million	From 75 to not exceeding 200
Non-Manufacturing	From RM300 thousand to less than RM3 million	From 5 to less than 30	From RM3 million to not exceeding RM20 million	From 30 to not exceeding 75

Source: SME Corporation Malaysia (2013)

4. RESULTS AND DISCUSSION

To keep the economy functioning while containing the threat of the pandemic, the government faces a multifaceted crisis that requires monetary, fiscal and policy responses (McKibbin and Fernando, 2020). Nevertheless, a longer-term response is more critical during this time. In this case, the inter-linkages between SMEs and large firms may provide the answer. This section reports the findings of the impacts of improving the inter-linkages between SMEs and large firms as a measure to reform the economy in post-COVID-19 periods. The findings are obtained through the sectoral simulations conducted based on the model developed in Section 3.1. In doing so, we manipulate the weak production inter-linkages issue between SMEs and large sectors in the simulation processes.

We structured this section into two parts. To visualize the extent of Malaysia's weak production inter-linkages issue, the first sub-section presents two production inter-linkages scenarios between SMEs and large sectors. The first scenario provides a national perspective of the issue, while the second scenario links the issue to the manufacturing sector. Next, the second sub-section presents the findings from the simulations. The

manufacturing sector is specifically targeted in the simulations because we aim to simulate the shifting of production inputs according to the sectoral grouping in the IMP3.

Production Interdependencies between SMEs and Large sectors

Table 3 presents the aggregate production inter-linkages between SMEs and large sectors in Malaysia based on the information available in SME-IO. Note that the production inputs consist of three categories, domestic intermediate inputs, imported intermediate inputs and other primary inputs (taxes and subsidies on products, and value-added). For domestic intermediate inputs, the figures are then separated into the amount of inputs obtained from SMEs, large sectors and RoS. In the case of production inter-linkages, the focus is given on the flow of domestic intermediate inputs between SMEs and large sectors.

Table 3: National production inter-linkages for SMEs and large sectors

Type of inputs	SMEs		Large	
	RM bil	%	RM bil	%
Domestic intermediate inputs	299.50	45.21	382.09	38.39
- *SMEs*	163.58	24.69	101.18	10.17
- *Large*	95.90	14.47	237.12	23.83
- *Rest of Sectors (RoS)*	40.03	6.04	43.79	4.40
Imported intermediate inputs	102.07	15.41	253.01	25.42
Taxes on products	4.93	0.74	6.21	0.62
(less) Subsidies on products	4.02	0.61	4.29	0.43
Value-added	260.07	39.25	358.25	36.00
- *Compensation of employees*	79.12	11.94	86.86	8.73
- *Operating surplus*	180.95	27.31	271.39	27.27
Total Output	662.54	100.00	995.27	100.00

Source: Derived from SME-IO

Based on Table 3, SMEs bought 45.21% inputs from domestic sectors, which include 24.69% from its cluster, 14.47% from large sectors and 6.04% from RoS. By observing a similar aspect in the last column of the table, large sectors bought a total of 38.39% inputs domestically. Specifically, 10.17% of the inputs originated from SMEs, 23.83% from its peers and 4.40% from RoS. In comparison, SMEs are shown to have a

higher inputs acquisition level from large sectors at 14.47%, while large firms only acquired 10.17% of the inputs from SMEs. The difference of 4.3% (14.47% vs. 10.17%) is explained by the dependency of large sectors on their peers and imports. From a broader perspective, the difference reflects the weak production inter-linkages issue.

As a consequence of the large sectors' dependency on their peers and imported inputs, they are shown to have lower value-added intensity as value-added only represents 36% of their input structure compared to 39.25% for SMEs. Lower value-added indicates that large sectors are showing lower contribution to labour income and profit. To observe whether a similar scenario is shown in the manufacturing sector, Table 4 provides the details.

Table 4: Production inter-linkages in the manufacturing sector for SMEs and large sectors

Types of inputs	Other SMEs		SMEs Manufacturing		Other Large		Large Manufacturing	
	RM bil	%	RM bil	%	RM bil	%	RM bil	%
Domestic intermediate inputs	148.57	36.10	150.93	60.14	146.81	33.85	235.28	41.90
- *Other SMEs*	65.26	15.85	41.64	16.59	22.29	5.14	34.03	6.06
- *SMEs Manufacturing*	15.69	3.81	41.00	16.34	14.11	3.25	30.75	5.48
- *Other Large*	21.85	5.31	31.62	12.60	37.07	8.55	99.66	17.75
- *Large Manufacturing*	13.13	3.19	29.30	11.68	46.95	10.82	53.44	9.52
- *Rest of Sectors (RoS)*	32.65	7.93	7.37	2.94	26.39	6.08	17.40	3.10
Imported intermediate inputs	46.30	11.25	55.77	22.22	52.61	12.13	200.40	35.69
Taxes on products	3.64	0.88	1.29	0.51	2.87	0.66	3.34	0.59
(less) Subsidies on products	2.80	0.68	1.22	0.49	3.11	0.72	1.18	0.21
Value-added	215.88	52.45	44.18	17.61	234.57	54.08	123.68	22.03
- *Compensation of employees*	65.23	15.85	13.89	5.54	53.20	12.27	33.66	5.99
- *Operating surplus*	150.65	36.60	30.29	12.07	181.36	41.81	90.03	16.03
Total output	411.59	100.00	250.96	100.00	433.75	100.00	561.52	100.00

Source: Derived from SME-IO

Table 4 separates SMEs and large sectors into four sectoral categories, which include other SMEs, SMEs manufacturing, other manufacturing sectors and large manufacturing sectors. The sectoral separation enables us to quantify the flow of inputs from large sectors to SMEs manufacturing

and from SMEs to large manufacturing sectors. The information on the flow of inputs is crucial because it helps to validate the existence of weak production inter-linkages issue in the manufacturing sector.

Empirically, SMEs manufacturing bought 24.28% (12.60% from other large sectors, and 11.68% from large manufacturing sectors) of inputs from large sectors, while large manufacturing sectors only bought 11.54% from SMEs (6.06% from other SMEs, and 5.48% from SMEs manufacturing). This relationship presents the imbalance between the amount of inputs acquired between SMEs manufacturing and large manufacturing sectors, whereby the SMEs are highly dependent on large sectors, but an opposite situation is shown for the dependency of large sectors on SMEs. Similar to the outcome of the national scenario, large manufacturing sectors are highly reliant on inputs from their peers and imports.

Improving Production Inter-Linkages between SMEs and Large Sectors

Discussion in the previous section provides evidence for the existence of weak production inter-linkages at the national and sectoral levels in Malaysia, particularly in the manufacturing sector. Turning this issue into a reform opportunity, this section presents the findings from shifting production inputs from large manufacturing sectors to SMEs. In this case, 1% of production inputs for each large manufacturing sector is shifted from all large sectors to the relevant SMEs. For example, 1% of inputs acquired by the Food Processing sector from large Crops sector is shifted to SMEs Crops sector.

Results from the simulations are given in Table 5. Panel A gives the results for resource based manufacturing sub-sectors, and Panel B presents the outcome for non-resource based sub-sectors. Note that we provide the results for output creation, imports requirement and value-added generation. Taking Food Processing sector as an example, the results can be interpreted as shifting 1% of intermediate inputs from large Food Processing sector to SMEs improves output and value-added level by

0.000706% (RM14.64 million) and 0.000024% (RM0.20 million), while reducing imports by -0.000046% (RM0.19 million).

Table 5: Economy-wide macroeconomic impacts of 1% input shift to SMEs from large sectors in resource and non-resource based manufacturing sector

Sector	Output		Imports		Value-Added	
	RM mil	%	RM mil	%	RM mil	%
A. Resource based						
Food Processing	14.64	0.000706	-0.19	-0.000046	0.20	0.000024
Wine & Spirit and Tobacco Products	0.08	0.000004	-0.02	-0.000006	0.02	0.000003
Wood, Paper & Paper Products and Furniture	-2.07	-0.000100	-0.97	-0.000241	1.01	0.000126
Petroleum Refinery	102.98	0.004965	31.55	0.007827	-32.60	-0.004049
Chemical	21.19	0.001022	4.34	0.001078	-4.50	-0.000558
Rubber Products	-0.27	-0.000013	-0.26	-0.000065	0.24	0.000029
Glass and Glass Products	0.28	0.000013	-0.19	-0.000046	0.16	0.000020
B. Non-resource based						
Textiles, Apparel & Footwear	-2.06	-0.000100	-0.72	-0.000180	0.70	0.000086
Printing	-0.17	-0.000008	-0.07	-0.000016	0.06	0.000008
Metal	-1.31	-0.000063	-2.03	-0.000505	1.91	0.000238
Machinery & Equipment	-1.62	-0.000078	-1.91	-0.000473	1.88	0.000233
Electrical & Electronic	-5.56	-0.000268	-3.10	-0.000770	2.99	0.000371
Medical & Optical Products	-0.29	-0.000014	-0.30	-0.000074	0.29	0.000036
Transport Equipment	-4.53	-0.000218	-7.70	-0.001910	8.84	0.001098
Total resource and non-resource based manufacturing	121.28	0.005923	18.43	0.004599	-18.80	-0.002347

Source: Computed based on equation (8)

The simulation provides three important findings. First, the shifting in production inputs from large manufacturing sectors to SMEs might not result in the improvement of production inter-linkages in all sectors. Based on the results given in Table 5, simulations on sectors such as Wood, Paper & Paper Products and Furniture, and Rubber Products would reduce output whereby the amount of output for the sectors declined from the baseline level. For example, the output of Wood, Paper & Paper Products and Furniture declined by RM2.07 million. In percentage terms, the decline is estimated at -0.0001%. Among the sectors, the simulation would result in the most significant decline in the output for Electrical & Electronic and Transport Equipment. The decline is recorded at -0.0003% (RM5.56 million) and -0.0002% (RM4.53 million), respectively. We may explain

these outcomes based on two perspectives, which are the level of imported intermediate inputs in SMEs and their quality (Chong et al., 2019). Lower dependency of SMEs on imports can be detrimental to their competitiveness as they do not fully appreciate the benefits of sourcing internationally in terms of cheaper and (or) higher-quality inputs. On the other hand, the dependency on low quality imported inputs can also be harmful as it exposes the sectors to productivity issues.

Second, priority must be set on the type of improvement desired in the economy based on the leading macroeconomic indicators. For some sectors, the simulation will result in the decline of their respective output level, but value-added creation might increase. This outcome is clearly shown by the list of manufacturing sub-sectors such as Wood, Paper & Paper Products and Furniture as well as Rubber Products. In another case, the output level might increase, but the value-added level decreases, as shown by the Petroleum Refinery and Chemical sectors. To explain this situation, the level of impacts on value-added is primarily driven by the changes in imports level. Imports are commonly referred to as a source of leakage to the domestic economy where funds used to purchase imports leave the domestic market, resulting in currency outflow (Saari et al., 2017; Hassan et al., 2018). Based on these outcomes, policy analysts should set the priority for which type of improvement is required in the economy.

Third, considering the first and second findings, the efforts to improve the production inter-linkages must be selective. As previously mentioned, the simulations resulted in different outcomes for different sectors. Thus, to maximize the impacts from the improvement of production inter-linkages, policy analysts need to identify the list of sectors that would bring maximum impacts in relation to output and value-added level. For example, results in Table 5 indicate that only Food Processing; Wine & Spirit and Tobacco Products; and Glass and Glass Products lead to the increment in output and value-added level through the simulation. However, it should also be noted that the improvement of production inter-linkages in sectors such as Wine & Spirit and Tobacco Products is not desirable from the perspective of public health policy. For more

information on how the simulation would impact other macroeconomic indicators such as labour's income and profit level, the analysis could be extended to cover these aspects in the future.

Altogether, the simulations highlighted that improvement in production inter-linkages might not necessarily improve the total macroeconomic outcomes. From a policy perspective, intervention measures to improve inter-linkages between SMEs and large firms should be selective, depending on the targeted macroeconomic indicators and other structural considerations. Among the structural considerations that may influence the policy decision include productivity differences (Economic Planning Unit, 2017) and innovation (Asada et al., 2017). Based on the Malaysia Productivity Blueprint, SMEs, in general, are found to be less productive than that of the larger firms (Economic Planning Unit, 2017). For instance, SMEs in sector such as Machinery & Equipment is empirically proven to be 1.4 times less productive than the large firms. On the other hand, the study by Asada et al. (2017) suggests that the lack of innovation has stalled the process of business upgrading in Malaysian businesses, which has consequently led to the lowering of economic contributions.

5. CONCLUSION

This paper simulates the impacts of improving the inter-linkages between SMEs and large firms as a measure to reform the economy in post-COVID-19 periods. To serve this purpose, sectoral simulations are performed for the case of resource based and non-resource based manufacturing sectors using the input-output modeling technique. As the paper deals with SMEs, the simulations are performed by applying the unique SME-IO. Results show that policy decisions regarding the desired type of improvement (whether the improvement in output, value-added or both) and which sectors to focus on must be cautiously made because the improvement in production inter-linkages might not necessarily improve the total macroeconomic outcomes.

Despite the usefulness of the findings provided in this paper, it is fair to note two main limitations. First, this paper does not consider the level of productivity that becomes an important determinant for production inter-linkages between SMEs and large firms. The low productivity of SMEs may explain why large firms are less dependent on SMEs to acquire intermediate inputs. Second, the findings provided in this paper only deal with the domestic market and do not connect with the global value chain. Thus, the findings only imply the effectiveness of SMEs as a mitigation measure from the domestic economy perspective. For future studies, addressing these limitations should be the key consideration.

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Appendix 1: List of sectors available in the SME-IO table

Num.	Sector
1	Crops
2	Rubber
3	Oil Palm
4	Poultry Farming
5	Other Livestock
6	Forestry & Logging
7	Fishing
8	Mining & Quarrying
9	Food Processing
10	Wine & Spirit and Tobacco Products
11	Textiles, Apparel & Footwear
12	Wood, Paper & Paper Products and Furniture
13	Printing
14	Petroleum Refinery
15	Chemical
16	Rubber Products
17	Glass and Glass Products
18	Metal
19	Machinery & Equipment
20	Electrical & Electronic
21	Medical & Optical Products
22	Transport Equipment
23	Other Manufacturing
24	Electricity & Gas
25	Construction
26	Wholesale and Retail Trade
27	Accommodation & Restaurants
28	Transport & Communication
29	Real Estate, Business & Private Services
30	Private Education
31	Private Health

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