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Reforming Economy in Post-COVID-19 Periods by Improving the Inter-linkages Between SMEs and Large Firms

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ABSTRACT

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 address the issue, it is still strongly evident and does not seem to be removed from the economy. With the outbreak of the Coronavirus Disease 2019 (COVID-19), the issue has exposed SMEs to a greater economic threat. Despite the severity of the COVID-19 impacts on SMEs and the economy as a whole, the pandemic also offers various reform opportunities to help the economy emerge strongly. 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 using the input-output modeling technique. The results show that the policy decision regarding the desired type of improvement (whether the improvement in output, value-added or both) and which sectors to focus on must be made cautiously because the improvement in the inter-linkages between SMEs and large firms may not necessarily improve the desired macroeconomic outcomes.

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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 cluster 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). Indonesia tops the chart with 61% of GDP contribution with 99% share of total establishment among these countries.

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 pandemic placed SMEs at particular economic risk.

Despite the severity of COVID-19 impacts on the economy, it offers various reform opportunities to help economies emerge strongly (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 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 increase their production level further as many are still in the business recovery phase. Second, imports may no longer able to fulfil the demands of large firms for intermediate inputs as most of Malaysia's major trade partners are still battling with the growing COVID-19 infection rates.

Therefore, this paper simulates the impacts 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 suppliers for large firms from their cluster 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 manufacturing sectors using the input-output modeling technique. This approach is utilized due to its capability in conducting economic-wide analyses, especially in SMEs studies (see 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, concerning scientific knowledge, this paper simulates the impacts of improving inter-linkages between SMEs and large firms as part of the economic reforms in the post-COVID-19 periods. Second, it recommends relevant policy measures that have the potential to improve the situation. Reviews on existing literature show a vast amount of studies that focus on the impact of COVID-19 on SMEs, but to the best of our knowledge, none is found to discuss the economic reforms opportunities.

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

[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).

inter-linkages simulation. Section 4 presents the main findings obtained from the simulations, and section 5 provides the concluding remarks.

CONTRIBUTION TO THE LITERATURE

Reviews on the existing literature provide two major research gaps. First, the list of studies examining the impacts of improving inter-linkages between SMEs and large firms to reform the economy, particularly during the post-pandemic periods, is unavailable. Past studies have primarily focused on analyzing the total economic impact of this pandemic, but less attention has been given to SMEs and none to its structural issue. Second, past studies mainly emphasized the use of short-term measures for mitigating the impact of COVID-19 on SMEs through the issuance of economic stimulus packages, but none found to focus on long term measures. As the impact of the pandemic outbreak is expected to last for an unspecified duration, it demands a more sustainable policy decision. Thus, our paper provides empirical contributions to the literature by addressing the specified gaps.

Empirically, a rich body of literature discussing the structural issues in SMEs is available, especially studies involving 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 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 partnerships and alliances between SMEs and large firms.

Various policy documents in Malaysia have underlined the measures to improve the inter-linkages between SMEs and large firms since the 1990s. One of the policy interventions is the Second Industrial Master Plan (IMP2, 1996-2015). The IMP2 introduces the industrial linkage program (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 of transportations and labor 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 cash flow issues, access to stimulus packages, and the risk of bankruptcy. The study by Cowling et al. (2020) in the United Kingdom has also presented a similar finding which asserts that COVID-19-induced economic lockdown measures have put many SMEs at severe risk of insufficient cash flow due to 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 short-term mitigation measure by issuing various economic stimulus packages. However, it is unfortunate to find that many have missed out on 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).

Improving the inter-linkages between SMEs and large firms and reforming the economy during the post-COVID-19 periods are two sides of the same coin. During the normal growth periods, improving the inter-linkages has to be planned and performed cautiously due to the potential distortive impacts on economic growth. Therefore, as the economy is now experiencing slow growth periods due to the pandemic crisis, policy makers need to leverage this opportunity to turn the structural issue into a measure of economic reform. The following section outlines the relevant methodological approach used to fulfil the identified research gaps.

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. Simulations are conducted on 14 large manufacturing sectors, and the choice of the sectoral focus is justified by the prevalence of the inter-linkages issue in the manufacturing sector (SME Corporation Malaysia, 2018). The simulation procedures involve shifting the input suppliers for the selected large manufacturing sectors from their clusters to SMEs. Then, the outcomes from the simulations are observed to assess the impacts of improving the inter-linkages level on macroeconomic outcomes. The detailed description of the technique is structured into two parts. The first part describes the framework of the SME-IO table as well as the model developed for the simulation, 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 to capture economic inter-linkages (see, for example, Rosland et al., 2020). 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 table columns show the consumption of intermediate inputs, imports and value-added (labor and capital) of SMEs and large sectors in the economy. The table rows 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 represented by vector **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.

$$\mathbf{x^S = Z^{SS} + Z^{SL} + f^S} \quad \text{for SMEs} \tag{1a}$$
$$\mathbf{x^L = Z^{LS} + Z^{LL} + f^L} \quad \text{for large sectors} \tag{1b}$$

For the total economy, equation (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 total economy perspective:

$$\mathbf{x = Zi + f} \tag{2}$$

where x is the total output, **Z** is the intermediate deliveries in which i represents a column vector of sector n, and 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 referred to as the Leontief model. The model treated intermediate inputs as endogenous variables while the final demands as exogenous. Equation (2) can be rewritten into a standard Leontief input-output model as the following:

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

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, and it can be expanded by considering an *n*-sector economy with intersectoral transaction matrix (**Z**) and sectoral total output vector (**x**) as follows:

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

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:

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

where **I** is the identity matrix, and $(\mathbf{I - A})^{-1}$ 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**.

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

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

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

where $\widetilde{\mathbf{A}}$ in equation (6) and (7) indicates the shifting of intermediate input and $\tilde{\mathbf{x}}$ gives the new output level generated. Next, 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, assume that for the large Food Processing sector to produce output, it requires intermediate input worth RM2 million from the large Food Crops sector. Based on the simulation, the amount of the intermediate input bought from the large Food Crops sector is reduced by 1% (RM20 thousand) and shifted to the SME Food Crops sector. The simulation specifies the input shift in percentage instead of the monetary term in response to the size differences between the sectors as measured by the output level. For instance, the size of a large manufacturing sector might not necessarily equal the size of a large services sector. Thus, by specifying the shift in percentage term, it indirectly reflects the size aspect.

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 from the economy.

However, it is important to note that we do not provide any specific analysis for mechanisms that could shift the intermediate inputs from large manufacturing sectors to SMEs. In practice, the ILP, business linkage (BLing) program, and SME mentoring program are among the mechanisms that are likely to shift the intermediate inputs (SME Corporation Malaysia, 2018). The programs are implemented with the primary focus to; facilitate market access through the integration of SMEs with large firms along the supply chains; promotes systematic and smart partnership by means of recognizing collaborations and establishing linkages between SMEs and large companies; and promotes potential SMEs in the Halal food and beverages industry to become a competent supplier to multinational companies (MNCs), respectively. Measuring the impacts of these mechanisms requires different modeling approaches and data requirements. Thus, it is considered beyond the scope of this paper.

Data Source and Classification

The dataset used in this paper is the SME-IO table for the base year 2010[2]. This dataset is 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 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 and not exceeding 200. In contrast, for non-manufacturing, it ranges between 30 and not exceeding 75.

[2] Although the use of the 2010 table 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.

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)

RESULTS AND DISCUSSION

To keep the economy functioning while containing the pandemic risk, 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 application of the model developed in Section 3.1. In doing so, we manipulate the weak production inter-linkages issue between SMEs and large firms in the simulation processes.

We structured this section into two parts. To visualize the extent of the weak production inter-linkages issue in Malaysia, 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.

Production Inter-linkages between SMEs and Large sectors

Table 3 presents the aggregate production inter-linkages between SMEs and large sectors in Malaysia. 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, including 24.69% from its cluster, 14.47% from large sectors and 6.04% from RoS. By observing the 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-linkage 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 labor 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. In comparison, 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 level in Malaysia, particularly in the manufacturing sector. Turning this issue into a reform opportunity, this section presents the simulation findings on 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 simulation are given in Table 5. 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 manufacturing sectors

Sector	Output		Imports		Value-Added	
	RM mil	%	RM mil	%	RM mil	%
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
Textiles, Apparel & Footwear	-2.06	-0.000100	-0.72	-0.000180	0.70	0.000086
Wood, Paper & Paper Products and Furniture	-2.07	-0.000100	-0.97	-0.000241	1.01	0.000126
Printing	-0.17	-0.000008	-0.07	-0.000016	0.06	0.000008
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
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 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, shifting production inputs from large manufacturing sectors to SMEs might not improve production inter-linkages in all sectors. Based on the results given in Table 5, simulation 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 term, the decline is estimated at -0.0001%. Among the sectors, the simulation would result in the biggest decline in 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 (Radam et al., 2008; 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 exposed the sector to productivity issues.

Second, priority must be set on the type of improvement desired in the economy. 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 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 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 required in the economy.

Third, the efforts to improve the production inter-linkages must be selective. As previously mentioned, the simulation resulted in a different outcome 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 to output and value-added. 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 labors' income and profit level, the analysis could be extended to cover these aspects in the future.

The simulations clearly highlighted that improving production inter-linkages may not necessarily improve the total macroeconomic outcomes. Therefore, in our view, the process of improving the inter-linkages should be selective, depending on the targeted macroeconomic indicators and sectors of interest. Leveraging the slow growth periods, post-COVID-19 provides opportunities for policy makers to reform the

economy. Two types of interventions are recommended to achieve this target, which includes strengthening existing linkages programs and establishing SMEs content requirement policy.

Undeniably, the linkages programs such as the ILP, BLing and SME mentoring program have contributed significantly to inter-linking SMEs and large firms. Nevertheless, these programs need to be strengthened to improve their effectiveness by broadening the linkages scope. For example, the policy makers need to identify the type of large firms (firms with government-linked companies (GLCs) status, non-GLC and MNCs) to be matched with the SMEs to achieve the targeted linkages outcome. Strengthening such programs would significantly benefit SMEs, not only from the inter-linkages aspect but also to increased market access, enhanced investment flows, skills development, and technological advancements.

In addition, considerations can be made to establish SMEs content requirement policy in large firms' products. This recommendation works by encouraging large firms to acquire intermediate inputs from SMEs. Precisely, the amount of intermediate inputs bought by large firms from SMEs can be increased while reducing their dependency on imported intermediate inputs. Certain thresholds for SMEs content in large firms' products can be introduced to support this policy initiative. However, as the introduction of this policy might result in the violation of the General Agreement on Tariffs and Trade (GATT) for unfairly treating imported products compared to domestic products (see WTO, n.d.), the policy can be made non-compulsory. To increase the compliance rate of large firms (based on voluntary basis), tax incentives can be introduced as part of the policy framework.

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. Findings show that large sectors are highly reliant on inputs from their peers and imports at the national and sectoral levels. From the policy perspective, this is a significant discovery for policy makers as it reveals the underlying factor that hinders the growth of SMEs. Meanwhile, from the business perspective, the outcome allows SMEs to grow further by leveraging various linkages programs. Altogether, 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, particularly among the manufacturing sectors, must be made cautiously because improving production inter-linkages may not necessarily improve the total macroeconomic outcomes. Therefore, priority must be given to sectors that would bring maximum impacts to output and value-added such as Food Processing; and Glass and Glass Products. For the policy recommendations, strengthening existing linkages programs and establishing SMEs content requirement policy are among the measures that can be considered.

Despite the usefulness of the findings provided in this paper, it is fair to note the three 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 study only focuses on the selected manufacturing sectors. Fixing the focus only on these sectors results in the study's inability to highlight the uniqueness of outcomes for other economic sectors. Third, 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

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