Determinants of Export Diversification of Agriculture Products in Malaysia

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ABSTRACT

This paper analysed the determinants of export diversification in Malaysian agricultural products using data for 186 products. Export diversification is assessed using the 5-digit code of the Standard International Trade Classification Revision Three (SITC Revision 3). Balassa measurement for export diversification was used. The study found that in 2012, Malaysia had a more diversified export market, which was attributed to government policies and programs promoting diversified and high-value agricultural exports. Additionally, an ARDL approach to cointegration is employed to assess the impact of GDP per capita, capital formation, and trade openness on export diversification in the long run. There was an inverse relationship between GDP per capita and the dot-com bubble with export diversification, while capital formation and trade openness have a direct relationship. Malaysia can intensify its economic policy, focusing on agricultural product

diversification with value addition, either by expanding the number of export lines or increasing existing product exports.

Keywords: *Export diversification; sustainable growth*

INTRODUCTION

The post-World War II economic recovery witnessed a series of structural reforms among the developing countries in order to expedite their financial performance. Since the 1990s, especially with the establishment of the World Trade Organisation (WTO), production activities have moved from specialisation toward export diversification. Structural transformation can transpose into export diversification of new products and trading partners along with the improvement in terms of the quality of products (Cadot et al., 2011; Espoir, 2020). In a modern economy, it is important that a country cannot exclusively rely on certain industrial activities but instead be more proactive to offset national factor disadvantages and sustain a national competitive advantage. This, in turn, helps improve economic performance, including productivity and investment, and stabilises a country's export earnings, leading to higher income (Espoir, 2020). The conventional theory states that the product of one country depends on factor endowment. However, this theory no longer holds due to the dynamic of the current international trade environment. On the other hand, modern trade theory highlights the impact of industrial development factors such as increasing returns to scale and imperfect competition (Helpman & Krugman, 1985). However, export diversification has been overlooked in the past due to the conventional theory of comparative advantage, which suggests that specialisation in products where a country has a comparative advantage is the path to gaining trade benefits. In light of these changes, this paper aims to build upon the critical insights from past studies such as Maliza and Ke (1993), Wagner and Deller (1998), Trendle and Shorney (2004) and Woerter (2007).

Against this background, therefore, it is vital to examine the impact of the degree of specialisation and diversification on agriculture products in Malaysia. In addition, this study intends to identify the determinants of export diversification in Malaysia's agriculture sector. In general, export diversification can be divided into horizontal and vertical diversification.

Horizontal diversification is associated with a diversity of products between different industry types, whereas vertical diversification occurs within the same industry, such as value-added ventures in further downstream activities (Kenji & Mengistu, 2009). As such, horizontal and vertical diversification will result in better export earnings.

LITERATURE REVIEW

Abro (2012) found that the per capita income was positively related to crop diversification towards high-value commodities. This was attributed to the augmented purchasing power of the farmers, which enabled them to purchase more vegetables, fruits, pulses and oilseed. Besides, Imbs and Wacziarg (2003) concluded that an increase in income reduces the risk of diversification, while export diversification increases when the GDP per capita rises. However, diversification declines after a certain income level because the need for diversification reduces; high-income economies tend to be economically and institutionally more stable. In a nutshell, per capita income growth positively influences export diversification for low-income countries. This also shows that lower levels of development in a country are associated with higher or greater export diversification.

On the other hand, at a high GDP per capita level, further income growth would result in a larger export concentration. Moreover, Elhiraika and Mbate (2014) revealed that per capita income, as in domestic income, was a driver that promoted export diversification because it increased the purchasing power and the ability of consumers to afford a diverse basket of goods. In addition, a past study revealed that export diversification results in growing income per capita, which drives economic growth (Magazzino et al., 2022). In contrast, GDP per capita and export diversification were found to have a hump-shaped or inverted U-shaped relationship between per capita income and export diversification (Cadot et al., 2011; Cieślik & Parteka, 2021). Furthermore, the United Nations Framework Convention on Climate Change [UNFCC] (2016) indicated that as the per capita income of a country rises, the distribution of sectoral economic activity varies. This diversifying pattern reduces with increasing per capita income, and after a turning point, which takes place at a very high level of income, the sectoral distribution exhibits re-specialisation. The findings revealed that per capita income and export diversification have a positive relationship, and the

extensive margin generally drives this. However, an inverse relationship was found between per capita income and diversification in Algeria (Maliki et al., 2021).

A past study conducted by De Silva et al. (2013) discovered that trade openness is positively linked with productivity in the agriculture sector due to the exposure to international competition that reduced inefficiency in resource allocation, which may have led to export diversification. This showed that trade openness can stimulate economic growth by diversifying the commodities in the agriculture sector into commodities with value addition. The finding was further supported by past studies indicating that trade openness has a positive long-term effect on export diversification in Algerian and East Asian economies (Ur Rehman & Sohag, 2023; Afaf et al., 2021; Esanov, 2012; Ferdous, 2011). Furthermore, Gnangnon (2021) indicated that a higher level of trade openness led to higher export diversification in developing countries. However, trade openness has an insignificant effect on export diversification when the models include resource-rich countries. In contrast, Agosin et al. (2011) found that trade openness could promote higher specialisation instead of diversification. Moreover, past findings showed that trade openness or the promotion of international trade does not lead to export diversification in advanced economies emerging or developing countries (Kurihara & Fukushima, 2016).

Also, past empirical results revealed a positive relationship between capital formation and export diversification in the studied countries. Therefore, an increase in capital formation will also cause export diversification to increase due to the capability of processing the products into outputs with value addition (Noureen & Mahmood, 2016). This can be further enhanced by the findings of Shadab and Tiwari (2021) and Hadjira and Zakane (2021) that increased capital formation stimulates export diversification. Meanwhile, it was found that capital formation negatively influenced diversification in both the short and long run, which implies that investment in capital goods was performed to boost production capacity and maximise revenue (Amjed & Ali Shah, 2021).

METHODOLOGY

This study used annual exportation data of 186 agricultural-related commodities in Malaysia from 1988 to 2014 for analytical purposes. The exportation data for these commodities[1] is obtained from the United Nations Commodity Trade Statistics Database (UN Comtrade Database).[2]

This study intends to examine the degree of export diversification of agricultural products in Malaysia. For this purpose, this study has adopted export diversification of agriculture products based on the formula proposed by Balassa (1989).

$$RCA_i^j = \frac{X_i^j / X_t^j}{X_i^w / X_t^w} \qquad (1)$$

where,
RCA = Index of revealed comparative advantage; x_i^j = Export of commodity i by country j $_{x_t^j}$; = Total export of country j $_{x_i^w}$; = Export of commodity in the world; = Total export of the world.

In essence, this method uses the standard deviation of revealed comparative advantage (RCA) indices. Equation (2) shows the mathematical notation of the RCA index. Based on equation (2), a smaller value of the standard deviation indicates a higher level of diversification. On the contrary, a larger value of the standard deviation shows a lower diversification level.

$$\sigma = \sqrt{\frac{1}{N} \sum_{i=1}^{N} (RCA_i - \overline{RCA})^2} \qquad (2)$$

Where,
N = the number of commodities; RCA_i the index of revealed comparative advantage of a particular commodity; and $\overline{RCA}$ = the mean of RCA index from N number of samples.

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[1] To conserve space, the 186 agricultural related products in Malaysia are not presented here but they are available upon request from the authors.
[2] See more information for UN Comtrade Database: http://comtrade.un.org/

The advantage of using this measurement is that it is derived from the standard deviation of Balassa RCA, which only considers the exportation data due to the trade protection system. Besides, this measure has no upper or lower limit; as time progresses, the standard deviation should be reduced to indicate that the country is more into diversification instead of specialisation.

However, focusing on this may not be sufficient since export diversification may be influenced by other factors that lead to export diversification of agriculture products in Malaysia. Therefore, this study proceeds by analysing the collected data using the Eviews 9.0 software to rule out the determinants of export diversification in Malaysia's agriculture products after generating the export diversification index. The Augmented Dickey-Fuller (ADF) and the Phillips-Peron (PP) unit root tests were conducted to examine the variables' stationary properties. Meanwhile, the bounds test for cointegration and the ARDL test were performed to obtain the long-run estimates and the ECM from the ARDL model. Furthermore, a series of diagnostic and stability tests were conducted to determine the appropriateness of the ARDL model.

The following functional form is used in the analysis of the determinants of the export diversification of Malaysian agriculture products. The model for the export diversification is expressed as below:

$$LDIV_t = \alpha + \beta_1 LGDPC_t + \beta_2 LCAPFORM_t + \beta_3 LTOGDP_t + \varepsilon_t$$

Where,

$LDIV_t$	=	Log of indicator for export diversification for Malaysia at period t
$LGDPC_t$	=	Log of the GDP per capita at period t
$LCAPFORM_t$	=	Log of capital formation in the agriculture sector at period t
$LTOGDP_t$	=	Log of trade openness to the GDP at period t
α	=	Constant
ε_{it}	=	Error term

The rationale for using the above-mentioned independent variables is that they are important variables that can affect export diversification. The equation considers GDP per capita as a determinants of export

diversification. GDP is a way to quantify a country's production and serves as a proxy for the production cost related to export diversification. Besides, capital formation is related to the output of a production process to inputs, reflecting the productivity level. Therefore, with capital formation, a country can diversify its products into more value-added produce, influencing the degree of diversification. Other than that, through trade openness, people in one country can have a better choice from various demands in various emerging economies.

GDP per capita is used because it is an indicator of economic progress. Magazzino et al. (2021) and Elhiraika and Mbate (2014) found robust empirical indications of the positive drive of export diversification on the growth of per capita income. Moreover, GDP per capita and export diversification were found to have a hump-shaped or inverted U-shaped relationship between per capita income and export diversification (Cadot et al., 2011; Cieślik & Parteka, 2021). Meanwhile, a negative correlation was discovered between per capita income and diversification in Algeria (Maliki et al., 2021). Capital formation was employed in the export diversification model since the increase in capital formation stimulates export diversification through its capability to process the products into outputs with value addition (Noureen & Mahmood, 2016; Shadab & Tiwari, 2021; Hadjira & Zakane, 2021). However, it was found that capital formation negatively affects short- and long-term diversification (Amjed & Ali Shah, 2021).

De Silva et al. (2013) discovered that trade openness is positively linked with productivity in the agriculture sector due to the exposure to international competition that reduced inefficiency in resource allocation, which may have led to export diversification. This obviously showed that trade openness is capable of stimulating economic growth by diversifying the commodities of the agriculture sector into commodities with value addition. The finding was further supported by the fact that trade openness has a positive long-term effect on export diversification in Algerian and East Asian economies (Afaf et al., 2021; Esanov, 2012; Ferdous, 2011). Furthermore, Gnangnon (2021) indicated that a higher level of trade openness led to higher export diversification in developing countries.

The basis of using the ratio of total trade to the GDP is it considers the effects of market size, as well as the volumes exchanged. Trade openness could boost growth. For example, Grossman and Helpman (1991) argued that an economy grows when the country engages in trade openness; thus, it leads to knowledge spillovers as well as an improvement in investments. Past studies, to name a few, such as Alexander and Warwick (2007, Sepehrdoust and Khodaee (2014), Afaf et al. (2021), and Gnangnon (2021) have pointed out that countries experience improved economic growth due to diversification as they pursue trade openness. As a result, this scenario leads to a positive impact on trade openness, resulting in diversification. This is because when a country is more open, this will lead to an increase in productive capacity, which will have an impact on export diversification. Likewise, Ur Rehman and Sohag (2023) found that trade openness plays a supportive role in fostering export diversification in the long-run. In addition, Mahadevan (2003) pointed out that the chances for trade in locally produced agricultural products will arise due to trade openness. In contrast, increased openness would lead to importing cheap agricultural products, eventually triggering competition with the local producers. Thus, it causes agricultural performance to decline. Therefore, trade openness can lead to a positive or negative relationship depending on the effect of competition or market access. Apart from that, Agosin et al. (2011) reported that trade openness can prompt higher specialisation instead of diversification.

RESULTS AND DISCUSSIONS

The results showed that the export diversification index in Malaysia for 2012 was the lowest throughout the empirical period from 1988 to 2014, which was 2.0. This indicates that Malaysia diversified its export structure for agricultural products in 2012. This is due to the implementation of the Economic Transformation Programme, which focuses on 12 national key economic areas in the tenth Malaysia plan, where agriculture was one of the identified economic areas. According to EPU (2010), effort has been placed on high-value agriculture activities in the tenth Malaysia plan, which was commenced in 2011 to 2010 to develop new products by diversifying into higher value-added outputs that contribute to the export performance in agriculture.

On the other hand, the results indicate that Malaysia experienced less diversification instead of specialisation in its export structure for agricultural products in 2001, with 5.3 as the index. Such consequences were due to the low palm oil supply since August 2001, and palm oil prices were forecasted to decline further to US$18 per barrel in 2002 (Bank Negara Malaysia, 2002). The low price of palm oil prompted the government to introduce incentives to reduce the supply of palm oil by reducing the existing stocks and encouraging replanting. Thus, it influenced the diversification level in 2001 since Malaysia is one of palm oil's major producers and exporters. Besides, the dot-com bubble collapse has caused huge losses for investors in equity markets. During this time, investment in commodity markets started to rise, and the dot-com crisis caused a severe impact on overall consumption, which led to a decline in incomes (Federman et al., 2023). Nevertheless, investors who had invested and suffered losses in the equity market have limited capital to re-invest in the commodity market and at the end of the boom, no higher value production impedes the ability to improve the development of agriculture (Mayer, 2010; Buysse & Vincent, 2015).

Having implemented the export diversification index, the analysis is carried out using ADF and PP tests before testing cointegration for each variable. The obtained results disclosed that the selected variables in this study are in a combination of both I(0) and I(1) processes, justifying the use of the Autoregressive-Distributed Lag (ARDL) estimator. The results of ADF and PP tests are available upon request from the authors in order to conserve space. Bounds testing and the ARDL tests introduced by Pesaran et al. (2001) were employed in the next stage to study the long-run equilibrium relationship of the indicated variables in the model since the series do not have the same order of integration in unit root test estimation. This is due to bounds testing does not impose restrictive assumptions that all the underlying variables should be integrated in the same order (Choong et al., 2003; Choong et al., 2005).

Hence, the bounds-testing approach to cointegration was utilised in the next stage to study the model's long-run equilibrium relationship of the indicated variables. As shown in Table 1, the F-statistic computed under the bounds test by the export diversification model is 1.822, which indicates that the value is less than the lower bound critical values at the 5 percent

significance level as tabulated in Pesaran et al. (2001) and Narayan (2005). Thus, this showed no long-run relationship between the test variables.

Table 1
Results of Bounds Test for Cointegration

F-statistic	Significant level	Pesaran Critical Values		Narayan Critical Values	
		I(0)	I(1)	I(0)	I(1)
	90%	2.2	3.09	2.52	3.56
1.822	95%	2.56	3.49	3.05	4.22
	99%	3.29	4.37	4.28	5.84

Notes: Critical values are obtained from Pesaran et al. (2001), table Case II: restricted intercept and no trend, and Narayan (2005), table Case II: restricted intercept and no trend.

After verifying the existence of the long-run relationship, this allows the long-run parameters analysis to be estimated. Table 2 shows the generated long-run cointegration estimates for the export diversification model. The test statistics for the LDIV model implied that the LGDPC and the DUM2002 variables are found to be negatively related to export diversification, whereas the LCAPFORM and the LTOGDP variables had a positive relationship with export diversification.

Table 2
ARDL Estimation Results of the Export Diversification Model

Regressor	Export Diversification Model (4,0,0,1) LDIV
Constant	7.199***
	{18.883}
	[0.000]
LGDPC	-0.984***
	{-7.997}
	[0.000]
LCAPFORM	0.069
	{0.825}
	[0.424]
LTOGDP	0.328**
	{2.971}
	[0.011]
DUM2002	-0.165**
	{-2.267}
	[0.041]

Notes: Asterisks (**) and (***) denote rejecting the null hypothesis at 5% and 1% significant levels, respectively. The figures in (…) refer to the selected lag length based on AIC. The figures in {…} and […] refer to the *t*-statistics and probabilities, respectively.

A negative relationship between GDP per capita and export diversification indicates that a country may diversify its commodities based on its relative advantages while reducing the proportion of commodities, for example, in the export of agricultural products by increasing the exports of other sectors (Hamed et al., 2014). Such a situation would result in declining export diversification in the agriculture sector when economic growth upsurges diversification (Cadot et al.,2011; Cieślik & Parteka, 2021).

Besides, the DUM2002 variable negatively influences export diversification, which means that the crisis, namely the dot-com bubble, has an adverse impact on the export diversification of agricultural products. Athukorala and Devadason (2011) indicated that the dot-com bubble impacted export-oriented manufacturing, especially the electronics industry. Such a situation also influences other sectors, as investors who have already invested in Internet-based companies suffer significant losses from such investments. According to Mayer (2010), the dot-com bubble crash resulted in great losses for investors in equity markets. The amount of investment in the commodity market started to rise intensely in early 2005. This is because the equity market became less attractive to investors and shifted more towards commodities trading, such as agricultural commodities. However, previous investors who had previously invested in the equity market had limited capital to invest in the commodity market, even though they desired to recover their investment losses in the equity market. Past studies have supported this finding that the dot-com crisis caused a severe impact on overall consumption, which led to a decline in incomes (Federman et al., 2023). Therefore, the crisis hampers the performance of export diversification of agricultural products as limited capital can be utilised to diversify agricultural products further into downstream processing with high-value addition for exportation.

On the other hand, the results revealed that capital formation and export diversification in the agriculture sector are positively related. In the case of Malaysia, capital formation has been allocated to boost the performance of the agriculture sector to become competitive. However, the effort to diversify the commodities of agriculture is mostly placed on commodities such as oil and gas, rubber and palm oil by diversifying towards downstream industries instead of diversifying cultivation of fruits and vegetables (Rahuman et al., 2014). Therefore, it is suggested that widening the diversification of other commodities is necessary to become a

world leader instead of concentrating only on commodities with comparative advantage to extend diversification as it enhances competitiveness (Ahmad & Jabeen, 2023; Jolo et. al., 2022). For example, antibiotic-free chickens can potentially be a good global prospect for Malaysia when it diversifies its poultry exports (Tengku Ahmad & Suntharalingam, 2009). Therefore, investment in capital formation drives diversification through productivity gains as the generation of new knowledge, tools or techniques through research and development would be able to create specialised agriculture industries and quality improvements that enable Malaysia to become competitive at the international level.

The results showed that the LTOGDP variable is significant at the 5 percent level, which implies that an increase in the LTOGDP leads to rising export diversification. Trade openness would lead to growth due to knowledge spillovers and investments in innovation and technology, boosting productivity and export diversification. Moreover, the trade openness of a country would also promote growth due to export and import activities, lower tariffs and fewer trade barriers among the trading countries in order to remain competitive in the international market. Consequently, this would add value to the commodities in terms of quality or diversity. The Malaysian government has tried to develop resource-based industries, which were closely related to the upstream production of natural rubber and tin ore, in order to promote import substitution. Under vertical diversification, the production of resource-based industries eventually emerged from raw or basic upstream commodity products into more advanced and complex downstream outputs such as the manufacturing of petrochemicals, oleochemicals, refined petroleum and palm oil, rubber gloves, tyres and prophylactic products (Rahuman et al., 2014). However, an effort to widen the diversification of other commodities such as poultry, fruits, and vegetables is needed to increase the variety and move towards high-value finished products. As such, Malaysia will be more competitive, and at the same time, it will enable the country to increase exports whilst reducing imports from other countries.

Next, the error correction term (ECT) is shown in Table 3. The ECT values for the export diversification model have been generated from the error correction model based on the cointegration framework. The obtained ECT values have a negative sign and are statistically significant at the one percent level. The generated coefficient of the ECT value is -0.845, which

suggests that about 84 percent of the short-run deviations of export diversification of the agriculture sector will be adjusted towards the long-run equilibrium on a yearly basis. In addition, a battery of diagnostic and stability tests was carried out to determine the robustness of the export diversification model. The diagnostic test result demonstrated that the model passed the serial correlation, functional form, normality and heteroscedasticity tests.

Table 3
ARDL Results of Error-Correction Representation for the Selected ARDL Models (Export Diversification Model)

Export Diversification Model	
Regressor	**Coefficient [*t*-statistic]**
D(LDIV(-1))	0.077 [1.043]
D(LDIV(-2))	0.051 [0.744]
D(LDIV(-3))	-0.143 [-1.998]
D(LGDPC)	-0.753 [-12.046]***
D(LCAPFORM)	0.013 [0.254]
D(LTOGDP)	0.035 [0.437]
D(DUM2002)	-0.133 [-4.854]***
ECT	-0.845 [-5.642]***
Diagnostic Tests:	
JB	0.293 [0.864]
AR [2]	0.326 [0.526]
ARCH [1]	0.089 [0.754]
RESET [1]	0.003 [0.956]
CUSUM	Stable
CUSUM^2	Stable

Notes: JB is the Jarque-Bera statistic for testing normality, AR[2] and ARCH[1] are the Lagrange Multiplier test for 2nd order serial correlation and ARCH effects, respectively. RESET refers to the Ramsey RESET specification test. At the same time, CUSUM is the cumulative sum of the residual stability test, and CUSUM2 is the cumulative sum of squares of the recursive residual stability test. Asterisk (***) denote rejecting the null hypothesis at a 1% significant level. The figures in […] refer to the probabilities.

CONCLUSION

This study has provided insights into the export diversification of agricultural products in Malaysia from 1988 to 2014, employing the Balassa measurement and econometric models to explore the determinants influencing the export diversification of agricultural products. GDP per capita and export diversification of agriculture products underscore the necessity to shift towards value products. Boosting the export performance

of commodities such as spices, livestock and fruits and vegetables, which have an advantage, can contribute to GDP and enhance the country's competitiveness. In view of this, exploring processing to add value holds promise for economic growth.

Besides, the finding highlights the significance of capital formation in stimulating export diversification of agricultural products. It is crucial for Malaysia to expand its efforts beyond commodities like oil and palm oil. Diversification focusing only on mainstream commodities will affect the economy in terms of export earnings. This was especially true during the coronavirus pandemic, wherein the average production of palm oil in 2020 was 1.595 million tonnes compared to 1.655 million tonnes in 2019 (Zakaria et al., 2022). Opportunities exist in industries such as processed fruits, with the potential for adding value and expanding market reach. Jani and Tih (2010) discovered that Malaysia has been the major exporter of fresh star fruit and dragon fruit category to the European market in terms of tropical fruits. This shows that there are prospects for downstream activities in Malaysia, such as the processed fruit industry, which comprises juices, puree, concentrates and processed fruit products, and it has become one of the major agri-businesses in the world (Yahya, 2001). Therefore, the government plays an imperative role in propelling private sector investment in agriculture capital formation to actualise this potential.

Moreover, economic shock can create disruptions in spending and result in a decrease in earnings. Consequently, the progress of diversifying exports in the industry is hindered since there is less capital available for expanding into downstream processing that adds substantial value for exportation. Furthermore, trade openness plays a pivotal role in promoting resource allocation efficiency and enhancing agricultural export performance. It facilitates technology transfer, foreign investment, and knowledge spillovers, contributing to export diversification. Trade openness also fosters the production of better-quality, value-added agricultural outputs by reducing trade barriers and increasing competitiveness. Therefore, it is suggested that the Malaysian government may utilise trade openness to promote commodities that can be developed but are yet to be diversified into high-value-added produce. This is because by viewing the competitiveness of downstream outputs, widening the diversification of other commodities will enable the country to have a diverse selection of

value-added outputs that would snowball exports and decrease imports from other nations.

In summary, Malaysia's agriculture sector must tackle the challenges and seize the opportunities. Malaysia can enhance its standing in the global agricultural market by focusing on value-added products through expansion beyond commodities and fostering open trade. These approaches stimulate economic growth and ensure the sector's long-term sustainability and competitiveness.

CONTRIBUTIONS OF AUTHORS

The authors confirmed that they have contributed equally to all aspects of this research, publication, and related editing works.

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CONFLICT OF INTEREST

All authors declare that they have no conflicts of interest.

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