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Examining the impact of oil rent dependence on manufacturing sector sustainability: Role of finance development

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Abstract
Purpose: This study aims to examine the impact of oil rent dependence on the sustainability of the manufacturing sector, with a specific focus on the moderating effect of financial development.
Design/Methodology/Approach: The analysis employed the Autoregressive Distributed Lag (ARDL) bounds test to address the research objectives.
Findings: While the direct significant impact of oil rent dependence on manufactured exports is not detected, the findings reveal that the adverse impacts of oil rent dependence on the production of the manufacturing sector are transmitted via financial development. Notably, our research underscores the inefficiency of the financial sector in channelling oil rent into the manufacturing sector.
Research limitations/Implications: The limitations of this research lie in the availability of data from the financial development index introduced by the International Monetary Fund and the exclusion of other potential moderating factors.
Practical implications: Policymakers should prioritise economic diversifications through targeted investments and policies to reduce the reliance on oil rent. A diversification strategy aligns with Sustainable Development Goal (SDG) 9 by shielding the manufacturing sector from the Dutch disease phenomenon. Besides, enhancing the financial sector is essential to mitigate the adverse impacts of oil rent dependence and promote oil rent utilisation. This effort indirectly contributes to SDG 17 by fostering collaborations between financial institutions and the manufacturing sector.
Originality/Value: This research contributes to the literature on sustainable development by examining the impact of oil rent dependence on the sustainability of the manufacturing sector, along with the study of the moderation effect of financial development. The findings of this research shed light on the role of financial development in shaping the production and export of the manufacturing sector in the context of oil rent dependence, supporting SDG 9 for sustainable industry and innovation.

Keywords: Oil Rent Dependence, Manufacturing Sector, Financial Development

Introduction

Building on Sustainable Development Goal (SDG) 9, which places significant emphasis on the imperative of industrialisation, the manufacturing sector has emerged as a powerful tool for countries worldwide to attain this goal. The manufacturing sector is of interest due to the opportunities for capital accumulation, economies of scale (Szirmai and Verspagen, 2015) and linkage and spillover effects (Herman, 2016) associated with the manufacturing sector. Aside from SDG 9, recent literature underscores the potential of the manufacturing sector to drive investments in research and development (Beraud et al., 2022). This, in turn, positions the sector as one of the contributors to achieving SDG 7 (Affordable and Clean Energy) and SDG 13 (Climate Action). This is accomplished through the enhancement of emissions efficiency and energy reduction (Halkos et al., 2021). Recently, there has been a renewed interest in the importance of the manufacturing sector. This is primarily due to its role as a catalyst for the expansion of higher-tech industries, which can help safeguard the country's economy from the adverse impacts of economic crises, such as the COVID-19 pandemic (United Nations Industrial Development Organization, 2022).

Despite the growing recognition of the pivotal role of the manufacturing sector, the United Nations has highlighted oil rent dependence as one of the challenges hindering the development of the manufacturing sector, owing to its crowding-out effect over the manufacturing sector (The United Nations Interagency Framework Team for Preventive Action, 2011). Oil rent dependence can be defined as the extent to which a country's economy is dependent on its oil resources (Pendergast et al., 2011; Wang et al., 2019; Zhang and Brouwer, 2020). When a country is overdependent on oil rent, it may suffer from the "oil curse" phenomenon, which is characterised by slower economic growth in oil-abundant countries due to oil rent dependence (Badeeb et al., 2016). Notwithstanding various mechanisms of the oil curse, the Dutch disease is widely regarded as the most prominent mechanism (Badeeb et al., 2017), with extensive research dedicated to understanding its implications since the pioneering work of Corden and Neary (1982). It is now well-established from the extant studies that the adverse impacts of oil rent dependence on the manufacturing sector are transmitted via the Dutch disease phenomenon, a phenomenon where the oil resources boom leads to the contraction of other tradable sectors (Neo, 2009). This phenomenon ultimately hampers overall economic growth through resource reallocation and exchange rate appreciation (Shao et al., 2020).

However, there is a belief that financial development plays a beneficial role in mitigating the adverse impacts of the oil curse by facilitating efficient resource allocation and directing the oil rent towards productive sectors (i.e. the manufacturing sector) (Ali et al., 2022). This view suggests that financial development can alleviate information asymmetry, mitigate financial constraints, and promote more effective resource allocation (Levine, 1997). Nonetheless, a contradictory discussion has been presented by the extant studies, suggesting that an underdeveloped financial sector may exacerbate the adverse impacts of oil rent dependence by dampening investment quality (Rongwei and Xiaoying, 2020). This argument is further substantiated by the reality that oil-cursed countries typically have a low level of financial development (van der Ploeg and Poelhekke, 2009).

While Badeeb, Szulczyk, and Lean (2021) underlined that oil rent dependence adversely impacts the manufacturing sector via the Dutch disease mechanism, there remains a notable research gap regarding the nexus between oil rent dependence and the production and export of the manufacturing sector. Furthermore, Badeeb, Clark, and Philip (2023) have emphasised the necessity for future investigations to delve into the impacts of oil rent dependence on the disaggregated components of the manufacturing sector. Addressing this knowledge gap will enable policymakers to formulate targeted policies that can effectively tackle the challenges associated with the development of the manufacturing sector. Besides, while there is a theoretical acknowledgement of the pivotal role of financial development in alleviating the oil curse through efficient resource allocation, empirical evidence on the moderation effect of financial development on the relationship between oil rent dependence and the manufacturing sector remains scarce. The contradictory discussions regarding the role of financial development also further indicate the presence of significant research gap that needs to be bridged. By doing so, policymakers can be provided with a clearer understanding of the current state of financial development and its implications for the Malaysian manufacturing sector.

In this research, we aim to investigate the impacts of oil rent dependence on the sustainability of the manufacturing sector within the context of Malaysia. In accordance with the Dutch disease theory, which asserts that oil rent dependence dampens the manufacturing sector from the aspect of production and export, we first examine the impact of oil rent dependence on the production and export of the manufacturing sector empirically. Subsequently, we investigate the moderation effect of financial development on the impact of oil rent dependence on the production and export of the manufacturing sector. While the results indicate an absence of a significant effect of oil rent dependence on manufactured exports, it is found that the adverse impacts of oil rent dependence on the production of the manufacturing sector are transmitted via financial development in Malaysia. The robustness tests conducted further validate the reliability and robustness of the results.

This research is conducted in Malaysia, an oil-based emerging economy (Badeeb et al., 2021) for several reasons. Firstly, despite the presence of a robust manufacturing sector, Malaysia's economy is known to have a high dependency on oil rent (Shangle and Solaymani, 2020), making it vulnerable to oil price volatility (Central Intelligence Agency, 2022). Secondly, the Malaysian government has voiced its concerns about the economy being caught in the middle-income trap, signifying its failure to transform into higher value-added manufacturing activities (Doraisami, 2015). According to Badeeb, Szulczyk, and Lean (2021), this can be attributed to oil rent dependence which dampens the manufacturing sector through the Dutch disease. Thirdly, while the previous studies have suggested that Malaysia has succeeded in escaping the oil curse through diversification and industrialisation (Auty, 2007; Gylfason, 2001), more recent research has offered contradictory arguments, indicating the potential existence of the oil curse phenomenon in Malaysia (Badeeb et al., 2021; Doraisami, 2015). This argument is also backed by the fact that oil resources led to the prosperity of the manufacturing sector during the 1970s and a subsequent contraction of the sector (-3.8%) during 1985-1986 (Doraisami, 2015). Therefore, the aforementioned discussions serve as the motivation for us to conduct an in-depth investigation into the impact of oil rent dependence on the production and export of the Malaysian manufacturing sector, with a specific emphasis on the moderating role of financial development.

This research makes valuable contributions to the literature in several folds. Firstly, it addresses the research gap by examining the relationship between oil rent dependence and the sustainability of the manufacturing sector. By investigating the impact of oil rent dependence on the sustainability of the manufacturing sector, this study sheds light on a crucial aspect that has received limited attention in previous research. These findings will advance the knowledge of policymakers regarding the challenges associated with the sustainable development of the manufacturing sector and provide valuable insights for evidence-based decision-making in the pursuit of the SDGs. Besides, the insights gained from this research also offer practical implications for manufacturers, empowering them to adapt their business strategies to navigate potential risks and seize opportunities for business expansion and new product development.

Secondly, the investigation of the moderation effect of financial development in this research enhances understanding of financial development and offers valuable insights for policymakers and investors. These insights will aid them in making more informed decisions regarding investment strategies, resource allocation and risk management. Moreover, considering the crucial role of a well-developed financial sector in facilitating sustainable industrialisation through effective resources allocation (Nkemgha et al., 2023), as well as the potential hindrances posed by an underdeveloped one, this research provides valuable insights for attaining SDG 9 (Industry, Innovation and Infrastructure). Precisely, this research sheds light on the current state of financial development in Malaysia by demonstrating how it can moderate the impact of oil rent dependence on the sustainability of the manufacturing sector.

The remainder of this research is organised as follows: Section 2 focuses on the literature review, while the data, model and methodology are presented in Section 3. In Section 4, we focus on the empirical findings and discussions, whereas the conclusion and policy implications are presented in Section 5.

Literature Review

The extant literature on oil curse is extensive and concentrates particularly on the impacts of oil rent dependence on other economic sectors, such as the agriculture sector (Apergis et al., 2014), and banking sector (Umar et al., 2021) as well as on economic growth (Majumder et al., 2020; Okoye et al., 2022; Satti et al., 2014). Based on Ofori-Sasu et al. (2023), oil rent refers to the difference between the production value of crude oil at the world price and its total production costs. Meanwhile, oil rent dependence is defined as the degree to which a country's economy depends on oil rent (Wu et al., 2018). Prior to the research of Nankani (1979), the impact of oil rent dependence was largely unknown. It is only since the study of Sachs and Warner (1995) that the research of the "natural resource curse" or "oil curse" has gained momentum.

Since the influential work of Sachs and Warner (1995), a substantial body of literature has extensively examined the role of oil resources in various countries (Damette and Seghir, 2018; Rahim et al., 2021; Ramírez-Cendrero and Wirth, 2016). After a thorough examination of the literature, it is evident that the majority of the studies have highlighted the adverse impacts of oil rent dependence on tradable sectors (Hosein et al., 2023; Ma and Wang, 2023), primarily attributing them to the Dutch disease phenomenon which arises from a high level of dependency on oil rent (Badeeb et al., 2017). The Dutch disease theory, otherwise known as the dependent economy model or Australian model, was first introduced by Corden and Neary (1982). This theory postulates that the oil resources boom will lead to the contraction of other tradable sectors, particularly the manufacturing sector, through an exchange rate appreciation and resource reallocation (Corden, 1984). Specifically, the Dutch disease phenomenon impinges on the manufacturing sector through the spending effect and the pulling effect.

On the one hand, the spending effect, which is also known as indirect deindustrialisation (Smith, 2019), occurs when the additional income generated from the oil resources boom stimulates the excessive demand for the services sector, resulting in increased prices within this sector (Alssadek and Benhin, 2021). Considering that the prices of the tradable sector are determined by the global market demand (Brahmbhatt et al., 2010), an increase in the prices of non-tradable sectors relative to the tradable sector leads to the inflation and appreciation of the exchange rate (Torvik, 2001). This, in turn, weakens the competitiveness of manufactured exports in the international market (Bunte, 2016; Rajan and Subramanian, 2011). Besides, the excessive demand for the services sector will result in higher wages, inducing the labour to shift away from the manufacturing sector and leading to a decline in its production (Mien and Goujon, 2022).

On the other hand, the pulling effect, otherwise known as direct deindustrialisation (Shao et al., 2020), occurs when oil resource boom leads to a shift of production factors away from the manufacturing sector and towards the oil resource and services sectors (Chang et al., 2021).

This can be ascribed to the higher marginal product within these sectors (Barczikay et al., 2020). In the study of Mogotsi (2002), the author further highlighted that even though the decline in the employment of the manufacturing sector may be offset by unskilled or unemployed labour, the overall production of the manufacturing sector will reduce nonetheless due to the less-skilled workers. This scenario is also claimed to further appreciate the exchange rate, primarily driven by the booming services sector at the expense of the manufacturing sector (Hao et al., 2021).

Unlike other oil-abundant countries that have been definitely categorised as either escaping or suffering from the oil curse phenomenon, researchers have long debated the status of Malaysia (Badeeb et al., 2016). While earlier studies regarded Malaysia as one of the countries that successfully escaped the oil curse (Auty, 2007; Gylfason and Zoega, 2006; Sachs and Warner, 1997, 2001), recent literature presents a contradictory argument, suggesting that Malaysia is experiencing the manifestation of the oil curse (Doraisami, 2015). For instance, Badeeb, Szulczyk, and Lean (2021) revealed that the oil curse dampens Malaysia's manufacturing sector via the Dutch disease. Given the double-edged sword characteristics of oil rent (Frankel, 2010), Badeeb, Clark, and Philip (2023) found that the negative impacts of oil rent dependence outweigh the positive impacts, leading to the shrinkage of the manufacturing sector in Malaysia when the share of oil rent in gross domestic product (GDP) exceeds 8%.

Since the work of Schumpeter (1912), an increasing emphasise has been placed by policymakers and researchers on the critical role of financial development in stimulating economic growth (Ma and Jalil, 2008). According to Dutta and Meierrieks (2021), financial development can be defined as the improvement of the key functions of the financial sector, which are risk and information management, resource allocation, corporate control, savings mobilisation and the ease of economic transactions. To date, considerable evidence has accumulated to substantiate the favourable role of financial development in promoting economic growth (Jedidia et al., 2014; Bist, 2018; Nguyen et al., 2022; Pradhan et al., 2023; Zhang et al., 2012). This argument is also further supported by Xu (2000) who demonstrated that the positive impact of financial development is channeled via the investment mechanism. However, a contradictory discussion has been presented by Ayadi et al. (2015), who conducted a panel data analysis on the dataset spanning 1985-2009. The authors determined the adverse impacts of financial development on economic growth. This can be attributed to the allocation of credit towards consumption rather than productive activities (Wen et al., 2021).

In the context of the oil curse phenomenon, Moradbeigi and Law (2016) highlighted the mitigation effect of financial development on the adverse impacts of oil price volatility on growth volatility. This finding is also backed by Law and Moradbeigi (2017) and Moradbeigi and Law (2017), who argued that a high level of financial development can alleviate the adverse impacts of oil rent dependence on economic growth through effective oil rent allocation. In a similar vein, Rongwei and Xiaoying (2020) further explained that human capital accumulation and technological innovation are the mechanisms through which financial development can alleviate the negative impacts of oil rent dependence. Despite the favourable role of financial development mentioned in these studies, it is also noticed that oil-dependent countries are typically associated with low levels of financial development (Rongwei and Xiaoying, 2020). According to Beck and Poelhekke (2023), this could be ascribed to the repressed financial system and weak governance. van der Ploeg and Poelhekke (2009) also highlighted that the presence of an underdeveloped financial sector will increase the country's vulnerability to oil price volatility.

After a close examination of the literature, it is evident that there are ambiguous findings regarding financial development in Malaysia. For instance, Badeeb, Lean, and Smyth (2016) shed light on the inefficiency of Malaysia's financial sector in allocating scarce financial resources. This argument is backed by Ang and McKibbin (2007), who underscored that the Malaysian banking sector's lending policy, which generates large non-performing loan, further reflects the inefficiency of the financial sector. In contrast to these studies, Ang (2008) highlighted the favourable role of financial development in promoting the economic growth by triggering public and private investments in Malaysia. In another study, Ang (2009) also argued that the positive impacts of foreign direct investment are channelled through financial development in Malaysia, suggesting the presence of a highly developed financial sector (An et al., 2023). Aside from Malaysia, Beck (1999) also provided evidence supporting the beneficial role of financial development in various other countries, demonstrating that a highly developed financial sector can boost the export of the manufacturing sector.

Aside from the oil curse phenomenon, recent literature also underscores the critical role of financial development in promoting the sustainable development of the manufacturing sector (Yang et al., 2023). For instance, Shahbaz and Lean (2012) situated their study in Tunisia and applied the Granger causality test. The authors found that a well-developed financial sector contributes to the manufacturing sector by stimulating more investments in the sector. In the study conducted by Svilokos, Vojinić, and Šuman Tolić (2019), the period spanning 2005-2015 was analysed with a fixed-effect panel regression model. In doing so, the authors concluded that financial development plays a beneficial role in promoting the development of the manufacturing sector. These favourable outcomes can be attributed to the ability of financial development to mobilize capital towards productive sectors, particularly the manufacturing sector (Kothakapa et al., 2021).

The literature shows that there is a paucity of research examining the impact of oil rent dependence on the sustainability of the manufacturing sector from the aspect of production and export. Furthermore, there is also no single study that scrutinises the moderation effect of financial development on the relationship between oil rent dependence and the production and export of the manufacturing sector. These research gaps highlight the need for further research on financial development in Malaysia.

Data, Methods and Methodology

Data and Variable

The annual data for the period 1970-2019 was employed in this research as it was the period when oil and natural gas resources became increasingly significant in Malaysia's economy (Doraisami, 2015). The data was obtained from different sources, including the World Development Indicators, the Department of Statistics Malaysia, the United Nations Conference on Trade and Development and the Federal Reserve Bank of St. Louis. The details of the data are presented in **Table 1**.

Oil Rent Dependence

According to Wu, Li, and Li (2018), oil rent dependence refers to the degree to which a country's economy relies on oil rent. Following Shahbaz et al. (2019), Matallah (2020) and Badeeb, Clark, and Philip (2023), the share of oil rent in GDP was employed as the indicator for oil rent dependence.

Production of Manufacturing Sector

The share of manufacturing value added in GDP was employed in this research to measure the production of the manufacturing sector. This indicator reflects the total additional output produced by the manufacturing sector (Amadu & Samuel, 2020).

Export of Manufacturing Sector

Following Demetriades, Al-Jebory, and Kamperis (1993), the share of manufactured exports in the total exports was employed as the indicator for manufactured exports.

Financial Development

Due to the multidimensions of financial development (Dogan et al., 2020), several proxies were employed in this research to measure the financial development, with reference to the studies by Asif et al. (2020) and Kim and Lin (2023). The first proxy was the share of domestic credit to the private sector by banks in GDP, which has been widely applied in the literature (Acheampong, 2019; Dwumfour and Ntow-Gyamfi, 2018; Guan et al., 2020). According to Yıldırım et al. (2020), this indicator refers to the financial resources channeled from financial institutions to the private sector. Another proxy is the share of broad money in GDP, a basic measurement of the size of the financial sector (Bittencourt, 2012; Rehman and Hysa, 2021). This indicator is considered the broadest measurement for financial development as it encompasses the activities of financial intermediaries, including banks, central banks and other types of financial institutions (Badeeb and Lean, 2017b).

Table 1 Descriptions of Variables

Variable	Description	Source
MVA	Manufacturing, value added (% of GDP)	World Development Indicators
EXP	Manufactured exports (% of Total Exports)	Department of Statistics Malaysia
ORD	Oil Rent (% of GDP)	World Development Indicators
$FD1$	Domestic credit to private sector by bank (% of GDP)	World Development Indicators
$FD2$	Broad Money (% of GDP)	World Development Indicators
AVA	Agriculture value added (constant 2015 US$)	United Nations Conference on Trade and Development
WR	Labour Compensation (% of GDP)	Federal Reserve Economic Data
$INFRA$	Fixed Telephone Subscriptions per 100 people	World Development Indicators
GDP	GDP per capita	United Nations Conference on Trade and Development

Model

The first objective of this study is to examine the impact of oil rent dependence on the production and export of the manufacturing sector. The rationale for this was to examine whether oil rent dependence dampens the production and export of the manufacturing sector through the pulling and spending effects, as postulated by the Dutch disease theory (Corden & Neary, 1982). Any adverse impact on the production and export of the manufacturing sector will hinder the country's progress towards achieving sustainability in the manufacturing sector. These models will provide important policy implications for attaining SDG 9 (Industry, Innovation and Infrastructure). Thus, following Yilanci, Aslan, and Ozgur (2021), the following model was constructed:

$$MVA_t = \alpha_0 + \alpha_1 ORD_t + \alpha_2 AVA_t + \alpha_3 WR_t + \varepsilon_t \quad (1)$$

where AVA and WR represent the share of agriculture value added in GDP and wage rate, respectively, and ε is the error term. Both AVA and WR are included as control variables as the former influences the production of the manufacturing sector by affecting the supply of production input (Kafando, 2018), while the latter hinders production by increasing production costs (Liew and Chan, 2018).

As inspired by Nawaz, Lahiani, and Roubaud (2019), the following model was specified to investigate the impact of oil rent dependence on the export of the manufacturing sector:

$$EXP_t = \beta_0 + \beta_1 ORD_t + \beta_2 INFRA_t + \beta_3 GDP_t + \vartheta_t \quad (2)$$

where $INFRA$ represents the level of infrastructure, measured by fixed telephone subscriptions (per 100 people), GDP is the GDP per capita in constant 2015US$ and ϑ is the error term. $INFRA$ and GDP are included as control variables due to their positive relationship with manufactured exports (Su et al., 2020).

The second objective was to examine the moderation effect of financial development on the relationship between oil rent dependence and the production and export of the manufacturing sector. The rationale was to investigate whether financial development indirectly affects the sustainability of manufacturing sector through the oil rent dependence channel. Any negative impact will weaken the nexus between oil rent dependence and the production and export of the manufacturing sector. Thus, following the work of Rongwei and Xiaoying (2020), the following models were constructed:

$$MVA_t = \gamma_0 + \gamma_1 ORD_t + \gamma_2 FD1_t + \gamma_3 (ORD * FD1)_t + \gamma_4 AVA_t + \gamma_5 WR_t + \epsilon_t \quad (3)$$

$$MVA_t = \delta_0 + \delta_1 ORD_t + \delta_2 FD2_t + \delta_3 (ORD * FD2)_t + \delta_4 AVA_t + \delta_5 WR_t + \omega_t \quad (4)$$

where ϵ and ω are error terms. $(ORD * FD1)_t$ and $(ORD * FD2)_t$ are the interaction terms between oil rent dependence and financial development, which are used to capture the moderation effect of financial development on the impact of oil rent dependence on the production of the manufacturing sector. At the margin, the impacts of an increase in financial development can be computed by determining the partial derivatives of production of the manufacturing sector with respect to oil rent dependence.

$$\frac{\partial MVA}{\partial ORD} = \gamma_1 + \gamma_3 FD1_t \quad (5)$$

$$\frac{\partial MVA}{\partial ORD} = \delta_1 + \delta_3 FD2_t \quad (6)$$

Equations (5) and (6) indicate how the impact of oil rent dependence on the production of the manufacturing sector changes with the level of financial development. In the scenario that the coefficients of the interaction term are negative and γ_1 and δ_1 are positive, it indicates that an increase in financial development weakens the relationship between oil rent dependence and the production of the manufacturing sector. Conversely, if the coefficients of the interaction term are positive, it implies that an increase in financial development will strengthen the nexus between oil rent dependence and the production of the manufacturing sector.

In an attempt to assess the moderation effect of financial development on the impact of oil rent dependence on the export of the manufacturing sector, the following models were proposed (Law and Moradbeigi 2017):

$$EXP_t = \theta_0 + \theta_1 ORD_t + \theta_2 FD1_t + \theta_3 (ORD_t * FD1_t) + \theta_4 INFRA_t + \theta_5 GDP_t + \mu_t \quad (7)$$

$$EXP_t = \sigma_0 + \sigma_1 ORD_t + \sigma_2 FD2_t + \sigma_3 (ORD_t * FD2_t) + \sigma_4 INFRA_t + \sigma_5 GDP_t + \rho_t \quad (8)$$

where μ and ρ are error terms. Similar to Equations (3) and (4), $(ORD * FD1)_t$ and $(ORD * FD2)_t$ are interaction terms included to capture the moderation role of financial development on the nexus between oil rent dependence and the export of the manufacturing sector.

$$\frac{\partial EXP}{\partial ORD} = \theta_1 + \theta_3 FD1_t \quad (9)$$

$$\frac{\partial EXP}{\partial ORD} = \sigma_1 + \sigma_3 FD2_t \quad (10)$$

Equations (9) and (10) indicate how the impact of oil rent dependence on the export of the manufacturing sector changes with the level of financial development. In the scenario that the coefficients of the interaction term are negative and θ_1 and σ_1 are positive, it indicates that an increase in financial development weakens the relationship between oil rent dependence and the export of the manufacturing sector. Conversely, if the coefficients of the interaction term are positive, it implies that an increase in financial development will strengthen the nexus between oil rent dependence and the export of the manufacturing sector.

Methodology

Unit Root Test

Given that the Autoregressive Distributed Lag (ARDL) bounds test requires the variables to be either I(0) or I(1), this research employed two types of unit root tests to confirm the stationarity of data (Belloumi, 2014; Shrestha and Bhatta, 2018). Following Wang et al. (2023), the Augmented Dickey-Fuller (ADF) and Philips-Perron (PP) unit root tests were applied in this research. In these tests, the null hypothesis of non-stationary was tested against the alternative hypothesis of stationary. The time series data is only considered stationary if the means and variance remain constant over time.

ARDL Bounds Test

In order to investigate the relationship between the variables, the ARDL bounds test, which was developed by Pesaran, Shin, and Smith (2001), was applied in this research for several reasons. Firstly, unlike Engle and Granger (1987) and Johansen and Juselius (1990), which require the use of data with similar integration orders, the ARDL bounds test can be applied on the data with different order of integration (Tursoy and Faisal, 2018). Secondly, the ARDL bounds test allows for examining both the long-run and short-run relationships at the same time (Pesaran et al., 2001). Thirdly, this approach tends to be more effective in smaller sample sizes (Liu and Tu, 2023). Lastly, the endogeneity and serial correlation issues, which arise from time series variables, can be solved by conducting the ARDL bounds test (Yilanci et al., 2021).
The ARDL cointegration equations for this research were as follows:

$$\Delta MVA_t = \alpha_0 + \alpha_1 MVA_{t-1} + \alpha_2 ORD_{t-1} + \alpha_3 AVA_{t-1} + \alpha_4 WR_{t-1} + \sum_{i=1}^{p} \alpha_5 \, \Delta MVA_{t-i} + \sum_{i=1}^{p} \alpha_6 \, \Delta ORD_{t-i} + \sum_{i=1}^{p} \alpha_7 \, \Delta AVA_{t-i} + \sum_{i=1}^{p} \alpha_8 \, \Delta WR_{t-i} + \varepsilon_t \quad (11)$$

$$\Delta EXP_t = \beta_0 + \beta_1 EXP_{t-1} + \beta_2 ORD_{t-1} + \beta_3 INFRA_{t-1} + \beta_4 GDP_{t-1} + \sum_{i=1}^{p} \beta_5 \, \Delta EXP_{t-i} + \sum_{i=1}^{p} \beta_6 \, \Delta ORD_{t-i} + \sum_{i=1}^{p} \beta_7 \, \Delta INFRA_{t-i} + \sum_{i=1}^{p} \beta_8 \, \Delta GDP_{t-i} + \vartheta_t \quad (12)$$

$$\Delta MVA_t = \gamma_0 + \gamma_1 MVA_{t-1} + \gamma_2 ORD_{t-1} + \gamma_3 FD1_{t-1} + \gamma_4 (ORD + FD1)_{t-1} + \gamma_5 AVA_{t-1} + \gamma_6 WR_{t-1} + \sum_{i=1}^{p} \gamma_7 \Delta MVA_{t-i} + \sum_{i=1}^{p} \gamma_8 \Delta ORD_{t-i} + \sum_{i=1}^{p} \gamma_9 \Delta FD1_{t-i} + \sum_{i=1}^{p} \gamma_{10} \Delta (ORD * FD1)_{t-i} + \sum_{i=1}^{p} \gamma_{11} \Delta AVA_{t-i} + \sum_{i=1}^{p} \gamma_{12} \Delta WR_{t-i} + \epsilon_t \quad (13)$$

$$\Delta MVA_t = \delta_0 + \delta_1 MVA_{t-1} + \delta_2 ORD_{t-1} + \delta_3 FD1_{t-1} + \delta_4 (ORD + FD2)_{t-1} + \delta_5 AVA_{t-1} + \delta_6 WR_{t-1} + \sum_{i=1}^{p} \delta_7 \Delta MVA_{t-i} + \sum_{i=1}^{p} \delta_8 \Delta ORD_{t-i} + \sum_{i=1}^{p} \delta_9 \Delta FD1_{t-i} + \sum_{i=1}^{p} \delta_{10} \Delta (ORD * FD2)_{t-i} + \sum_{i=1}^{p} \delta_{11} \Delta AVA_{t-i} + \sum_{i=1}^{p} \delta_{12} \Delta WR_{t-i} + \omega_t \quad (14)$$

$$\Delta EXP_t = \theta_0 + \theta_1 EXP_{t-1} + \theta_2 ORD_{t-1} + \theta_3 FD1_{t-1} + \theta_4 (ORD + FD1)_{t-1} + \theta_5 INFRA_{t-1} + \theta_6 GDP_{t-1} + \sum_{i=1}^{p} \theta_7 \Delta EXP_{t-i} + \sum_{i=1}^{p} \theta_8 \Delta ORD_{t-i} + \sum_{i=1}^{p} \theta_9 \Delta FD1_{t-i} + \sum_{i=1}^{p} \theta_{10} \Delta (ORD * FD1)_{t-i} + \sum_{i=1}^{p} \theta_{11} \Delta INFRA_{t-i} + \sum_{i=1}^{p} \theta_{12} \Delta GDP_{t-i} + \mu_t \quad (15)$$

$$\Delta EXP_t = \sigma_0 + \sigma_1 EXP_{t-1} + \sigma_2 ORD_{t-1} + \sigma_3 FD1_{t-1} + \sigma_4 (ORD + FD2)_{t-1} + \sigma_5 INFRA_{t-1} + \sigma_6 GDP_{t-1} + \sum_{i=1}^{p} \sigma_7 \Delta EXP_{t-i} + \sum_{i=1}^{p} \sigma_8 \Delta ORD_{t-i} + \sum_{i=1}^{p} \sigma_9 \Delta FD1_{t-i} + \sum_{i=1}^{p} \sigma_{10} \Delta (ORD * FD2)_{t-i} + \sum_{i=1}^{p} \sigma_{11} \Delta INFRA_{t-i} + \sum_{i=1}^{p} \sigma_{12} \Delta GDP_{t-i} + \rho_t \quad (16)$$

where $(\alpha_1, \alpha_2, \alpha_3, \alpha_4)$, $(\beta_1, \beta_2, \beta_3, \beta_4)$, $(\gamma_1, \gamma_2, \gamma_3, \gamma_4, \gamma_5, \gamma_6)$, $(\delta_1, \delta_2, \delta_3, \delta_4, \delta_5, \delta_6)$, $(\theta_1, \theta_2, \theta_3, \theta_4, \theta_5, \theta_6)$, and $(\sigma_1, \sigma_2, \sigma_3, \sigma_4, \sigma_5, \sigma_6)$ denote the long-run coefficients whereas $(\alpha_5, \alpha_6, \alpha_7, \alpha_8)$, $(\beta_5, \beta_6, \beta_7, \beta_8)$, $(\gamma_7, \gamma_8, \gamma_9, \gamma_{10}, \gamma_{11}, \gamma_{12})$, $(\delta_7, \delta_8, \delta_9, \delta_{10}, \delta_{11}, \delta_{12})$, $(\theta_7, \theta_8, \theta_9, \theta_{10}, \theta_{11}, \theta_{12})$ and $(\sigma_7, \sigma_8, \sigma_9, \sigma_{10}, \sigma_{11}, \sigma_{12})$ represent the short-run coefficients. Following Pesaran, Shin, and Smith (2001), the Wald or F-statistic test was applied to determine the existence of the cointegration relationship. The null hypotheses were as follows: $H_0\colon \alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = 0$; $H_0\colon \beta_1 = \beta_2 = \beta_3 = \beta_4 = 0$; $H_0\colon \gamma_1 = \gamma_2 = \gamma_3 = \gamma_4 = \gamma_5 =$

$\gamma_6 = 0$; $H_0: \delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = \delta_6 = 0$; $H_0: \theta_1 = \theta_2 = \theta_3 = \theta_4 = \theta_5 = \theta_6 = 0$; $H_0: \sigma_1 = \sigma_2 = \sigma_3 = \sigma_4 = \sigma_5 = \sigma_6 = 0$ which imply that there is no cointegration between the variables tested against the alternative hypotheses. The computed F-statistic value was compared with the critical value obtained from Narayan (2005). If the computed F-statistic value is greater than the upper bound critical value, the null hypothesis of no cointegration will be rejected, and it is concluded that the variables are cointegrated. Conversely, if the computed F-statistic value is less than the lower bound critical value, the null hypothesis will be accepted, indicating the absence of a relationship between the variables. However, if the computed F-statistic value lies between the upper-bound and lower-bound critical values, the results will be considered inconclusive.

According to Kremers, Ericsson, and Dolado (1992), the Error Correction Term (ECT) can act as an alternative in examining the presence of cointegration among the variables. The ECM versions of Equation (11), (12), (13), (14), (15) and (16) were as follows:

$$\Delta MVA_t = \alpha_0 + \sum_{i=1}^{p} \alpha_1 \Delta MVA_{t-i} + \sum_{i=1}^{p} \alpha_2 \Delta ORD_{t-i} + \sum_{i=1}^{p} \alpha_3 \Delta AVA_{t-i} + \sum_{i=1}^{p} \alpha_4 \Delta WR_{t-i} + \tau_1 ECT_{t-1} + \varepsilon_t \quad (17)$$

$$\Delta EXP_t = \beta_0 + \sum_{i=1}^{p} \beta_1 \Delta EXP_{t-i} + \sum_{i=1}^{p} \beta_2 \Delta ORD_{t-i} + \sum_{i=1}^{p} \beta_3 \Delta INFRA_{t-i} + \sum_{i=1}^{p} \beta_4 \Delta GDP_{t-i} + \tau_2 ECT_{t-1} + \vartheta_t \quad (18)$$

$$\Delta MVA_t = \gamma_0 + \sum_{i=1}^{p} \gamma_1 \Delta MVA_{t-i} + \sum_{i=1}^{p} \gamma_2 \Delta ORD_{t-i} + \sum_{i=1}^{p} \gamma_3 \Delta FD1_{t-i} + \sum_{i=1}^{p} \gamma_4 \Delta (ORD * FD1)_{t-i} + \sum_{i=1}^{p} \gamma_5 \Delta AVA_{t-i} + \sum_{i=1}^{p} \gamma_6 \Delta WR_{t-i} + \tau_3 ECT_{t-1} + \epsilon_t \quad (19)$$

$$\Delta MVA_t = \delta_0 + \sum_{i=1}^{p} \delta_1 \Delta MVA_{t-i} + \sum_{i=1}^{p} \delta_2 \Delta ORD_{t-i} + \sum_{i=1}^{p} \delta_3 \Delta FD1_{t-i} + \sum_{i=1}^{p} \delta_4 \Delta (ORD * FD2)_{t-i} + \sum_{i=1}^{p} \delta_5 \Delta AVA_{t-i} + \sum_{i=1}^{p} \delta_6 \Delta WR_{t-i} + \tau_4 ECT_{t-1} + \omega_t \quad (20)$$

$$\Delta EXP_t = \theta_0 + \sum_{i=1}^{p} \theta_1 \Delta EXP_{t-i} + \sum_{i=1}^{p} \theta_2 \Delta ORD_{t-i} + \sum_{i=1}^{p} \theta_3 \Delta FD1_{t-i} + \sum_{i=1}^{p} \theta_4 \Delta (ORD * FD1)_{t-i} + \sum_{i=1}^{p} \theta_5 \Delta INFRA_{t-i} + \sum_{i=1}^{p} \theta_6 \Delta GDP_{t-i} + \tau_5 ECT_{t-1} + \mu_t \quad (21)$$

$$\Delta EXP_t = \sigma_0 + \sum_{i=1}^{p} \sigma_1 \Delta EXP_{t-i} + \sum_{i=1}^{p} \sigma_2 \Delta ORD_{t-i} + \sum_{i=1}^{p} \sigma_3 \Delta FD1_{t-i} + \sum_{i=1}^{p} \sigma_4 \Delta (ORD * FD2)_{t-i} + \sum_{i=1}^{p} \sigma_5 \Delta INFRA_{t-i} + \sum_{i=1}^{p} \sigma_6 \Delta GDP_{t-i} + \tau_6 ECT_{t-1} + \rho_t \quad (22)$$

Diagnostic Tests

Several diagnostic tests were applied in this study to ensure the health of the econometric models. The first diagnostic test was the Lagrange Multiplier (LM) test for serial correlation, which occurs when the errors are sequentially correlated over the study period (Anderson, 1954). Following the LM test, autoregressive conditional heteroskedasticity (ARCH) was applied to test heteroscedasticity, which refers to the presence of an inconstant variance along the regression line (Nelsen, 2023). Another issue that demanded our attention was the misspecification in the models. According to Plosser, Schwert, and White (1982), the presence of a misspecification issue in the model can lead to biased outcomes, and thereby, impede the consistency of coefficient estimators. Therefore, following the study of Badeeb, Lean, and Smyth (2016), Badeeb and Lean (2017) and Badeeb, Szulczyk, and Lean (2021), misspecification was tested by employing the Ramsey Regression Equation Specification Error Test (RESET).

Stability Test

Following Vijayalakshmi and Raj (2020), the cumulative sum of recursive residuals (CUSUM) and cumulative sum of squares of recursive residuals (CUSUMSQ) tests, which were first introduced by Brown, Durbin, and Evans (1975), were applied in this study to confirm the stability of the econometric models. If the plots of CUSUM and CUSUMSQ lie within the critical boundaries of a 5% level of significance, the null hypothesis of stable regression coefficients cannot be rejected (Shahid et al., 2024).

Robustness Test

Given that the robustness of the results is of particular interest for an empirical study, the robustness test was also conducted in this research (Lu and White, 2014). Following Mehrara (2009) and Cockx and Francken (2016), this research tested the sensitivity of results to the data frequency and additional control variables.

The annual data spanning 1970-2019 was first converted to quarterly data through the quadratic match-sum method, which is claimed to be more convenient in comparison to the interpolation method (Sbia et al., 2014; Shahbaz et al., 2017, 2018). This method poses the advantage of eliminating point-to-point data variations when converting annual data into quarterly data (Sharif et al., 2020).

In the model examining the production of the manufacturing sector, the investment (INV) was included as the additional control variable. The rationale behind the inclusion of this control variable is that empirical findings have demonstrated a positive relationship between investment and the production of the manufacturing sector (Jamaliah, 2016; Saba and Ngepah, 2023). This variable was also included as the control variable in the study by Nnyanzi et al. (2022). Therefore, in line with Wilantari et al. (2022) and Dinga (2023), the share of gross fixed capital formation in GDP was used as the proxy for the investment. Another control variable, foreign direct investment (FDI), was included in the model estimating the export of the manufacturing sector. The inclusion of this variable is mainly due to its ability to facilitate the transfer and dissemination of technology and improve product quality, thereby, establishing a competitive advantage for manufactured exports (Anwar and Sun, 2018; Rahmaddi and Ichihashi, 2013). In this research, the foreign direct investment was proxied by the net inflow of foreign direct investment (% of GDP). This indicator was also used by Nguyen and Lee (2021) and W. Wang et al. (2023).

Empirical Result and Discussion

The empirical findings of this research are presented in this section, beginning with the descriptive statistics, followed by the unit root test, ARDL bounds test, diagnostic test, stability tests and robustness test.

Descriptive Statistics

The descriptive statistics of the variables employed in this research are presented in **Table *2***. In contrast to other variables, WR, MVA and EXP have the lowest standard deviation at 0.0923, 0.1954 and 0.3426, respectively. Besides, the substantial difference between the maximum and minimum values of ORD indicates that this variable is highly volatile during the study period.

Table 2 Descriptive Statistics

Variable	Mean	Median	Maximum	Minimum	Standard Deviation
MVA	3.1249	3.1293	3.4319	2.6220	0.1954
EXP	2.3014	2.1891	3.2222	1.8886	0.3426
ORD	1.5887	1.6226	4.1989	0.4615	0.6258
$FD1$	1.3904	4.6501	5.0427	3.0581	0.5570
$FD2$	4.6289	4.8024	4.9471	3.7112	0.3437
AVA	9.6105	9.6470	10.1659	8.5888	0.3874
WR	1.1345	1.1851	1.1851	0.9264	0.0923
$INFRA$	2.0748	2.6775	3.1597	0.0381	1.0288

GDP	8.5018	8.6187	9.3406	7.3646	0.5347

Unit Root Test

Although the ARDL bounds test can be applied to data with a mixed order of integration, the dependent variables must be I(1) while the independent variables must be either I(0) or I(1). Therefore, to confirm the stationarity of data, both the ADF and PP unit root tests were applied in this research. Based on the results presented in **Table 3**, all the variables are I(1), with the exception of ORD, AVA and GDP being I(0). Since the variables applied in this study meet the requirements of the ARDL bounds test, we proceeded with our study by applying the ARDL bounds test.

Table 3 Results of Unit Roo Tests

Variable	**ADF**		**PP**	
	Level	1^{st} Difference	Level	1^{st} Difference
MVA	-1.2916	-5.2747***	-1.3972	-5.2768***
EXP	-1.5058	-10.3477***	-1.5341	-9.9089***
ORD	-8.1135***		-8.8170***	
$FD1$	-1.5525	-6.8334***	-1.5431	-6.8332***
$FD2$	-2.8033	-6.5604***	-2.6917	-7.6317***
AVA	-5.8837***		-5.4260***	
WR	-0.5552	-5.3704***	-0.7391	-3.9420**
$INFRA$	-1.3751	-4.2485***	-0.9132	-4.1811***
GDP	-4.1247**		-4.0323**	

Note: *** and ** denote significant at 1% and 5% level, respectively.

ARDL Bounds Test

As the ARDL bounds test is sensitive to the number of lags, Schwarz Information Criterion was employed to select the optimal lag length. The results of the ARDL bounds test are presented in **Table 4**. The results confirm the presence of a long-run relationship between the variables in the first four models. Despite the inconclusive results obtained from the F-statistic test regarding the presence of a long-run relationship in Model 5 and Model 6, ECT can be considered an alternative way of determining the existence of cointegration between the variables (Kremers et al., 1992). The negative estimated coefficients of the lagged ECT indicate that cointegration exists in all models.

Table 4 Results of ARDL Bounds Test

	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
Optimal Lag	(2,1,2,0)	(2,0,0,2)	(2,0,0,1,0,0)	(1,0,2,1,0,0)	(2,0,0,0,0,2)	(2,0,0,0,0,2)
F-Statistic	4.7633**	4.9774**	4.7412**	5.4578**	3.3258	3.2792
ECT_{t-1}	-0.2335***	-0.3624***	-0.3079***	-0.2890***	-0.3921***	-0.3436***

Critical Values	**K=3**			**K=5**		
	1%	**5%**	**10%**	**1%**	**5%**	**10%**
Lower Bound	4.865	3.500	2.873	3.955	2.900	2.435
Upper Bound	6.360	4.700	3.973	5.583	4.218	3.600

Note: Critical bound values obtained from Narayan (2005) with unrestricted intercept and no trend. *** and ** denote significant at 1% and 5% level, respectively.

Long-Run and Short-Run Analysis

Since that the variables are cointegrated with each other in all models, we proceed to conduct the long-run and short-run analysis to examine the impact of oil rent dependence on the production and export of the manufacturing sector from the aspect of production and export, with a particular focus on the moderation effect of financial development on this relationship. The results of long-run and short-run analysis are shown in **Table 5**.

Table 5 Results of Long-Run and Short-Run Analysis

Model	1	2	3	4	5	6
Dependent Variable	MVA	EXP	MVA	MVA	EXP	EXP
Panel A: Long-Run Results						
C	-1.0105** (-1.9643)	-1.8900** (2.5979)	-2.1385*** (-2.7314)	-1.7946** (-2.5922)	-1.4249 (-1.4373)	-2.1224** (-2.3180)
ORD	-0.1067** (-2.2892)	-0.0751 (-1.1702)	0.5926*** (2.9619)	1.1374*** (3.3691)	0.0375 (0.0864)	0.0536 (0.0663)
$FD1$	-	-	0.2088** (2.3563)	-	-0.2554 (-0.7161)	-
$FD2$	-	-	-	0.4367** (2.4799)	-	0.2815 (0.6027)
$ORD * FD1$	-	-	-0.1753*** (-3.2852)	-	-0.0314 (-0.2825)	-
$ORD * FD2$	-	-	-	-0.2860*** (-3.5967)	-	-0.0328 (-0.1743)
AVA	0.5422*** (4.5308)	-	0.6786*** (3.8403)	0.5098*** (3.0426)	-	-
WR	-2.1722*** (-5.5166)	-	-2.5632*** (-5.8364)	-2.4029*** (-6.8735)	-	-
$INFRA$	-	-0.3534*** (-3.3881)	-	-	-0.1822 (-0.7856)	-0.3882*** (-3.2261)
GDP	-	0.4223** (2.2489)	-	-	0.3346 (1.6378)	0.3900* (1.8417)
Panel B: Short-Run Results						
$\Delta ORD(-1)$	-0.0249*** (-2.7205)	-	-	-	-	-
ΔORD	-	-0.0272 (-1.0736)	0.1825** (2.5472)	0.3287*** (2.7979)	0.0147 (0.0854)	0.0184 (0.0658)
$\Delta FD1$	-	-	0.0643** (2.1598)	-	-0.1001 (-0.7346)	-
$\Delta FD2$	-	-	-	-	-	0.0967 (0.6178)

$\Delta FD2(-1)$	-	-	-	0.1262** (2.3717)	-	-
$\Delta ORD * FD1$	-	-	-	-	-0.0123 (-0.2708)	-
$\Delta ORD * FD1(-1)$	-	-	-0.0540*** (-2.8366)	-	-	-
$\Delta ORD * FD2$	-	-	-	-	-	-0.0112 (-0.1710)
$\Delta ORD * FD2(-1)$	-	-	-	-0.0826*** (-3.0017)	-	-
ΔAVA	-	-	0.2090*** (2.7310)	0.1473** (2.0929)	-	-
$\Delta AVA(-1)$	0.1266** (2.3041)	-	-	-	-	-
ΔWR	-0.5071*** (-3.0453)	-	-0.7893*** (-3.7338)	-0.6945*** (-3.6337)	-	-
$\Delta INFRA$	-	-0.1281* (-1.9490)	-	-	-0.0714 (-0.7215)	-0.1334* (-1.8885)
$\Delta GDP(-1)$	-	0.1530* (1.9231)	-	-	0.1312 (1.5411)	0.1340 (1.5678)
ECT_{t-1}	-0.2335*** (-4.5298)	-0.3624*** (-4.6263)	-0.3079*** (-5.6652)	-0.2890*** (-6.0873)	-0.3921*** (4.7519)	-0.3436*** (-4.7185)

Note: ***, ** and * denote significant at 1%, 5% and 10% level, respectively. T-statistics are presented in parenthesis.

The results in Panel A reveal that oil rent dependence adversely impacts the production of the manufacturing sector in the long-run. This can be ascribed to the fact that wages offered by Malaysia's oil resources sector are three times higher than those offered by the manufacturing sector (Department of Statistics Malaysia, 2017a, 2017b). According to the pulling effect of the Dutch disease, the oil resources boom results in higher wages in the oil resource sector, inducing the labour to shift out of the manufacturing sector and subsequently reducing its output (Algieri, 2011). Our findings align with those of Badeeb, Szulczyk, and Lean (2021), who provided strong evidence for the adverse impact of the oil curse on the manufacturing sector, which is transmitted via the Dutch disease. However, this finding is contrary to those of Gylfason and Zoega (2006) and Auty (2007), who suggested that Malaysia has successfully overcome the oil curse through industrialisation and diversification.

On the one hand, the findings of this research indicate the positive relationship between agriculture value added and the production of the manufacturing sector. This finding is in consistent with the argument of Shifa (2015), who asserted that the agriculture sector contributes to the manufacturing sector through market creation. Mellor and Johnston (2012) further highlighted that the increase in demand resulting from the expansion of the agriculture sector will drive substantial growth in manufacturing employment and output. On the other hand, the wage rate is found to adversely impact the production of the manufacturing sector. This is because a higher wage rate will increase production costs, reduce profitability (Xiang et al., 2023), and thereby induce manufacturers to reduce their production.

Nevertheless, the estimated long-run coefficient reflects the absence of significant impact of oil rent dependence on manufactured exports. This result is expected as the stable exchange rate in Malaysia has confirmed the absence of spending effect of the Dutch disease (Chang et al., 2021). Another recent study by Badeeb, Clark, and Philip (2023) also highlighted that the adverse impacts of oil rent dependence on manufactured exports only become significant when the level of dependence surpasses a certain threshold. Unlike oil rent dependence, the results indicate the adverse impacts of the level of infrastructure on manufactured exports, implying the issue of a lack of infrastructure in Malaysia (Rehman et al., 2020). This argument is supported by Chandran, Krishnan, and Devadason (2017), who highlighted that the inadequacy of research and development infrastructure has prevented Malaysia's manufacturers from strengthening their competitiveness in the global market. In contrast, another control variable, economic development, is found to have positive impacts on manufactured exports. This result aligns with prior studies by Ahmad and Harnhirun (1995) and Arnade and Vasavada (1995), both of which substantiated the growth-led hypothesis within the Malaysian context. According to the growth-led hypothesis, economic development acts as a driving force for the expansion of exports (Panta, Devkota, and Banjade 2022).

As we found the adverse impact of oil rent dependence from Model 1, we proceeded to determine the moderation effect of financial development in Model 3 and Model 4. The empirical results reveal the positive impacts of both oil rent dependence and financial development on the production of the manufacturing sector in the long-run. However, the positive impacts of oil rent dependence reduce along with an increase in financial development, as indicated by the negative estimated coefficients of the interaction terms between oil rent dependence and financial development. These results suggest that financial development acts as the mechanism through which the adverse impacts of oil rent dependence are transmitted. This finding aligns with the arguments of Ang and McKibbin (2007), Badeeb, Lean, and Smyth (2016) and Sufian et al. (2016), whose studies highlighted the inefficiency of Malaysia’s financial sector in allocating scarce resources.

Despite the absence of a direct impact of oil rent dependence on manufactured exports, we attempted to determine the indirect impact of oil rent dependence from Model 5 and Model 6. The empirical results pertaining to these two models are shown in columns 6 and 7 of Panel A in **Table 5**. Both financial development and oil rent dependence do not have any significant impact on manufactured exports. The coefficients of the interaction term between oil rent dependence and financial development are insignificant, indicating the presence of an underdeveloped financial sector in Malaysia (Erdoğan et al., 2020). While financial development does not directly affect manufactured exports, the inefficiency of the financial sector is evident in its inadequate allocation of oil rent into productive activities.

Panel B of **Table 5** presents the results of the short-run analysis. Similar to the long-run results, the results reveal that although oil rent dependence adversely impacts the production of the manufacturing sector, it does not have any significant impact on manufactured exports. The results also reveal the weakening effect of financial development on the favourable role of oil rent dependence in promoting the production of the manufacturing sector. The inefficiency of the financial sector is also reflected by the absence of a moderation effect of financial development on the nexus between oil rent dependence and manufactured exports. These findings can be ascribed to the presence of an underdeveloped financial sector in Malaysia as per the arguments of van der Ploeg and Poelhekke (2009) and Rongwei and Xiaoying (2020).

Lastly, the negative sign on the estimated lagged ECT in all models further confirms the presence of a long-run relationship between the variables. These estimated coefficients indicate that the deviation from the long-run equilibrium following a shock is corrected by approximately 23%, 36%, 31%, 29%, 39% and 34% per year, respectively.

Diagnostic and Stability Test

The results of diagnostic tests are presented in **Table 6**. The results show that all models pass the diagnostic tests. Along with the diagnostic tests, the plots of CUSUM and CUSUMSQ presented in Figure 1 to Figure 12 have provided strong evidence for the stability of the coefficients. Although the plots in Figure 2 and Figure 4 exceed the boundaries of 5% due to the Global Financial Crisis and Asian Financial Crisis, the plots of CUSUM in Figure 1 and Figure 3 confirm the stability of the estimated coefficients in Model 1 and Model 2. Despite the oil supply glut in 2015 which causes the plot of CUSUMSQ in Figure 8 to exceed the boundaries, the plot of CUSUM in Figure 7 confirms the stability of the estimated coefficients in Model 4.

Table 6 Results of Diagnostic Tests

Test	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
LM	1.5696 [0.2179]	1.6609 [0.2035]	1.5165 [0.2328]	1.3886 [0.2625]	0.8500 [0.4358]	2.3294 [0.1119]
ARCH	1.4014 [0.2573]	1.6874 [0.1970]	2.0217 [0.1448]	1.6099 [0.2117]	1.5727 [0.2192]	1.9521 [0.1544]
RESET	0.7650 [0.4725]	1.0728 [0.2900]	0.0664 [0.9359]	0.2008 [0.8189]	1.5167 [0.2331]	0.8361 [0.1740]

Note: P-values are presented in brackets.

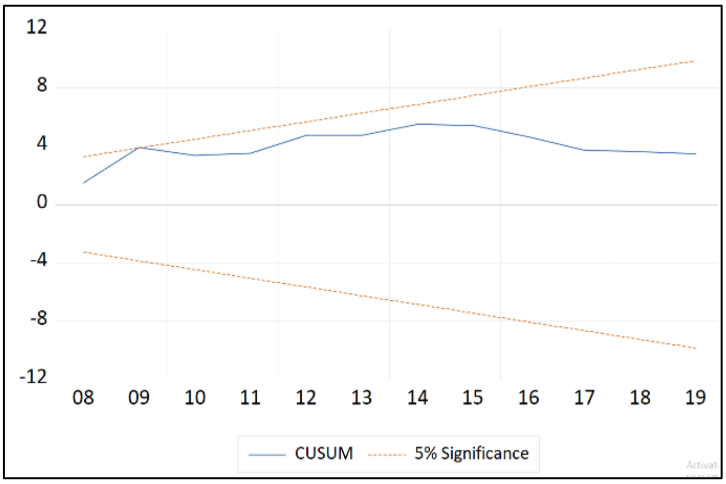

Figure 1 Plot of Cumulative Sum of Recursive Residuals (Model 1)

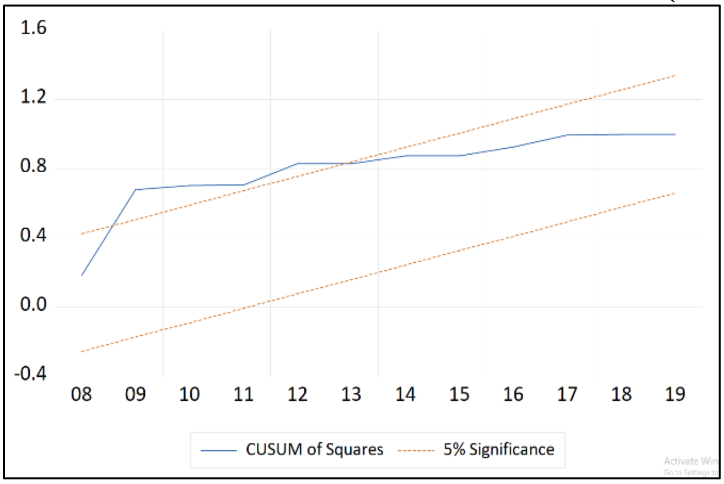

Figure 2 Plot of Cumulative Sum of Squares of Recursive Residuals (Model 1)

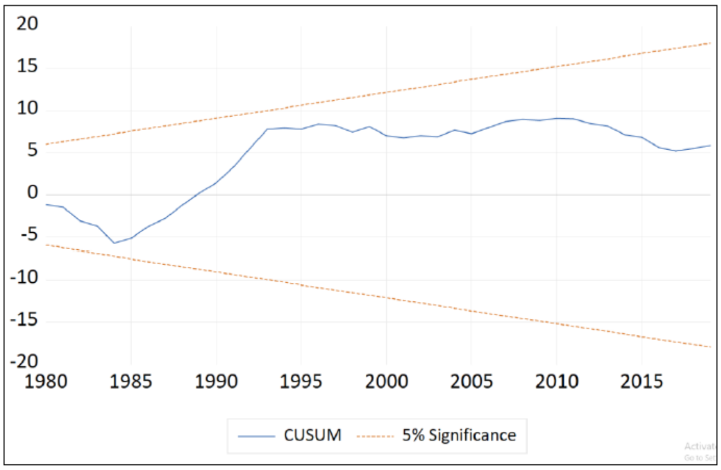

Figure 3 Plot of Cumulative Sum of Recursive Residuals (Model 2)

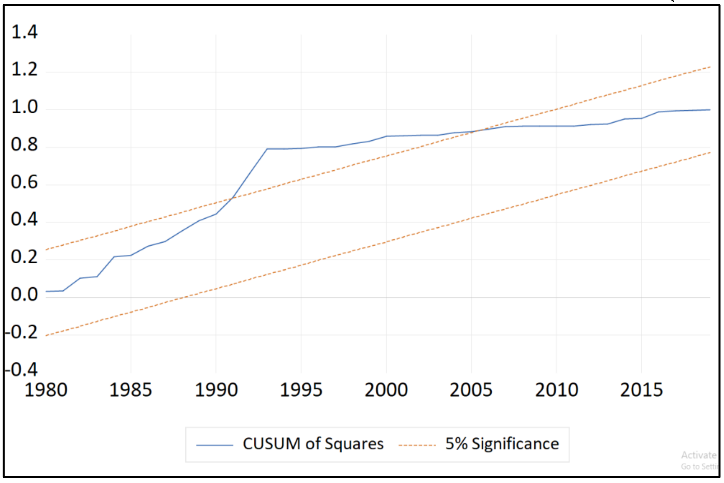

Figure 4 Plot of Cumulative Sum of Squares of Recursive Residuals (Model 2)

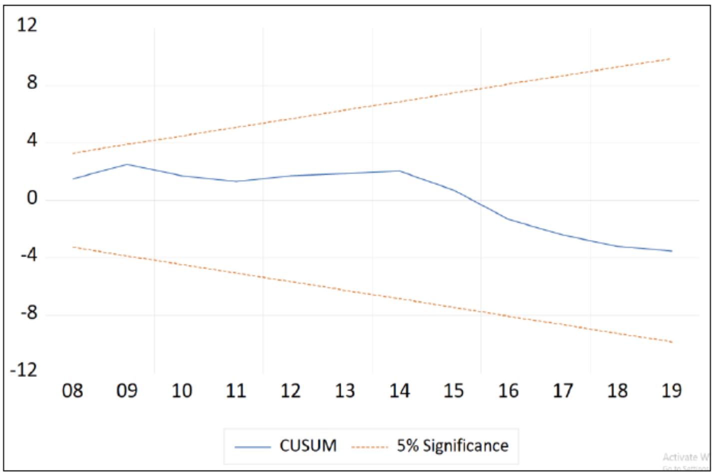

Figure 5 Plot of Cumulative Sum of Recursive Residuals (Model 3)

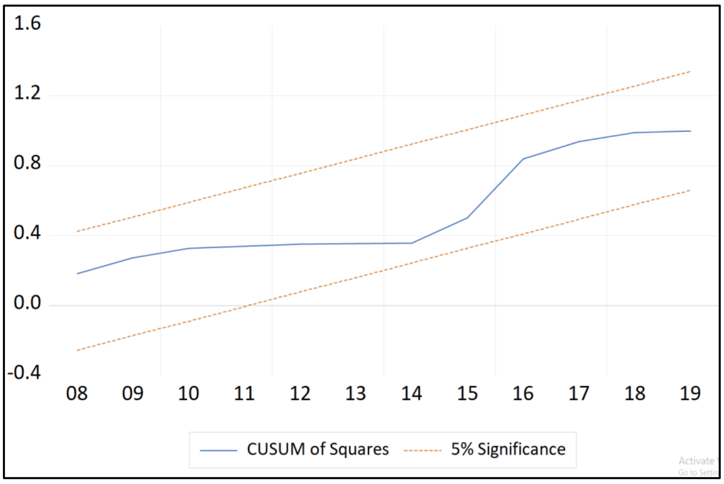

Figure 6 Plot of Cumulative Sum of Squares of Recursive Residuals (Model 3)

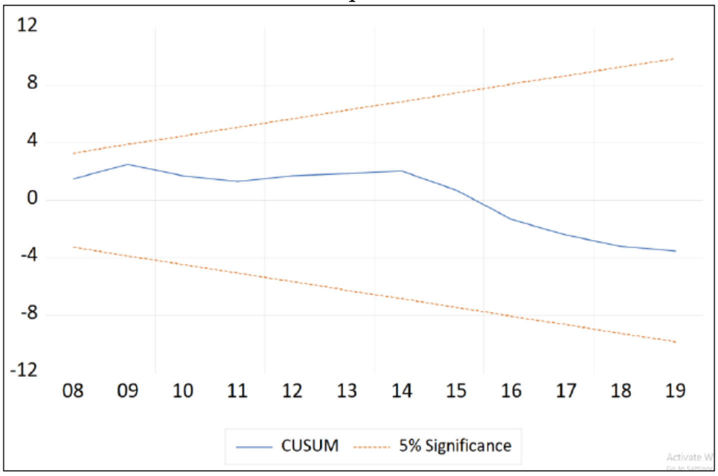

Figure 7 Plot of Cumulative Sum of Recursive Residuals (Model 4)

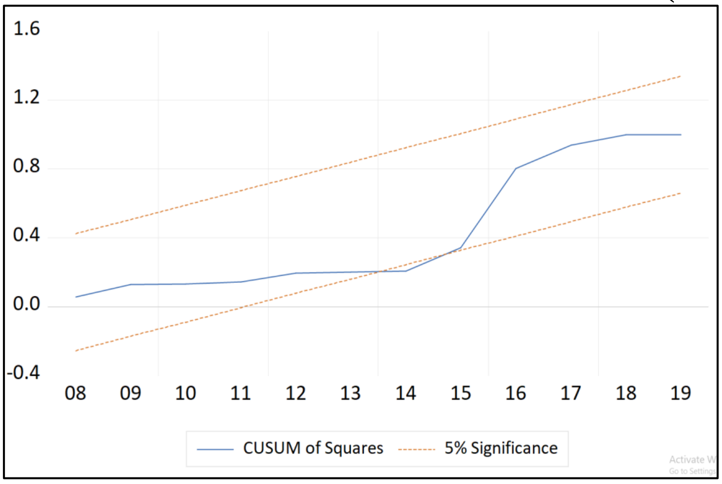

Figure 8 Plot of Cumulative Sum of Squares of Recursive Residuals (Model 4)

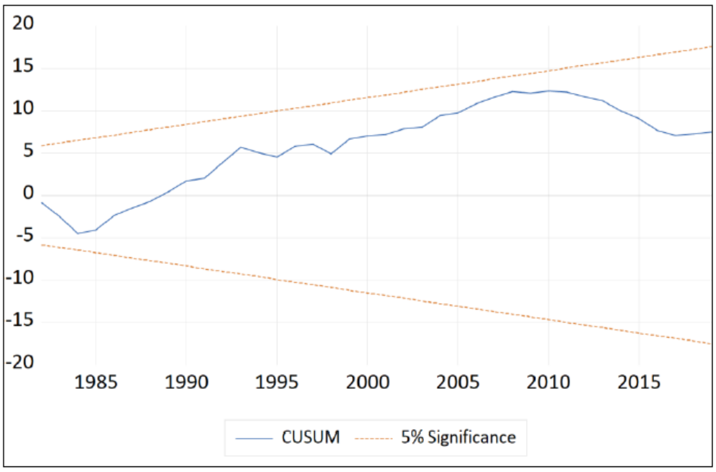

Figure 9 Plot of Cumulative Sum of Recursive Residuals (Model 5)

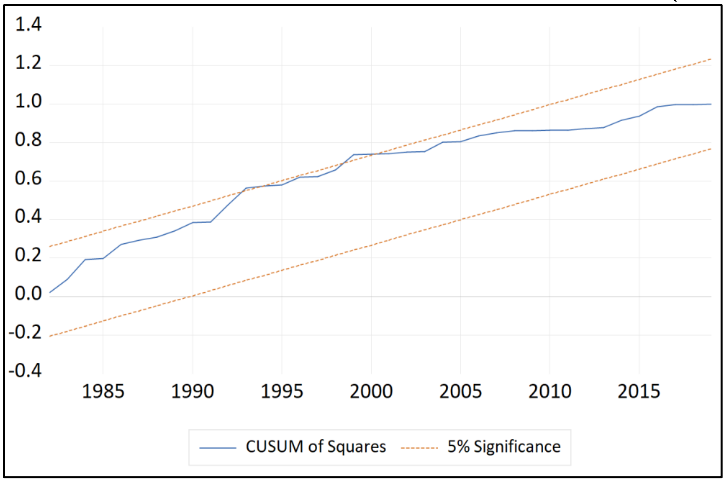

Figure 10 Plot of Cumulative Sum of Squares of Recursive Residuals (Model 5)

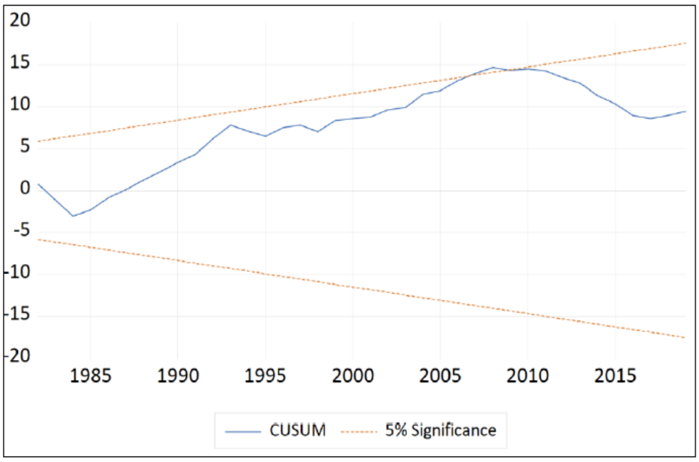

Figure 11 Plot of Cumulative Sum of Recursive Residuals (Model 6)

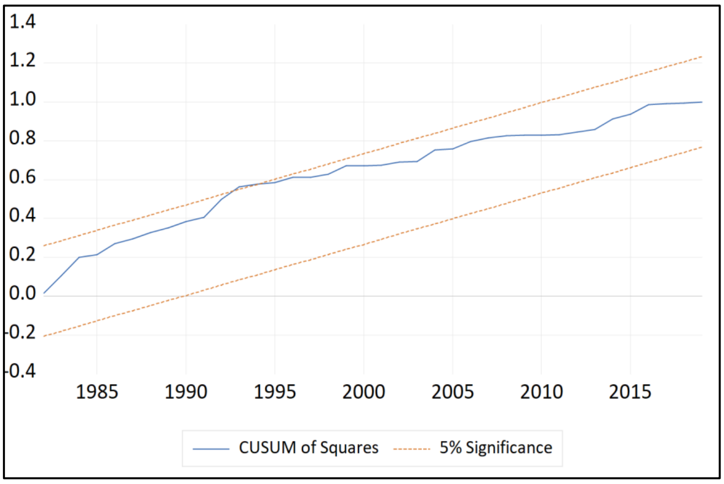

Figure 12 Plot of Cumulative Sum of Squares of Recursive Residuals (Model 6)

Robustness Check

In order to confirm the robustness of the results, following Mehrara (2009), Cockx and Francken (2016) and Law, Kutan, and Naseem (2018), we investigated the sensitivity of the results to data frequency and additional control variables. In general, the results of the robustness check validate the findings of the ARDL bounds test.

Consistent with previous findings, the robustness tests reveal that oil rent dependence exerts a negative impact on the production of the manufacturing sector, while having no significant impact on manufactured exports. Moreover, the robustness tests also confirm the weakening effect of financial development on the positive relationship between oil rent dependence and the production of the manufacturing sector. This observation aligns with our previous argument concerning the underdeveloped financial section in Malaysia, which acts as a mechanism for transmitting the adverse impacts of oil rent dependence. The results also demonstrate the absence of a moderation effect of financial development on the nexus between oil rent dependence and manufactured exports, further substantiating the existence of an underdeveloped financial sector in Malaysia.

Table 7 Robustness Check

Model	1	2	3	4	5	6
Dependent Variable	MVA	EXP	MVA	MVA	EXP	EXP
C	-0.0335** (-2.1005)	-0.0110 (-0.4915)	-0.0703*** (-3.4547)	-0.0682*** (-2.7327)	0.0015 (0.0559)	0.0422 (1.1134)
ORD	-0.0739* (-1.9647)	-0.0533 (-1.1332)	1.0053*** (3.6343)	0.5533*** (3.3997)	0.2429 (0.4130)	0.1868 (0.6520)
$FD1$	-	-	0.3257** (2.4797)	-	-0.2668 (-0.7650)	-
$FD2$	-	-	-	0.2037** (2.2349)	-	-0.3389 (-1.3875)
$ORD * FD1$	-	-	-0.2542*** (-3.7996)	-	-0.0481 (-0.3431)	-
$ORD * FD2$	-	-	-	-0.1656*** (-3.6635)	-	-0.0686 (-0.9000)
AVA	0.5907*** (5.2637)	-	0.5977*** (5.2384)	0.6297*** (3.6838)	-	-

WR	-2.1701*** (-5.1521)	-	-2.4541*** (-8.1566)	-2.5236*** (-6.3095)	-	-
INV	-0.0485 (-0.3954)		-0.0814 (-1.0364)	-0.0640 (-0.7699)	-	-
$INFRA$	-	-0.4239*** (-4.9126)	-	-	-0.2939** (-2.5475)	-0.1655 (-0.9988)
GDP	-	0.4512*** (2.7637)	-	-	0.4722** (2.4928)	0.2906* (1.9028)
FDI	-	0.0435 (0.8272)	-	-	-0.0113 (-0.2083)	0.0357 (0.8776)

Note: ***, ** and * denote significant at 1%, 5% and 10% level, respectively. t-statistics are presented in parenthesis.

Conclusion

This research empirically examines the impact of oil rent dependence on the production and export of the manufacturing sector in Malaysia, with a specific focus on the moderation effect of financial development on this relationship. Our findings indicate that despite the absence of a significant direct impact of oil rent dependence on manufactured exports, the adverse effects of oil rent dependence on the production of the manufacturing sector are transmitted via financial development. Precisely, the underdeveloped financial sector in Malaysia weakens the positive contributions of oil rent dependence to the production of the manufacturing sector and exacerbates its adverse impacts, leading to an overall reduction in output and competitiveness in the manufacturing sector. Our findings align with the study of Badeeb, Lean, and Smyth (2016, pg. 163), who stated that "The financial sector in Malaysia channels funds inefficiently into non-productive investment."

Implications

The findings of this research produce several important policy implications. Firstly, policymakers should prioritise economic diversification to reduce reliance on oil rent and promote the development of other economic sectors. This can be achieved through targeted policies and investments that support the expansion and competitiveness of other sectors. By diversifying the economy, Malaysia can reduce the vulnerability of the manufacturing sector to oil prices shocks and mitigate the risks associated with oil rent dependence. This strategy aligns with SDG 9 (Industry, Innovation and Infrastructure).

Secondly, given the well-established role of a highly-developed financial sector in mitigating the adverse impacts of oil rent dependence and fostering sustainable economic growth, policymakers should prioritise the enhancement of the financial sector in their policy formulation. This can be achieved through measures such as improving the accessibility of financial resources for productive activities, strengthening financial institutions and promoting efficient resource allocation. By creating an enabling environment that supports a robust and resilient financial sector, policymakers can indirectly contribute to SDG 17 (Partnerships for the Goals) by fostering partnerships and collaborations between financial institutions and the manufacturing sector.

Limitation and Future Research Recommendations

The limitations of this research lie in the availability of data from the financial development index introduced by the International Monetary Fund and the exclusion of other potential moderating factors. Thus, it is recommended that future studies consider employing the financial development index once data accessibility and up-to-date information are improved, as such an approach can contribute to greater accuracy in the study's results. Besides, future studies should expand their scope by including additional potential moderators, thereby providing a more comprehensive understanding of oil rent dependence. By incorporating these variables, researchers can offer new insights and enrich the existing knowledge in this area of study.

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