Shadow Economy and Foreign Direct Investment Inflows: Evidence from Malaysia

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Abstract: Despite Malaysia's reputation as one of the most attractive destinations for foreign direct investment (FDI) in Asia, the nation has experienced a downward trend in FDI flows since reaching a peak in 2011. This sustained decline warrants a critical examination of the shadow economy, a lesser-explored determinant of FDI, impeded by measurement challenges. By focusing on the roles of smuggling and tax evasion – two key components of the shadow economy – this study examines their impact on Malaysia's attractiveness to foreign investors. Our research utilises data from Malaysian Customs annual reports from 1999 to 2018 and employs the autoregressive distributed lag technique to analyse the relationship between the shadow economy and FDI inflows. The findings reveal a significant negative impact: the uncertainties created by smuggling and tax evasion impose additional costs on investors, thereby deterring FDI. This study underscores the urgent need for Malaysia to enhance its investment climate through the establishment of transparent and unambiguous laws, rules and regulations, thereby reducing investor uncertainty and revitalising FDI inflows.

Keywords: ARDL, FDI inflow, shadow economy, smuggling, tax evasion
JEL classification: E26, F21

1. Introduction

Foreign direct investment (FDI) is widely recognised as a key driver of economic growth, facilitating the transfer of knowledge, technology and capital, as well as the introduction of new expertise, management skills, production techniques and improved competitiveness (Cambazoglu & Karaalp, 2014; Osano & Koine, 2016). It also enhances employment opportunities (Beloucif et al., 2020). Given the significance of FDI, numerous studies have been conducted to identify the factors influencing FDI inflows,

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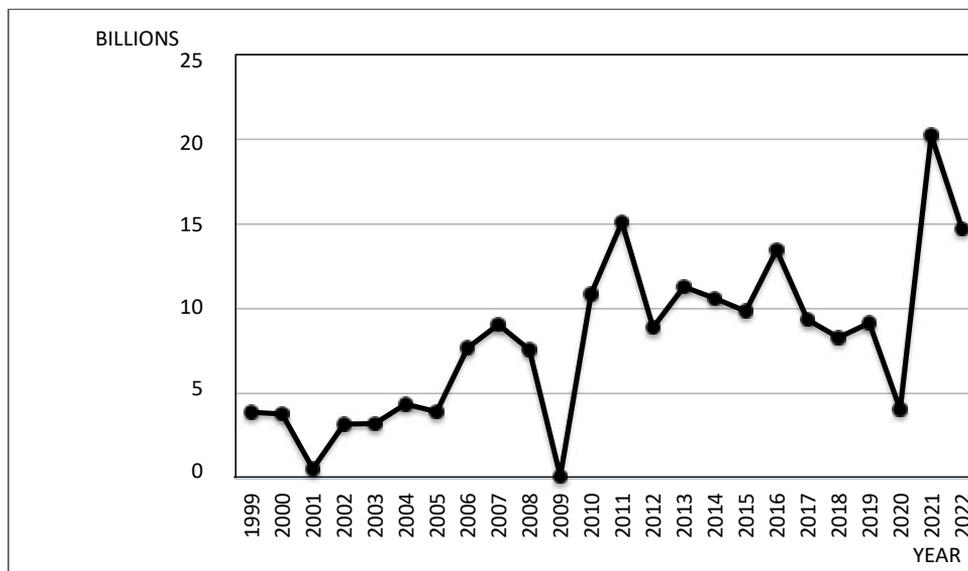
Figure 1. FDI inflow trends in Malaysia from 1999 until 2022
Source: World Bank (n.d.).

aiming to formulate effective strategies and policies to attract foreign investors and stimulate economic growth.

Figure 1 compellingly visualises FDI inflows to Malaysia since 1990, illustrating the transformation of the country's economic landscape. This evolution is characterised by a shift from primary to secondary economic sectors, with a current progression towards the tertiary sector.[1] Kohlhagen (1977) observed that significant foreign capital inflows into the manufacturing sector were crucial for Malaysia's transition from agrarian to industrialised economies. However, despite Malaysia's reputation as an attractive destination for foreign direct investment in Asia, the FDI inflows have been on a downward trajectory since peaking in 2011. This decline is particularly concerning given that FDI is a major driver of economic growth. The contrast between Malaysia's perceived attractiveness and the reality of declining FDI inflows raises important questions about the factors influencing foreign investment.

While various factors have been examined in previous studies, including macro-economic indicators, financial variables, market characteristics, infrastructure, human capital and institutional factors (Abdul Karim & Fleming, 2012; Hamood et al., 2018; Jahan, 2020; Yusop & Ghaffar, 1994), our research focuses on a potentially crucial yet

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[1] The primary sector typically involves extracting and harvesting natural resources, such as agriculture, forestry, fishing, mining and hunting. The secondary sector involves processing raw materials from the primary sector, including manufacturing and construction activities, where raw materials are transformed into finished goods. The tertiary sector provides retail, healthcare, entertainment, hospitality, education and financial services.

often overlooked factor: the shadow economy. This perspective aligns with studies by Bayar et al. (2020), Davidescu and Strat (2015), Deilami (2010) and Nikopour et al. (2009), which suggest that the shadow economy could significantly influence FDI attraction. The shadow economy is a global phenomenon that affects all economies, with its size varying significantly from under 10% to over 40% of an economy's total worth (Davidescu & Strat, 2015). Notably, emerging economies tend to have larger shadow economies compared to more developed nations (Kelmanson et al., 2019). In Malaysia's case, the Ministry of Finance (2020) reports a gradual decline in the shadow economy's share of GDP, from an average of 49.6% in 1990–1999 to 30.2% in 2000–2009, and further down to 21.2% in 2010–2019, as illustrated in Figure 2. Despite this decline, the potential impact of the shadow economy on FDI inflows in Malaysia warrants further investigation, especially considering the downward trend in FDI inflows observed since the peak in 2011, as illustrated in Figure 1.

Some studies suggest that the shadow economy positively affects FDI. Empirical findings by Nikopour et al. (2009) and Deilami (2010) indicated that higher levels of the shadow economy correlate with increased FDI. This is because governments in countries with substantial shadow economies might seek to attract FDI to expand their tax base on goods, services and international trade, potentially offsetting budget deficits caused by the shadow economy (Nikopour et al., 2009). Deilami (2010) further noted that tax avoidance, a key element of the shadow economy, facilitates capital mobility across borders, allowing investors to optimise their tax strategies and invest in more favourable economic environments globally. Additionally, factors prevalent in developing economies with large shadow economies, such as ambiguous legislation, high corruption levels, and the presence of tax havens, might inadvertently attract multinational enterprises seeking to capitalise on lower tax burdens and less stringent regulatory oversight (Davidescu & Strat, 2015; Jones & Temouri, 2016; Okada & Samreth, 2014).

The shadow economy can have a significant detrimental influence on FDI inflows. Bayar et al. (2020) argued that the negative long-term effect of the shadow economy on FDI inflows could be attributed to the fact that shadow economies often arise due to high tax and labour burdens. When faced with excessive taxation and cumbersome
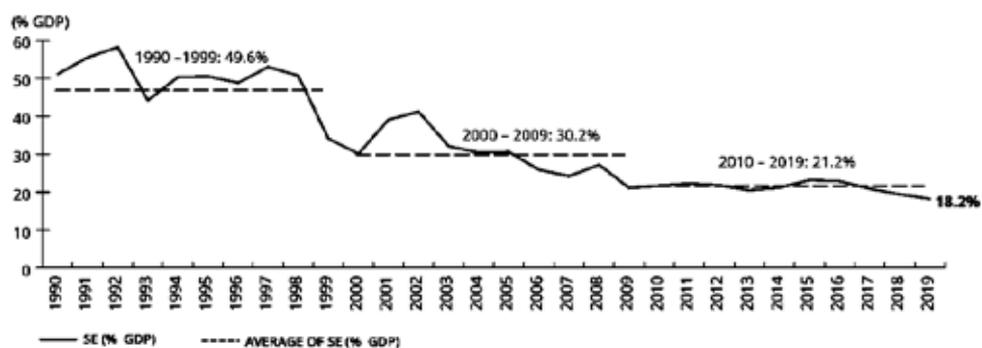

Figure 2. Size of shadow economy (SE) in Malaysia, 1999–2019
Source: Ministry of Finance Malaysia (2021).

labour regulations, businesses may be driven to operate in the informal sector. This reduces the tax base and creates an uneven playing field for foreign investors, who are more likely to comply with formal regulations. Furthermore, countries with larger shadow economies often suffer from weak institutional quality, marked by extensive bureaucracy and government predation, which further discourages FDI. Such environments lack the stability and transparency that foreign investors require, exacerbating the negative impact of the shadow economy on investment decisions. Bayar et al. (2020) also emphasised that the shadow economy's adverse effects extend to tax morale, tax compliance and overall economic growth. The resulting uncertainty in the business environment increases risks for potential foreign investors.

Despite the importance of understanding the relationship between the shadow economy and FDI, the literature has significant gaps. Previous studies, such as those by Bayar et al. (2020), Deilami (2010) and Nikopour et al. (2009), utilised broad estimates of the shadow economy size that encompass a wide range of informal economic activities. Similarly, Davidescu & Strat (2015) employed comprehensive shadow economy estimates through the currency demand approach in their analysis of Romania. However, the specific impacts of smuggling and tax evasion activities on FDI remain largely unexplored, with most studies focusing on general shadow economy size rather than on these distinct components. This study addresses the above research gap by specifically examining the effects of smuggling and tax evasion on FDI inflows in Malaysia, using data from customs annual reports. This focused approach provides a more detailed analysis of these elements of the shadow economy.

The structure of this paper is outlined as follows: Section two introduces the institutional background of the Royal Malaysia Customs Department. Section three reviews relevant theories, definitions and the scope of the shadow economy, along with a synthesis of empirical studies examining the relationship between the shadow economy and FDI. The methodology and empirical results are detailed in the subsequent two sections. The paper concludes with the final section, which summarises the findings and discusses policy recommendations.

2. Institutional Background

The Royal Malaysia Customs Department (RMCD), under the Ministry of Finance Malaysia (MoF), plays a crucial role in combating the shadow economy. Its core responsibilities include preventing smuggling, curbing tax evasion and enforcing customs regulations. As a critical arm of the government, RMCD also functions as an indirect tax collector, ensuring compliance with customs laws and mitigating the adverse effects of economic challenges. Two key departments within RMCD tackle these issues: the Enforcement Department and the Compliance Management Department.

The Enforcement Department within RMCD is tasked with border protection, given Malaysia's shared borders with Thailand, Singapore, Brunei, Indonesia and the Philippines. This department is pivotal in conducting intelligence operations, conducting investigations, executing physical operations such as roadblocks and patrols, and inspecting alleged locations and outlets through raids, searches, operations and propaganda. Additionally, the department is responsible for creating investigative
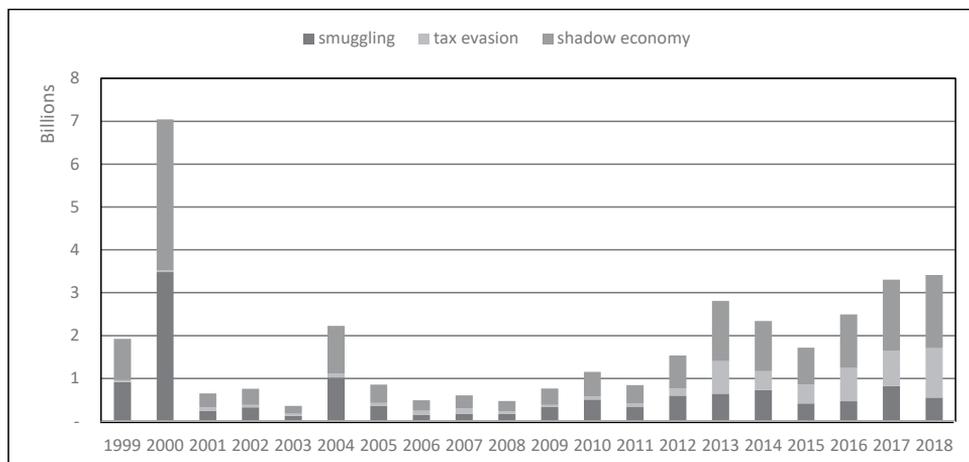
Figure 3. Malaysia's smuggling, tax evasion, and total shadow economy
Source: Customs' *Annual report* (various years, 1999–2018).

reports, managing the storage and disposal of confiscated items, and executing anti-smuggling campaigns. Smuggling activity, defined as the unauthorised import of goods into Malaysia via air, water, or land without proper customs declarations, is a primary focus of these efforts. These operations target high-risk smuggled goods, including vehicles, cigarettes, drugs, liquor, textiles, tiles and fireworks. Over the past two decades, the value of goods confiscated in these operations is depicted in Figure 3, highlighting the significant impact of enforcement actions on smuggling activities. The fluctuations in smuggling cases reflect the nature and scale of each incident tackled by the department, with the highest value recorded in 2000 due to a surge in vehicle-related cases.

The Compliance Management Department primarily deals with tax evasion through audits of licensees and importers. Tax evasion occurs when individuals or organisations attempt to avoid paying taxes through various means, such as under-declaring goods' value, declaring the wrong goods, or creating unofficial transactions. This department's rigorous audits and oversight help maintain business tax discipline, contributing to the government's efforts to curtail the shadow economy. From 1999 to the present, several structural changes have been implemented within the customs to strengthen the response to tax evasion activities, as illustrated in Figure 4. Despite these structural changes aimed at bolstering tax collection, Figure 3 shows that the trend of tax evasion activities has been on the rise, posing concerns about its contribution to the shadow economy and the broader implications for FDI inflows into Malaysia.

3. Review of Related Literature

This section begins by reviewing relevant theories that explain the relationship between the shadow economy and foreign direct investment (FDI). Subsequently, it offers a concise overview of the definition and scope of the shadow economy. Finally, the section concludes by reviewing prior studies that have explored this relationship.
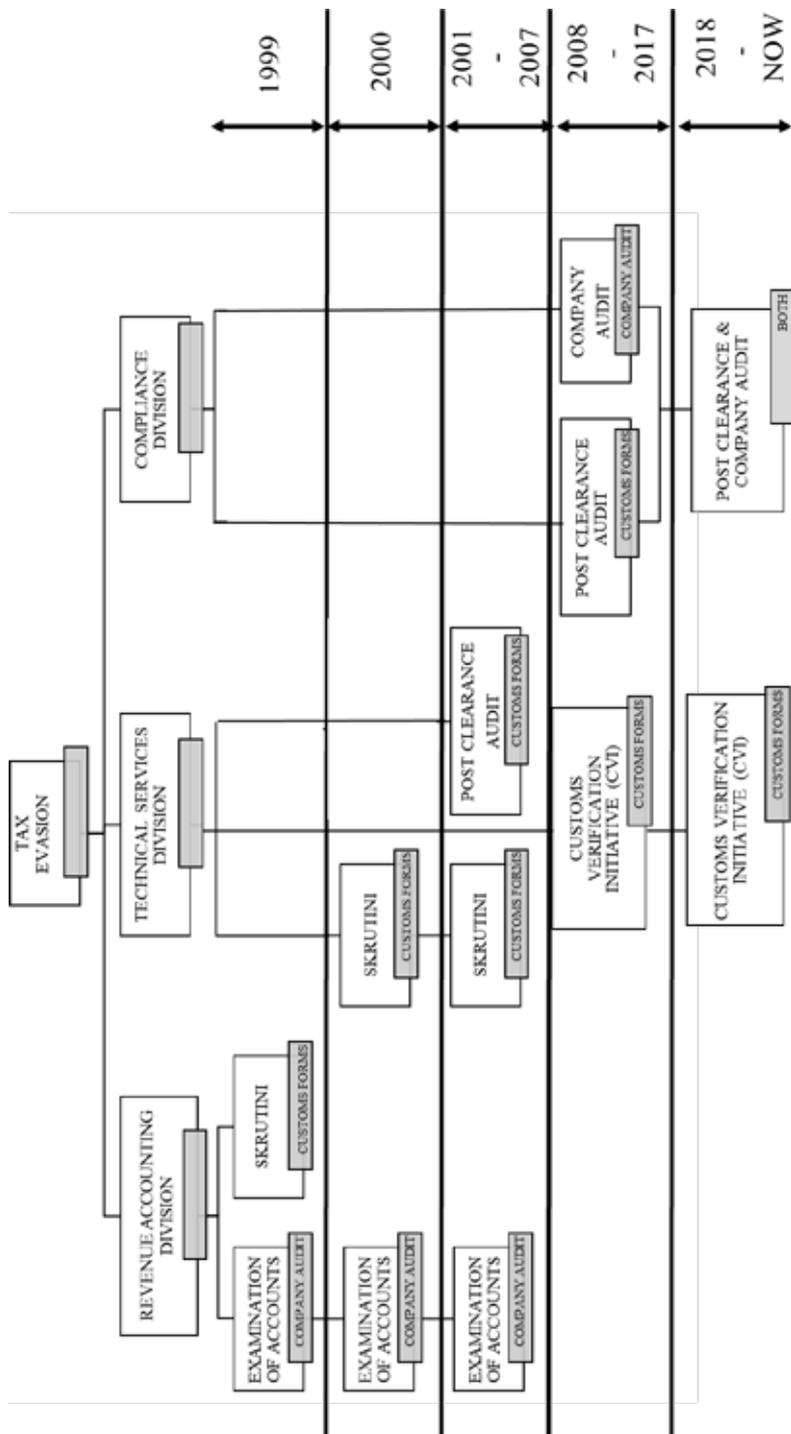
Figure 4. Customs' division structure that deals with tax evasion from 1999 until 2020

Source: Author's illustration.

3.1 Some Basic Theories

Institutional theory, rooted in sociology and organisational studies, offers a comprehensive framework for exploring how established behaviours, norms, rules and structures influence human interactions, ranging from formal organisations to informal societal values (Peters, 2000). This theory is particularly insightful when examining the relationship between the shadow economy and FDI. It clarifies how formal and informal institutions shape shadow economic activities and FDI decisions. For instance, formal institutional frameworks, including legal and regulatory systems, significantly affect the prevalence of the shadow economy. According to Frey and Weck-Hannemann (1984) and Williams and Schneider (2016), restricted access to formal employment, barriers to entry in formal sectors, and wealth and income distribution disparities propel individuals and businesses toward informal economic activities. These institutional factors also influence FDI as foreign investors consider the quality of formal institutions when evaluating potential host countries. On the other hand, informal institutions, such as social norms and perceptions of fairness, critically impact decisions to engage in shadow economic activities (Johnson et al., 1998). Countries with weaker informal institutions might see higher levels of shadow economic activity and face challenges in attracting FDI, attributed to increased perceived risks and uncertainties.

Legalist theory, deeply embedded in political philosophy and legal studies, provides a framework for understanding the relationship between the shadow economy and FDI. While closely related to institutional theory, legalist theory focuses on the role of legal institutions and the rule of law in shaping economic behavior. It can be viewed as a subset of institutional theory emphasising the importance of formal legal frameworks. In the context of the shadow economy and FDI, legalist theory suggests that the quality and efficacy of legal institutions directly affect both informal economic activities and decisions regarding foreign investment. Rose-Ackerman (1999) contends that weak legal institutions and ineffective enforcement of property rights create opportunities for informal economic activities to thrive outside the formal regulatory framework. Furthering this viewpoint, Schneider and Enste (2000) and Williams and Schneider (2016) argued that deficiencies in legal systems – such as corruption, bureaucratic inefficiency and arbitrary enforcement – substantially fuel the growth of the shadow economy. These same factors also significantly impact FDI decisions, as foreign investors avoid regions where their investments might not be securely protected. Conversely, legalist theorists like La Porta et al. (1998) asserted that legal systems marked by transparency, impartiality and predictability boost investor confidence and mitigate risks associated with foreign investments. This perspective becomes particularly vital in understanding how the shadow economy, legal institutions and FDI interact. Countries with strong, reliable legal frameworks are better positioned to curb informal economic activities while creating a more appealing environment for foreign investors.

The eclectic paradigm, also known as the OLI framework, developed by Dunning (1979, 1988), provides a comprehensive model to explain foreign direct investment (FDI) decisions. This framework assesses three critical factors: ownership advantages (O), location advantages (L), and internalisation advantages (I). In terms of the shadow economy and FDI, the location advantages component is especially pertinent. A

large shadow economy can simultaneously represent a location disadvantage and an advantage for FDI. As a disadvantage, a significant shadow economy often signals weak governance, pervasive corruption and a complex business environment. These are factors that Schneider and Enste (2000) identified as escalating risks and operational costs for foreign investors, thus reducing a location's attractiveness. Conversely, some multinational enterprises (MNEs) may view a substantial shadow economy as a location advantage. Deilami (2010) and Nikopour et al. (2009) pointed out that the shadow economy can provide opportunities for tax evasion, lower labour costs and access to informal market networks. These attributes can attract FDI from firms looking to minimise costs or engage in regulatory arbitrage.

3.2 Definitions and Scope of Shadow Economy

The concept of the shadow economy has attracted considerable attention since the 1980s, eliciting concerns among economists due to its impact on official economic measures. Various terms are used interchangeably to describe the shadow economy, including cash economy, illegal economy, unofficial economy, black market, hidden economy, parallel economy and subterranean economy. Schneider and Enste (2002) defined the shadow economy as encompassing all illicit activities or unreported income generated from the production of legal goods and services, whether through monetary exchanges or barter systems. Building upon this, Medina and Schneider (2018) further broadened this definition to include both monetary and non-monetary transactions that are legal in nature, covering all productive economic activities that would typically be taxable if reported to state authorities.

Table 1 offers a comprehensive taxonomy of underground economic activities, differentiating between monetary and non-monetary transactions across illegal and legal activities. This classification underscores the extensive range of the shadow economy, from trade in stolen goods and drug dealing to unreported income from

Table 1. A taxonomy of underground economic activities

Type of activity	Monetary transaction		Non-monetary transaction	
Illegal activities	Trade with stolen goods, drug dealing and manufacturing, prostitution, gambling, smuggling, fraud, etc.		Barter of drugs, stolen goods, smuggling, etc. Produce or grow drugs for their own use. Theft for own use.	
	Tax evasion	Tax avoidance	Tax evasion	Tax avoidance
Legal Activities	Unreported income from self-employment, wages, salaries and assets from unreported work related to legal services	Employee discounts, fringe benefits	Barter of legal services and goods	All do-it-yourself work and neighbour help

Source: Lippert & Walker (1997, p. 5).

self-employment and the barter of legal services. It is important to recognise that the definition of the shadow economy varies between countries due to differences in rules, regulations and laws. As Hall and the editors of *Encyclopædia Britannica* (2025) noted, the shadow economy is best characterised by the actions of its participants: engaging in work for cash without paying taxes or fully adhering to tax laws and regulatory statutes.

The shadow economy manifests in various forms, making it challenging to provide a comprehensive description within a single framework (Schneider & Enste, 2002). The covert nature of these transactions and the deliberate attempts by participants to avoid detection severely complicate the accuracy of data collection. Despite these obstacles, most determinants of shadow economic activities are tax-related, primarily involving tax non-compliance, tax evasion, or tax avoidance (Feige, 2016). Although the precise definitions of these terms remain debatable and are often used interchangeably, for the purpose of this study, "tax evasion" will refer collectively to these three activities. Tax evasion, defined as the illegal and unethical avoidance of tax obligations by contravening a country's tax laws and regulations, is an escalating global issue (Alm & Torlger, 2011; Pantoja & Penaloza, 2014). Typical methods of tax evasion include under-reporting or omitting actual income, filing a false tax return, declaring false deductions or overstating the amount of deductions, and intentionally making false entries in books or keeping two sets of books (Kesselman, 1997). Developing countries are particularly vulnerable to substantial tax revenue losses due to fake transactions, fraudulent billing, and payments for non-existent goods and services (Fuest & Riedel, 2009). The extent of such non-compliance is often indicative of the size of the shadow economy, with higher levels of tax evasion correlating with a larger shadow economy.

Another indicator of the shadow economy that has received less attention is smuggling. While smuggling is a criminal or illegal activity, it is not always included in the calculation of the shadow economy (Ali & Bohara, 2017). Smuggling is rampant in developing and underdeveloped nations (Basu, 2014; Haken, 2011) and has multiple definitions. It can be defined as the movement of commodities or other objects (prohibited by law) across customs boundaries, either by concealing them from customs control, using fraudulent documentation, or through dubious declarations. Mozayani (2021) describes smuggling as commercial exchanges between countries conducted to evade trade regulations and standards, hidden from authorities and omitted from official commercial records. These goods may be prohibited (illegal) or legal, depending on whether appropriate customs or excise duties have been paid (Federation of Indian Chambers of Commerce and Industry [FICCI], 2019).

Smuggling activities are regarded as a form of illicit internationalisation and a major threat to national security because smugglers engage in unofficial and even illegal trade for their own benefit, challenging the legitimacy and ability of governments to control their territories (Abraham & Schendel, 2005). While some governments ignore smuggling, others take steps to fortify their borders to curb smuggling and other illegal cross-border flows in the interests of national security (Su, 2022). Smuggling not only results in tax revenue losses (Fuest & Riedel, 2009) but also creates unofficial job opportunities and can become ingrained in local cultures as a means of "easy money" (United Nations Office on Drugs and Crime [UNODC], 2018). Additionally, as shown
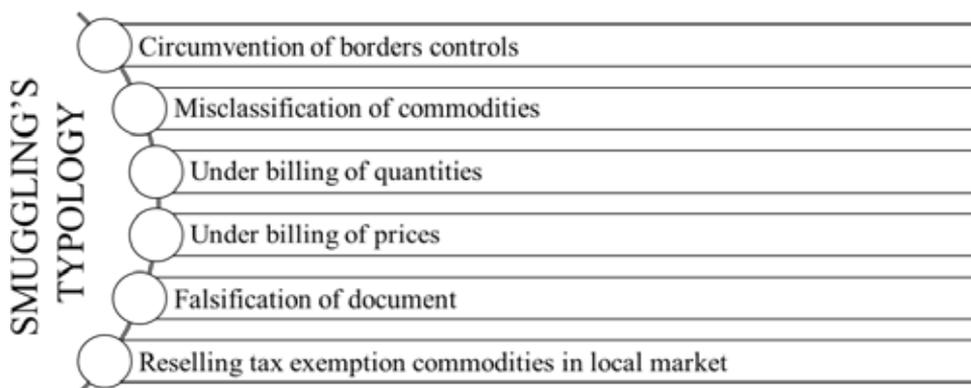
Figure 5. Typology of smuggling
Sources: FICCI (2019), Mozayani (2021), and UNODC (2018).

in Figure 5, there are six typologies of smuggling, including reselling tax exemption commodities in the local market, falsification of documents, underbilling of prices, underbilling of quantities, misclassification of commodities, and circumvention of border controls (FICCI, 2019; Mozayani, 2021; United Nations Office on Drugs and Crime [UNODC], 2018).

3.3 Empirical Studies on Shadow Economy–FDI Relationship

Empirical research on the relationship between the shadow economy and foreign direct investment (FDI) has yielded mixed findings, with some studies indicating a positive correlation. Certain scholars suggest that a larger shadow economy can serve as an informal mechanism that facilitates investment by providing flexibility in navigating regulatory constraints. In countries where excessive regulations, complex labour laws, and high tax burdens create barriers to formal business operations, investors may be drawn to economies where informal channels offer cost-saving advantages. Studies have shown that investors, particularly those in developing economies, may benefit from tax evasion, reduced labour costs, and the ability to influence government policies to access limited resources or more favourable business conditions (Ali & Bohara, 2017; Cuong et al., 2021; Davidescu & Strat, 2015; Jones & Temouri, 2016; Nikopour et al., 2009; Okada & Samreth, 2014). Furthermore, the presence of a shadow economy is linked to increased opportunities for greenfield investments, allowing multinational enterprises (MNEs) to establish subsidiaries while bypassing stringent regulatory and tax requirements. In some cases, it has been found that a one-unit increase in the shadow economy leads to a 0.0571% rise in FDI inflows (Ali & Bohara, 2017), indicating that informal economic activities may, under certain conditions, enhance foreign investment inflows.

Conversely, a significant body of literature underscores the negative impact of the shadow economy on FDI inflows. Several studies highlight that illicit activities such as smuggling and tax evasion create an unpredictable investment climate, increasing risks

and discouraging foreign investors who prioritise stability and regulatory transparency (Castro & Nunes, 2013; Fahad, 2016; Nikopour et al., 2009). The negative correlation between the shadow economy and FDI is often attributed to the additional costs incurred from regulatory uncertainty, labour issues and tax avoidance, which diminish the overall investment appeal of a country (Bayar et al., 2020). Moreover, tax evasion associated with the shadow economy makes it difficult for international acquirers to accurately assess the value of target firms, further discouraging cross-border mergers and acquisitions (Cuong et al., 2021). Empirical findings suggest that an increase of one unit in the shadow economy rate can reduce FDI inflows by 0.073% (Lyulyov & Moskalenko, 2020). These studies reinforce the argument that a thriving shadow economy undermines institutional credibility, reduces government revenue for critical infrastructure investments, and ultimately weakens investor confidence. Addressing these challenges through enhanced institutional reforms and stronger regulatory enforcement is essential to mitigating the adverse effects of the shadow economy on FDI inflows.

4. Methodology

This study examines the relationship between the shadow economy and FDI in Malaysia. The empirical model can be expressed as:

$$FDI_t = \beta_0 + \beta_1 WGI_t + \beta_2 TRD_t + \beta_3 SE_t + \mu_i \qquad (1)$$

where FDI is foreign direct investment inflows, WGI is the World Governance Indicator, TRD is total trade, SE is the shadow economy, t denotes the time period, and μ is the error term.

The study utilises annual time-series data spanning a 20-year period from 1999 to 2018 for Malaysia. Table 2 provides a detailed overview of the variables, their measurements and data sources. FDI inflows are measured as the total amount of FDI inflows in Malaysia in US dollars, as reported by UNCTAD (2021). The World Governance Indicator is a composite measure that encompasses six key dimensions of governance: voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law and control of corruption. This data is sourced from the World Bank (2021). Trade is measured as a percentage of GDP, also obtained from the World Bank (2021).

The shadow economy variable is further broken down into smuggling and tax evasion. Smuggling is quantified as the total amount of smuggled items confiscated, including a wide range of goods such as vehicles, cigarettes, drugs, alcohol, textiles, fireworks and rice, among others. This is valued in Malaysian Ringgit. Tax evasion is measured as the total amount of tax collected through auditing customs declarations or companies, also in Malaysian Ringgit. Both shadow economy measures are derived from the RMCD *Annual Reports* from 1999 to 2018.

The econometric analysis begins by addressing the potential non-stationarity of the time series data, which is a common challenge in econometric modelling. First, to ensure the reliability of regression outcomes, unit root tests are conducted using the Augmented Dickey–Fuller (ADF) and Phillips-Perron (PP) tests to determine the

Table 2. Measurement and source of variables

Variable	Notation	Measurement	Source of data
FDI inflows	*FDI*	Total amount of FDI inflows into Malaysia in billion US dollar	UNCTAD (2021)
World Governance	*WGI*	Mean of six key governance dimensions: voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law and control of corruption.	World Bank (2021)
Trade	*TRD*	Trade (% of GDP)	
Shadow economy:	*SE*		
Smuggling	*SMG*	Total amount of smuggling items confiscated, like vehicles, cigarettes, drugs, wine, beer, textiles, mosaic, fireworks, firecrackers, rice and others, in million Ringgit Malaysia	RMCD *Annual Report* (1999 – 2018)
Tax evasion	*TEV*	Total amount of tax collected through auditing the customs declaration or company in million Ringgit Malaysia.	

stationarity of each variable. Confirming stationarity is crucial, as the presence of unit roots can lead to spurious regression results.

We perform the standard ADF unit root test for each region without allowing for structural breaks. The standard ADF test for a unit root y_{it}, allowing for a linear deterministic trend, is as follows:

$$\Delta y_{it} = \alpha + \beta_t + \delta y_{t-1} + \sum_{j=1}^{k} \gamma_j \Delta y_{t-j} + \varepsilon_t$$

where Δ denotes first difference operator ε_t is the disturbance term. The index t =1, ..., T denotes the time period.

The Phillips-Perron (PP) test extends the original Dickey–Fuller framework by allowing for more general forms of serial correlation and heteroscedasticity in the disturbance term. Whereas the ADF test controls for higher-order autocorrelation by including lagged differences of the dependent variable as additional regressors, the PP test achieves the same objective through a non-parametric correction to the Dickey–Fuller test statistics. This correction adjusts for autocorrelation and heteroscedasticity directly in the residuals, without requiring the specification of lag length in the test equation. As in the ADF test, the null hypothesis of the PP test is that the series contains a unit root. The test is therefore robust to unspecified autocorrelation and heteroscedasticity in the error process, making it a useful complement to the ADF test in empirical applications.

Given the potential non-stationarity of our variables, we employ the autoregressive distributed Lag (ARDL) approach to cointegration. This method is particularly advantageous as it accommodates variables integrated in different orders, primarily I(0) or I(1). This flexibility makes ARDL well-suited for handling series with varying levels

of integration and effective even with small sample sizes. To confirm the existence of the long-run relationship, we proceed with the Bounds cointegration test. To do this, we need to transform Eq. (1) into unrestricted error correction model (UECM) form as follows:

$$\Delta lnFDI_t = \alpha_0 + \alpha_{11} lnFDI_{t-1} + \alpha_{12} lnWGI_{t-1} + \alpha_{13} lnTRD_{t-1} + \alpha_{14} lnSE_{t-1} +$$

$$\sum_{i=1}^{p} \alpha_{2i} \Delta lnFDI_{t-i} + \sum_{i=0}^{q} \alpha_{3i} \Delta lnWGI_{t-i} +$$

$$\sum_{i=0}^{r} \alpha_{4i} \Delta lnTRD_{t-i} + \sum_{i=0}^{s} \alpha_{5i} \Delta lnSE_{t-i} + \varepsilon_t \qquad (2)$$

Thus, from Eq. (2), the null and alternative hypotheses are constructed as H_0: α_{11} = α_{12} = α_{13} = α_{14} = 0 (no cointegration) against H_A: $\alpha_{11} \neq \alpha_{12} \neq \alpha_{13} \neq \alpha_{14} \neq 0$ (cointegration). If cointegration is confirmed, indicating the presence of a long-term equilibrium relationship, we estimate an error correction model (ECM) within the ARDL framework. The error correction term (ECT) captures the short-run dynamics while accounting for any deviations from the long-term equilibrium, which can be expressed as follows:

$$\Delta lnFDI_t = \alpha_0 + \alpha_1 ECT_{t-1} + \sum_{i=1}^{p} \alpha_{2i} \Delta lnFDI_{t-i} + \sum_{i=0}^{q} \alpha_{3i} \Delta lnWGI_{t-i} +$$

$$\sum_{i=0}^{r} \alpha_{4i} \Delta lnTRD_{t-i} + \sum_{i=0}^{s} \alpha_{5i} \Delta lnSE_{t-i} + \varepsilon_t \qquad (3)$$

To ensure optimal model specification, we use the Schwarz Information Criterion (SIC) to select the most appropriate lag lengths for the variables in the ARDL model. This approach helps balance the model's complexity with its explanatory power, ensuring efficiency and robustness. The validity of the model is then thoroughly assessed through various diagnostic tests, including tests for autocorrelation, heterogeneity and stability. These tests ensure the robustness and reliability of the model specifications. Once the model passes all diagnostic checks, the results from the ARDL model can be effectively interpreted and discussed.

5. Empirical Results

The 20-year data have been analysed, and the descriptive analysis for each variable can be referred to in Table 3. The correlation matrix presented in Panel II reveals varying degrees of linear associations between FDI and the other variables included in the study. Our primary focus is on the two proxies for the shadow economy: tax evasion (TEV) and smuggling (SMG). The results indicate that FDI exhibits a positive correlation with TEV, suggesting that higher levels of tax evasion may coincide with increased foreign direct investment inflows. Conversely, smuggling (SMG) shows a negative correlation with FDI, aligning with the expectation that the prevalence of smuggling activities could deter foreign investment. These univariate relationships change signs when considered in a multiple regression setting, as the effects of other variables are controlled for. Addressing the potential for multicollinearity, an examination of correlations among the independent variables reveals that all correlations are below the commonly used threshold of 0.8. The highest correlation observed is -0.7462 between trade (TRD) and tax evasion (TEV). This suggests that multicollinearity is not a major concern in the current analysis, as the correlations among predictors are within an acceptable range.

Table 3. Descriptive statistics and correlation matrix

	Panel I: Descriptive statistics				
				SE	
	FDI	WGI	TRD	SMG	TEV
Mean	6.892	0.466	172.351	0.619	0.275
Maximum	12.198	0.627	220.410	3.481	1.154
Minimum	0.550	0.281	126.900	0.124	0.040
Standard deviation	3.675	0.089	32.912	0.722	0.339
	Panel II: Correlation matrix				
FDI	1.000				
WGI	-0.223	1.000			
TRD	-0.750	0.080	1.000		
SMG	-0.104	-0.002	0.260	1.000	
TEV	0.539	0.191	-0.746	-0.033	1.000

Notes: FDI is foreign direct investment in billion USD, WGI is World Governance Indicators from 6 dimensions, TRD is trade (% of GDP) in billion USD, SMG is smuggling, and TEV is tax evasion, both in billion Ringgit Malaysia.

Table 4. Unit root test

	Augmented Dickey-Fuller (ADF) test				Phillips-Perron (PP) test			
	Level		First difference		Level		First difference	
	C	C & T	C	C & T	C	C & T	C	C & T
FDI	-1.909	-3.228	-5.215***	-5.163***	-1.806	-3.091	-8.784***	-9.326***
WGI	-3.365**	-3.201	-4.355***	-2.636***	-2.594	-2.539	-5.764**	-5.344***
TRD	-0.634	-3.022	-4.073***	-4.001***	-0.636	-1.984	-4.080***	-4.010**
SMG	-1.613	-2.000	-5.139***	-4.422**	-3.960***	-4.065***	-9.765***	-9.776***
TEV	0.289	-1.371	-5.033***	-4.759***	1.606	-1.021	-5.094***	-11.958***
SE	-1.652	-2.307	-6.996***	-4.622***	-1.652	-2.144	-6.996***	-17.181***

Notes: FDI is foreign direct investment in billion USD, WGI is World Governance Indicators from 6 dimensions, TRD is trade (% of GDP) in billion USD, SMG is smuggling, and TEX is tax evasion both in billion Ringgit Malaysia, SE is shadow economy derived from the mean of SMG + TEV. C is constant without trends, and C & T is constant with trends. ** and *** denote significance at 5% and 1% critical values, respectively.

As presented in Table 4, the unit root tests are crucial for determining the order of integration of the variables and ensuring the appropriateness of the chosen econometric techniques. The Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests are employed to investigate the stationarity properties of the variables. The null hypothesis for both tests is that the series contains a unit root, implying non-stationarity, while the alternative hypothesis suggests that the series is stationary. Table 4 displays test statistics under two conditions: a constant (C) and a constant and trend

(C & T). The results indicate that all variables become stationary after first differencing, implying that they are integrated of order one, I(1). Despite the fact that all variables are integrated into order one, the ARDL model will be employed to test for the level of relationship among the variables. The ARDL framework is particularly suitable in this context, given the small sample size, as noted by Harris and Sollis (2003).

After establishing the order of integration of the variables through unit root tests, the next step is to investigate the existence of a long-run relationship among the variables using the bounds cointegration test. Table 5 presents the results of the bounds cointegration test for three different models, each representing the shadow economy through different proxies: smuggling (Model 1), tax evasion (Model 2), and a composite of smuggling and tax evasion (Model 3). The bounds cointegration test is particularly suitable for the ARDL framework, as it allows for testing the existence of a long-run relationship irrespective of whether the underlying regressors are I(0), I(1), or mutually cointegrated. The test involves comparing the calculated F-statistic with the critical values provided by Pesaran et al. (2001). If the F-statistic exceeds the upper bound critical value, the null hypothesis of no cointegration is rejected, indicating the presence of a long-run relationship among the variables.

The results in Table 5 consistently reject the null hypothesis of no cointegration at the 1% significance level across all three models. Specifically, Model 1 (SMG) yields an F-statistic of 5.9813, Model 2 (TEV) shows an F-statistic of 9.6615, and Model 3 (SE) produces an F-statistic of 6.4279. All these values substantially exceed the 1% critical value of 4.66, allowing us to reject the null hypothesis of no cointegration at the 1% significance level for all three models. This implies that there is a stable, long-run equilibrium relationship between FDI and its determinants, including the shadow economy (represented by smuggling, tax evasion, or a composite of both), World Governance Indicators and trade. The finding is particularly important as it suggests that despite short-term fluctuations, the variables in our models tend to move together over time, maintaining a long-run equilibrium.

Table 5. Bounds cointegration test

Model	F-statistic	Critical Value	
Model 1: TAX = SMG	5.981***	1%	4.66
Model 2: TAX = TEV	9.662***	5%	3.67
Model 3: TAX = SE	6.428***	10%	3.20

Notes: Model 1 is proxied by smuggling, Model 2 is proxied by tax evasion, and Model 3 is proxied by smuggling and tax evasion. *** denotes significance at 1% level. The critical values are taken from Pesaran et al. (2001). The test is based on the following setup:

Model 1: $\Delta lnFDI_t = \alpha_0 + \alpha_{11}lnFDI_{t-1} + \alpha_{12}lnWGI_{t-1} + \alpha_{13}lnTRD_{t-1} + \alpha_{14}lnSMG_{t-1} + \sum_{i=1}^{p}\alpha_{2i}\Delta lnFDI_{t-i} + \sum_{i=0}^{q}\alpha_{3i}\Delta lnWGI_{t-i} + \sum_{i=0}^{r}\alpha_{4i}\Delta lnTRD_{t-i} + \sum_{i=0}^{s}\alpha_{5i}\Delta lnSMG_{t-i} + \varepsilon_t$, $H_0 : \alpha_{11} = \alpha_{12} = \alpha_{13} = \alpha_{14} = 0$ (no cointegration).

Model 2: $\Delta lnFDI_t = \alpha_0 + \alpha_{11}lnFDI_{t-1} + \alpha_{12}lnWGI_{t-1} + \alpha_{13}lnTRD_{t-1} + \alpha_{14}lnTEV_{t-1} + \sum_{i=1}^{p}\alpha_{2i}\Delta lnFDI_{t-i} + \sum_{i=0}^{q}\alpha_{3i}\Delta lnWGI_{t-i} + \sum_{i=0}^{r}\alpha_{4i}\Delta lnTRD_{t-i} + \sum_{i=0}^{s}\alpha_{5i}\Delta lnTEV_{t-i} + \varepsilon_t$, $H_0 : \alpha_{11} = \alpha_{12} = \alpha_{13} = \alpha_{14} = 0$ (no cointegration).

Model 3: $\Delta lnFDI_t = \alpha_0 + \alpha_{11}lnFDI_{t-1} + \alpha_{12}lnWGI_{t-1} + \alpha_{13}lnTRD_{t-1} + \alpha_{14}lnSE_{t-1} + \sum_{i=1}^{p}\alpha_{2i}\Delta lnFDI_{t-i} + \sum_{i=0}^{q}\alpha_{3i}\Delta lnWGI_{t-i} + \sum_{i=0}^{r}\alpha_{4i}\Delta lnTRD_{t-i} + \sum_{i=0}^{s}\alpha_{5i}\Delta lnSE_{t-i} + \varepsilon_t$, $H_0 : \alpha_{11} = \alpha_{12} = \alpha_{13} = \alpha_{14} = 0$ (no cointegration).

Having established the existence of a long-run relationship through the bounds cointegration test (Table 5), the next step is to examine the short-run dynamics and the speed of adjustment toward long-run equilibrium using the error correction model (ECM). The ECM results reported in Table 6 show that the error correction term (ECT) is negative and highly significant across all three models, with coefficients ranging from −0.6703 to −0.6981. These values fall within the expected interval of −1 and 0, indicating a stable adjustment process. Specifically, between 67% and 70% of any short-run deviation from the long-run equilibrium is corrected within a single period, reflecting a relatively rapid convergence to equilibrium. The significance and magnitude of the ECT confirm that the system responds appropriately to disequilibrium: when FDI diverges from its long-run path, the adjustment mechanism moves the system back toward equilibrium in the subsequent period. This finding reinforces the earlier conclusion of a long-run relationship among FDI and its key determinants, including World Governance Indicators, trade and the shadow economy proxies.

Panel II of Table 6 presents the diagnostic test results. Across all models, the LM test indicates no residual autocorrelation, while the heteroscedasticity and normality tests show no major violations of classical assumptions. The Ramsey RESET tests also suggest that the functional form of each estimated model is correctly specified. Collectively, these diagnostics support the reliability and robustness of the ECM estimations.

Table 6. Error correction model (ECM) results

Panel I: Error correction models

Model 1: $\Delta FDI_t = -0.670 ECT*** + 1.170 \Delta WGI***$
Model 2: $\Delta FDI_t = -0.698 ECT*** + 1.190 \Delta WGI*** + 8.625 \Delta TEV_t$
Model 3: $\Delta FDI_t = -0.694 ECT*** + 1.050 \Delta WGI*** - 15.196 \Delta SE_t$

Panel II: Model criteria

	Model 1	Model 2	Model 3
Adj-R^2	0.696	0.791	0.726
Std. dev.	1656.303	1374.094	1574.879
Autocorrelation	0.603	0.172	0.321
Heteroscedasticity	0.780	0.133	0.732
Normality	0.819	0.845	0.861
Stability	0.134	0.347	0.887

Notes: FDI is foreign direct investment, WGI is World Governance Indicators derived from 6 dimensions, and TRD is trade (% of GDP). Model 1 is proxied by smuggling (SMG), Model 2 is proxied by tax evasion (TEV), and Model 3 is proxied by utilising smuggling and tax evasion (SE). *** denotes significance at 1% level. Δ indicates the first difference. Autocorrelation uses the LM test (i.e., LM = n$R^2 \sim \chi_k^2$ where k is the degree of freedom), H_0: "no autocorrelation", heteroscedasticity uses the Breusch-Pagan-Godfrey test (i.e., BPG = ½(explained sum of squares) $\sim \chi_{k-1}^2$, H_0: "homoscedastic"), Normality uses the Jarque-Bera test (i.e., $JB = \frac{n}{6}\left(S^2 + \frac{1}{4}(K-3)^2\right) \sim \chi_2^2$, where S is skewness, and K is kurtosis, H_0: "normal distribution"), and stability is based on the Ramsey Reset test (i.e., given the auxiliary equation of $y_i = x_i\delta + \sum_{i=2}^{J}\gamma_j\hat{y}_i^j + \eta_i$, F-statistic on $H_0 = \gamma_j$ or "no misspecification"). The reported values for autocorrelation, heteroscedasticity, normality, and stability are the p-values of the respective diagnostic tests.

Table 7. Long-run equation [DV: FDI]

	Model 1: SE=SMG	Model 2: SE=TEV	Model 3: SE=SMG+TEV
Constant	4.3911	-9.3499	0.0888
	(0.6279)	(-3.0732)***	(0.0142)
WGI	-3.3101	4.7003	2.8003
	(-0.8732)	(2.5726)***	(0.0084)
TRD	-0.0023	0.0365	0.0087
	(-0.1048)	(3.5859)***	(0.3751)
SE	–	–	-0.0392
			(-1.9281)*
SMG	-0.0255	–	–
	(-1.8511)*		
TEV	–	-0.0293	–
		(-3.0733)***	

Notes: DV is dependent variable, FDI is foreign direct investment, WGI is a World Governance Indicator derived from 6 dimensions and TRD is trade (% of GDP). Model 1 is proxied by smuggling (SMG), Model 2 is proxied by tax evasion (TEV), and Model 3 is proxied using smuggling and tax evasion (SE). * and *** denote significance at 10% and 1% levels, respectively. Values in parentheses represent t-statistics.

The long-run equation results are provided in Table 7, where the dependent variable is FDI. Each model distinctively incorporates different elements of the shadow economy to assess their impact. In Model 1, the negative coefficient of SMG (-0.0255), significant at the 10% level, suggests that increased smuggling activities deter foreign direct investment over the long term. This observation supports the theoretical expectation that illegal activities and a sizeable informal sector heighten perceived risks and uncertainties for foreign investors, discouraging FDI. Model 2 replaces smuggling with tax evasion (TEV) as a proxy for the shadow economy. TEV shows a negative coefficient (-0.0293), statistically significant at the 1% level, indicating that higher levels of tax evasion negatively impact FDI in the long term. Tax evasion likely signals poor institutional quality and a lack of transparency, presenting a challenging business environment for foreign investors. In Model 3, the shadow economy is represented by a composite indicator that combines both smuggling and tax evasion (SE). The associated coefficient is negatively significant (-0.0392) at the 10% level, reinforcing that a more extensive shadow economy adversely affects FDI. These results highlight the broader implication that substantial shadow economic activities, including illegal operations and tax avoidance, negatively influence FDI. For policymakers, these findings underscore the potential benefits of mitigating shadow economic activities, especially tax evasion, to foster a more conducive environment for increasing FDI inflows.

The negative relationship between Malaysia's FDI inflows and its shadow economy can be attributed to several factors, primarily revolving around compliance issues with customs laws and regulations. First, a high-shadow economy often reflects poorly on institutional transparency, which can lead to misunderstandings that are detrimental to investors. Such a lack of transparency signals a risky environment where laws and

regulations are inadequately adhered to, thus discouraging investment. Each country operates under its unique set of acts, rules and regulations, which differ significantly from one nation to another. Activities permissible in one country may be prohibited in another, contributing to the complexity of international investments. Second, this variability complicates the flow of information, making it challenging for investors to obtain crucial data about taxation systems and trade facilitation opportunities. The resultant opacity can hinder investors' ability to make well-informed decisions.

Furthermore, the lack of clear, reliable information imposes additional costs on investors. They may find themselves compelled to allocate more resources and time to conduct thorough due diligence to offset the information deficit. This necessity often increases reliance on third-party services such as secretarial companies or tax consultants, elevating the overall investment cost. Third, the ambiguity and uncertainty prevalent in FDI contexts can also increase non-compliance risk, leading to potential legal penalties. Moreover, low transparency can exacerbate information asymmetries between customs officials and investors, further complicating their understanding of the local tax landscape, associated risks and opportunities. This information imbalance erodes investor confidence, fostering a more cautious investment approach and potentially resulting in higher capital costs.

A high shadow economy can also attract other illicit activities and criminals due to the ease of engaging in illegal endeavours. As suggested by Jadoon and Milton (2019), countries with larger shadow economies frequently experience increased incidences of terrorist attacks, fatalities and mass-casualty events, contributing to an unstable and unsafe environment for foreign investment. Additionally, Fisunenko et al. (2020) argued that a substantial shadow economy can intensify economic crimes, thus undermining the state and compromising the economic interests of its citizens. Romanov (2019) further emphasised that the cash-intensive nature of shadow economies makes them particularly vulnerable to criminal activity, intrusions and fraudulent behaviour. This increased risk of illegal activities can significantly deter foreign investment, as multinational corporations often seek stable and secure business environments to ensure safety and predictability in their operations.

6. Conclusion

This study investigates the relationship between the shadow economy and FDI inflows into Malaysia from 1999 to 2018, utilising the ARDL approach. The analysis reveals that both individual components of the shadow economy – smuggling and tax evasion – as well as their combined impact, exert a consistently negative influence on FDI. Specifically, smuggling activities are significantly associated with decreased FDI, indicating that the risks linked to illegal trade deter foreign investors. Similarly, elevated tax evasion levels correlate with diminished FDI inflows, raising concerns about Malaysia's economic governance and regulatory framework. These negative correlations highlight the substantial impact that shadow economic activities can have on Malaysia's appeal as a destination for foreign investment. The findings suggest that effectively addressing the underlying causes of smuggling and tax evasion is crucial for enhancing the investment climate and reversing the negative trend in FDI.

To combat the shadow economy effectively and attract more FDI into Malaysia, the government should prioritise reducing uncertainty through transparent and effective laws, rules, regulations and enforcement. Addressing the issue at the grassroots level is crucial. Customs and government agencies should collaborate with community leaders to raise awareness about the adverse impacts of the shadow economy on FDI and over-all economic growth. Organising workshops and dialogues that bring together experts, economists, business associations and community leaders can facilitate constructive discussions and knowledge sharing. Highlighting success stories of businesses transition-ing to the formal economy can inspire positive change. Furthermore, launching com-prehensive public awareness campaigns through various media channels will ensure a widespread understanding of the issues at stake, fostering stakeholder collaboration to create an environment conducive to FDI.

The government should accelerate the digitalisation of customs processes to curb shadow economy activities and promote transparency. These processes predominantly involve cash transactions and manual processing. Despite ongoing modernisation efforts, manual processes persist due to resistance to change and familiarity with traditional methods. Encouraging a shift to digital platforms can enhance transaction traceability, potentially reducing shadow economy activities while creating an environ-ment more attractive to foreign investors. User-friendly interfaces and comprehensive training programs should accompany this digital transformation to ease the transition for businesses and individuals.

Furthermore, fostering cooperation between customs and various national agencies – including port authorities, the Royal Malaysia Police, the National Anti-Drug Agency, Malaysian Quarantine and Inspection Services, the Inland Revenue Board of Malaysia, and the Department of Statistics Malaysia – is crucial. This collaboration would enhance the effectiveness of information sharing and joint efforts to combat illicit activities. Extending these partnerships to international agencies such as the US Customs and Border Protection, Canada Border Services Agency, Australian Border Force, Singapore Customs, German Customs Administration, Thailand Customs Department, Indonesia Directorate General of Customs and Excise, UK HMRC, China GACC, and India CBIC is also vital. Such international cooperation strengthens the capacity to tackle global smuggling and tax evasion and promotes secure and efficient cross-border trade, further enhancing Malaysia's attractiveness as an investment destination.

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