QUANTIFYING THE MALAYSIAN SHADOW ECONOMY AND ANALYSING ITS IMPACT ON THE OFFICIAL ECONOMY OF MALAYSIA

AMER AMERA MOHAMMED AHMED

SULTAN IDRIS EDUCATION UNIVERSITY

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QUANTIFYING THE MALAYSIAN SHADOW ECONOMY AND ANALYSING ITS IMPACT ON THE OFFICIAL ECONOMY OF MALAYSIA

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ABSTRACT

The primary aim of this study is to assess the magnitude of the shadow economy (SE) in Malaysia through the lens of public expenditure during the period from 1970 to 2022, employing the modified currency demand approach introduced by Pickhardt and Sardà (2006). Using the autoregressive distributed lag (ARDL) technique to estimate the Currency Demand Function Model (CDFM), the findings reveal that the SE accounts for an average of 24.225 percent of Malaysia's official GDP over the study period, with its size ranging between 22.435 percent and 25.741 percent. Moreover, the application of the non-linear ARDL technique highlights that both positive and negative changes in the SE are positively linked to economic growth in the short and long term. However, the long-term effects of positive SE shocks on economic growth are found to be more significant compared to the impacts of negative shocks. Additionally, the results establish a "U-shaped" relationship between public expenditure (PE) and the SE, whereby an increase in SE initially reduces PE up to a trough (estimated at RM454.589 billion of PE and RM68.167 billion of SE), after which further SE growth corresponds with an increase in PE levels. The Toda-Yamamoto causality test further uncovers a unidirectional causal link running from SE to financial development, inflation, and economic uncertainty, with no evidence of reverse causality. Additionally, a unidirectional relationship is observed between monetary uncertainty and SE, while a bidirectional causal relationship exists between SE and urban population growth. Based on these findings, it is recommended that the government address the underlying drivers of SE, including poverty, unemployment, and income inequality, as well as reduce barriers to participation in the formal economy, such as high taxation and burdensome regulatory requirements. Furthermore, the government is urged to prioritize investments in both human and physical capital to mitigate the growth of the shadow economy.

TAJUK BM

ABSTRAK

Tujuan utama kajian ini adalah untuk menilai magnitud ekonomi gelap (SE) di Malaysia melalui perspektif perbelanjaan awam bagi tempoh 1970 hingga 2022, dengan menggunakan pendekatan permintaan mata wang yang diubah suai seperti yang diperkenalkan oleh Pickhardt dan Sardà (2006). Dengan menggunakan teknik autoregressive distributed lag (ARDL) untuk menganggar Model Fungsi Permintaan Mata Wang (CDFM), dapatan kajian menunjukkan bahawa SE menyumbang purata sebanyak 24.225 peratus daripada KDNK rasmi Malaysia sepanjang tempoh kajian, dengan julat antara 22.435 peratus hingga 25.741 peratus. Selain itu, penggunaan teknik ARDL tidak linear menonjolkan bahawa perubahan positif dan negatif dalam SE mempunyai hubungan positif dengan pertumbuhan ekonomi dalam jangka pendek dan panjang. Walau bagaimanapun, kesan jangka panjang kejutan positif SE terhadap pertumbuhan ekonomi didapati lebih signifikan berbanding kesan daripada kejutan negatif. Disamping itu, hasil kajian menunjukkan hubungan berbentuk "U" antara perbelanjaan awam (PE) dan SE, di mana peningkatan awal dalam SE mengurangkan PE sehingga mencapai titik minimum (dianggarkan pada RM454.589 bilion bagi PE dan RM68.167 bilion bagi SE), selepas itu pertumbuhan SE selanjutnya dikaitkan dengan peningkatan tahap PE. Ujian kausaliti Toda-Yamamoto seterusnya mendedahkan hubungan kausal sehala yang bergerak dari SE kepada pembangunan kewangan, inflasi, dan ketidaktentuan ekonomi, tanpa bukti kausaliti songsang. Selain itu, hubungan sehala juga diperhatikan antara ketidaktentuan monetari dan SE, manakala hubungan kausal dua hala wujud antara SE dan pertumbuhan penduduk bandar. Dapatan ini menyarankan kerajaan menangani punca asas kewujudan SE termasuk kemiskinan, pengangguran, dan ketidaksamarataan pendapatan, serta mengurangkan halangan untuk penyertaan dalam ekonomi formal seperti cukai yang tinggi dan keperluan peraturan yang membebankan. Dapatan ini juga mengesakan kerajaan memberi keutamaan kepada pelaburan dalam modal insan dan fizikal bagi mengurangkan pertumbuhan ekonomi gelap.

CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

ADF	Augmented Dickey Fuller
AIC	Akaike Information Criterion
AO	Additive Outlier Model
ARDL	Autoregressive Distributed Lag
BMA	Bayesian Model Averaging technique
CCE-GMM	Common Correlated Effect with GMM estimator
CDA	Currency Demand Approach
CDFM	Currency Demand Function Model
CUSUM	Cumulative Sum of Recursive Residuals
CUSUMSQ	Cumulative Sum of Squares of Recursive Residuals
DGEM	Dynamic General Equilibrium Model
DOLS	Dynamic Ordinary Least Squares
FE	Fixed Effect Estimator
FMOLS	Fully Modified Ordinary Least Squares Estimator
GDP	Gross Domestic Product
GH	Gregory and Hansen's model
GMM	Generalised Method of Moment Estimator
GNP	Gross National Product
IMF	International Monetary Fund
IO1	Innovational Outlier 1 Model

IO2	Innovational Outlier 2 Model
IV	instrumental variables estimators
MCDR	Modified Cash Deposits Ratio
MIMIC	Multiple Indicators Multiple Causes Model
OECD	Organization for Economic Cooperation and Development
OLS	Ordinary Least Squares
RE	Random Effect
SE S	Shadow Economy
US	The United States

LIST OF APPENDICES

CHAPTER 1

INTRODUCTION

1.1 Background of the Study

The definition, size and drivers of the shadow economy has been the basis for many debates in academic and policy circles, not only in developing countries and emerging markets, but also in advanced economies. This is because it has an important slice over the economic activities that may not be included in calculating the official Gross Domestic Product (GDP) for a country[1]. However, recent global developments, such as migration waves, trade tensions, climate change, advances in digital technology, and shift in labour market dynamics, has influenced the scope, composition, and characteristics of the phenomenon, thus triggering a renewed interest in the vicissitudes surrounding the shadow economy (Medina & Schneider, 2019).

[1] The official economy refers to the legal one that is measured by the GDP. The definition for the shadow economy is discussed in Chapter Two of this thesis.

The definition of the shadow economy has long been a contentious topic among scholars. Despite significant attention from both researchers and policymakers, there is no universally agreed-upon definition of this phenomenon (Nguyen et al., 2022). This ambiguity arises largely because the shadow economy is dynamic in nature, continually evolving in response to shifts in taxation and regulatory environments (Schneider & Enste, 2002). Medina and Schneider (2019) describe the shadow economy as comprising legal and productive economic activities deliberately concealed from official authorities due to monetary factors (e.g., taxes and social contributions), regulatory burdens (e.g., excessive governmental bureaucracy or stringent regulatory frameworks), and institutional issues (e.g., corruption, the quality of political institutions, and a weak rule of law). Alm et al. (2004), in a broader context, define the shadow economy as encompassing all economic activities "that contribute to the officially calculated gross national (or domestic) product but that are not included in these accounts." Additionally, the concept includes both legal and illegal activities that function outside the scope of formal regulations, taxation systems, and government oversight (Feige, 1979). Beyond definitional challenges, the shadow economy is referred to by various terms in the literature, such as underground, informal, hidden, grey, black, or parallel economy. Consequently, the definition of the shadow economy often hinges on the specific methodology employed to estimate its size and scope (Nguyen et al., 2022).

The rising interest of scholars, policymakers and regulators in understanding the extent and dimension of the shadow economy is motivated by the far-reaching dire social, economic and political implication which its development impose on countries (Alm & Embaye, 2013; Nguyen et al., 2022; Medina & Schneider, 2019). For instance,

an expanding shadow economy has been associated with poor governance outcomes and significant lags in attaining sustainable economic and social development (Nguyen et al., 2022). Due to the erosions in tax revenue occasioned by the underreporting of wages and output and tax evasion, evidence suggest that countries with large shadow economies tend to have less access to revenue to finance the provision of public goods and services, leading to lower productivity, slower capital and human capital accumulation, and inability to enhance social and economic inclusion (Kelmanson et al., 2019; Nguyen et al., 2022). Besides, it is argued that shadow economy widens the income and poverty gap, thus making progress toward the sustainable economy growth and development difficult (Özgür et al., 2021).

In addition, since the production cost firms operating in the shadow economy are usually lower in comparison with those in the formal economy, the expansion in shadow economy tends to also promotes unfair price competition in both input and output markets, distortion in the allocation of economic resources, and consequently significant welfare losses (Asiedu & Stengos, 2014). More so, several empirical research have illustrated that expanding shadow economy is equally associated with the pervasiveness of corruption (Friedman et al., 2000; Johnson et al., 2000), and consequently political instability (Elbahnasawy et al., 2016). Besides, evidence also shows that the shadow economy plays a very crucial role in the design and implementation of economic policy. Generally, large shadow economy is associated with inaccurate, unreliable and incomplete official statistics (on unemployment rate, labour force, inflation rate, income level, and consumption) (Dell'Anno & Adu, 2020). Therefore, following it role in biased official statistics, an expansion in shadow economy subverts policy efforts by reducing policy effectiveness, thus leading to poor

economic and social outcome (Dell'Anno et al., 2018; Karimo et al., 2022; Tan et al., 2016).

Beyond the inherent challenges in defining the shadow economy, measuring its magnitude poses significant difficulties as well. This challenge primarily arises from the secretive nature of activities within the shadow economy, along with the intentional efforts of those involved to avoid detection and scrutiny (Nguyen et al., 2022; Medina & Schneider, 2019). As a result, achieving precise and definitive measurements of the shadow economy, both at national and global levels, remains an exceedingly complex endeavor. Nevertheless, despite these substantial obstacles, researchers have proposed and adopted numerous methodologies over the years in an effort to provide meaningful estimations and shed light on the scale and scope of this elusive phenomenon.

In the literature, there exist about twelve commonly used measures, but they are often categorised into three – the direct, indirect, and model-based approaches (Elgin et al., 2021; Nguyen et al., 2022; Schneider & Buehn, 2018). The direct approach is mostly based on samples, interviews and surveys, rely on "voluntary replies, or tax auditing and other compliance methods" to ascertain the degree to which the shadow economy. The indirect measures (also indicator approaches), use macroeconomic indicators (such as currency demand, transaction indicators, electricity consumption) to determine the size of shadow economy based on certain assumptions. Lastly, the model-based approach estimates the shadow economy by explicitly considering the possible (multiple) causes and pointers of the shadow economy, and treating the phenomenon as an unobserved component (Medina & Schneider, 2019; Nguyen et al., 2022). The

"multiple indicators-multiple causes" (MIMIC) approach is one of the most popular models under this category.

Over time, one or more of these approaches – especially the indirect currency demand function model (CDFM) and model-based approaches – has been employed to determine the size of shadow economy, both globally and within a national economy. Recent studies conducted around the world, based on these approaches, suggest that a significant portion of economic activities remains "hidden from the authorities and many workers are getting paid but with no record to validate the transactions" (Tan et al., 2016). For example, using the MIMIC approach, Medina and Schneider (2019) reveal that the average size of the shadow economy in 157 developed and developing countries between 1991 and 2017 is equivalent to about 30.9 percent of the global GDP. Additionally, the results suggest that the size of the shadow economy ranges from less than 20 percent of GDP in high-income OECD countries to almost 40 percent in developing countries. Similarly, employing the CDFM method, Alm and Embaye (2013) discovered that the shadow economy accounts for about 32 percent of the official GDP in 111 OECD and non-OECD countries during the 1984-2006 period, with the values varying between about 16.9 percent (OECD countries) and 38.2 percent (low-income countries).

Besides the differences in the figures generated, the outcomes seem to suggest that the incidence of shadow economy is more prevalent in developing countries. In the literature associated with shadow economy, it is shown that a significant number of individuals and small enterprises in developing economies and emerging markets operate in the shadow economy (Elgin et al., 2021; Nguyen et al., 2022). Specifically,

the shadow economy reportedly constitutes over 70 percent of total employment and account for about one-third of the national output (Elgin et al., 2021; Medina & Schneider, 2019). In some Sub-Saharan Africa (SSA) countries, shadow economy account for more than 90 percent of the total employment and as much as 62 percent of the official GDP (ILO, 2018; World Bank, 2019). In the recent decades, the thriving of shadow economic activities in these countries have been cited as an important obstacle to their development (Jacolin et al., 2021).

Like most developing economies and emerging markets, evidence suggest that Malaysia is also associated with large shadow economic activities. Available statistics on the shadow economy generated grounded on the CDFM and MIMIC approaches suggest that the average size of the shadow economy relative to the GDP is about 17 percent between 1975 and 2012 (Tan et al., 2017), and 30 percent (Alm & Embaye, 2013) and 31 percent (Medina & Schneider, 2019), during the 1984-2006 period and 1999-2017 period, respectively. Country-specific studies in Malaysia[2], however, painted a rather gloomy picture of the incidence of shadow economy in the country. For instance, Kasipillai et al. (2000) suggested that shadow economy only constitutes about 7.05 percent of Malaysian GNP between 1971 and 1994. In contrast, recent studies reported that the average size of shadow economy relative to the official GDP during the 1972-2012 period is about 42.53 percent, ranging from less than 20 percent to about 115 percent (Gamal et al., 2019; Tan et al., 2016). On their part, Din et al. (2019)

[2]In the existing literature, a country-by-country approach to analyzing the size of the shadow economy is often preferred, largely due to variations in tax policies and the socioeconomic characteristics of different nations (Tan et al., 2016). Additionally, the factors driving the growth and development of the shadow economy are not uniform across countries, further emphasizing the necessity for country-specific analyses (Karimo et al., 2022).

indicated that about 44.5 percent of the GDP is ascribed to the shadow economy in the country during the 1970-2013 period.

In a regional context, these figures places Malaysia among the top four Southeast Asian countries with sizable shadow economy, only behind Cambodia, Myanmar and Philippines. Within-country analysis of the dimension and evolution of shadow economy equally demonstrate that the intensity and size of the shadow economy varies across the thirteen (13) Malaysian states. For instance, estimating the size of state-level shadow economy, Yap et al. (2017) discovered that smaller urbanised Malaysian states (such as Melaka, Selangor, and Penang) have relatively smaller shadow economy in comparison with states with large land size, rural population, and significant presence of unskilled labour force (such as Sabah and Sarawak). Typical of a developing country, activities in the Malaysian shadow economy include unregistered small- and medium-scale businesses and industries (such as manufacturing, restaurant, retailing, and distributive trade) and small-scale street vending, specifically petty trading and hawking in the night markets (Din, 2016; Kassim & Jayasooria, 2001). Besides, the Malaysian shadow economy also covers small, medium and large-scale illicit activities such as tax evasion, counterfeiting, smuggling, trafficking in drug and weapon, human trafficking and prostitution ring, money laundering, gambling, and terrorism-related activities, amongst others (Masron et al., 2011).

Like most developing and emerging market economies, the thriving of shadow economic activities in Malaysia may well be associated with the country's pervasive corruption, unemployment, weak institutional quality, and most importantly, the country's high level of income inequality in relation to other Asian countries and

economics with similar economic potentials (Ab Hamid et al., 2020). From about 50 percent in 1957, Malaysia was able to reduce its poverty rate to less than 1 percent in the recent decades, and equally raising its GDP per capita from about US$244.61 in 1960 to more than US$11,109.26 in 2021, ranking it third in terms of income per capita in the Southeast Asian region only behind Singapore and Brunei (Ab Hamid et al., 2020; World Bank, 2023; Yap et al., 2017). Despite these, evidence indicate that more than half of the population and about 78 percent of the rural population earn less than one-ninth of the per capita income (Yap et al., 2017). Clearly, this suggest that the country's high economic growth and income growth are disproportionately distributed among the Malaysian states and income groups (Ab Hamid et al., 2020; Yap et al., 2017). Ironically, in the literature associated with the shadow economy, increase in income inequality is associated with expanding shadow economic activities (Dell'Anno, 2016; Winkelried, 2005).

Without doubt, the large size of shadow economy in Malaysia implies that the country will have to contend with persistent decline in tax revenue, ineffective economic policies, and poor economic outcomes. Perhaps due to the expansive shadow economy in Malaysia, Murphy (2011) reported that the country losses an average of about US$11.243 billion annually to tax evasion activities between 1999 and 2007. With the growing shadow economy and massive loss of revenue to tax evasion practices, coupled with the emergence of the COVID-19 pandemic, public revenue and debt problem is aggravated and fiscal sustainability is emerging as a significant apprehension for inclusive and sustainable economic growth and development in the country (Hashemi-Nabi et al., 2021; Nguyen et a., 2022). The implication of such potential public revenue on social and economic development is rather obvious.

The success in calculating the size of the shadow economy has provided a more comprehensive picture into what shadow economy is and the drivers of the shadow economy. Most importantly, the access to the shadow economy statistics has presented policymakers and researchers with an opportunity to better understand the phenomenon and give pragmatic policy recommendations to tackle the issue head-on (Nguyen et al., 2022). Unfortunately, in a situation where the estimates generated are incomplete or incorrect, policy actions and efforts based on them to reduce the incidence and adverse consequences of the shadow economy tend to be ineffective. The estimations of the shadow economy generated may either be overstating or understating the extent of the issue due to the clandestine nature of shadow economy, on the one hand, and mostly on account of the methodological issues and the inadequacies associated with the existing approaches of measuring the phenomenon (see Breusch, 2005a, 2005b; 2005c; 2005d; Huynh & Nguyen, 2020; Medina & Schneider, 2019; Nguyen et al., 2022; Schneider & Buehn, 2018).

Besides the methodological issues associated with the existing methods, the adequacy of estimates of shadow economy generated may be determined or influenced by the arbitrary attribution of the evolution of the shadow economy to some perceived factor(s), while ignoring the role of some important drivers of the phenomenon. In fact, herein lies one the major criticism against the use of the indirect approaches to estimate the magnitude of the shadow economy (Medina & Schneider, 2019; Nguyen et al., 2022; Schneider & Buehn, 2018). In this regard, the MIMIC model-based approach is not even any better or superior to the other methods. This is mainly on account of the fact that the choice of cause and indicator variables in the MIMIC framework are arbitrary and not reinforced by theory, notwithstanding the consideration of multiple

causes and indicators of the shadow economy (Gamal & Dahalan, 2015; Karimo et al., 2022; Medina & Scheneider, 2019). More so, the assumption of homogenous drivers of shadow economic activities across countries in most of the existing cross-country studies tend to also impair the adequacy of the estimates generated (Karimo et al., 2022; Tan et al., 2016).

Interestingly, while a wide range of factors can drive the shadow economy (see Medina & Schneider, 2019; Schneider & Buehn, 2018), much of the research has primarily concentrated on the tax burden (and social security contributions) as the principal determinant(s) of the shadow economy (Nguyen et al., 2022; Schneider & Buehn, 2018; Tan et al., 2016). Schneider (2009), for instance, found that the tax and social security contribution burden accounted for approximately 45 to 52 percent of the shadow economy's prevalence. However, evidence shows that countries with higher tax rates often have a relatively smaller shadow economy compared to nations with lower tax burdens but larger shadow economies. This observation implies that a high tax rate or burden may not necessarily correlate with the expansion of the shadow economy (Gaspareniene & Remeikiene, 2015). Recent studies further reveal that beyond tax and social security burdens, public expenditure—alongside public debt and fiscal deficits—plays a crucial role in influencing whether firms and individuals choose to participate in the formal economy or the shadow economy (Berdiev & Saunoris, 2018; Elgin & Oztunali, 2014; Esaku, 2021; Nguyen et al., 2022).

The size and nature of public spending may drive and sustain the shadow economy for the following reasons. First, expanding public expenditure often leads to the crowing-out effect on private investment, discourages savings, investment, and

distort resource allocation, and ultimately hinder the growth of the (formal) economy (Barro, 1990). In response, individuals and firms are encouraged to consider the shadow economy (Dell'Anno et al., 2018). Second, increase in public spending is typically accompanied with a "heavy burden of laws, regulations, and costly and cumbersome procedures", which causes operational constraints and limits the freedom of choice to work in the formal sector (Nguyen et al., 2022). In the Legalist theory, it is argued that individuals and firms will avoid these excessive regulations of the government by operating in the shadow economy (De Soto, 1989; Nguyen et al., 2022). Third, rising public expenditure is normally associated with an increase in taxes to overcome budget imbalances. Unfortunately, evidence suggest that such upsurge in taxes creates a rancorous cycle of pushing more individuals and business into the shadow economy (Nguyen et al., 2022).

Meanwhile, besides the inconsistent figures of Malaysian shadow economy presented in the literature, available statistics from the World Bank's World Development Indicators (WDI) suggest that Malaysian tax burden (ratio of tax revenue to GDP) is amongst the lowest in the world. In addition to this, the country's public expenditure is also marked by a consistent increase from 1960 through 2021 (World Bank, 2023). In particular, while the tax burden in Malaysia (ratio of tax revenue to the GDP) averaged at less than 15 percent between 1996 and 2021, public expenditure has risen from about US$237.49 million in 1960 to about US$7.05 billion and US$47.42 billion in 1998 and 2021, respectively. In a way, this may be an indication that the incidence and advance of shadow economy in Malaysia is not mainly driven by tax burden. Ironically, all the existing studies on the size of shadow economy in Malaysia are founded on the assumption that the choice to operate in the shadow are driven by

tax burden (see for instance, Alm & Embaye, 2013; Din et al., 2019; Gamal et al., 2019; Medina & Schneider, 2019; Tan et al., 2016; Tan et al., 2017). In this regard, and given the trend of changes in the country's public spending, it may be suggestive that beyond tax burden, the size of public expenditure may have played a momentous role in the development of the shadow economy in Malaysia.

Since research in the area of shadow economy is still limited and the robustness of the available methods of measuring the phenomenon are difficult to ascertain, it may be beneficial to incorporate the behaviour of public expenditure, one of the overriding pillars of fiscal policy, in the estimation of the size of shadow economy in the country. Therefore, the present study seeks to re-estimate the size of the shadow economy in Malaysia through the channel of public expenditure. The present research is relevant and contributes to the extant literature in many ways. First, the study is a pioneering attempt to explicitly explore the development of the shadow economy through the lenses of public expenditure both in Malaysia and elsewhere. The study is a major departure from the existing studies which focused on tax burden (and social security contribution burden, regulation, institutional quality, and unemployment) as drivers of shadow economy. Second, the present study provides a comprehensive, accurate and robust estimation of the size and evolution of the Malaysian shadow economy since 1970. To achieved this, the study employs the currency demand approach proposed by Pickhardt and Sardà (2006). The procedure does not require a reference year in which the size of the underground economy is assumed to be zero, neither does it require that the velocity of cash circulation in both the formal and the shadow economy to be the same.

Third, to ensure accurate and reliable conclusions regarding the size of the shadow economy and its determinants in Malaysia, this study employs the autoregressive distributed lag (ARDL) bounds-testing methodology proposed by Pesaran et al. (2001). Alongside this approach, additional estimation techniques are utilized, including the Gregory-Hansen cointegration test, non-linear ARDL (NARDL) bounds-testing, dynamic ordinary least squares (DOLS), canonical cointegration regression (CCR), and fully modified OLS (FMOLS) procedures. These methods are applied to assess both the drivers and the impacts of the shadow economy in Malaysia. Fourth, by examining the size and progression of the shadow economy over an extended period, from 1970 to 2022, this study offers a significantly longer time series than most existing literature, thereby providing deeper insights into its evolution. Lastly, by re-evaluating the shadow economy's size in Malaysia, the findings of this research contribute to the expanding body of literature on the subject and equip policymakers with more precise and reliable estimates of the shadow economy, which are crucial for effectively addressing the associated challenges.

1.2 Problem Statement

In recent decades, particularly after the Asian financial crisis in late 1990s, Malaysian economy has enjoyed rapid economic growth, with the gross domestic product (GDP) increasing from about US$93.79 billion in 2000 to more than US$372.98 billion in 2021, at an average of 5.4 percent annually (World Bank, 2023). With a nominal GDP of about US$407.923 billion in 2022, the country emerged as the fourth largest economy in Southeast Asia, only behind Indonesia, Thailand, and Singapore. Moreover,

from about US$244.61 in 1960, Malaysian's GDP per capita has almost reached the high-income level at about US$12.364 in 2022, positioning her as the third largest Southeast Asian country in term of per capita income in 2022, only after Singapore and Brunei (World Bank, 2023). Indeed, occasioned by Malaysia's strong sustained economic growth, relatively stable economic and political environment, and efforts in reducing poverty amongst the populace (Ab Hamid et al., 2020; Huynh & Nguyen, 2020; Yap et al., 2017). At the same time, income gap is widened in the country. With a Gini index of about 41.2 in 2018, statistics suggest that Malaysia has the highest income inequality in Asia (Ab Hamid et al., 2020). In addition, evidence reveal that more than half of the population and about 78 percent of the rural population earn less than one-ninth of the per capita income, an indication that the recent rapid economic growth in Malaysia has disproportionately distributed across Malaysian states and income groups (Ab Hamid et al., 2020; Yap et al., 2017). Meanwhile, in the literature, widening income gap is associated with the evolution of the shadow economy in developing countries (Dell'Anno, 2016; Winkelried, 2005). In a way, high income inequality fosters the "development of the shadow economy, and the incidence of the shadow economy further widens the income gap in an economy" (Özgür et al., 2021).

Evidence have shown that considerable number of individuals and business in developing countries and emerging market economies operate in the shadow economy, a development which have significant adverse implication for sustainable economy growth and development (Elgin et al., 2021; Nguyen et al., 2022). Unfortunately, like most developing countries and emerging market economies, evidence suggest that shadow economic activities account for a substantial share of the economy. In Malaysia, the shadow economy encompasses activities ranging from unregistered businesses and

industries and small-scale street vending to small, medium and large-scale illicit activities such as tax evasion, counterfeiting, smuggling, trafficking, money laundering, and gambling amongst others (Din, 2016; Kassim & Jayasooria, 2001; Masron et al., 2011). Expectedly, the development of "shadow economy in Malaysia" indicate that the country will have to contend with persistent decline in tax revenue, ineffective economic policies, and poor economic outcomes. For example, on account of the sizable "shadow economy in Malaysia", Murphy (2011) indicated that the country losses an average of about US$11.243 billion annually between 1999 and 2007 to tax evasion activities. With sustained expansion in the shadow economy and increase in the loss of revenue to tax evasion practices, it is not unexpected that government's ability to provide public goods and services will be significantly affected, and consequently social and economic development.

Despite the difficulties associated with estimating the size of the shadow economy, employing some of the approaches proposed in the literature has provided a comprehensive picture on the scale of the phenomenon and the factors driving its development. For instance, using the MIMIC and CDFM approaches, it is demonstrated that the "average size of Malaysian shadow economy relative to the GDP" is about 17 percent between 1975 and 2012 (Tan et al., 2017), 30 percent during the 1984-2006 (Alm & Embaye, 2013), and 31 percent during the 1999-2017 period (Medina & Schneider, 2019). Some other studies indicated that the shadow economy account for about 42.53 percent of the GDP during the 1972-2012 period (Gamal et al., 2019; Tan et al., 2016) and about 44.5 percent during the 1970-2013 period (Din et al., 2019).

Notwithstanding the benefits associated with the access to the "estimates of shadow economy", with the number of methodological issues and the inadequacies associated with the existing approaches used in estimating the size of shadow economy (see Medina & Schneider, 2019; Nguyen et al., 2022; Schneider & Buehn, 2018), the tendency of generated estimates either overstating or understating the extent of the issue cannot be totally ignored. Moreover, and most importantly, "the fact that the evolution of the shadow economy is typically" tied to some arbitrary indicators/factors may also impair the adequacy of the generated estimates of shadow economy. While the indirect approach is often criticised on the grounds that the decision of individuals and firms to operate in the shadow is influenced by a single factor/indicator (Medina & Schneider, 2019; Schneider & Buehn, 2018). The fact that the choice of cause and indicator variables in the model-based approaches are arbitrary and not reinforced by theory also exposes the approach to serious possibility of misleading estimates (Gamal & Dahalan, 2015; Karimo et al., 2022; Medina & Scheneider, 2019).

In the literature associated with the shadow economy, there exists a plethora of factors capable of driving individuals and firms to operate in the shadows (see Medina & Schneider, 2019; Schneider & Buehn, 2018). However, emphasise is mainly on the tax (and social security contribution) burden (Nguyen et al., 2022; Schneider & Buehn, 2018; Tan et al., 2016). Besides, about 45 to 52 percent of the evolution of the shadow economy is attributed to tax a social security contribution burden (Schneider, 2009). However, with evidence showing countries with high taxes having a relatively small shadow economy compared to countries with lower tax burden and larger shadow economies, this long-standing perception has been brought to scrutiny (Gaspareniene & Remeikiene, 2015). Interestingly, recent evidence has shown that, beyond tax burden,

public expenditure (in addition to public debt and fiscal deficit) also plays a very critical role in influencing the decisions of firms and individuals to either operate in the formal or go into the shadow (Berdiev & Saunoris, 2018; Elgin & Oztunali, 2014; Esaku, 2021; Nguyen et al., 2022).

This is basically on account of the crowing-out effect of public expenditure and the fact that increase in public spending is typically accompanied with an increase in taxes and a "heavy burden of laws, regulations, and costly and cumbersome procedures" which causes operational constraints and limits the freedom of choice to work in the formal sector (Barro, 1990; De Soto, 1989; Nguyen et al., 2022). Moreover, an expansion in public expenditure may either be positive or negative. Larger public expenditure may promote the decision of individuals and firms to go underground when it creates bureaucratic bottlenecks, while it may deter the development of public expenditure such expansion is associated with greater enforcement (Goel & Nelson, 2016).

Therefore, in the light of the above, in addition to the fact that "Malaysian tax burden (ratio of tax revenue to GDP) is amongst" the lowest in the world and the country's public expenditure is marked by a consistent increase from 1960 through 2021, the present study seeks to re-estimate and present a comprehensive, accurate and robust estimation of the size and evolution of the shadow economy in Malaysia through the channel of public expenditure. To the best of our knowledge, all the existing studies on the size of shadow economy in Malaysia and elsewhere are based on the assumption that the decision to operate in the shadow are driven by tax burden (see for instance, Alm & Embaye, 2013; Din et al., 2019; Gamal et al., 2019; Medina & Schneider, 2019;

Tan et al., 2016; Tan et al., 2017). To achieve this, the study improves on the modified version of the currency demand proposed function by Pickhardt and Sardà (2006) which provides a simple and transparent mathematical calculation for the size of the shadow economy.

1.3 Research Questions

Based on the foregoing discussion, the following questions are raised:

i. What is the magnitude of shadow economy through the public expenditure channel in Malaysia?
ii. Is the effect of shadow economy on economic growth in Malaysia non-linear?
iii. What level of the Malaysian shadow economy can be attributed to the level of public expenditure?
iv. Is there a causal relationship between shadow economy, public expenditure, self-employment, and corruption in Malaysia?

1.4 Research Objectives

In light of the questions outlined above, the primary aim of this study is to assess the size of the shadow economy and identify its key determinants in Malaysia over the period from 1970 to 2022. The specific objectives of the research are as follows:

i. To quantify the magnitude of shadow economy through the public expenditure channel in Malaysia.

ii. To examine the asymmetric effect of shadow economy on economic growth in Malaysia.

iii. To determine the level of shadow economy that is related to the level of public expenditure in Malaysia.

iv. To ascertain the causal relationship between shadow economy and its potential drivers in Malaysia.

1.5 Research Hypotheses

The hypotheses in their null form are specified as:

H_1^0: The size of Malaysian shadow economy through the public expenditure channel is unknown.

H_2^0: The effect of shadow economy on economic growth in Malaysia is not asymmetric.

H_3^0: The level of shadow economy related to the level of public expenditure in Malaysia is not known.

H_4^0: There is not causal relationship between shadow economy and the drivers of its size in Malaysia.

1.6 Motivation and Significance of the Study

The motivation of the present research is derived from the unimaginable height of income inequality in Malaysia and the disproportionate distribution of the benefits accrued from the recent impressive and rapid growth of the economy across the states and income groups. To change the narrative, huge funds are needed to invest in critical sectors of the economy and "human capital development," in addition to the design, adoption and implementation of pragmatic economic policies. Unfortunately, evidence suggest that the presence of large shadow economy may impair these efforts, specifically due to its direct influence in reducing public revenue and limiting the effectiveness of economic policies through biased economic and social statistics. To address the prevailing socioeconomic issues and control the expansion of the shadow economy, it is therefore paramount to identify the scale of the phenomenon to better understand what it entails and the factors that drive the phenomenon.

This study is both relevant and justified for several reasons. First, it concentrates on Malaysia, one of the world's fastest-growing economies. Second, although numerous studies have examined the size of the shadow economy in Malaysia and other countries, this study is a pioneering effort to determine the size and development of the shadow economy in Malaysia through the public expenditure channel. To the best of our knowledge, previous research on this topic has primarily focused on estimating the shadow economy in relation to the tax burden (see Alm & Embaye, 2013; Din et al., 2019; Gamal et al., 2019; Medina & Schneider, 2019; Tan et al., 2016; Tan et al., 2017). Third, beyond examining the shadow economy's evolution through the lens of public expenditure, this research is particularly innovative due to the use of the modified

currency demand function approach developed by Pickhardt and Sardà (2006). This approach, known for its straightforward and transparent calculation method for estimating the shadow economy's size, takes into account the role of public expenditure in shaping the decisions of individuals and businesses to engage in the shadow economy. As a result, it provides a comprehensive, precise, and robust estimate of the size and evolution of Malaysia's shadow economy from 1970 to 2022.

Fourth, this research is further justifiable due to its examination of the asymmetric effects of the shadow economy on Malaysia's overall economy. Given the variation in economic development levels across countries and the divergent views in the literature regarding the relationship between the shadow economy and economic growth, investigating whether the impact in Malaysia is non-linear presents a valuable area for exploration. Fifth, the study also explores whether the size of the shadow economy in Malaysia is influenced by the prevailing levels of public expenditure and/or corruption in the country. Finally, by estimating the magnitude of Malaysia's shadow economy using the modified cash-deposit-ratio (MCDR) approach and considering how public expenditure affects decisions to operate in the shadow economy, this research aims to provide a more robust and thorough understanding of the size, scope, and evolution of the shadow economy in the nation. Most importantly, the results generated are crucial for policymakers and relevant authorities in crafting and implementing effective policies to address the challenges posed by the shadow economy.

1.7 Scope of the Study

The primary objective of this study is to examine the size, evolution, and underlying drivers of the shadow economy in Malaysia. More specifically, the research aims to quantify the magnitude of the shadow economy in the country. In addition, the study investigates the factors that influence the shadow economy, explores its asymmetric impact on economic growth, and assesses the role of the interaction between corruption and public expenditure in shaping the level of the shadow economy in Malaysia during the period under consideration. The decision to re-estimate the size of Malaysia's shadow economy and identify its key drivers stems from the mixed evidence in the existing literature regarding the size and development of the shadow economy in the country. The study covers the period from 1970 to 2022, with this time frame selected based on the availability of relevant data for analysis during these years.

1.8 Organisation of the Thesis

The research is structured as follows. Chapter one serves as the introduction to the study. It includes the background of the study, the problem statement, research questions, research objectives, hypotheses, the significance and motivation for the study, the scope of the study, and the plan of the study. Chapter two presents a comprehensive review of the literature. This chapter is divided into six sub-sections. The first sub-section discusses the conceptual literature related to the shadow economy, while the second and third sub-sections provide an overview of the Malaysian economy and the development and evolution of the shadow economy in the country. The

remaining sub-sections focus on reviewing both the theoretical and empirical literature concerning the shadow economy. Chapter three outlines the research methodology, which includes model specification, methods of data analysis, and the sources of data. The empirical results are presented and analyzed in chapter four. Finally, chapter five summarizes the key findings of the study, provides policy recommendations, and concludes with the limitations of the study and suggestions for future research.