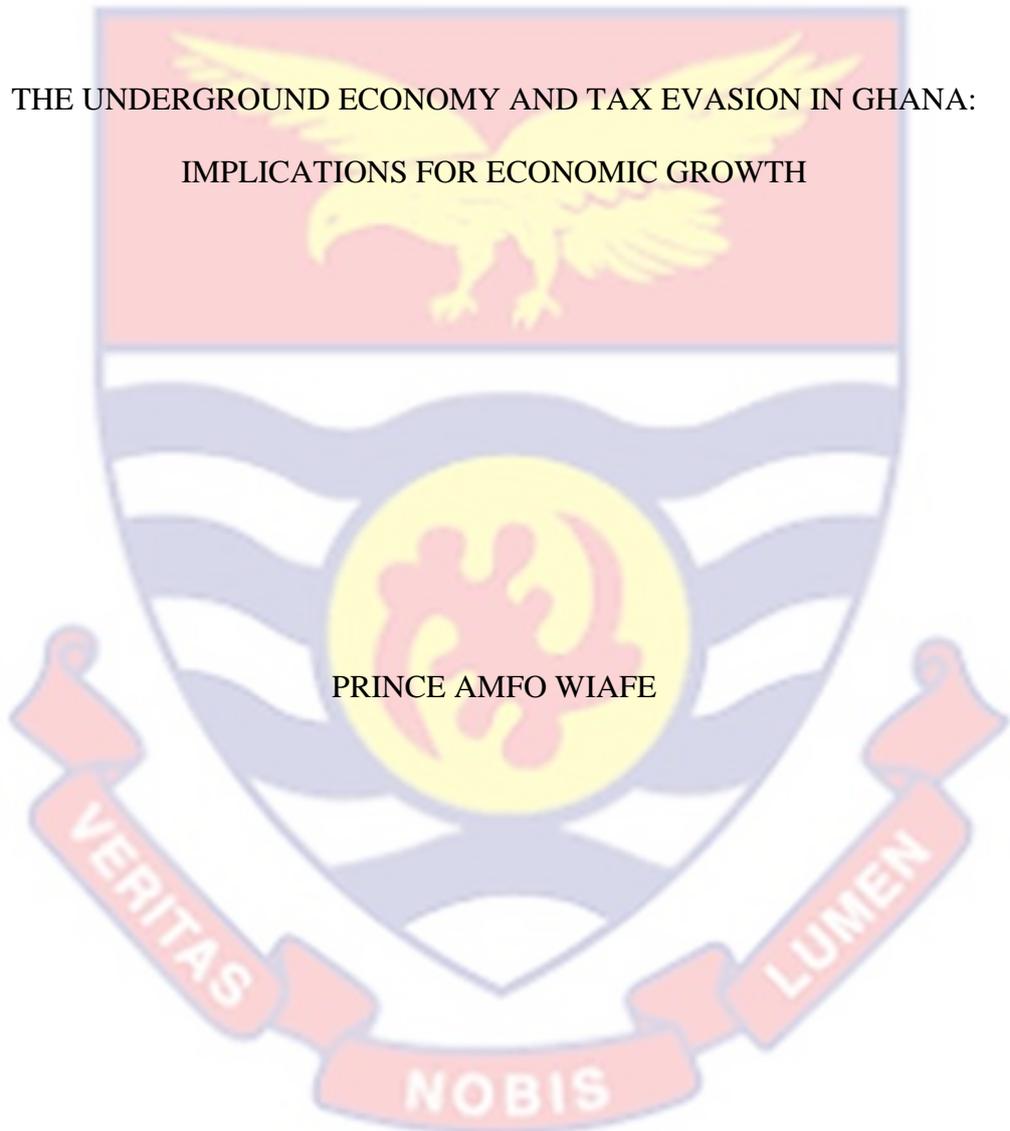


UNIVERSITY OF CAPE COAST



THE UNDERGROUND ECONOMY AND TAX EVASION IN GHANA:
IMPLICATIONS FOR ECONOMIC GROWTH

PRINCE AMFO WIAFE

2022

UNIVERSITY OF CAPE COAST

THE UNDERGROUND ECONOMY AND TAX EVASION IN GHANA:

IMPLICATIONS FOR ECONOMIC GROWTH

BY

PRINCE AMFO WIAFE

Thesis Submitted to the Department of Economic Studies of the School of Economics of the College of Humanities and Legal Studies, University of Cape Coast, in partial fulfilment of the requirement for the award of Master of Philosophy Degree in Economics.

JUNE 2022

DECLARATION

I hereby declare that this thesis is the result of my own original research and that no part of it has been presented for another degree in this university or elsewhere.

Candidate's Signature Date

Candidate's Name: Prince Amfo Wiafe

Supervisors' Declaration

We hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines of supervision of thesis laid down by the University of Cape Coast.

Principal Supervisor's Signature: Date

Principal Supervisor's Name: Dr. Mark Armah

Co-Supervisor's Signature: Date

Co-Supervisor's Name: Prof. Ferdinand Ahiakpor

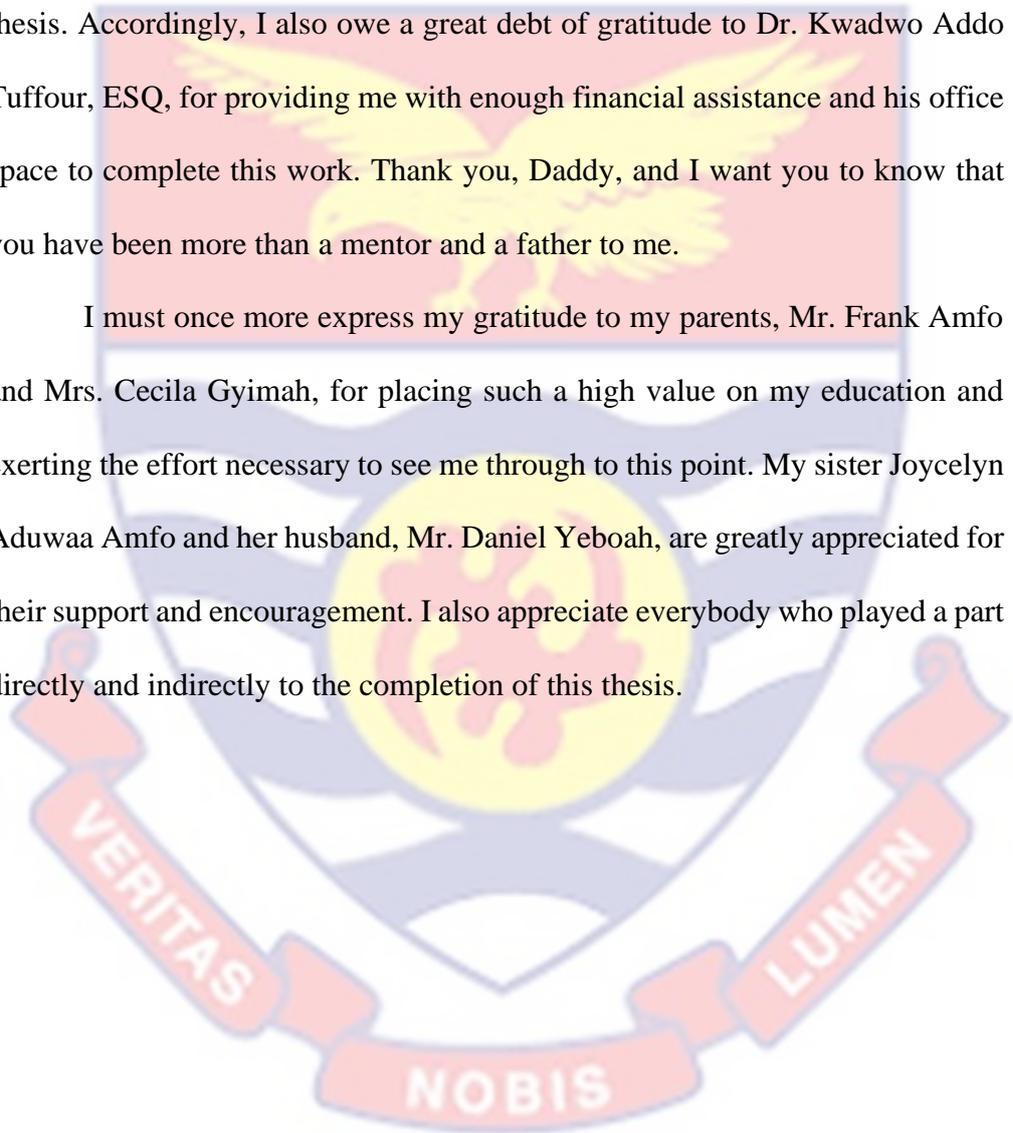
ABSTRACT

The objective of the study was to determine the size of Ghana's underground economy and the extent of tax evasion in Ghana. The underground economy in most countries is vital because it serves as a survival place for most people. However, their activities are mostly related to tax evasion because their economic activities are mostly concealed from government tax authority agencies. The study used the Multiple Indicator Multiple Cause (MIMIC) model, a variant of the Simultaneous Equations Model (SEM), to estimate the size of Ghana's underground economy. The data was obtained from the World Bank country indicators, Economic Freedom and Bank of Ghana and its spans from 1990 to 2020. The study is one of the premier to estimate the size of Ghana's underground economy using the MIMIC model. The study found that the average size of Ghana's underground economy is about 44 per cent of the official GDP of the economy and is primarily caused by Tax burden, government integrity, government spending, unemployment, self-employment, inflation and employment in the agricultural sector. The estimated tax evasion due to the presence of the underground economy is, on average, about 6.28 per cent of GDP. Other findings from the study were that, while tax evasion negatively affects economic growth, the underground economy's size positively affects economic growth in Ghana. The study recommends that since the underground economy, to some extent, provides job security to some individuals within the country, their activities must be formalized by ensuring proper documentation and registration. Furthermore, the government should ensure a fair, equitable and simplified tax system while encouraging innovation and entrepreneurship.

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I must once more express my gratitude to my parents, Mr. Frank Amfo and Mrs. Cecila Gyimah, for placing such a high value on my education and exerting the effort necessary to see me through to this point. My sister Joycelyn Aduwaa Amfo and her husband, Mr. Daniel Yeboah, are greatly appreciated for their support and encouragement. I also appreciate everybody who played a part directly and indirectly to the completion of this thesis.



DEDICATION

To my family, Mr Frank Amfo, Mrs Cecila Gyimah, Dr Kwadwo Addo
Tuffuor ESQ, Mrs Joycelin Aduwaah Amfo, and my late sister Mrs Lydia
Asantwaa.

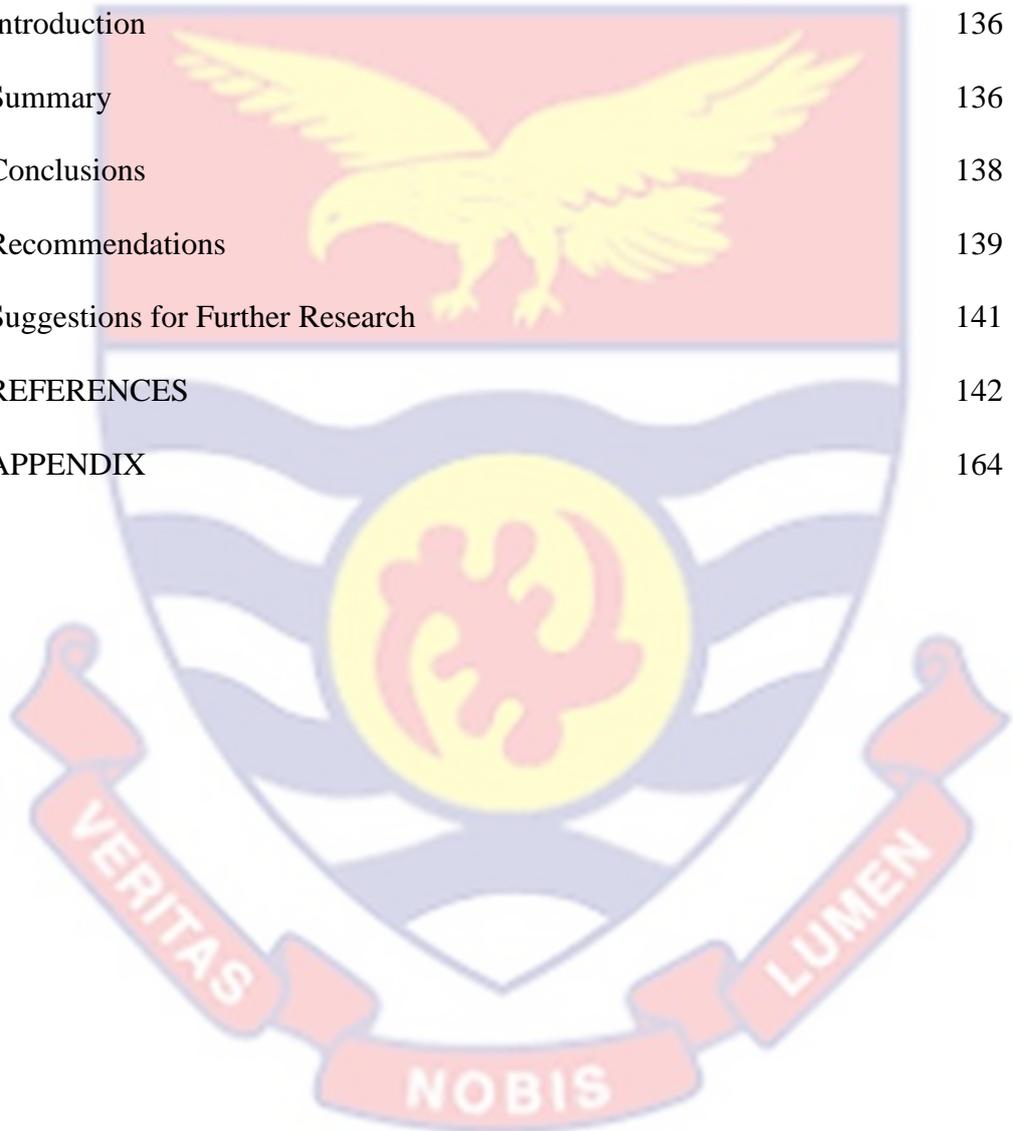


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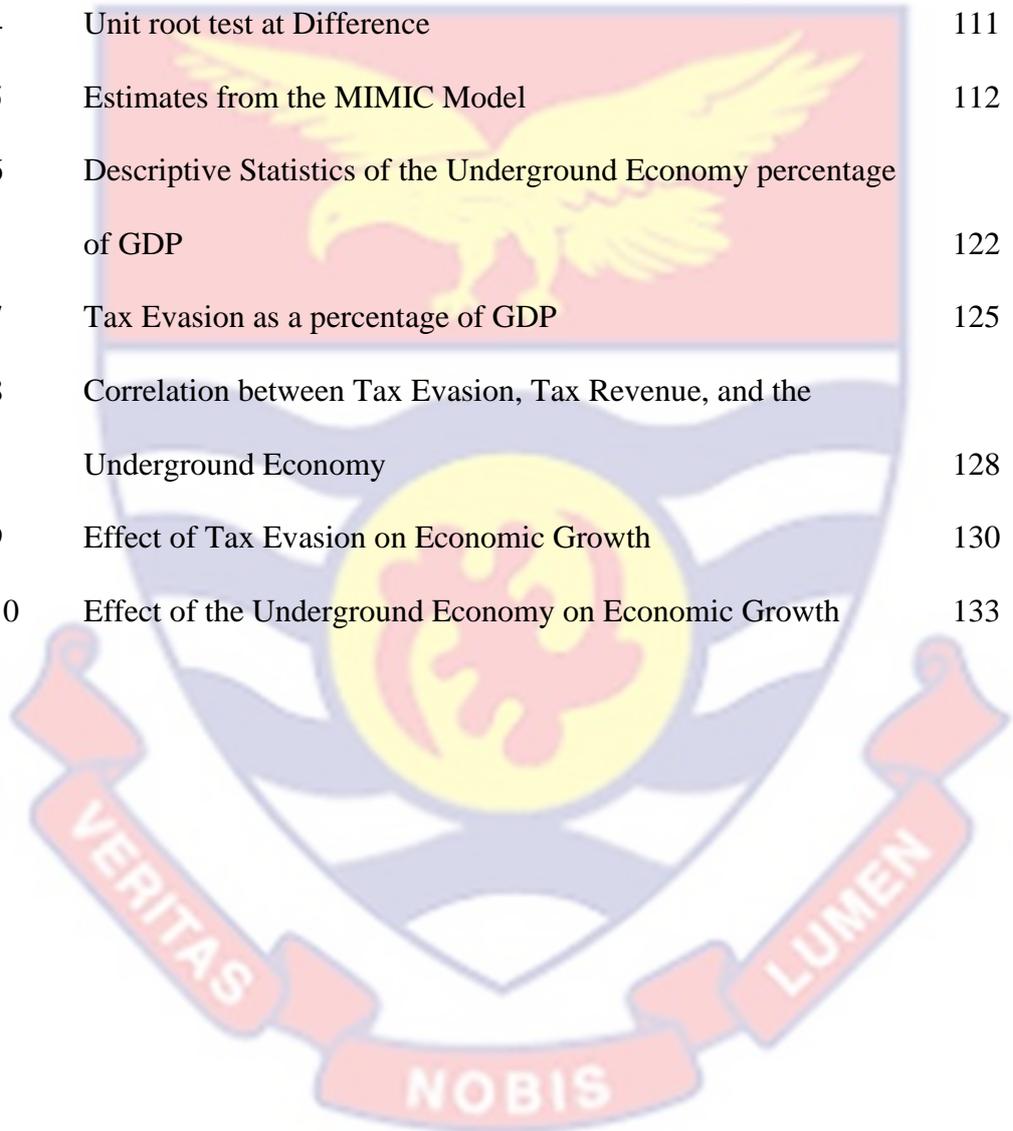
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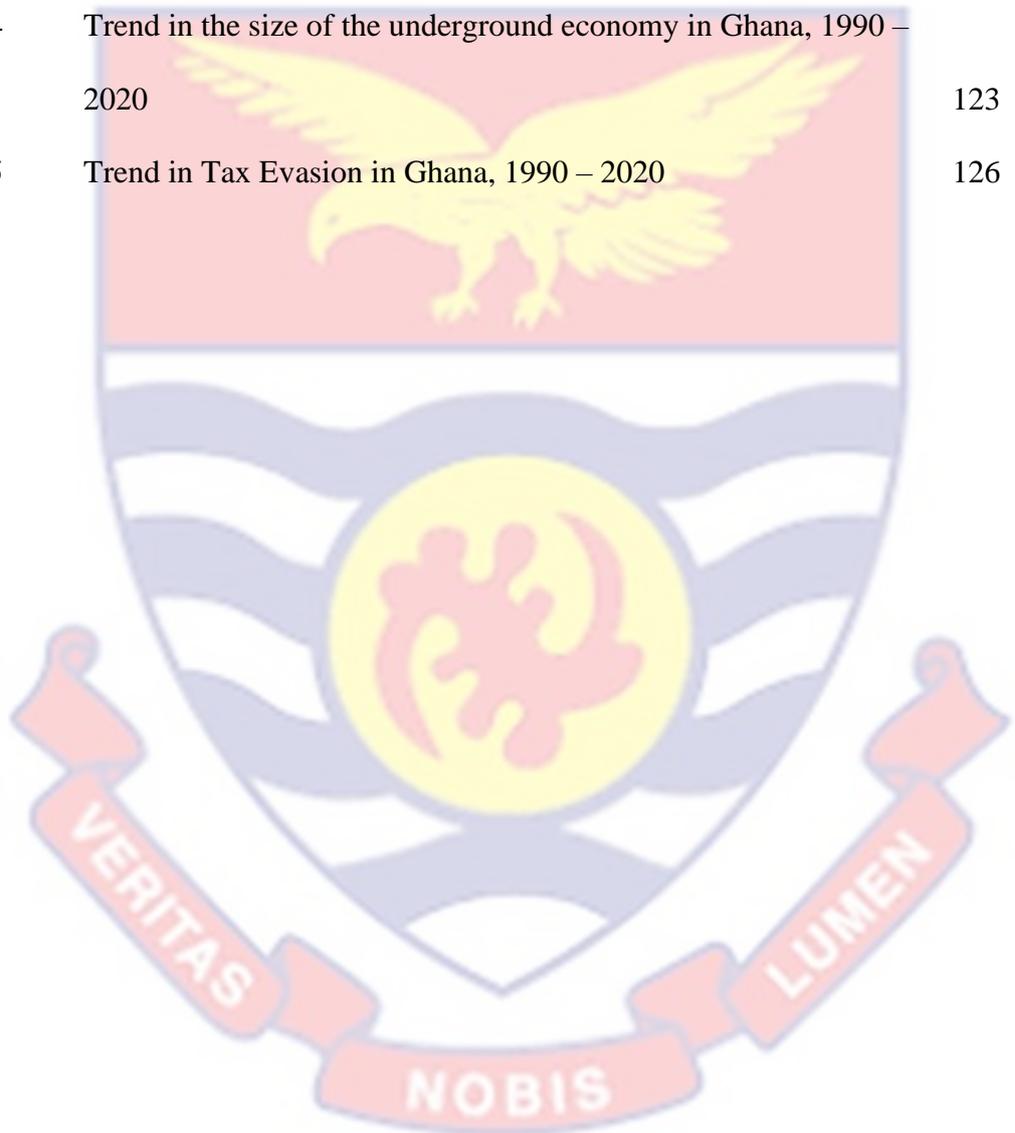
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CHAPTER ONE

INTRODUCTION

Background to the Study

Every government's goal is to stimulate economic growth in the country. According to Dfid (2008), achieving economic growth is the most effective tool in every country's quest to eradicate poverty while raising living standards and the quality of life. Economic growth is primarily linked with a rise in a country's national income or output and is conventionally measured using a country's per capita GDP. It is an essential indicator of the health of an economy and is typically associated with increased employment, higher incomes, and improved standards of living. Growth is paramount in every nation because sustained growth over time leads to development, in the sense that government output increases and, therefore, there is enough to finance its budget and developmental projects. Also, it is essential for achieving Sustainable Development Goals (SDGs) more quickly.

However, not all economic activities are visible to government officials, therefore, accounting for them in the country's GDP becomes problematic. For instance, some individuals engage in economic activities within the household, making it difficult for their output to be taxed or captured in the national income accounting (Thomas, 1992). These activities are most predominant in the underground or informal economy. Although the underground economy exists in all economies, particularly those of emerging nations, identifying it is difficult (Schneider, 2010). Schneider (2005) asserts that defining this phenomenon is a continuing challenge for scholars trying to assess the size of the underground or hidden economy. The underground economy cannot be

directly observable and should be treated as a latent variable in the estimation (Mazhar & Méon, 2017, Draeseke & Giles, 2002, Breusch 2005, and Schneider & Buehn, 2016). Smith (1994) proposed that the creation of commodities and services on the market that are not included in the nation's official GDP calculations, whether they are produced legally or illegally, may be referred to as the hidden economy. Tokman and Klien (1996) describe this phenomenon as any economic engagement that predominantly occurs outside the established regulatory authorities. Whereas Onyima & Ojiagu (2017) describes the underground economy as any business firm or entity which is not formally registered with the registered general department.

In all the definitions, the underground economy's common characteristic is that its operations are mostly concealed from government authorities without formal regulations. This can include activities such as unreported income, black market transactions, and illegal trade. Because these activities are not reported to the government or included in official economic statistics, they can distort measures of economic growth and make it more difficult for policymakers to make informed decisions about economic policy. In some cases, the underground economy can contribute to economic growth by providing employment opportunities and generating income for people who might otherwise be excluded from the formal economy. However, it can also have negative consequences, such as reducing tax revenue, distorting market competition, and promoting criminal activity.

In Ghana, the underground economy is a significant part of the overall economy. While there is limited official data on the size of the underground economy, various studies and reports provide empirical evidence of its existence

and impact. In Ghana, the majority (70%) of those employed are in the underground economy, however, they contribute only 16.7 per cent of the tax revenue (Akoto, 2020). Another study conducted by the Ghana Statistical Service (GSS) in 2017 found that although the informal sector accounted for 87 per cent of employment in Ghana, the sector accounted for 38 per cent of the country's GDP in 2015. The sector thus contributes considerably to several economic and social issues, such as environmental risks, losses to state revenue, and labor law violations, even while it offers more employment options and additional cash to citizens in need (Nchor, 2015). For instance, Small-scale mining remains vital in Ghana's economic growth. However, operations in the field, such as the polluted air and fumes from drilling and blasting for minerals, present severe health and environmental risks (Bansah et al., 2016). One of the major contributors to Ghana's underground economy is the agricultural sector (Ocran, 2018). Many small-scale farmers in Ghana operate outside the formal sector, selling their products directly to consumers or informal marketplaces, making it difficult for the government to track the economic activity in this sector and collect taxes on it.

Another essential contributor to Ghana's underground economy is the informal sector, which includes street vendors, small businesses, and artisans (Ocran, 2018). Many of these businesses operate without formal registration or licenses and may not comply with labor or tax regulations. This can create challenges for the government in collecting taxes and regulating economic activity. In addition, the underground economy in Ghana also includes illegal trade activities, such as smuggling, counterfeiting, and even prostitution (Ocran, 2018). These activities can negatively impact legitimate businesses and limit

economic growth and development. Moreover, with the advancement of technology and mobile phone penetration in the country, the underground economy has grown significantly, leaving most of their activities undetected by government authorities.

Taxes remain essential for governments to realize revenue (Lashkaripour, 2020). Many sources of government income, both domestically and internationally, are common to all nations. Borrowings, loans, operating charges from state-owned enterprises, and, most generally, taxes are a few examples. A tax is a legally required monetary levy or payment to a country placed on its citizens or other residents who reside in that country by the central authority. And especially in developing countries where resources are scarce, these taxes serve as the only way to finance government deficits and debts. However, like many developing countries, Ghana's tax authorities face similar challenges, including a low rate of voluntary taxpayer compliance with tax laws, the predominance of cash transactions in the market, and high levels of tax evasion (Otiaku, 1992, as cited in Amoh and Adafula, 2019). According to Akoto (2020), most tax evaders in Ghana are within the underground economy. This is because it cannot be right that a sector that constitutes 70 per cent of the nation's output will contribute only 16.7 per cent of the tax revenue. But this is evident because the underground economy's activities escape government regulation, hence evade their civil responsibilities such as tax payment and other duties associated with their work.

Tax evasion is the practice of using unethical methods to lessen one's tax obligation to the government (Jones et al., 2010). It is prudent at this stage to note that tax evasion is not the same as tax avoidance. Tax avoidance is when

firms and individuals use legitimate means to minimize their income and tax burden, but tax evasion implies an illegal way to minimize one's tax payment (Pyle, 1989). Tax evasion is a widespread practice in all cultures, showing that people worldwide act in the same manner. Tax evasion suffocates economic growth and development and tends to interfere with the delivery of high-quality public goods. The underground economy is frequently linked to the activity of tax evasion (Pyle, 1989). Tax evasion is usually measured as the amount of unreported income (Clotfelter, 1983). And this unreported income is estimated as the disparity between actual income reported to the tax authorities and the amount that should have been reported (Clotfelter, 1983). For instance, if individual A, a full-time public sector worker, engages in consultant services to earn additional income during his free time but fails to disclose to the tax authorities the revenue he or she gains from this consultancy, then he or she is liable for tax evasion.

Most underground economy firms either understate their revenue to attract less tax or do not even report their returns. However, not all aspects of direct taxes are similarly problematic. Although corporate taxes make up a minor fraction of total income tax revenue in most developed countries, they are equivalent to or even outweigh personal income tax revenue in most developing countries (Prichard, 2009). According to Prichard (2009), personal income tax receipts account for about 8% to 10% of GDP in developing countries, while personal income tax collections in developed countries are frequently less than 1% of GDP. Within this narrow income tax base, withholding taxes on formal sector earnings provide the vast majority of revenue, often as high as 95 per cent, meaning a near-total failure to tax the self-employed and employees of

enterprises that avoid the withholding tax system. This implies that there is more tax burden on the few formal sector employees who pay their taxes.

Ghana's economy's fundamental problem is that the country does little regarding revenue mobilization, which eventually affects the economic performance of the country. Since 2016 Ghana's expenditure has far exceeded its accumulated revenue (Asiama, Akosah, & Owusu-Afriyie, 2014). For instance, in 2016, the total government revenue was GH¢33.7 billion, as against an expenditure of GH¢51.1 billion. In 2017 the story was not different; Ghana's expenditure and revenue stood at GH¢51.9 and GH¢40.3, respectively (Government Fiscal Operations – Bank of Ghana, 2022). However, there was a significant rise in these values in 2020. Thus, in 2020 Ghana's total expenditure stood at GH¢100.1 billion, with total revenue at GH¢ 55.1 billion, which is twice the amount the country mobilized as revenue (Government Fiscal Operations – Bank of Ghana, 2022). Since 2006, the government debt-to-GDP ratio has risen, mostly as a result of ongoing budget overruns and a significant amount of activity in the underground economy (Asiama et al. 2014). According to Asiama et al. (2014), Ghana's debt-to-GDP grew from 26% of GDP in 2006 to 57.7% at the end of 2013, just 2.3 per cent below the IMF's essential debt level of 60% of GDP. Currently, Ghana's debt stock as of 2020 stands at GH¢291.6 billion (BoG, 2020), constituting 76.1% of GDP, which is higher than the IMF acceptable sustainability level of 60%. These facts significantly influence the growth and development of the economy.

Tax evasion and the underground economy can have a detrimental impact on economic growth and the achievement of Sustainable Development Goals (SDG) (Aslam, 1998). Firstly, tax evasion reduces government revenue,

restricting the policymakers' ability to invest in education, infrastructure, healthcare, and other public goods and services (Folayan & Adeniyi, 2018). This can negatively impact economic growth and the ability to achieve the SDG, such as poverty reduction, access to education, and access to healthcare. Secondly, tax evasion can create unfair competition among businesses. According to Bobbio (2016), organizations that succeed in evading taxes have a higher cost advantage over organizations that pay their taxes, which can lead to market distortions and the displacement of legal businesses. This can harm economic growth by discouraging legitimate businesses from investing and expanding, which will eventually limit the potential for sustainable economic growth. (Bobbio, 2016). Thirdly, there are higher chances that economic indicators will be distorted due to the underground economy, making it difficult for policymakers to assess economic performance and make informed decisions accurately. This can lead to suboptimal policies that harm economic progress and development.

Furthermore, the underground economy can also increase the incidence of corruption and illegal activities like money laundering, which can further undermine economic growth by creating an unstable and unsafe business environment. According to the World Bank (2017) report on Illicit Financial Flows, Ghana has been identified as one of Africa's countries with the highest illicit financial flows (IFFs). IFFs refer to illegal or unethical movements of money or assets from one country to another, often for the purpose of tax evasion. A report by the African Union estimated that Ghana lost around \$6.2 billion to IFFs between 2013 and 2015. Therefore, policymakers must

implement policies that will help combat tax evasion and the underground economy to promote sustainable and inclusive economic growth.

The underground economy's activities, size, and potential economic impact have piqued the interest of economists and politicians. Because most of these economic actors in the underground economy evade tax officials' notice and are difficult to detect, the participants benefit personally from concealing their actions while the nation suffers in terms of economic growth. Additionally, due to their hidden character, the level of tax evasion in an economy and the size of the underground economy are difficult to observe and investigate. As a result, researchers have adopted various methods to measure the underground economy's size and the degree of tax evasion across multiple jurisdictions. Three methodologies dominate the literature according to Pyle (1989 p27): “as a 'direct procedure' the survey method first applied by Isachsen et al. (1982), and as 'indirect procedures' the modified currency demand approach first applied by Klovland (1984) and Tanzi (1980) and the model approach dating back to Frey and Weck-Hannemann (1984) and Weck (1983)”, however, these various methods provide remarkably diverse results and outcomes. (Kirchgässner, 2017).

Statement of the Problem

A country's economic growth is not achieved in isolation from economic policies. The government possesses several economic policies both at the micro and macro levels to achieve economic growth. However, knowing that these economic policies are as powerful and good as the data that underpins them is prudent. Unfortunately, many of these economic policies are not successful simply because the official data from which these policies were formulated are

misleading due to the presence of the underground economy (Schneider and Enste, 2002). Simply put, a significant underground economy leads to incorrect economic statistics, which eventually undermines the effectiveness of implemented policy initiatives which intend to affect economic growth in the long run (Schneider and Enste, 2002). For instance, key policy variables such as consumption, unemployment, labor force participation, and income will all be inaccurate when a significant portion of economic activities are concealed from government authorities. Also, as the underground economy expands, resources cannot be distributed among the various economic sectors equitably and efficiently, which tends to impede economic growth. This further raises the tax burden on those who work in the formal economy, reducing public tax revenues and slowing GDP growth (Yasmin and Rauf, 2003). According to Feige (1990), the underground economy's size and growth and the implied tax gap affect government deficits, government debt, and tax reform policies.

Mobilization of resources to improve domestic revenue is a target to be achieved by all nations as part of the Sustainable Development Goals (SDGs). Thus, nations are encouraged to strengthen domestic resource mobilization to improve domestic tax and revenue collection capacity. Domestic revenue mobilization is crucial for achieving the SDGs as it provides the financial resources needed for development. Countries that are able to mobilize domestic resources effectively are better positioned to achieve the SDGs and promote sustainable economic growth and development. This is because when countries are able to raise sufficient domestic resources, they are less dependent on foreign aid and can better direct their own development agendas. However, the persistent surge in the size of the underground economy poses huge challenges

to this goal as it can potentially decrease government revenue. Achieving the SDGs is paramount to every nation, therefore, anything that will serve as a deterrent in the quest to achieve this goal should be treated with utmost concern.

The government's quick response to achieve this domestic revenue mobilization is to widen the tax net. As indicated earlier, taxes remain the most significant way for nations to mobilize revenue. As indicated earlier, taxes remain the most significant way for nations to mobilize adequate revenue. Broadening the tax net can be done either by introducing new taxes, increasing old taxes, or increasing the number of citizens and firms who pay taxes. However, in the quest to improve the tax revenue, most governments introduce new taxes, either direct or indirect, which worsens the situation as it further burdens the few tax-law-abiding citizens who pay their taxes. Also, governments are mindful that significant underground economic activities and tax rate adjustments are linked to slower economic growth through increased tax evasion, higher revenue losses, and higher budget deficits (Fethi, 2004). Hence, the available option for the government in the quest to widen the tax net is to reduce the number of individuals and firms participating in the underground economy or evading taxes.

Nevertheless, due to the hidden nature of the underground economy and tax evasion, observing it and studying it is pretty problematic. In Ghana, studies on the underground economy's size and tax evasion are limited to the works of Asante (2012) and Amoh and Adafula (2019). However, there are several significant ways in which this study is different from past ones in Ghana. First, this study employs the Multiple Indicator Multiple Cause (MIMIC) model in estimating the size of the underground economy and the magnitude of tax

evasion in Ghana. It is prudent to note that the method used to calculate the underground economy significantly impacts its size and affects other economic growth indicators (Schneider and Buehn, 2016). Asante (2012) and Amoh and Adafula (2019) estimated Ghana's underground economy size and the magnitude of tax evasion using the currency demand approach. However, there are several problems associated with the use of this method which is based on its assumptions. Some studies, like Aigner et al. (1986) and Kirchgässner (2017), have argued that the currency demand method can lead to highly implausible results when used to estimate the underground economy. Thus, this approach tends to underestimate the size of the underground economy.

One fundamental assumption of the currency demand approach is that those who hide their economic activities do so using cash in their transactions to avoid paying taxes on such transactions (Amoh and Adafula, 2019). But this assumption may not necessarily be valid because not all transactions use physical cash as a means of exchange (Emerta, 2010). Thus, many informal economic activities may be conducted using non-cash methods, such as bartering or informal credit arrangements. Therefore, assuming that physical cash is the only method of conducting economic activity in the underground economy can lead to an underestimation of the size of the underground economy. Also, the rise of electronic payments and mobile money can make it difficult to estimate the size of the underground economy using the currency demand approach. This is because these payment methods are not tracked in the same way as cash transactions, making it harder to determine the level of economic activity in the underground economy. Therefore, this procedure may underestimate the size of the underground economy.

Again, Asante (2012) and Amoh and Adafula (2019) assume that the size of Ghana's informal sector is affected by the tax burden alone in their currency demand approach. However, other factors such as regulation quality, taxpayers' attitudes toward the state, tax morality, and corruption can significantly affect the size of the underground economy (Schneider and Buehn, 2016). Therefore, if these other factors are included in the underground economy estimation, the values might be higher than the values reported in the studies of Asante (2012) and Amoh and Adafula (2019).

According to Schneider and Buehn (2016), the approach employed to estimate the underground economy substantially influences its size which eventually may affect economic planning and growth. The MIMIC approach in estimating the underground economy was proposed to resolve the weakness in the other methods of estimating the underground economy, like the currency demand approach. The fundamental assumption of the MIMIC model is that the underground economy can be viewed as an "unobservable variable" affected by several factors, such as tax burden, regulation quality, corruption, attitudes of taxpayers, and high transaction costs. These factors affect the output in the underground economy, which is tied to several indicators. The manifestation of the underground economy appears in various forms and simultaneously affects production, labor, and the money market. Therefore, describing or estimating it using just a single variable indicator and cause to capture this effect may lead to inconsistent results and estimates, but this has been the case with the various methods discussed so far.

The MIMIC model is important because it provides a more accurate estimate of the underground economy than traditional approaches that rely on a single indicator or source of data. By combining these indicators, the model can provide a more accurate approximation of the size of the hidden economy than a single indicator could provide. The accurate estimation of the underground economy is important for policymakers and researchers because it provides insight into the overall health of the economy and the potential for sustainable economic growth. Furthermore, an accurate estimate of the underground economy can help governments to design policies that encourage businesses and individuals to participate in the formal economy and to comply with tax and labor regulations.

Therefore, the model method is a valuable tool for estimating the hidden economy in multiple countries at the same time, as long as it is used with caution (Nchor, 2015). Some of the recent studies that use the MIMIC model to estimate the underground economy and tax evasion are Dell Ano and Solomon (2008) for the US, Brambila Macias and Cazzavillan (2008) for Mexico and Alanon and Gomez-Antonio (2005) for Spain. However, the model has not been used thus far in developing countries because of the lack of data. Indeed, the applicability of the model approach is relatively restricted, even in cases where the data are accessible. A review of the literature reveals that the model approach in estimating the underground economy and tax gap may be the first of its kind in Ghana. Hence, it's against this background that the study seeks to examine Ghana's underground economy's size and tax evasion to address economic growth.

Objectives of the Study

The objective of the study is to estimate the size of the underground economy and the extent of tax evasion in Ghana.

Specifically, the study will seek to;

1. Estimate the size of Ghana's underground economy
2. Estimate the extent of tax evasion from the size of the underground economy
3. Examine the effect of tax evasion on economic growth
4. Examine the effect of the underground economy on the growth of the official economy.

Research Questions

1. What is the size of Ghana's underground economy?
2. What is the extent of tax evasion in Ghana from the size of the underground economy?

Research Hypotheses

1. H_0 : There is no significant effect of tax evasion on economic growth
 H_1 : There is a significant effect of tax evasion on economic growth
2. H_0 : There is no significant effect of the underground economy on the growth of the official economy.
 H_1 : There is a significant effect of the underground economy on the growth of the official economy.

Significance of the Study

Ignoring the underground economy makes it difficult for the government to implement effective macroeconomic policies that will lead to optimum economic performance. This is because macroeconomic policies are

... tied to the projections from national accounts, which means that omitting any economic activities will influence these projections' values, which could eventually result in incorrect policy analysis. For instance, standard monetary and fiscal policy instruments will be less effective if estimates from the gross domestic product's growth rate (GDP), consumption, investment, and savings are biased due to the omission or the understated value of the size of the Ghanaian underground economy.

Again, mobilizing domestic revenue has been at the heart of governments, however, for many years, the tax administration GRA has struggled to meet their revenue mobilization target due to a variety of factors, including limited information on certain economic agents in the underground sector, citizens' non-compliance with tax obligations, corruption, and many others; however, it is prudent for tax authorities to continue to pursue their revenue mobilization goals. Nevertheless, for tax authorities to be efficient and effective, there is the need to implement appropriate policies and reforms in the tax structure and system. Hence this study seeks to recommend better policies to improve the administrative practices, regulation quality, and legal equity in terms of tax issues in Ghana.

Lastly, given limited studies in the area of tax evasion and the underground economy in the country, the findings of this study would add to knowledge and literature.

Organization of the Study

The study is organized into five main chapters. The first chapter of the study will give a background to Ghana's underground economy and tax evasion. It will also entail the statement of the problem and the objectives and hypothesis

on which the study is built. The second section will give a detailed theoretical and empirical review of the literature on the underground economy, tax evasion and economic growth. The third chapter gives an overview of the methodology used to analyze the data. It outlines the technique of estimations and describes variables and sources of the study used. The fourth section gives a detailed analysis of the data. Thus, the results and discussions are presented here. The last section summarises results and study implications and makes recommendations based on the analyzed results and discussions.



CHAPTER TWO

LITERATURE REVIEW

Introduction

According to Fink (2010), reviewing related literature to a problem involves a critical examination of publications and other relevant scientific works in relation to the problem being studied. The literature review is based on the study's objectives and relevant theoretical underpinnings related to the underground economy and tax evasion.

Theoretical Review

Theories of economic growth generally focus on the factors contributing to capital accumulation and productivity growth over time (El Yamani et al., 2020). The two primary theoretical frameworks underpin economic growth are the neoclassical and endogenous growth theories (El Yamani et al. 2020).

Neoclassical growth theory highlights the significance of savings, investment, and technological progress as factors driving economic growth. It assumes that market mechanisms operate efficiently and that economic agents act rationally to maximize their utility (Lucas Jr, 1988). In this theory, the underground economy is seen as a distortion or deviation from the formal economy and, therefore, negatively influencing economic growth (Lucas Jr, 1988). The neoclassical model assumes that tax evasion and informal economic activities reduce government revenues, leading to lower investments in infrastructure, education, healthcare, and other public goods, which are critical for economic growth. Furthermore, the underground economy may also create unfair competition among businesses (Grubb, 2004). Firms that operate in the underground economy and succeed in evading their legitimate taxes may have

a cost advantage over firms that operate legally, which can lead to market distortions and the displacement of legal businesses (OECD, 2004). This can harm economic growth by discouraging legitimate businesses from investing and expanding. In addition, the underground economy may lead to a failure in the quality of institutions and governance (Singh, 2012). Since the underground economy operates outside the rule of law and often involves illegal activities, it can increase the incidence of fraud and weaken the quality of institutions. This can create an unstable and unsafe business environment, which can further undermine economic growth.

Endogenous growth theory, alternatively, suggests that the hidden economy can have unclear effects on economic growth, depending on the context and the specific circumstances. This theory emphasizes the role of innovation, knowledge accumulation, and human capital in driving economic growth and suggests that these factors can be influenced by the size and nature of the hidden economy (Grosman and Helpman, 1994). The endogenous growth theory sees the hidden economy as a potential source of innovation and productivity growth (Cziraky and Gillman, 2004). It suggests that informal economic activities and the hidden economy may serve as a training ground for entrepreneurs and small businesses, leading to innovation, knowledge spillovers, and ultimately economic growth. Thus, entrepreneurs who operate in the underground economy may learn valuable skills and develop innovative strategies that can be applied in the formal economy, leading to productivity growth and economic development. Also, the underground economy can provide employment opportunities for individuals who may not have access to formal sector jobs (Fugazza and Jacques, 2004). This can help reduce poverty

and increase economic participation, leading to higher human capital and economic development.

However, the negative consequences of the underground or hidden economy on economic growth and development should not be ignored. The endogenous growth theory recognizes that the underground economy can also create market distortions and unfair competition (Singh, 2012). For example, firms that operate in the underground economy and evade taxes may have a cost advantage over firms that operate legally, leading to market distortions and the displacement of legal businesses. Moreover, the underground economy can also reduce government revenue, which can lead to a decline in public investments (Amoh and Adafula, 2019). Public investments, such as infrastructure, education, and healthcare, are essential for economic growth, and a decline in such investments can slow down economic development.

In conclusion, the endogenous growth theory contends that the underground economy can have both positive and negative effects on economic growth, depending on the context and the particular circumstances, in contrast to the neoclassical growth theory, which sees the underground economy as a negative influence on economic growth.

Conceptual Review

The underground economy is synonymously denoted to as the shadow, black, informal, cash, grey, or hidden economy (Medina & Schneider, 2019). In other words, the underground economy in most cases is the same as the informal economy (Medina & Schneider, 2019). These synonyms allude to some form of activities that are hidden in an economy, and they have been used a lot, although in different ways. This is because most researchers have to first conceptualize

this phenomenon in their quest to unravel the hidden nature of the economy. To others (Mazhar & Méon 2017, Draeseke & Giles 2002, Breusch 2005, and Schneider & Buehn, 2016), the existence of the underground economy cannot be observed, but it manifests itself in several observable ways. Feige (1989), in contrast, argues that all economic activities concealed or conducted at the blindsight of government officials constitute the underground economy. Pyle (1989) modify this definition by including the intention to engage in this economic activity. Thus, according to Pyle (1989), it consists of those income generated activities concealed at the blindsight of tax officials in an attempt to evade paying taxes. According to Fleming et al. (2000), as cited in Dell'Anno (2003), it is possible to categorize the various explanations of the underground economy into two approaches: the definitional and the behavioural approach.

The definitional method to defining the underground economy, according to Fleming et al. (2000), has to do with those economic engagements that are not included in the official computation of the country's national revenue. This definition was adopted and explained further by Schneider and Enste (2000). They argued that the inconsistency that exists between the national income and expenditure account is due to the unrecorded activities within the underground economy. Smith (1994) agrees with this definitional approach to the underground economy and characterizes it as the "market-based production of goods and services, whether legal or illegal, which escapes detection in the official estimates of GDP". The behavioural approach to describing the underground economy includes the intention and rationale of why people engage in these activities. According to Fleming et al. (2000), the descriptions emphasize the essence of institutional regulations and social

context. In contrast, Feige (1990) contends that the institutional rules that the individual disobeys are what give rise to the traits that the underground economy possesses. However, according to Thomas (1999), the underground economy indicates how an economy is over-taxed or over-regulated. Medina and Schneider (2019) sum the various definitions up by arguing that the underground economy constitutes all those activities within the economy concealed from tax agencies for financial, monitoring, and institutional purposes. Tanzi (1980:34) argues “that taxes and restrictions are the two fundamental factors that create an underground economy. Either the taxes or restrictions alone are sufficient to bring about an underground economy”.

A serious problem that is closely tied to the operations of the underground economy is tax evasion. Tax evasion, as previously stated, is when people or businesses use unethical methods to lower their tax obligations to the government (Jones et al. 2010). As a result, it is impossible to adequately characterize this aspect of the economy without not defining tax evasion. This is because the underground economy's activities are primarily carried out to avoid paying different direct and indirect taxes that would otherwise be incurred if they were reported to the tax authorities. These activities are very hard to detect—for instance, a university student who engages in food delivery services. Thus prepares the food and delivers it to his or her customers. Although this activity in itself is not illegal and prohibited, it becomes when this individual fails to fill his return with the appropriate authority to attract the necessary tax. Again, perhaps the meal is prepared in his room and delivered to a specific customer at a location; therefore, it will be challenging for authorities to also go and hold that individual accountable for not filing his returns. Due to these

reasons, some studies like Smith (1986) and Kenadjian (1982) have resorted to including the market value of criminal activities within the definition of the hidden economy. It is, therefore, imperative to define the underground economy as synonymous with tax evasion (Pyle, 1989).

Issues of the Underground Economy

There are several issues associated with the underground economy; however, the study will consider four significant issues, as cited in the works of Pyle (1989). According to Pyle (1989), although there are other issues worth discussing, he believes that those issues are consolidated in these four major areas. The four areas include:

- a. Size and measurement;
- b. Participation;
- c. Economic consequences and;
- d. Policy

These classifications of areas have also been predominant in the literature, although they may not have isolated them as Pyle (1989) did. Some economists like Gutmann (1977), Feige (1979) and Tanzi (1980) have shown much concern about measuring the underground economy's size due to its economic consequences and policy implications.

Size and Measurement of the Underground Economy

The question of how big the underground economy should be to warrant a safe economic atmosphere seems topical to most researchers in this field due to its implication for further analysis. The argument has been made that if the underground economy size is high, then it tends to pose a threat to the economy at large, but it can safely be ignored if and only if the size is small (Pyle, 1989).

This is because an ongoing argument suggests that there is an optimum level of informality that, when attained, will maximise aggregate welfare, which will shrink over time due to the growth in the formal sector. Nevertheless, evidence suggests that after decades of focusing on the regular economy, the underground economy, instead of shrinking, is actually growing. Therefore, the question remains, what should be the actual size of the hidden economy? In the quest to address this question has led to the development of various theories and models on how to estimate or measure the underground economy's size. According to Schneider and Buehn (2016), the approach employed to estimate the underground economy substantially influences its size. Several approaches have been developed to estimate the hidden economy size efficiently. However, these approaches can be characterized into three broad areas: direct, indirect, or model approaches.

Direct Approaches

The direct approach is a microeconomic way of assessing the underground economy's size. These methods are used to gain firsthand information regarding undeclared income from businesses and individuals involved in underground activities. The auditing of tax returns and questionnaire surveys of people and businesses are the two approaches used in this approach (Orsi, Raggi, & Turino, 2012).

Auditing of tax returns

Using this method, the difference between income reported for tax reasons and that obtained through selective checks is used to estimate the extent of the underground economy. Thus, the auditing of tax returns relies on a rigorous assessment of a random sample of taxpayers' income-tax returns. The

objective of this method is to examine whether the individuals or firms have concealed some portion of their income for tax purposes. This method strives on the definition that the hidden economy constitutes all those economic activities concealed at the blindsight of tax authorities. Therefore, any income generated from any engagement in economic activity must be reported to the appropriate authorities to attract the necessary tax. However, those unreported incomes will represent the underground economy if things are done contrary. Several studies, including Simon and Witte (1982), Witte (1987), Clotfelter (1983), and Feige (1986), have used this method of calculating the extent of the underground sector. Although this study has been employed in various jurisdictions, several difficulties beset the use of this method. First, using tax compliance data may be associated to biased population sample. Second, tax audit estimates only reflect the portion of the underground economy income that authorities were able to uncover. Therefore, there is a huge likelihood that some significant fraction of the income may be hidden.

Questionnaire survey method

The survey method deals with administering questionnaires to households to know the income they earn as a result of the economic activities they engage in and how much of that income they report to tax authorities. According to Fortin et al. (2010), the rationale under this method is due to the fact that people can under-declared their revenue from self-employment but not from paid work because with paid work, taxes are directly deducted. Therefore, it is through engaging with the individuals that those self-employed activities could be identified. Fortin et al. (2010) evaluated the underground economy of Quebec using the microeconomic approach using a household data survey.

According to Fortin et al. (2010), the underground economy of Quebec was about 4.6 per cent of the official GDP in 1997 but rose a little to 5.7 per cent in 2002. The study also concluded that on the government's side, it might represent roughly \$ 3.3 billion as foregone taxes for the year 2002. Their results were consistent with Gervais's (1994) and Fortin and Lacroix (2009) report using different estimation methods and data. Mogensen et al. (1995) also used the sampled survey method to estimate the hidden economy of Denmark to be 3.0 and 3.1 per cent of GDP for 1993 and 1994, respectively.

One notable benefit of the survey method is its ability to provide comprehensive information on the underground economy's structure and composition (in terms of labor) (Schneider & Enste, 2000). This is because individuals are interviewed under this method, and specific information regarding the informal economy and the individual's economic activity could be addressed. Despite its advantage of providing in-depth information, studies like Schneider and Buehn (2016), Fortin et al. (2010), and Pyle (1989) have all concluded that gathering such information from these individuals may be extremely difficult and problematic because people who mostly find themselves within the underground economy typically do not want to be identified. Therefore, there is a tendency for them to hide information that may influence findings and conclusions. Moreover, the results from this approach will also largely depend on the respondents' willingness to cooperate and provide the needed information. For instance, individuals may never disclose the gifts they have ever received when filing their tax returns because, in Ghana, gifts received are taxable. Schneider & Enste (2000) put it this way "...most

interviewed hesitate to confess fraudulent behaviour, and quite often, responses are unreliable, making it difficult to estimate the extent of undeclared work".

Another drawback of taking into account both techniques, tax audits and surveys, is that they only produce point estimates of the underground sector, therefore, there is a high tendency to miss that target and provide unreliable estimates for policymakers (Schneider & Enste, 2000). This is because it would be unlikely to account for all illegal economic activity, therefore they can be thought of as offering lower-bound estimations. Also, individuals or businesses may be reluctant to disclose their unreported activities due to legal or ethical concerns. Additionally, the accuracy of the estimates may be affected by factors such as sampling bias or measurement error.

Indirect Approaches

One method for estimating the size of the hidden economy is through the indirect method. This involves looking at economic variables that are thought to be correlated with hidden economy activity, such as electricity consumption, gasoline sales, or currency in circulation. By analyzing changes in these variables over time, researchers can estimate the size and growth of the hidden economy. The indirect way to measure the hidden economy's size was developed in response to the direct approach's numerous criticisms and flaws. Unlike the direct approach, which is micro and deals with the individuals in question, the indirect approach is macroeconomics in nature. It estimates the size of the hidden economy using a wide range of economic and other relevant factors. This is useful because, as earlier mentioned, many people who engage in activities within the underground sector do not want the relevant authorities to know about their involvement in this economy and strive to conceal it. Hence,

the indirect approach is also known as the indicator approach (Asaminew, 2010). It is prudent to note that this approach primarily includes legal and illegal activities in estimating the size of the underground, hence providing upper bound estimates. According to Schneider and Enste (2000), indirect approach include; "... (i) the discrepancy between national expenditure and income statistics; (ii) the discrepancy between the official and actual labor force; (iii) the electricity consumption approach of Kauffman & Kaliberda (1996); (iv) the transaction approach of Feige (1979); and (v) the currency demand approach of Cagan (1958)".

The discrepancy between national expenditure and income statistics

This method also known as the "residual," is utilized to estimate the value of the hidden economy. This discrepancy can occur when there is unreported income or unrecorded transactions, which can result in an underestimation of national income and an overestimation of national expenditure. Because income and expenditure reflect opposing sides of the same activity, therefore the national income measure of GNP must be equal to the national spending measure of GNP at the conclusion of the accounting year. It essentially refers to how much money people receive and how they spend it. Therefore, any discrepancy between these figures is mainly due to the presence of the hidden economy. For instance, households with declared incomes that are less than their expenditures may be hiding a portion of their income. As said earlier, activities within this sector are primarily undetected by authorities and are unrecorded in the official computation of the nation's national income (Schneider & Enste, 2000). The users of this method argue that although it is easier for participants within the underground economy to hide or understate

their income from authorities for tax purposes, it is more difficult for them to hide their expenditures. Assuming that there is an independent estimate of national expenditures, the difference between spending and income measurements can be used to estimate the size of the hidden economy. This approach has extensively been used by Boca (1981) for Germany, Franz (1983) for Austria, and Park (1979) for the United States in estimating the hidden economy. According to Kyle (2001), there is evidence of underreported incomes and tax evasion in Bulgaria since the revenue approach gives a growth rate of two percentage points lower than the expenditure approach in the country for 1998 and 1999. Thus, the study indicated that people's expenditure reveals a percentage of 5.4 and 4.4 in 1998 and 1999 respectively, while official figures based on revenues generated stood at 3.5% and 2.4%, respectively.

Although this approach reveals the underground economy's hidden nature through the discrepancy between the national expenditure and income, it has come under heavy critiques. According to Pyle (2000), the underground economy's size cannot solely be attributed to the disparities between the national income and the expenditure figure, but a deliberate dissaving of individuals may result in excessive spending. Schneider and Enste (2000) claim that if all elements of the expenditure side were accurately captured, this approach would produce a reasonable estimate of the underground economy's size. Thus, the models assume little or no error in the underlying estimates. Unfortunately, in reality, this is not the case. The difference between the estimates may reflect all omissions and inaccuracies throughout the national account data and, therefore, may not necessarily be the result of the activity of the underground economy. Hence, the reliability of these estimates is questionable. According to Fleming

et al. (2000), one limitation of this method is due to the fact that estimates may be generated from a non-representative sample. For instance, in the United Kingdom, expenditure estimates are derived from the various household and industrial surveys, whereas the income estimates are derived from revenue-tax returns submitted to the IRS (Pyle, 2000).

The discrepancy between the official and actual labor force participation

Another way to evaluate the magnitude of the underground economy is by using the discrepancy that exists in the labor statistics. The labor force of every country constitutes all members who are eligible and able to work. Therefore, according to the users of this approach, like Schneider (2011), Pozo (1996), Frey (1972, 1975, 1978, 1980), Bartlett (1998), and Tanzi (1999), a decline in the official participation rate of labor force could suggest an upsurge in the size of the underground sector under the assumption of a constant total labor force participation. This is consistent with Lemieux, Fortin and Fréchet's (1994) conclusion that there is a negative correlation between the participation rates and the time spent working in both the underground and regular sectors. By definition, every activity within the underground economy involves some level of hidden labor market (Schneider, 2011). When employees, employers, or both occupy a hidden position within the economy, they are considered part of the shadow labor market. Furthermore, these labour activities go undetected and hence violate some labor regulations like not contributing to social security, not withholding taxes that are due government from employees' salaries, and possibly working below the accepted minimum wage. Like the hidden nature of the underground economy, workers within this sector are also very difficult to observe.

The underground economy has been chiefly hypothesized to be an alternative place of survival for most individuals who do not find their feet in the official economy (Ahn, 1997). Therefore, the difference between the actual and official labor force figures may well be attributed to the very existence of the underground economy. However, one flaw associated with using this method is that disparities in participation rates could result from other factors (Schneider, 2011). Again, to keep up with growing expenses, individuals can work in the informal sector, although they may have other jobs in the regular economy. For instance, a lecturer may buy and sell clothes or jewellery to his colleagues'. Hence, using this method to estimate the underground economy's size may not capture these activities. As a result, estimations based on these methodologies may be seen as lagging indications of the underground economy's size and growth.

The electricity consumption approach

Another method under the indirect approach is the use of the physical input or electricity consumption approach, which Kauffman and Kaliberda first used in 1996 to estimate the underground economy size. According to Kaufmann and Kaliberda (1996), the estimates of the underground economy could be drive when we attribute the disparity between the growth of GDP and electricity consumption to the growth in the underground economy. According to Kyle (2001), energy consumption is the single most important indicator inside an economy and is proportional to total economic activity. Therefore, any changes in electricity or energy consumption that are not accompanied by an equivalent change in the level of the nation's overall economic activity should indicate a change in the nation's underground economy. This means that an

indicator of the expansion of a nation's shadow economy is the ratio of power consumption to overall economic activity increasing. The energy consumption approach provides an easy estimate of underground economy trends in a country, however, it is not a precise tool, according to Kyle (2001). This is because the energy consumption can be biased by different factors that affect the final results and for economies that experiences dramatic structural shifts or countries with unstable growth path, this approach in estimating the underground economy may not be reliable (Kyle, 2001).

Another shortcoming of using the electricity or energy consumption approach is the difficulty in finding an absolute value for the underground economy size without using some exogenous estimate for its size in the base year. Again, not all activities that are undertaken within the underground economy requires a considerable amount of electricity for instance some personal services may resort to other source of energy consumption like gas, oil or coal either than the electricity for operation. Moreover, some businesses within the formal economy too sometimes consumes energy beyond what they are expected to use which may not necessarily translate into productivity. Therefore, attributing the discrepancy between GDP and energy consumption may not fully capture or represent the actual size of the underground economy. Nevertheless, despite the major critiques, this method has been used by several studies (Boca and Forte 1982; Kaufmann and Aleksander Kaliberda 1996; Kyle 2001; Alejandro Portes 1996; Johnson, Kaufmann, and Shleifer 1997; and Lizzeri 1979) to calculate the size of the hidden economy.

The transaction approach

The transaction method is another way of indirectly estimating the underground economy's size. Feige first developed this approach in 1979 and, ever since, has gotten its feet in literature as a way of estimating the underground sector. This approach strives upon Fisher's quantity theory of money as specified in the equation $M \times V = P \times T$ (where the money supply is denoted by M, V, P, and T refers to the velocity, the Price and total transactions, respectively). The major assumption of this approach is that the number of transactions and the official Gross National Product (GNP) have a consistent relationship. Again, some prepositions have to be made concerning the velocity of money and the associations between the total value of transactions $P \times T$ and total value-added (official and unofficial). The underground economy will be computed by subtracting the official GNP from the total nominal GNP by relating the transaction value to the total nominal GNP (Kyle, 2001 and Feige, 1996). However, to generate estimates for the underground economy over a period, one must also assume the absence of the hidden economy at a benchmark year.

Although this approach is appealing in theory, it has several flaws that make it unsuitable for calculating the size of the hidden economy. For instance, a constant velocity of money over time seems quite arbitrary and may be affected by additional indicators like the development of cheques and payment centres which will eventually influence the desired amount of cash holdings and hence the velocity. Again, accurate values on the total volume of transactions must be available to obtain reliable estimates for the hidden economy estimates. However, this might be difficult in a system where cash transactions are

predominated and largely depend on the durability of printed banknotes. In general, as previously indicated, this strategy is theoretically appealing, but the empirical prerequisites for obtaining trustworthy estimates are extremely difficult to meet. As a result, its application may produce ambiguous results. However, amazed by this shortcoming in this approach, several studies have employed it to estimate the underground economy in many jurisdictions. For instance, in the Netherlands, this approach was used by Boeschoten and Fase (1984) in the quest to evaluate the extent of the hidden economy. Langfeldt (1984) also used this approach when estimating the underground economy of Germany

Currency demand approach

Among all the indirect methods in estimating and measuring the underground economy's size, the currency demand approach seems to be the most common and extensively used across literature and regions (See Karmann, 1986, 1990; Pedersen 2003; Schneider and Williams 2013; Asante, 2012; Amoh and Adafula, 2019; Schneider 1997, 1998, 2011; Thomas 1992, 1999; Williams and Windebank 1995; Feige 1986; Ahumada et al. 2004; Nchor & Konderla, 2016; Ferwerda et al. 2010).

Phillip Cagan in 1958 first developed the currency demand approach in the quest to examine the relationship between currency demand and tax pressure for the United States. According to Cagan (1958), tax pressure was one of the major triggers of the hidden economy in the USA. Therefore, employing its relationship between currency demand could clearly indicate the underground. Tanzi (1980, 1983) later redefined and employed this approach in the U.S. economy. The major assumption of this approach stems from the premise that

transactions within the underground economy mostly require cash payments with the intention of leaving no observable trace for the tax authorities.

Moreover, since they require a lot of physical cash to transact business and operations, it will eventually increase the demand for currency. Therefore, an increase in currency demand strongly indicates a massive presence of the underground economy. Therefore, a currency demand equation is estimated over time to isolate the consequent excess demand for currency. In estimating the currency demand equation, certain variables are assumed to be significant reasons instigating people to work in the underground economy. These variables may include the tax burdens (direct or indirect), tax morale, state institutions and government regulation. In contrast, other conventional causes such as income development, payment habits, interest rates, credit, and other debit cards as a substitute for cash are acknowledged and controlled for. According to Tanzi (1983), the currency demand equation can be estimated using a regression equation specified as follows;

$$\ln\left(\frac{C}{M_2}\right)_t = \beta_0 + \beta_1 \ln(1 + TW)_t + \beta_2 \ln\left(\frac{WS}{Y}\right)_t + \beta_3 \ln R_t + \beta_4 \ln\left(\frac{Y}{N}\right)_t + \mu_t \quad (2.1)$$

Such that $\beta_1 > 0, \beta_2 > 0, \beta_3 < 0$ and $\beta_4 > 0$. In equation (2.1), \ln represents the natural logarithms. C/M_2 represent the ratio of cash holdings to deposit and current accounts. TW represent the weighted average of the tax rate (a proxy for the changes in the underground market). R is the interest paid on savings deposits (to reflect the potential cost of keeping money), and Y/N is the per capita income. WS/Y represents the proportion labor price (i.e wages) in national income, which is largely used to track changing payment and money holding patterns.

It is prudent to note that any increase in currency demand and the amount unexplained by the conventional factors may be ascribed to the rising tax burden and other reasons influencing individuals to work in the underground economy (Tanzi 1983, as cited in Schneider and Buehn, 2016). The currency demand equation is econometrically derived in two steps to generate figures for the hidden economy. First, the size of the hidden economy is calculated by comparing the disparity between currency growth when the direct and indirect tax burden and government regulation are held at their lowest levels to the currency growth in instances when the current tax burden and government regulation are held higher. Secondly, the next step is to assume that the velocity of income for currency used in the underground economy is the same as the legitimate currency used in the regular economy. This will enable the size of the underground to be calculated and compared to the official GDP. Despite its dominance in literature, this approach has heavily been criticized on various grounds. The following are the most common criticisms of this method:

1. When it comes to underground economy activities, not all transactions are paid in cash. Especially in developing countries, some activities are paid in kind or in the form of debt settlement (Schneider and Buehn, 2016). Therefore, assuming that the underground economy deals with cash payment alone may under-represent the underground economy. An empirical confirmation of this could be seen in Isachsen and Strm (1985), when they concluded that around 80 per cent of all the transactions in the underground economy in Norway were carried out in cash after using the survey method to estimate the underground economy size. According to the study, the total size of the underground

economy (including barter) could be substantially greater than earlier thought.

2. Most studies (like Asante, 2012 Amoh and Adafula, 2019) that have employed this approach in estimating the size of the underground economy consider only one factor, the tax burden, as the cause of the underground economy. However, other factors (such as the impact of government regulation, the rule of law, taxpayers' attitudes toward the state, tax morality, among others) are not considered for several reasons, such as the unavailability of reliable data for most countries. Pommerehne and Schneider (1985) concluded that tax variable roughly contributes to 60–70 per cent of the size of the U.S. shadow economy. This is also confirmed in the study of Zilberfarb (1986). Therefore, attributing the size of the underground economy to only tax purposes may lead to unreliable estimates. Because there is a high tendency that other factors may also impact the extent of the shadow economy. Therefore, the size of the underground economy might again be larger than the initial reports in most studies.
3. According to Feige (1996), Garcia (1978), and Park (1979), an increase in currency demand may not necessarily be an indication of a growing shadow economy but rather a decrease or slowdown in demand deposit. Also, changes in the demand for currency could be driven by factors such as changes in interest rates or shifts in consumer behavior other than underground economic activity. This assertion was made empirically using the United States as a case

4. Tanzi's studies are criticized by Blades (1982) and Feige (1986, 1996) on the grounds that the United States dollar is employed as an international currency (Schneider and Buehn, 2016). Therefore, an increase in the demand for the U.S. dollar may not be due to the growing nature of the underground economy but the reliability of the U.S. dollar to trade internationally. Moreover, the demand for a local currency in a developing country may be low, not necessarily due to the non-existence of the underground economy but the high taste and demand for foreign currency like the dollar to trade. Hence attributing every increase or decrease in the demand for the currency to the growing or shrinking nature of the underground economy may lead to unreliable estimates. Instead, Tanzi could have considered and controlled for the presence of U.S. dollars, which are used as an international currency and held in cash abroad.
5. Although studies like Kirchgässner (1983, 1984), Hill and Kabir (1996), and Schneider (1986) conclude that the estimation results for Germany, Denmark, Norway, Sweden, and Canada are pretty robust when using the currency demand method. Frey and Pommerehne (1984) and Thomas (1986, 1992, 1999) concludes otherwise by arguing that the currency demand approach may yield parameter estimates that are not very stable.
6. The rationale that the velocity of money in both the official and underground economies are the same may theoretically be appealing but practically impossible due to the complexity of obtaining full information or knowledge on the underground economy. According to

Hill and Kabir (1996) and Klovland (1984), the velocity of money in the official economy is uncertain, while that of the shadow economy is even more challenging to estimate. Moreover, since information about the velocity of money in the informal economy is not available, researchers are left with no option but to assume that money moves at the same rate in all sectors, not necessarily because it is so.

7. According to Ahumada et al. (2004), the income elasticity must be equal to one for the velocity of money among the informal and formal economies to be equal and correct.
8. Finally, the hypothesis that there is no informal economy in the base year is debatable. Hence, relaxing this relationale may increase the size of the hidden economy once more.
9. Currency substitution: In some countries, people may use foreign currencies or alternative forms of money, such as cryptocurrency, to conduct transactions in the underground economy. This can make it difficult to track the use of domestic currency and estimate the size of the underground economy.

As stipulated earlier, despite its heavy criticisms, it is among the most widely used approaches in estimating the hidden economy size across many regions and countries. The only advantage presented in this approach is the convenient way of estimating the underground economy.

Modelling Method

Both the direct and indirect methods discussed so far consider just one indicator to capture all the effects of the underground economy. Again, these methods also usually consider the burden of tax as the major and primary cause

in determining the size and growth of the underground economy. However, it is prudent to note that the manifestation of the underground economy appears in various forms and simultaneously affects production, labor, and the money market. Therefore, describing or estimating it using just a single variable indicator and cause to capture this effect may lead to inconsistent results and estimates, but this has been the case with the various methods discussed so far. However, Frey and Weck-Hannemann (1984) proposed that a more complex methodology, known as the Multiple Indicators Multiple Causes (MIMIC) model, could be used to estimate the complex nature of the underground economy (Breusch, 2005).

Multiple Indicator Multiple Cause (MIMIC) approach

This method has its origins in the literature on factor analysis in psychometrics. However, it gained popularity in economics thanks to Zellner (1970) and Goldberger (1972) latent variable models and the use of Structural Equation Modelling (SEM). Other economists like Dell'Anno (2003) employed this method to estimate Italy's shadow economy. Aigner et al. (1988) adopted this procedure in calculating the size of the U.S underground economy. Helberger & Knepel (1988), in their quest to estimate the underground economy size for 17 countries, used the MIMIC model, while Dell'Anno, Gómez & Pardo (2004) also employed the MIMIC model in estimating the underground economy size for Spain, France and Greece. The model explicitly incorporates multiple causes for the underground economy's existence and growth and its multiple effects across time. Thus, this approach involves combining multiple economic indicators that are thought to be correlated with underground economic activity, and using a statistical model to estimate the size of the

underground economy based on these indicators. The MIMIC model relies heavily on the statistical assumption and theory of unobserved variables, which indicates that the underground economy cannot be measured and observed directly, but there are multiple causes of this phenomenon resulting in multiple indicators to be measured. Breusch (2005) argues that since the underground economy is an unknown and a concealed figure, the MIMIC procedure, which is a latent estimator approach, is applicable.

The MIMIC method examines the relationship between observable and unobservable variables using a Simultaneous Equation Model (SEM). The MIMIC model is conducted using a measurement model and a structural model (Baldemir et al., 2009). The measurement model links the latent variable to the observable indicators, while the structural model specifies the relationship between the causes and the unobservable variable. According to Cooley (1978), “the MIMIC approach helps establish the plausibility of a theoretical model and determine the degree to which the explanatory variables affect the unobservable variable”. Thus, the model examines real data with hypothesized correlations between observed (measured) variables and unobserved (latent) variables to assess the consistency of an economic theory (Schneider et al., 2010). This approach in estimating the size of the underground economy is further discussed in detail in the next chapter of the study.

There are several advantages that the MIMIC model offer, and it is argued to produce a more reliable estimate compared to other statistical methods when calculating the size of the hidden economy. However, the MIMIC approach is also subject to limitations, such as the need for accurate data on multiple economic indicators and the potential for biases and errors in the

statistical model. Studies like Dell'Anno (2003) and Helberger and Knepel (1988) criticize the use of this method in estimating the underground economy based on the assumptions behind the choice of variables and empirical limitations on data availability. Meanwhile, as Giles and Tedds (2002) noted, the strength of the MIMIC model far outweighs the weakness argued by Dell'Anno (2003). According to Giles and Tedds (2002), the MIMIC takes on a wider form as compared to the other competing approach in estimating the size of the hidden economy. This is because the MIMIC approach allows for multiple indicator and causal variables into consideration at the same time. Again, model methodology allows wide flexibility in its application, especially with the choice of variables (indicator and causal variables). Thus, the choice of causal and indicator variables depends on the particular features of the underground economy under consideration, the period in question, and the availability of data. And according to Schneider and Enste (2000) this flexibility in methodological application could lead to some progress in estimation techniques for the size and development of the informal economy, hence potentially superior to other estimation methods. Another advantage of the MIMIC model, according to Cassar (2001), is that, when compared to other methods, this approach does not need restrictive assumptions to operate. Similarly, Thomas (1992, p. 168) argues that the MIMIC procedure relies on a broad definition of the underground economy and that the only real constraint of this approach is not in its conceptual structure, but in the choice of variables which in essence is a challenge to all the other methods of estimating the underground economy.

Participation in the Underground Economy

This section tries to address the question, why do people engage in underground economy activities? Per the definition of the hidden economy activities, it consists of those income generated activities concealed at the blindsight of tax officials to evade paying taxes (Pyle, 1989). Therefore, embedded in its definition alone, we can conclude that the sole participation in the underground economy is for tax purposes. People participate in this sector by either not reporting all their returns to the appropriate authority to attract the appropriate tax or to avoid some labor market regulations (Pyle, 1989). Therefore, to fully appreciate why people engage in the underground economy, it is prudent to unearth the motivation individuals in this sector derive from choosing not to report their revenue, supply labour to the hidden economy, or even buy goods and services from that sector. Therefore, the study reviews various theoretical models on tax evasion decisions to address this particular question. Works in this area are rare and hard to find, however, Allingham and Sandmo (1972) could be credited for being the first to model individual behaviour towards tax evasion theoretically.

Theoretical Models of Tax Evasion

According to Allingham and Sandmo (1972), given individuals' rational nature, the individual will calculate and weigh up the costs against the possible benefits when considering breaking the law. The choice to declare income to tax authorities is based on uncertainty. Failure to declare one's total income does not automatically provoke a reaction in the form of penalty or punishment. In light of the danger of getting detected and punished, individuals contemplate how much revenue they should declare to the tax officials. In order words,

because individuals are rational beings, they seek to maximize their expected utility against all these possible odds of tax evasion and punishment. Allingham and Sandmo (1972) assumed that every taxpayer is confronted with two options strategy to choose from. The first strategy available to the taxpayer is to choose to declare his actual income (W). The second strategy is that the taxpayer may decide to report an amount less than his or her actual revenue (X). If the individual prefers the second strategy, then his or her payoffs will only be contingent on whether or not he or she will be caught and investigated by the appropriate tax authorities. If he or she succeeds in under-declaring his actual income without any detection from tax authorities, the individual is clearly better off than choosing the first strategy. However, if he or she is caught, then obviously, he becomes worse off because of a possible penalty or punishment.

Allingham and Sandmo (1972) again assume that the individual has an indirect utility function similar to the Von Neumann-Morgenstern axiom of behaviour under uncertainty. Again, the taxpayer is assumed to be risk-averse (reluctant to take a risk); hence his marginal utility is assumed to be strictly positive and a decreasing function. Again, tax officials do not have full information concerning the individual's actual income, and this actual income (W) is exogenously determined and available only to the taxpayer. The tax rate (θ) is constant and levied on declared income (X), the individual's decision variable. There is some probability level (p) that the individual will be detected of not reporting all his income. When this happens, the individual will have to pay a tax on the underdeclared income ($W - X$) at a penalty rate (π) which is higher than the initial tax rate (θ). Given these conditions available to the

taxpayer, he or she then have to choose an amount of X to maximize the expected utility. Mathematically this can be written as;

$$\max_X(EU) = (1 - p)U(W - \theta X) + pU[W - \theta X - \pi(W - X)] \quad (2.2)$$

In order to find the "entry condition" to which taxpayers may decide to evade tax. Equation 2.2 is differentiated with respect to X , thus the amount of declared income and evaluated at $X = W$. Hence the first-order condition of equation 2.2 is given as

$$\frac{dEU}{dx} = -\theta(1 - p)U'[W - \theta X] + pU'[W - \theta X - \pi(W - X)][-(\theta - \pi)] = 0$$

$$MU_X = -\theta(1 - p)U'[W - \theta X] - (\theta - \pi)pU'[W - \theta X - \pi(W - X)] = 0$$

For interior solutions, the above equation is evaluated at the point where $X = W$ (thus, the actual income is declared), and since the marginal utility is assumed to be strictly a decreasing function, we have

$$MU_X = -\theta(1 - p)U'[W - \theta W] - (\theta - \pi)pU'[W - \theta W - \pi(W - W)] < 0 \quad (2.3)$$

$$-\theta(1 - p)U'[W - \theta W] - (\theta - \pi)pU'[W - \theta W] < 0$$

$$U'(W - \theta W)[- \theta(1 - p) - (\theta - \pi)p] < 0$$

$$U'(W - \theta W)[- \theta(1 - p) - (\theta - \pi)p] < 0$$

$$- \theta(1 - p) - (\theta - \pi)p < 0$$

$$p\pi < \theta \quad (2.4)$$

Therefore, Allingham and Sandmo (1972) first proposition was that individuals would continue to evade taxes or participate in underground economy activities so long as the expected fine is lower than the standard tax rate.

Allingham and Sandmo (1972) proceeded to examine how adjustments in the tax rate (θ), revenue (W), the punishment rate (π) and the probability detection (p) will affect the optimal amount of income declared (X) by the

individual. In other words, they wanted to examine whether changes in these parameters (W, θ, π, p) will change the individual's decision to participate in the underground economy or how does the individual's decision to under-report their income depends on these parameters. To ascertain this effect, Allingham and Sandmo (1972) used the Arrow-Pratt risk-aversion measurements of absolute and relative risk in differentiated equation (2.3) with respect to these parameters (W, θ, π, p) . Due to the complexity of these proofs, this study only presents the results. According to Allingham and Sandmo (1972), "... the absolute risk aversion was diminishing, but they were unclear regarding relative risk aversion". The following were the outcomes after differentiating the marginal utility of the declared income with respect to (W, θ, π, p) :

$$\frac{\partial X}{\partial W} = \frac{1}{D} \theta (1 - p) U'(Y) [R_A(Y) - (1 - \pi) R_A(Z)] \quad (2.5)$$

$$\frac{\partial X}{\partial \theta} = \frac{1}{D} X \theta (1 - p) U'(Y) [R_A(Y) - R_A(Z)] + \frac{1}{D} [(1 - p) U'(Y) + p U'(Z)] \quad (2.6)$$

$$\frac{\partial X}{\partial \pi} = -\frac{1}{D} (W - X) (\theta - \pi) p U''(Z) - \frac{1}{D} p U'(Z) \quad (2.7)$$

$$\frac{\partial X}{\partial p} = \frac{1}{D} [-\theta U'(Y) + (\theta - \pi) p U'(Z)] \quad (2.8)$$

$$\frac{\partial(X/W)}{\partial W} = -\frac{1}{W^2} \frac{1}{D} \theta (1 - p) U'(Y) [R_A(Y) - (1 - \pi) R_A(Z)] \quad (2.9)$$

Where $Y = W - \theta X, Z = W - \theta X - \pi(W - X)$.

$R_A(Y) = -\frac{U''(Y)}{U'(Y)}$ and $R_A(Z) = -\frac{U''(Z)}{U'(Z)}$ are the Arrow-Pratt risk-aversion

Allingham and Sandmo (1972) again made several propositions from the equations above. From Equation (2.5), it is evident that the sign of the bracketed expression depends on the value of π . Thus, it is only when $\pi > 1$ can we conclude that the derivative $\left(\frac{\partial X}{\partial W}\right)$ is unambiguously positive. This means that individuals will intend to declare more of their income for tax

purposes anytime there is an increase in income but with the condition that the penalty rate should be greater than 100 per cent. The other side implies that if $\pi < 1$, then the effect $\frac{\partial X}{\partial W}$ (effect of change in actual income on declared income) cannot be determined.

Equation (2.6) presents how changes in tax rate will affect the amount of income declared or people's decision to participate in the hidden economy. The result indicates that the sign of the derivative is ambiguous and depends on the nature of the individual's risk aversion function. Although the second term of the equation on the right is unambiguously negative, the sign of the first term in the equation could be positive, zero or negative depending on whether the individual absolute risk aversion is decreasing, constant or increasing. This makes it difficult to conclude the connection between the regular tax rate and reported income. Although this assertion is contrary to the fact that increasing tax rates largely inspire evasion, Allingham and Sandmo (1972) indicated that the results could be best explained if both the first and second terms of the equation are viewed as income effect and the substitution effect, respectively. Thus, the second term is undoubtedly negative since an increase in the tax rate makes it more profitable for the individual to evade taxes on the margin. The first term is positive because an increase in tax rate makes the taxpayer less wealthy, reducing both the value of $Y (W - \theta X)$ and $Z [W - \theta X - \pi(W - X)]$ for all levels of X , which under decreasing absolute risk aversion, tends to reduce evasion. Meanwhile, Pyle (1989) argued that it is only by resorting to empirical evidence that we could validate this proposition.

According to Allingham and Sandmo (1972), it is possible to examine how the law-enforcement variables (π , p) can affect the taxpayer's decision to participate in the hidden economy. In other words, Allingham and Sandmo (1972) examined how reported income depends on the penalty rate (π) and the probability of detection (p). The results are summarized in Equations (2.7) and (2.8) above. From these equations, it is evident that $\frac{\partial X}{\partial \pi} > 0$ and $\frac{\partial X}{\partial p} > 0$. Thus, the penalty rate and the probability of detection or investigation all have a positive effect on the amount of income the taxpayer decides to declare to the tax authorities. In other words, the unambiguous positive effect of these equations indicates that the amount of one's actual income disclosed will increase so long as probability of detection and penalty rates are high. At this point, the model concluded that the penalty rate (π) and the likelihood of detection (p) could be considered paramount in any policy intended at reducing evasion. In other words, people engage in the underground economy because the consequence or penalty after detection or even the probability of detection is very low. Therefore, if tax authorities set these law-enforcement variables (π and p) high enough, it will deter people from tax evasion or participating in the underground economy (Pyle, 1989). According to Allingham and Sandmo (1972), these two variables (i.e., π and p) should be paramount to policymakers in their quest to address underground economy participation. This is because the π is a parameter over which the tax authority exercises direct control. At the same time, the p may be assumed to control indirectly through the amount and efficiency of resources spent on detecting tax evasion. Hence the model implies that these two policy tools are substitutes for each other. While a decrease in p

will lower the estimated tax rate yield, the loss of tax revenue could be offset by a rise in π .

Although several studies have cited Allingham and Sandmo (1972) model in their attempts to explain why people engage in the underground economy or tax evasion, there has been several modifications and replication of this particular model in various ways and forms. For instance, Srinivasan (1973) in his model assumed that the individual would maximize his expected income instead, not his utility, as Allingham and Sandmo (1972) assumed. According to Srinivasan (1973), the individual is risk-neutral. To maximize expected revenue after taxes and penalties, individuals will always choose a percentage of their actual earnings to keep private. Although Srinivasan assumptions differ from the Allingham and Sandmo (AS) model, the results and conclusions from Srinivasan (1973) were consistent with that of Allingham and Sandmo (1972). Thus, these changes in assumptions could not significantly change the comparative static predictions made in the earlier model. For example, Srinivasan (1973) found that an increase in (p) , which is the detection rate, still explicitly discouraged tax evasion by leading to more actual income being declared, a conclusion consistent with the Allingham- Sandmo (AS) model.

According to Srinivasan (1973) model, “given a progressive tax function and a probability of detection independent of income, an increase in the taxpayer's income will lead to him declaring a smaller proportion of all income”. In other words, there is a high tendency to participate in the hidden economy when a progressive tax system exists. This is because the progressive revenue tax system acts as an incentive to underreport revenue in the absence of a corresponding increase in the possibility of penalty. The story may, however,

alter if both the marginal tax rate and the probability of discovery remain constant. According to Srinivasan (1973), if the marginal tax rate remained constant and the likelihood of detection increased as a function of direct income, an increasing percentage of income would be disclosed for tax purposes as income increased. Therefore, unlike the first instance where the progressive tax rate serves as an incentive to participate in the hidden economy, in this instance, it is rather the increased likelihood of investigation and possible fine that acts as an inducement to the individual to disclose more of his revenue, provided higher marginal tax rates create no counteracting disincentive effect.

Yitzhaki (1974) also provides an essential theoretical model for underground economy participation. The fundamental trust of Yitzhaki's new model was to eliminate those ambiguities presented in Allingham and Sandmo's conclusions by modifying the punishment function. As discussed earlier, in Allingham and Sandmo model, the individual faces punishment and ask to pay the penalty at a rate of (π) when he or she is caught evading taxes. However, this penalty rate (π) , according to the AS model, is imposed upon the undeclared income $(W - X)$. This presumption, per Yitzhaki (1974), leads to the conclusion that when tax rate levels are high, there will be two competing effects: the income and substitution effects. Meanwhile, Yitzhaki (1974, p34), in his proposition, argues that "under both American and Israeli tax laws (and indeed many other countries), penalty fines are imposed upon the evaded tax, i.e. $\theta (W - X)$ ". Thus, incorporating this new penalty function $(F\theta)$ will resolve the issue of contradictory effects. Therefore $\frac{\partial X}{\partial \theta}$ would rather be positive while $\frac{\partial X}{\partial W}$ becomes negative, provided that the absolute risk aversion of the individual assumes a decreasing function.

According to Yitzhaki (1974) model, an increase in tax rate will lead to more revenue being declared, discouraging evasion. However, this conclusion from Yitzhaki appears to contradict the usual assertion that increasing tax rate levels will induce evasion. The argument is that higher tax rates help prevent tax evasion, a conclusion which looks distinctly odd from the usual assertion. This conclusion resulted from how Yitzhaki formulated his penalty function (as a function of the evaded tax), making the penalty rate ($F\theta$) and the tax rate (θ) directly proportional to each other. When absolute risk aversion is decreasing, it causes the taxpayer to transition to formal legal activity, i.e., they tend to declare more of their revenue officials. Therefore, should the tax rate increase, it will only have an income effect, not a substitution effect. Meanwhile, Christiansen (1980 p32) concluded that “depending upon the precise nature of the relationship between the probability of detection (p) and the penalty rate (π), a rise in the penalty rate might induce tax evasion”. This theoretical conclusion is also consistent with Witte and Woodbury (1985) when they also concluded that the individual would intend to report more of his income when there is an increase in the probability of agency action (such as the ability to audit and impose civil penalty).

Tax evasion and Labor Supply

Although people’s decisions to participate in the hidden economy or evade taxes are not limited to only the law enforcement variable (i.e. penalty rate and the likelihood of detection) and the tax rate level as seen in the various models presented earlier. However, there are more when it comes to participating in the underground economy. According to Pyle (1989), there are some correlations between labor supply and the choice to evade tax. According

to Pyle (1989), the individual will choose to participate in the underground economy and succeed in evading taxes to increase his or her net wage rate, which will eventually affect his or her labor supply. Andersen (1977), Baldry (1979), Sandmo (1981) and Weiss (1976) all have made contributions to literature in this regard. The models presented in these papers are considered below, but in a simplified manner for a clearer appreciation

The individual is believed to be faced with a von Neumann-Morgenstern utility function which is defined as a function of total income (W) and hours of leisure time (L). i.e. $U = U(W, L)$. Again, the model assumes that each taxpayer has a constant proportional tax rate (θ), and there is a probability of detection or investigation (p) for evading tax, which, when caught, the individual will pay a penalty rate (π) which is per unit of the evaded tax. In the model, the price of labor is given as the wage rate (w), and the time available for work (H) is the same as the total number of hours within the day (T) minus the individual's leisure time (L). Assume also that the individual declares X amount of his actual income to the tax authorities. Then the individual is expected to have the following disposable income; either $w.H - \theta.X$ with a probability of $1 - p$ (not detected) or $w.H - \theta.X - \pi\theta(w.H - X)$, with a probability of p (detected). Given that the above preamble holds, the individual taxpayer battles with the question of, what optimal value of H and X can he choose to maximize the expected utility of;

$$EU = (1 - p)U[wH - \theta X, T - H] + pU[wH - \theta X - \pi\theta(wH - X), T - H] \quad (2.10)$$

The model assumes an interior optimum for simplicity, hence;

$$Y = wH - \theta X \text{ and } Z = wH - \theta X - \pi\theta(wH - X)$$

Therefore, the F.O.C for a maximum is specified as;

$$-\theta(1-p)U_1^Y - p\theta U_1^Z(1-\pi) = 0 \quad (2.11)$$

and

$$(1-p)U_1^Y w + pU_1^Z w(1-\pi\theta) - U_L^Y - pU_L^Z = 0 \quad (2.12)$$

Since the utility function is a composition of leisure and income, U_1^Y , U_1^Z , U_L^Y and U_L^Z represent the partial differential of the utility function with respect to income and leisure, which are all evaluated at Y and Z, respectively. According to the model developed above, the effect of changes in θ , π , p and w upon H and X could be done by differentiating Equation (2.11) and (2.12) with respect to θ , π , p and w . However, according to Pyle (1989), it is impossible to determine the sign of these derivatives. Baldry (1979) argues that the reason for the almost impossible determination of the signs is due to three possible effects - a leisure effect, an income effect and a portfolio effect. Moreover, among these three effects, it is only the portfolio effect whose sign can be determined ambiguously.

For instance, assuming there is an increase in income tax, the individual worker will have his net wage reduced by the substitution effect. This reduction in disposable income will serve as an incentive for the individual worker to take more leisure. However, the income effect will offset this effect due to the reverse nature of the two results. For instance, assuming the individual leisure time is a normal good, then the individual will be encouraged to increase his labour supply. Hence, it is almost impossible to conclude that when the tax rate increases, it will eventually reduce or increase the quantity of labor supplied. However, this rise will simply depend on the relative magnitudes of these two opposed effects, which cannot be determined beforehand (Pyle, 1989).

Isachsen and Strøm (1985) have also contributed to the theoretical discussion on the nexus between labor supply and tax evasion. This model differs significantly from the earlier one due to certain assumptions made. According to Isachsen and Strøm (1985), each individual has a particular utility function expressed in terms of income and Time. However, the time (T hours) has to be divided between working in the underground economy (H_B hours), formal economy (H_R hours) and taking up leisure. The price of labor in both the underground and formal economy is assumed to be fixed and exogenously given as W_B and W_R respectively. In other words, individuals in the labor market are price-takers. The model also assumes that tax rate levels (θ) in the formal or regular economy, the probability of discovery (p), and the fine or penalty rate (π) are constant. Therefore, the individual is expected to have a utility function given as;

$$EU = (1 - p)U[W_R H_R (1 - \theta) + W_B H_B, T - H_B - H_R] + pU[W_R H_R (1 - \theta) + W_B H_B (1 - \pi), T - H_B - H_R] \quad (2.13)$$

In this model, it is prudent to note that individuals will declare all of their income obtained from working in the formal economy, but none of the earnings from the underground economy activities is concealed. Each individual is assumed to choose between the time (T hours) spent on working in the underground economy (H_B hours) and formal economy (H_R hours) to maximise expected utility. To solve this problem, an independent labour-supply function is usually specified in the form

$$H_R = f(W_R, W_B, p, \theta, \pi) \text{ and } H_B = g(W_R, W_B, p, \theta, \pi)$$

Two conditions exist for an entry condition for an interior optimum to exist,

$$W_R(1 - \theta) < W_B(1 - \pi p) \quad (2.14)$$

$$W_R(1 - \theta) > W_B(1 - \pi). \quad (2.15)$$

Equation (2.14) suggests that for individuals to risk working in the underground economy, the expected net price of labor (wage) in the hidden or underground economy should be greater than the formal economy net tax wage. Equation (2.15) further shows that in situations where punishment is inevitable, it is smart for people to refrain from engaging in shadow activities if the net tax wage in the formal or regular economy is greater than the price of labor (wage rate) in the hidden economy. If this were not true, people would not take the trouble to work in the formal or regular economy because doing so would provide them more motivation to operate in the shadowy sector and pay their fines.

Isachsen and Strøm (1985) made some specific assumptions to narrow this problem down for further predictions. According to Isachsen and Strøm (1985), the individual is assumed to have a specific utility function as $U = \log W + \log L$, where W and L represent income and leisure respectively. Also, all income from the underground economy activity is confiscated (i.e. $\pi = 1$). Due to the nature of the utility function, the total working hour is constant ($\frac{T}{2}$) and the model divide this time between working in the formal economy (H_R hours) or underground economy (H_B hours). Given the above assumptions, Isachsen and Strøm (1985) concluded that participating in the underground economy activity is possible so far as the expected wage rate from the underground economy surpasses the formal economy's net tax rate wage. i.e. $(1 - p) W_B > W_R (1 - \theta)$. Isachsen and Strøm (1985) predicted that;

- i. if the wage rate, thus the price of labor in the hidden economy increases, individuals are encouraged or have the incentive to move from the formal economy into the underground market.

- ii. an increase in wages within the formal economy will decrease the informal participation
- iii. a rise in the formal sector's wage, all things being equal, will reduce the number of hours allotted to work in the informal sector;
- iv. an increase in the probability of detection will serve as a disincentive for participation in the underground economy activity;
- v. as tax rates rise, labor is forced to leave the formal economy and enter the black market.

Tax evasion and information uncertainty

According to Pyle (1989), although the models discussed above tend to influence policy, it is important to further interrogate this phenomenon by relaxing some assumptions. First, all the previous models discussed assumes that people have complete knowledge of all the variables driving their participation in the shadow economy. In other words, taxpayers are considered to be fully aware of the tax rate level, the likelihood of getting detected, and the fine or penalty rate in the event of a conviction. However, in reality, this assumption of perfect knowledge may not hold absolutely. For instance, Benjamni and Maital (1985) concluded: “that individuals tend to underestimate the probability of being audited by the Internal Revenue Service and the marginal income-tax rate”.

Sproule (1985) has developed a model for underground economy participation by incorporating imperfect information about the tax system parameters. The main objective of this model was to examine the effect of taxpayers' decisions on evasion in a circumstance where the individual does not have complete information. The overall model of Isachsen and Strm (1985), in

which labor supply and disclosed income are endogenous variables, was adopted by Sproule (1985). Sproule (1985) concluded that the entry condition shown in Equations (2.14) and (2.15) in the Isachsen and Strøm model would no longer hold in an event where the levels of tax rate are regarded as a stochastic variable. According to Sproule (1985), “*In general, the I-S condition for an interior solution is affected by the amount of information about the parameters of the tax system which is available to the decision-maker. Therefore ... the availability of information can be viewed as a factor that affects the decision to work in the hidden economy.*” Sproule (1985) again demonstrated that the choice to work either in the underground economy or the formal economy depends mainly on the uncertainty of the tax rate, which will eventually affect the total time dedicated to working in either the formal or the underground economy. However, according to Sproule (1985), this is only possible given that the individual exhibit a constant risk-aversion utility function and work is an inferior good irrespective of the type of economy engaged.

Interaction amongst tax-evaders

All the previous models discussed so far (Allingham and Sandmo, 1972; Srinivasan, 1973; Yitzhaki, 1974; Christiansen, 1980; Baldry, 1979; Andersen, 1977; Isachsen and Strøm 1985 and Sproule, 1985) treat the individual taxpayers in isolation to each other when it comes to their decision whether to participate in the underground economy or not. Meanwhile, it is evident and reasonable to assume that individuals decision to participate in the underground economy or evade paying taxes might depend largely on how other people or taxpayers are committed to tax evasion. In other words, when people know or believe others

are doing the same regarding not paying their legitimate taxes, they will equally do the same by not paying their taxes as well, hence participating in the underground economy (Pyle, 1989). For instance, individuals may feel reluctant to pay their taxes if tax evasion is common in the environment where they find themselves because it will be fair to them to evade too. In contrast, if the majority of taxpayers embrace taxes and frown on evasion in an environment, then any taxpayer might find it very difficult not to declare all of their income. This study discusses the model of Benjamini and Maital (1985), a theoretical model for the interaction between taxpayers.

In Benjamini and Maital (1985) model, the utility function of the individual is specified as,

$$U = (-B + AN)X + CN \quad (2.15)$$

According to Benjamini and Maital (1985 p254), model “B is defined as the stigma or psychic cost associated with tax evasion. A is used to proxy the decline in stigma for each person who evades tax. N in the model represents the number of other people who evade. X is the decision variable and is dichotomous in nature; thus, X will be equal to zero (0) if the individual does not evade but takes on the value of 1 if he or she evades. C is the individual's utility or disutility obtained from each other person who evades”. For convenience, the model assumes that the parameters B, A and N are constant and C is greater than zero (Because the individuals are expected to benefit from others' evasion behaviour). If the individual taxpayer chooses not to evade taxes, then their utility function will be of the form $U_0 = CN$. However, if their decision is to evade paying their legitimate taxes, then the utility function is expected to be of the form;

$$U_1 = -B + (A + C)N$$

Benjamini and Maital now used the game theory model to explain how participation in the underground economy occurs. According to them, all

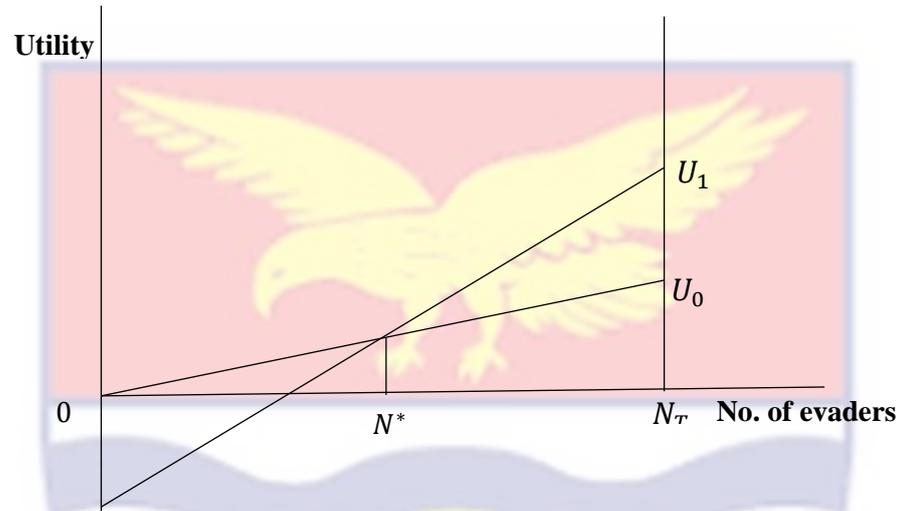


Figure 1: Utility function with taxpayer interdependence
Adopted from Benjamini and Maital (1985)

According to them, if the standard or the practice in the environment is for people to honestly declare all their revenue, both X and N will be equal to zero, indicating a stable solution. Because of this norm that cheating is not allowed, the individual cannot maximize his or her utility by cheating or under-declaring his income because he or she will suffer stigma (B), which is a utility loss. However, assuming there are fluctuations in expectations and norms, individuals start to cheat or evade. So long as the number of evaders are less than the equilibrium number N^* , N will continue to be zero (i.e. $0 < N < N^*$). The individual will remain faithful by declaring all his income because the utility derived will still be higher than when he decides to evade at this point.

However, in a situation where the number of evaders is higher than the equilibrium number N^* , then N will no longer be insignificant but will approach N_T , and beyond the equilibrium point N^* , everyone will be better off cheating since their utility will be higher at every point. In the end, Benjamini and Maital concluded that in an event where “every-one evade” norm has been established, “incremental” anti-evasion policies might be ineffectual. On the other hand, further anti-evasion efforts are unnecessary when the number of evaders is successfully reduced to a number less than N^* (Benjamini and Maital, 1985).

Although the theoretical models of the shadow or underground economy participation and tax evasion have been considerably developed over the last few years, it appears there are more to the theoretical predictions. According to Peneavel (1979, p.124), “literature in this area needs a healthy infusion of empirical work to confront these hypotheses with actual behaviour and resolve the ambiguities”. Thus, the fuse of theoretical and empirical evidence will complete the story.

Empirical Evidence

In spite of all the theoretical models discussed so far, it is evident that explaining why people participate in the underground economy needs more than just qualitative predictions. Given the very nature of the phenomenon, it requires precise estimates of elasticities and empirical testing of these hypothetical models. However, empirical works are very scanty, although it is not surprising. Because given the very nature of tax evasion and underground economy participation, activities and incomes are mostly concealed and done at the blindsight of government and tax authorities, data to which these tests could be performed are mostly missen or inadequate. Notwithstanding, the very few

studies that have sort to examine the participation of the hidden economy do so by either the use of questionnaire or the survey method, game simulation or the use of the econometric approach (Pyle, 1989).

Surveys of taxpayers' attitudes

Studies that use this approach usually use questionnaires to collect information from a random population concerning the behaviour and attitude of the taxpayer towards the tax system. Although using the questionnaire approach helps explore attitudinal and behavioural tax ethics. However, given the criminality nature of tax evasion, there is a high tendency that respondents may refuse to provide genuine information or even accept to be part of the study. Therefore, evidence from this method must be treated and addressed with some level of caution (Pyle, 1989). Regardless, they provide some fascinating and potentially relevant information for subsequent research.

Song and Yarbrough (1978) attempted to examine the behavioural aspects of tax ethics of households in North Carolina. Although the study administered 640 questionnaires, only 287 questionnaires representing 45 per cent were consistent and completely filed. The respondents were asked to rate how much they agreed or disagreed with seven statements that were created to gauge their ethical stance on paying taxes. Some of the statements include the following: Since tax evasion benefits only the government, it is not a major offence, and the most important thing to remember while dealing with the IRS is to avoid getting discovered. Respondents were to score these statements from 0 to 4, and these scores were added and converted to percentages. According to Song and Yarbrough, scores above 50 per cent will mean positive tax ethics, while anything below 50 per cent will mean negative tax ethics. Song and

Yarbrough (1978) found that little over 60 per cent of the participants had their tax ethics positive, while 20 per cent of the respondents had negative tax ethics, while the rest demonstrated neutral tax ethics'. Again, the study showed that although the majority (88%) of the respondents regarded evasion of tax as an offence, they felt that they had no responsibility to report evaders or themselves to the appropriate authorities. Again, it was clear from the study that the majority of the respondents will either inflate their expenses or not report all their revenue to the relevant tax officials to attract the correct tax. There could not have been a better conclusion than the conclusion Song and Yarbrough gave themselves. According to Song and Yarbrough (1978, p. 444), "...the typical taxpayer considers tax evasion only slightly more serious than stealing a bicycle". Song and Yarbrough further assessed the correlation between tax ethics and the respondents' socioeconomic and demographic characteristics. It is important to note from the study that individual taxpayers with higher income and education levels tend to have higher tax ethics compared to those with low income and educational levels. Again, individuals under the age of 40 and over the age of 65 had low scores representing low tax ethics, whereas those who are 40 to 65 years had high scores. This age (40 to 65 years) primarily represents every country's working class.

A similar study conducted by Lewis (1979) in the UK revealed that people's attitudes towards income taxation are strongly influenced by their level of income. Lewis (1979) noted that individuals with higher income levels have low satisfactory attitudes in relation to income taxation, however, they have no option but to follow happily. This means that if these individuals were to have their way and opportunity, they would evade or avoid paying income taxes.

Lewis (1979) again found out that most people, especially those with higher incomes, felt that their individual contributions were too high. This finding is consistent with what Dean et al. (1980) and Song and Yarbrough (1978) found. In Dean et al. (1980), the majority of the respondents used for the study indicated that the amount of money they are paying on their income as tax compared to other people within the workforce is too much. Again, the study by Dean et al. (1980) revealed that the most popular single reason people mostly evade taxes or participate in the underground economy is high levels of taxation. A study by Mason and Calvin (1984) also indicated that people tend to cheat on their income because of high taxes. Although this conclusion contradicts the model of Yitzhaki (1974) and the study by Geeroms and Wilmots (1985), it, however, confirms the model of Allingham and Sandmo (1972) and Srinivasan (1973) that higher taxes have the propensity to increase underground economy participation.

Mason and Calvin (1984) again analysed the effect of the law enforcement variable on the individual decision to evade taxes. The study was initially undertaken in 1975 with 800 taxpayers but replicated again in 1980 in Oregon. The study showed that the fear of apprehension or being caught was the only significant variable in maintaining compliance among most taxpayers. According to Mason and Calvin (1984, p. 494), “the implication for this finding was that these groups could eventually become tax-evaders if compliance norms are negated, and sanction fear weakened”. In other words, when these enforcement variables are weakened and less enforced, the fear will decline, eventually leading the vast majority of taxpayers to evade taxes or under-declare their income.

Experimental tax game simulation

Under this section, three experimental tax ‘games’ played are examined. These games were carried out and reported by Friedland, Maital and Rutenberg (1978), Spicer and Becker (1980), and Spicer and Hero (1985). Although these experimental games were undertaken with different participants, the rule of the game was similar. Participants were informed about the nature of the game at the beginning of the game to seek their consent. The games were conducted in rounds, and participants were provided with certain information like their available income at that period in each round. Participants were also made aware of the tax rate and the fact that there is a probability of being audited at any given period, and if caught evading tax, the kind of punishment they will receive. Money incentives were allocated to participants who would accumulate the maximum net income after the game. The purpose of these incentives was to ensure that all participants took the game seriously.

Friedland, Maital, and Rutenberg (1978) aimed to look at the impact of elements like the tax rate and the possibility and harshness of penalties on evasion. Fifteen (15) participants, aged 25 years, were presented with a hypothetical tax evasion decision, and their behaviour was observed. The simulation game was played for four (4) rounds, each lasting ten (10) months. Friedland, Maital and Rutenberg (1978) found a positive correlation between the levels of tax rate and the probability of underreporting revenue or income. They argue that the tax rate is the most critical thing affecting evasion. Thus, when they increased the tax rate from 25 to 50 per cent, the probability of underreporting also increased dramatically from 0.5 to 0.8. These findings appear to be consistent with the theoretical model of Allingham and Sandmo (1972) and

Srinivasan (1973). Again, the penalty or fine was also found to be directly related to tax evasion. Thus, the study revealed that the probability of underreporting income decreased when the penalty or fine after being caught was increased. The study concluded that substantial fines deter underground economy participation more effectively. Again, the decision to underreport income appears to be influenced by different factors, and it defers widely among individuals (Friedland et al. 1978).

Another study that used this experimental approach is the study by Spicer and Becker (1980). The core objective of Spicer and Becker was to examine the relationship between fiscal inequity and tax evasion. Similar to the earlier study, participants' behaviour was observed after facing a hypothetical tax evasion decision. However, in this current study, fifty-seven participants were employed compared to the fifteen participants used in Friedland, Maital and Rutenberg (1978). Again, in Spicer and Becker's game, information asymmetry existed among the participants. Participants were given incorrect information about the tax rates imposed on other players in the game. All game participants had information on the average tax rate which was valued at 40 per cent. After this, participants were divided into three equal groups.

The first and second groups were later informed separately that the average tax rate was 65 and 15 per cent, respectively, while the last group were told the true tax rate. At the end of the rounds, the game revealed that participants who believed they were paying more tax than others tend to declare less of their income. Thus, from the study, 33 per cent of taxes were lost due to people thinking they were paying more taxes than others, whereas those who thought they were paying less taxes compared to others evaded only about 12

per cent on their tax payables. The group who were told the truth about the actual tax rate evaded approximately 25 per cent of tax. This finding confirms the interrelated nature of taxpayers when it comes to their decision to evade taxes or participate in the underground economy. According to Pyle (1989) and Benjamini and Maital (1985) model, individuals' decision to participate in the underground economy or evade paying taxes might depend largely on how other people or taxpayers are committed to tax evasion. Again, the findings from this study also support the theory that the amount of taxes evaded will increase for victims of fiscal inequity but decrease for beneficiaries of fiscal inequity (Spicer and Becker, 1980).

A similar game was conducted in the works of Spicer and Hero (1985) by testing taxpayers' heuristics in making tax evasion decisions. The study employs thirty-six undergraduate psychology students to test the following hypotheses; First, the study assumes that the taxpayer's level of evasion will be directly related to what they perceive as the levels of evasion by others. Second, taxpayers who have been audited are more likely to decrease their levels of evasion. Although Spicer and Hero found no significant evidence to support the first claim, there was enough evidence to support the subsequent proposition. Thus, auditing and tax evasion had a strong and significant negative correlation. As a result, taxpayers who have been audited are more likely to perceive the likelihood of an audit as greater, resulting in lower levels of tax evasion.

A similar game was played in Germany and reported by Anderhub (2001). Each participant earns his income by solving intertemporal allocation tasks in the game. All accumulated incomes must be declared in a tax return,

and this tax return is randomly audited. If participants are caught in tax evasion after the audit, he or she is punished and charged with a fixed penalty representing the fact that tax dishonesty is a crime in the country. Anderhub (2001) experimental game used four tax periods, where the tax rates increased in two periods. Participants were made aware of the use of the tax. At the end of the game, Anderhub (2001) found out that higher income levels encourage tax evasion. Thus, anytime individuals actual income increases, the proportion of income they declare tends to decrease significantly. Surprisingly the study found out that an increase in tax rate does not affect tax evasion, hence confirming the model of Yitzhaki (1974).

Econometric studies

All the studies discussed under the survey and experimental game approach have focused on the individual's attitude and behaviour towards tax ethics and evasion. However, the magnitude or amount of income they evade or under-declare is still unknown. However, some econometric studies have tried to estimate the amount by examining individual taxpayers income tax returns. For instance, Mork (1975) attempted to provide empirical evidence when examining the association between 'true' income and 'falsified' revenue in Norway. In this study, Mork used two data sources, where he first interviewed the respondents and asked them to state their income. He later obtained information on each respondent from tax authorities on the income they declared to the tax officials. By comparing the discrepancy between these two incomes, Mork found out that the 'true' income that the respondents had to declare themselves is always in excess of about 8000 Norwegian currency every year. Moreover, the study revealed also that anything the individual's actual

income increases, the proportion of income they declare tends to decrease. This is consistent with Anderhub (2001) finding when he experimentally examined the income earned and tax evasion. Again, the finding also confirms the theoretical model of Allingham and Sandmo (1972) and Srinivasan (1973), which suggest that progressive tax rate tends to affect evasion positively. With the presence of progressive tax rates, individuals tend to pay more on their actual income earned and the only means to avoid that is to declare less to attract relatively less tax.

Clotfelter (1983) conducted a similar study to examine the association that exists between the amount of income tax declared and marginal tax rates. The total number of respondents used in the study were 47000 taxpayers captured in the IRS data. According to Clotfelter (1983), undeclared income is measured as the income difference between the amount auditors determined to have been paid by each individual and the actual amount they report to the authority. The study employed the Tobit maximum likelihood procedure because it appeared that many individuals under-declared income was zero to regress the under-declared variable, which is in a logarithm form on several explanatory variables. Clotfelter, in the end, found out that there is a significant relationship between underreporting and afterwards-tax income, as well as the marginal tax rate. Thus, the study shows that an increase in both marginal and after-tax tends to increase underreporting. Depending on the kind of tax return, the underreporting elasticity with regard to income was found to range from 29% to 66%. Also, the elasticity of underreporting of marginal tax rate ranged from 52% to 84%. And according to Clotfelter (1983), this is a strong indication that greater tax rate levels have the propensity to increase or encourage tax

evasion, as postulated by Allingham and Sandmo (1972) and Srinivasan (1973). Again, the study revealed that in an event where the individual's source of income is largely made up of wages and salaries, interest rate and dividends, then tax evasion becomes less common. The reason is that tax withholding is mainly common to these sources of income.

Clotfelter (1983) study has been criticised on the basis that his empirical model did not include any sanction variable like the probability of detection or penalty rate. However, he argued that including such variables might cause simultaneous equation bias because these variables are embedded in wages and salaries, interest rates, and dividends in the form of withholding. Moreover, because his model captures interest rate, dividends, wages and salaries, including these sanction variables might result in the problem of multicollinearity. Due to this, Witte and Woodbury (1985) have attempted to examine how tax laws and tax administration affect tax compliance using the individual taxpayer as a case study. In their quest to examine tax compliance, Witte and Woodbury integrated certain aspects of the US federal income tax laws in their analysis. For instance, a progressive tax structure and multiple penalties for tax non-compliance were adopted, each of which depends on the amount of taxes evaded. The study employed data from the Internal Revenue Service from the US, and in this data set, 1969 individual taxpayer returns were filed for the year 1970. The data set also contains tax agency variables (i.e. audit rates, prosecution rates, the seriousness of sentences imposed for conviction of criminal tax fraud) and socio-economic and demographic variables. The study employed the Seeming Unrelated Regression (SUR) technique proposed by Arnold Zellner in (1962) in estimating their model.

Witte and Woodbury (1985) found that tax compliance is likely to increase if the probability of audit, information reporting, and tax withholding increases. Thus, people's participation in the underground will decrease if the individual knows that he or she will be audited for tax evasion at any point in time. Therefore, the probability of detection in their model serves as a disincentive for underground economy participation or tax evasion, which confirms the theoretical model of Allingham and Sandmo (1972). Again, increasing sanctions, like increasing prison sentences for fraud, will increase tax compliance. In addition, an increase in IRS compliance activities, such as sending warning notices to taxpayers, significantly affects compliance. The taxpayers' attitudes, like fear of detection, were also significant in increasing compliance. The finding confirms the earlier study by Mason and Calvin (1984). Finally, older individuals with better education are likelier to fulfil the tax laws than poor and unemployed individuals. Feinstein (1991) revealed similar results and concluded that a stronger inclination to evade taxes are associated with a higher detection rate.

Poterba (1987) performed a more rigorous analysis when he attempted to examine the relationship between tax rate and tax compliance for capital gains. Data for this study was obtained from the IRS, and compliance, the dependent variable, was measured as a segment of capital gains which was reported on tax returns. Poterba (1987) results reveal that tax rates and compliances are negatively related, and this relationship was significant. Thus, as the marginal tax rate level goes up, it eventually decreases the individual level of compliance, which increases underground economic activity in the end. It is prudent to note that this finding is consistent with several studies like Clotfelter

(1983), Friedland, Maital and Rutenberg (1978), Feinstein (1991), Crane and Nourzad (1986), Allingham and Sandmo (1972) and Srinivasan (1973).

In the study of Crane & Nourzad (1986), the effect of inflation on aggregate tax evasion was examined using the disparities between IRS-reported income and adjusted gross. It was evident from the study that sanctions variables play a significant role in addressing tax evasion. Inflation rates were also found to influence tax evasion positively. This is because when prices of goods and services keep increasing, the individual will intend to conceal some of his income to still keep up with the bundle of goods and services he or she can purchase. Again, Crane and Nourzad (1986) confirm the study of Clotfelter (1983) when they found out that when a larger portion of income is sourced from wages and salaries, tax evasion will reduce due to the fact that these income sources are generally associated with withholding taxes and sanctions.

Franzoni (1998) also argue that although its penalty rate and the probability of audit is essential in determining and enforcing tax compliance, the institutional factors and procedures are also crucial as these sanction variables. He argues that the ability to settle disputes amicably between taxpayers and authorities can significantly increase tax compliance.

Participation in the hidden economy and tax evasion have been extensively discussed from the theoretical and empirical sides. Although some of the studies discussed above have conflicting evidence, significant reasons and determinants of underground economy participation have been unearthed and established. It was evident that the penalty rate, probability of detection, interest rate, inflations, among others, are some critical determinants of tax evasion and hence hidden economy participation. The policy implication of

these findings will be discussed in the subsequent section. However, it is prudent and necessary to consider the economic consequence of tax evasion and underground economy participation.

The Effect of Underground Economy and Tax Evasion on Economic Growth (Economic Consequences)

According to some scholars, tax evasion poses harmful consequences to economic growth, whilst others feel it has some potential benefit. Although the debate in the literature is ongoing, I will discuss the effect and consequences from both the Macroeconomics and Microeconomics sides.

Tax-revenue losses

Tax evasion and the underground economy have several implications for economic growth. This is because taxes have the propensity to distort capital accumulation, which is an integral variable in determining the economic growth of a country. According to studies like Lucas (1988), Rebelo (1991) and Lucas (1990), there is a positive relationship between the rate of capital (human or physical) accumulation and private returns. Therefore, any raise in tax rates has the propensity to decrease one's private returns or income, eventually reducing capital accumulation and leading to a slower growth rate (Caballé and Panadés, 1997).

Another obvious consequence posed by the existence of the hidden economy is that some incomes from economic activities go untaxed. Again, some indirect taxes like the Value Added Tax (VAT) are evaded. In other words, revenue accumulated is always lower than in the situation where every individual was supposed to pay their taxes. This is due to the very nature and definition of the underground economy. Therefore, every unit of the existence

of the underground economy represents revenue loss for the government. When this happens, government revenue may be affected, which will have a replica effect on the number of public goods (roads, healthcare facilities, among others) produced by the government. The multiplier effect of this government revenue loss may significantly impact the economy's growth.

The revenue loss due to the existence of the hidden economy could be estimated by multiplying the standard tax rate with the underground economy size (Feige, 1981). This is done on the assumption that the individual would have paid the standard rate on their income had it not been concealed from tax officials. Several studies have employed and adopted this method of estimating the revenue loss due to the existence of the underground economy. According to Keith's (1983) report, the United Kingdom loses about £4-5 billion in revenue every year due to the underground economy. This figure was derived after the average size of the underground economy of £15 billion every year was multiplied by a standard tax rate of 30p. Emerta (2010) used a similar approach and concluded that in Ethiopia, the revenue loss due to the presence of the underground economy is about 10 per cent of the country's economy. In Ghana, Amoh and Adafula (2019) concluded that tax revenue loss on average is about 20.78 per cent of the country's GDP. Nchor and Konderla (2016) found out that in the Czech Republic, the country loses an average tax revenue of about 7.2 per cent of GDP every year. This value was derived as the product of the underground economy size and the average tax rate.

Information bias

Tax evasion leads to information bias because most activities occur at the blindsight of authorities. Therefore, government authorities do not include

it in the official calculation of certain key performance indicators of the economy, which may lead to unreliable estimates. Thus, with the growing presence of tax evasion, certain developmental indicators and statistics may not be a valuable guide in measuring economic performance. For instance, GDP estimates may reveal a depressed economy in which, in an actual sense, the actual values of the GDP are much higher than the reported. This will mean that the economy may be operating at full-employment potential instead of the depressed nature depicted. Also, unemployment figures may be lower than the reported unemployment rate. If those employed in the shadow economy are counted as unemployed, then the official unemployment rate will therefore be higher than it actually is. According to Matthews (1983), the 1.3 million employees in the UK who were supposedly unemployed at the time were actually working in the shadow economy. This will mean that the UK employment rate will dramatically reduce by nearly 50 per cent.

Hence, key economic performance indicators may be unreliable, which tends to affect policy and decision-making. For instance, the government may decide to use expansionary fiscal and monetary policies tools to restore the economy to full employment potential (higher GDP and lower unemployment rate); however, due to disinformation and the fact that the economy is already operating at or very close to its maximum potential, this policy may increase the price of products and services rather than increase output. Thus, with the presence of the underground economy, most government policy becomes ineffective. Pyle (1989) argues that data on inflation, prices, and growth rates could be inaccurate when the underground economy takes a significant portion of the country's total economic activity. Also, Feige (1981) argued that the

breakdown of macroeconomic theories in the 1970s was a result of the growing nature of the hidden or underground economy, which eventually altered the information system and made certain key indicators like inflation a statistical illusion.

Income distribution

Another consequence of tax evasion and the underground economy is its ability to affect income distribution which will eventually and undoubtedly affect the notion of equity. For example, suppose an income-tax rates structure is established to attain a certain distribution of post-tax earnings. The distribution of post-tax incomes may then deviate from the intended distribution as a result of income-tax evasion. However, this will happen depending on how widespread tax evasion is among the population. Again, individuals engaged in underground economic activities may intend to have higher income on a relative scale than employees whose salaries have tax deducted at source. According to Pyle (1989), since not everyone has the same opportunity to evade taxes and get away with it, evasion redistributes income arbitrarily. And when income tax distribution is not even, there is a tendency to collapse the whole tax system (Pyle, 1989). This is because if individual taxpayers become enraged by others' tax evasion, they may decide to do the same. This will undermine the revenue base, forcing tax authorities to spend even more money enforcing tax laws.

Resource Allocation

The underground economy's existence, growth, and tax evasion pose welfare losses upon society through inefficient use and allocation of resources (Pyle, 1989). Peacock (1983) argues that the presence of the underground or hidden economy will eventually lead to ineffective uses of human and physical

resources. According to Peacock (1983), some individuals with particular aptitudes and acquired skills that may be appropriate for the industry may choose to enter into the shadow market that is difficult to tax and also engage in some form of employment in which they are less skilled and not so well trained.

The economic consequence of this phenomenon, thus the underground economy and tax evasion, has been examined by considering its effect on revenue, information, income distribution and resources allocation. It is evident from the above discussion that the presence of the underground economy affect government revenue and renders some government policies ineffective. Also, tax evasion and the underground economy generate inefficiencies in allocating resources and significantly impose a welfare cost to society. Due to these consequences, there may be a need to reduce tax evasion. However, the presence and growth of this phenomenon can be curtailed or reduced only through certain policy implementation. The next section examines some policy issues targeted at the underground economy and tax evasion.

Policy Issues

As argued by some scholars, the underground economy and tax evasion at some point possess some potential benefit to the society. For instance, the underground economy serves as a lifesaving jacket for most people to find ends meet in times of crisis (Schneider and Enste, 2002). The sector sometimes provides additional employment opportunities and extra income to the needy population. However, despite some potential benefit to society at a particular time, the phenomenon, as discussed in the previous section, poses some threat to resource allocation, reduce government revenue, renders some fiscal and monetary policies ineffective. This means the underground economy is

desirable at a point while it imposes substantial welfare costs upon society beyond that point. In other words, there is an optimal level of the underground economy and tax evasion that maximizes aggregate welfare. However, beyond this optimal point, the underground economy and tax evasion will greatly affect the economy. There are several policy weapons by which authorities use to fight tax evasion problems and reduce participation in the hidden or underground economy.

Much of the study on the economics of tax-law enforcement mostly strives to assume that tax evasion and the underground economy is basically undesirable phenomenon that needs to be curtailed entirely by detecting and persecuting offenders. The approach of some studies in this area, like Singh (1973), Mc Caleb (1976), Fishburn (1979) and Christiansen (1980), are drawn from the model of Allingham and Sandmo (1972), which suggests that the probability of detection and the severity of punishment is the only policy variable through which policy makers exercise both direct and indirect control on the amount of evasion. Moreover, to eliminate evasion and the growing nature of the underground economy, policymakers must be able to set the law-enforcement high enough to be greater than the tax rate. This will eventually ensure that no individual takes the opportunity of under-declaring their revenue, and evasion would be eradicated because the penalty associated with evasion and underground economy participation would be higher than the actual tax rate evaded. This means that the optimal value of the law enforcement variable depends largely on the value of the tax rate.

The question left to unravel is whether tax evasion will be eliminated completely when penalties or law enforcement variables are raised indefinitely. According to Slemrod (1985) and Keith Report (1983), penalties as a weapon for combating tax evasion are mostly very not severe. According to Pyle (1989), there is a need to make the punishment fit the 'crime'. No one would want to see other people put to death or given life sentences simply because of evading taxes. Also, Pyle (1989) argues that the effect of severe penalty in addressing the phenomena of tax evasion will be ineffective based on equity. Therefore, if severe penalties were used discriminatorily, those who were caught and those who were not would be treated quite differently, eventually leading to further inequality in wealth distribution. Therefore, it is evident that there are some drawbacks in setting punishments and penalties very high for tax evasion and underground economy participation. Hence, it is prudent for policymakers to accept that there should be an optimal or limit to the value of π (i.e., severity of punishment). For instance, in order to maintain a little amount of marginal deterrence, the punishment must be related to the offense. Again, according to Pyle (1989), for policy aimed at evasion to be optimal, the policy or intervention used must not impose an additional cost to the society. In other words, the policy may not be optimal until policymakers rely on costless punishment ways in dealing with evasion. Therefore, before enacting any policy to end evasion, policymakers must compare the benefits of increasing investigative efforts to the costs of discouraging evasion.

However, when developing an anti-evasion policy, the government should concentrate on unreported income rather than a system of fines or penalties (Pyle, 1989). This point of view is confirmed by Koskela (1983), who

came to the conclusion that tax rate reductions will decrease evasion under the condition that penalties are based on unreported income. Again, Cowell and Gordon (1986) also argued that government and tax authorities should not increase the tax rate when public goods are underprovided. This is because the improved provision of public goods makes individuals feel better off than evading.

Other studies like Clotfelter (1983) and Graetz and Wilde (1985) have argued that lowering the tax rate tends to increase compliance and reduce evasion and underground economy participation. For instance, according to Clotfelter (1983), tax reduction may reduce unreported income. However, Pyle (1989) argues that although tax compliance will increase due to the tax cut, the end effect will not automatically translate into higher government revenues. Hence this approach to eliminating evasion and the underground economy needs careful scrutiny.

Another optimal policy weapon proven to be essential in eliminating tax evasion and underground economy participation is tax withholding legislation. Empirical research demonstrates unequivocally that compliance issues are much reduced in situations when income is subject to tax deduction at source. For instance, Witte and Woodbury (1985) found that tax compliance is likely to increase if tax withholding increases. Therefore, policymakers need to find a way to subject all sources of income to tax withholding.

Chapter Summary

The study has reviewed related works associated with the underground economy. First, the extent and measurement of the underground economy were examined. Secondly, the study examined the theoretical and empirical motives

that cause individuals to participate in the underground or hidden economy. The study examined the economic consequence of tax evasion and underground economy participation. The fourth and final section was devoted to some policy issues associated with the presence and advancement of the underground economy. The review has identified a gap in the literature in Ghana when it comes to estimating the underground economy's size. Although some studies use the indirect approach in calculating the underground economy size, there is a huge gap when it comes to using the modelling approach to estimate the underground or hidden economy size, especially in Ghana and Africa. Compared to other statistical methods used in calculating the underground economy size, it was identified that the model approach offers several advantages and reliable estimates. Again, it is prudent to note that people's participation in the underground economy and the decision to evade taxes are determined by a number of factors such as tax rate, the severity of penalties, detection rates, interest rate, inflations, their level of income, the stigma associated with tax evasion and their source of income. Therefore, for any anti-evasion policy to be optimal, the law enforcement variable should be a key consideration.

CHAPTER THREE

RESEARCH METHODS

Introduction

The chapter gives an overview of the techniques and methods employed in the analysis of data and also describes the sources and type of data used, the choice of variables and estimation techniques.

Data Type and Source

The data used in this study was secondary and sourced from the World Bank Development Indicator (WDI), Bank of Ghana (BoG) and Economic Freedom Index. The variables used in this study are all real and in logs. The data is collected on an annual basis and covers the years 1990 through 2020. The availability of data, theoretical and empirical justification influenced the sample period chosen, and the variables used.

Model Specification

Underground Economy

The study adopts the Multiple Indicators Multiple Cause (MIMIC) model method to calculate the size of Ghana's underground economy. Since the underground economy cannot be directly observed, the MIMIC approach considers the underground economy as a "latent" variable. The MIMIC model is usually employed by social research to explore unobservable variables (Baldemir at al., 2009). It estimates the underground economy based on the simultaneous interaction between several indicators and causes. According to Cooley (1978), the MIMIC approach helps establish the plausibility of a theoretical model and determine the degree to which the explanatory variables affect the unobservable variable. Thus, the model test the consistency in an

economic theory by examining actual data with the hypothesized relationships between observed (measured) variables and the unobserved (latent) variable (Schneider et al., 2010).

Although the economic activities cannot be directly observed, its effects on the economy at larger is inevitable. Therefore, the MIMIC approach uses a Simultaneous Equation Model (SEM) to examine the relationship between the observable and unobservable variables. It is based on the measurement and structural models (Baldemir et al. 2009). The measurement model relates the latent variable to the observable indicators, while the structural model specifies the relationship between the causes and the unobservable variable.

Mathematically, the MIMIC model can be described as;

$$y_1 = \lambda_1 \eta + \varepsilon_1, \quad y_2 = \lambda_2 \eta + \varepsilon_2, \dots, \quad y_p = \lambda_p \eta + \varepsilon_p, \quad (3.1)$$

$$\eta = \Phi_1 x_1 + \Phi_2 x_2 + \dots + \Phi_q x_q + \zeta, \quad (3.2)$$

Where the underground economy, which is the latent variable (η_t), is linearly expressed in the first model by a set of indicator variables y ($p \times 1$) and another vector x ($q \times 1$) of causal variables in the second model, subject to a disturbance term of ε ($p \times 1$) $\sim N(0, \sigma^2)$ and ζ (scalar) in the first and second models, respectively. λ ($p \times 1$) and ϕ ($q \times 1$) are the structural parameter in the measurement model and structural model, respectively. The general structure of the MIMIC model is specified in Figure 2.

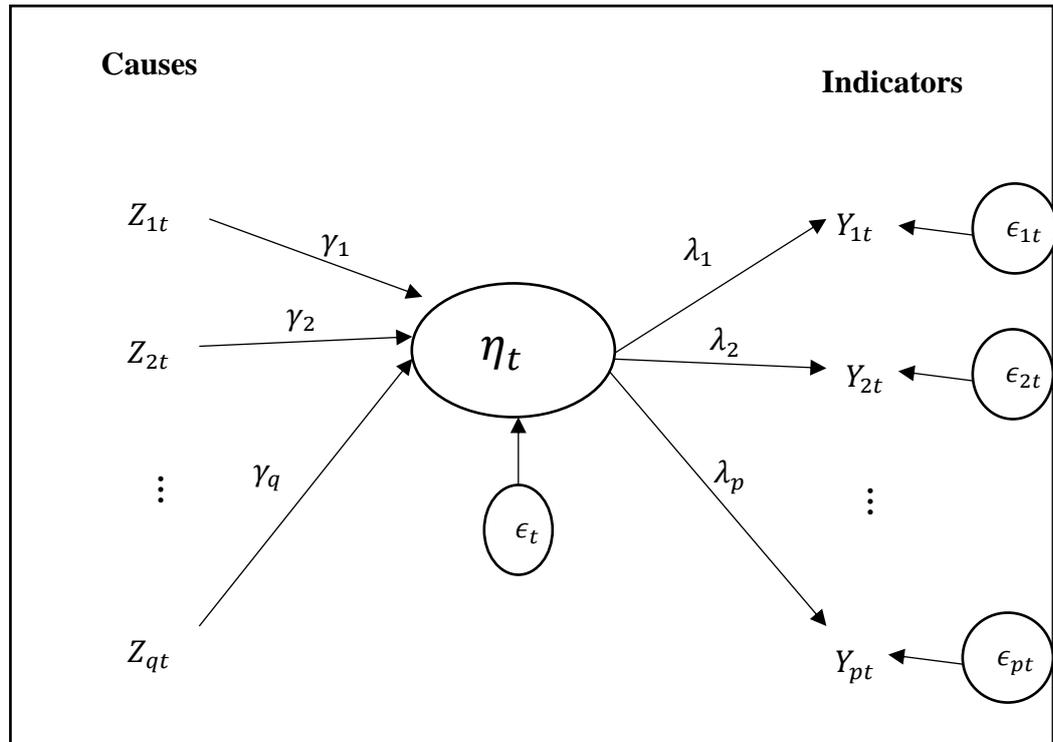


Figure 2: The General Structure of the MIMIC Model

Source: Schneider and Buehn (2016)

From the figure above, the size of the underground economy (η_t) is caused by certain observable variables $Z(q \times 1)$. These causal variables provide incentives to individuals and firms to engage in underground activities. Although these variables may not necessarily represent the underground sector, it has a replicate effect on the sector's size. And since the size of the underground economy is represented with a latent variable (η_t) we can only observe the effect of these causal variables on certain indicators $Y(p \times 1)$. It is possible to directly observe and measure these indications of the magnitude of the shadow economy. Therefore, the MIMIC model tries to establish the statistical relationships that exist among the latent (unobserved) and manifest (observed) variables. In essence, the MIMIC model is a confirmatory model of the consistency of the structural theory through the test of empirical data.

Equations (3.1) and (3.2) can be rewritten in a vector form as ;

$$\mathbf{y} = \lambda\boldsymbol{\eta} + \boldsymbol{\varepsilon} \quad (3.3)$$

$$\boldsymbol{\eta} = \boldsymbol{\phi}'\mathbf{x} + v \quad (3.4)$$

Equation (3.3) relates the underground economy to its indicators, while equation (3.4) associates the underground economy with a set of observable causes. By assuming that the error terms $\boldsymbol{\varepsilon}$ and ζ are jointly normally distributed and mutually uncorrelated over time with $\text{var}(v) = \sigma^2_v$ and $\text{cov}(\boldsymbol{\varepsilon}) = \boldsymbol{\Theta}_\varepsilon$, the above equation could be solved by first solving for the reduced form of the equation. Thus, the reduced form equation can be obtained by combining the functional form of equations (3.3) and (3.4);

$$\mathbf{y} = \lambda(\boldsymbol{\phi}'\mathbf{x} + v) + \boldsymbol{\varepsilon}$$

Hence the Reduced form equation will be;

$$\mathbf{y} = \boldsymbol{\pi}\mathbf{x} + \boldsymbol{\mu} \quad (3.5)$$

Where $\boldsymbol{\pi} = \lambda\boldsymbol{\phi}'$ is a matrix with dimension $(p \times q)$ and rank equal to 1 and $\boldsymbol{\mu} = \lambda v + \boldsymbol{\varepsilon}$ is a vector of dimension $(p \times 1)$ which is normally distributed with zero mean and a constant variance. The covariance of the error term is given as $\text{cov}(\boldsymbol{\mu}) = E[(\lambda v + \boldsymbol{\varepsilon})(\lambda v + \boldsymbol{\varepsilon})'] = \lambda\lambda'\sigma^2_v + \boldsymbol{\Theta}_\varepsilon$, which is similarly constrained like the $\boldsymbol{\pi}$ matrix.

The reduce form equation can be estimated using the maximum likelihood estimator. However, a restriction implied in both the coefficient matrix $\boldsymbol{\pi}$ and the covariance matrix of the errors $\boldsymbol{\mu}$ is sufficient in estimating equation (3.4). In general, a normalization condition is required in the structure of the MIMIC model before estimating the reduced form equation. A convenient way to do this is to restraint one element in the λ vector to some pre-assigned value to obtain the values of λ and $\boldsymbol{\phi}$ (Schneider et al., 2010). Once the

parameters have been estimated, the covariance matrix is compared to the MIMIC model-implied covariance matrix, which could be derived from equations (3.1) and (3.2). If the two matrices are consistent, the structural equation model can be deemed likely to explain the relationships between the variables under investigation.

Underground Economy and Economic Growth

The traditional economic growth model, which assumes that all economic activities take place in the formal sector, may not accurately capture the role of the underground economy. To account for the underground economy, economists have developed modified growth models, such as the Mankiw-Romer-Weil model (1992). This model includes the size of the underground economy as a factor affecting economic growth. The model can be expressed as follows:

$$Y = A \times F(K, L, H, U) \quad (3.6)$$

Where: 'Y' is real GDP, 'A' is total factor productivity, 'K' is the stock of physical capital, 'L' is the labor force, 'H' is human capital, and 'U' is the quantum of the underground economy which is measured as a share of the total economy in the model. The larger the underground economy, the smaller the reported GDP and the lower the reported labor productivity. This leads to a decrease in total factor productivity. In other words, the underground economy reduces the efficiency of the formal economy by diverting resources and labor away from productive activities and creating market distortions and inefficiencies. As a result, the model shows that the size of the underground economy has a negative impact on economic growth.

The underground economy can also reduce the incentives for firms to invest in R&D and innovation. Firms that operate in the underground economy may not have access to formal financing channels or legal protection for their intellectual property, which can reduce their ability to innovate and compete in the global market. This can lead to a reduction in economic growth by limiting the creation and diffusion of new technologies. Moreover, the underground economy can also reduce government revenue, which limits the government's ability to invest in public goods and services such as education and infrastructure. This reduces the availability of basic resources needed for economic growth, which can further hinder economic progress.

This modified growth model highlights the importance of addressing the factors that lead to the existence of the underground economy, such as excessive taxation, regulatory burdens, and corruption, in order to promote sustainable and inclusive economic growth

Empirical Model

Objective One

The underground economy is seen as a latent variable in the MIMIC approach and links the underground economy's activities to several observable indicators and causes. In specifying the model, the study uses two sets of variables: the observed and indicator variables. The observed variables represent the causal factors or determinates of the underground economic activities. According to Asiedu (2014), the leading causes or determinants of the underground economy in Ghana may include the level of the tax burden, the size of government consumption, tax morale, unemployment, self-employment, social security payment, inflation and institutional quality. The indicator

variables determine the existence of an underground economy. These may include the amount of labor participation in the official system, the amount of cash held outside the banking system, and growth in GDP per capita. Hence the hypothesized relationship between the latent (unobservable) variable and the observable causes and indicator variables is shown in the figure below. Figure 3 shows MIMIC 7-1-3 model, thus, in this model, there are seven multiple causes of the underground economy and three indicators of this economy.

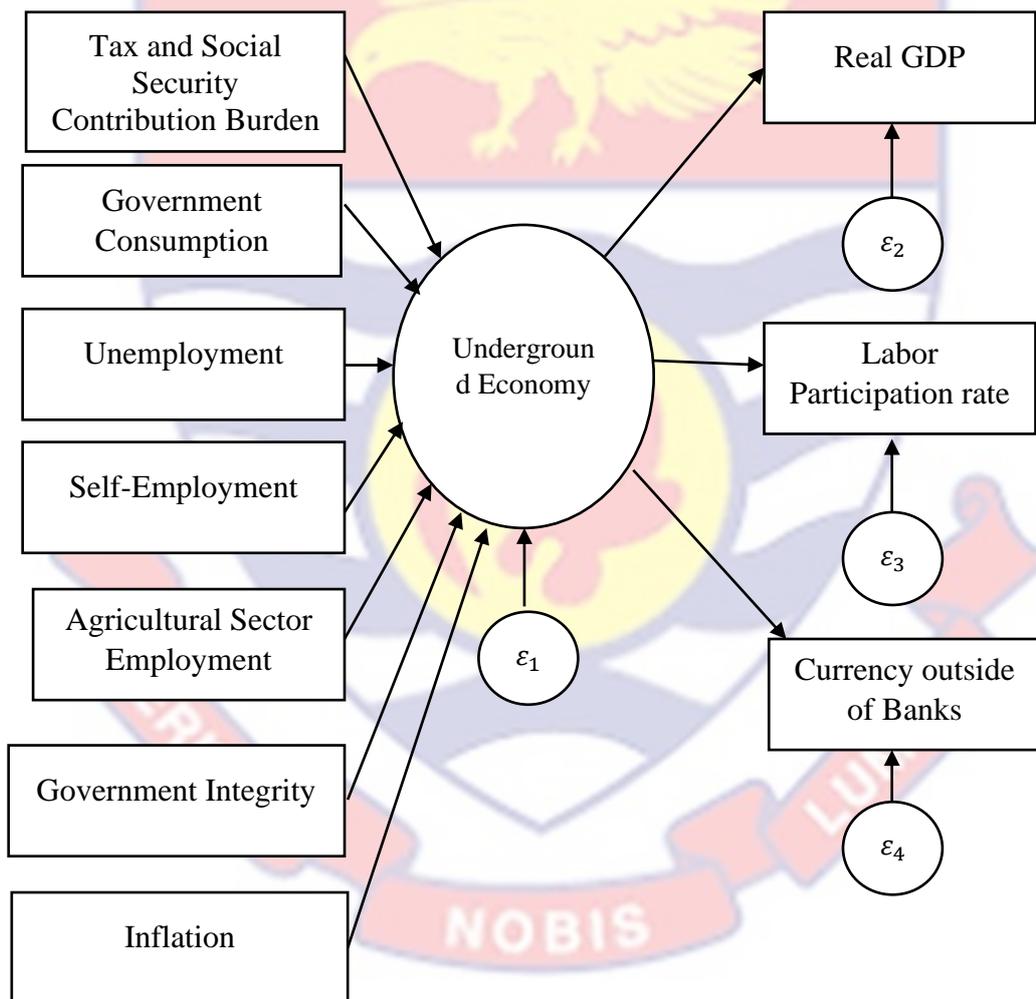


Figure 3: MIMIC 7 -1 – 3

Source: Author's construct, 2022

The index of the underground economy is estimated by equation (3.7),

$$\Delta\hat{\eta} = \hat{\gamma}_{11}\Delta X_1 + \hat{\gamma}_{12}\Delta X_2 + \hat{\gamma}_{13}\Delta X_3 + \hat{\gamma}_{14}\Delta X_4 + \hat{\gamma}_{15}\Delta X_5 + \hat{\gamma}_{16}\Delta X_6 + \hat{\gamma}_{17}\Delta X_7$$

(3.7)

In equation (3.7), the structural coefficients are multiplied for the “filtered” data for stationarity and the latent variable is estimated in the same transformation of independent variables (first difference). The latent variable is now integrated to obtain the index for the underground economy. In order to generate a time series variable for the underground economy, a number of calibration procedures are proposed. However, due to several advantages, the study used the calibration procedure proposed by Nchor and Adamec (2015). According to Nchor and Adamec (2015), the underground economy size can be estimated from the equation below.

$$\hat{\eta}_t = 100 \times \frac{\tilde{\eta}_t}{\tilde{\eta}_{2004}} \times \eta^*_{2004}$$

(3.8)

In Equation (3.8), the underground economy’s size is generated as a percentage of the official economy. $\hat{\eta}_t$ is the estimated value of the latent variable at time t; The study selected the year 2004 as the based year in the calibration process because it is possible to build an average with eight different estimates and almost all the kinds of methodologies. $\tilde{\eta}_t$ is the calculated MIMIC index at time t. $\tilde{\eta}_{2004}$ is the estimate of the underground economy in the base year. And η^*_{2004} is the exogenous estimate of the underground economies in 2004. The exogenous estimate introduced into this model is helpful to guarantee greater truthfulness of the estimates. This exogenous information is chosen from a year in which several estimates of the underground economy exist.

Objective Two

The study adopted the model proposed by Feige (1981) evaluate the value of tax evasion in Ghana. Thus, the value of tax evasion due to the existence of the underground economy was estimated by multiplying the value of the average tax rate (ATR) by the size of the underground economy. This is done on the assumption that the standard rate would have been paid on incomes had it not been concealed from tax officials. Mathematically it is represented as,

$$\text{Tax Evasion} = \text{Average Tax rate} \times \text{underground economy as a percentage of GDP} \quad (3.9)$$

Objective Three

$$\begin{aligned} \text{Ln}(\text{GDPPC}) = & \beta + \beta_1 \text{LnTEGDP}_t + \beta_2 \text{LnINF}_t + \beta_3 \text{LnGNS}_t + \\ & \beta_4 \text{LnPSI}_t + \beta_5 \text{LnFDI}_t + \beta_6 \text{LnIRS}_t + \mu_t \end{aligned} \quad (3.10)$$

Where GDPPC represent GDP per capita a proxy for economic growth, TEGDP represents the extent of tax evasion in the country, INF represent the rate of inflation, GNS is the Gross national savings as a percentage of GDP, PSI represents the public sector savings also as a percentage of GDP, FDI is the foreign direct investment and IRS is the interest rate. Hence tax evasion is expected to have a negative effect on economic growth.

Objective Four

$$\begin{aligned} \text{LnGDPPC}_t = & \beta_0 + \beta_1 \text{UE}_t + \beta_2 \text{GCF}_t + \beta_3 \text{DEVHEXP}_t + \\ & \beta_4 \text{TERENROLL}_t + \beta_5 \text{LnINF}_t + \beta_6 \text{IR}_t + \mu_t \end{aligned} \quad (3.11)$$

Where; GDPPC is GDP per capita which is the dependent variable, GCF represents Gross capital formation a proxy for total Investment, DEVHEXP is Development expenditure in the health sector; TERENROLL is enrollment in tertiaries, INF is the rate of Inflation, IR represent interest rate and hidden

economy represents the size of the underground economy measured as a percentage of GDP (own estimates). The variables TIPC, DEVHEXP, TVIENROLL, and UNIENROLL, are expected to obtain a positive sign, while INF and IR are expected to affect economic growth negatively. As already discussed, the sign of the underground economy on the formal economy cannot be determined a priori. Hence the study expects either a positive or negative sign.

Justification of Variables

Causal Variables

Tax and Social Security Contribution Burden

Tax burden remains a primary determinate of the underground economy in literature. Because when citizens are paying a greater portion of taxes, there is a high propensity not to comply or evade these huge taxes. The tax burden is measured as the total share of direct and indirect taxes, including social security contribution, expressed as a percentage of the GDP. When the tax burden is high, it encourages some individuals and firms to evade tax by either not making their activities known to the tax authorities or underreporting their revenue to attract less tax. Thus, taxpayers may be encouraged to engage in tax-evading activities as long as the tax burden is huge (Amoh, 2019). In the quest to capture the tax burden, most studies always ignore the social security payments even though it is a relevant component of the overall tax burden. This is because most individuals engage in activities in the underground sector deliberately at the blindsight of state authorities to avoid social security payment (Schneider and Buehn 2016). Hence including the social security contribution to the calculation of tax burden in this present study.

The tax burden is the main cause or determinates of the underground economy, hence an important variable to consider when determining the size of the underground economy (Johnson et al., 1998, and Schneider and Enste, 2000). This phenomenon occurs as a result of the country's tax system. Studies like Emerta (2010), Savasan (2003), Dell'Anno et al. (2007), and Amoh (2019) have concluded that there is a strong correlation between the tax burden and the size of the underground economy. Thus, an increase in tax burden will lead to a high underground economy. In all the MIMIC models, the variable tax burden is added as a major cause of the underground economy. According to Christopoulos (2003), when direct and indirect taxes increases, taxpayers move into the underground economy as quickly as they move out of it when they decrease. Hence in the hypothesized model, the study expects that the case is no different in Ghana. Thus, the level of the tax burden will have a positive sign and effect on the underground economy.

Real Government Consumption

The size of the public sector is another cause why people engage in the underground economy. The public sector is mainly associated with a bureaucratic system which sometimes becomes problematic to follow and abide by, therefore, when the size of the public sector increases, then one is assured of an increase in these bureaucratic and discretionary regulations. According to Johnson et al. (1997), the high level of regulatory and bureaucracy discretion is a key determinant of underground activity because, in the underground economy, the activities of these individuals are primarily undetected by state authorities. Therefore, most people use the underground economy to hide from these bureaucratic regulations that exist within the public sector. Aigner et al.

(1988), postulated that an increase in the size of the public sector and the degree of economic system regulation provide a relevant encouragement for individuals to participate in the informal economy. According to Frey and Weck-Hanneman (1984) and Giles, Tedds (2002) huge regulation burden tends to affect the hidden economy positively. Hence capturing the size of the public sector in the empirical model is paramount in determining the size of the underground economy. Real government consumption is used in this study to proxy State activities' presence, and the coefficient in the model is projected to be positive. Thus, "more State" in the market will be an indication of an increase in regulation which will eventually be an incentive for people to operate in the underground economy.

Unemployment

The underground economy has mostly been hypothesized to be an alternative place of survival for most individuals who do not find their feet in the official economy. Unemployment refers to the percentage of the workforce without a job but in search of one. The unemployment rate is measured using labor force survey, and the rate is calculated as the number of unemployed individuals divided by the total labor force (employed and unemployed individuals). It is prudent to note that the effect of unemployment on the size of the informal sector is not clearly stated in the literature. This is because, within the underground economy, there exist heterogeneous laborforce giving rise to this problem. Thus, within the underground economy, some people have at the same time formal and informal jobs. For instance, some people who are employed in the formal sector but mostly engage in underground activities on weekends

Some empirical studies like Medina and Schneider (2019) argues that unemployment in the formal sector would force individuals to engage in informal economic activities, implying a positive relationship between unemployment and the underground economy. However, as cited in Tanzi (1999), the impact of this phenomenon may not necessarily affect the underground economy due to measurement problems. This will occur if people in the workforce who are traditionally known as unemployed make a living through unreported activities. Giles and Tedds (2002) also argue that the relationship between the unemployment rate and the underground economy is negative. Hence an increase in unemployment will decrease the underground economy since the underground economy is positively related to GDP growth. This relationship between the underground economy and GDP growth will negatively affect the unemployment rate. On this note, Tanzi (1999) concludes that the relationship between the unemployment rate and the underground economy is ambiguous. Even though this relationship is unclear, a positive sign is expected in Ghana due to specific characteristics in the economy.

Self-Employment

Employment within the informal sector is operationally defined as comprising of domestic service, the self-employed, unremunerated family workers, and workers in "small" firms whose size ranges from less than 5 to 50 employees (Portes, 1983). The World Bank measures the rate of self-employment using data from household surveys that collect information on employment and income. The self-employment rate is then calculated as the percentage of individuals who report being self-employed out of the total labor force (Portes, 1983). The percentage of the self-employed labour force

contributes significantly to the underground economy (Dell'Anno, 2003). This is because those who are considered self-employed contribute significantly to the overall GDP. However, most of their activities are conducted behind closed doors without the knowledge of state authorities. In Italy, the most important component that distinguishes their productive system from other European countries is their significant number of small and large firms that are considered self-employed (Bordignon and Zanardi 1997). According to Bordignon and Zanardi (1997), the percentage of self-employed in the country is 26.7 per cent, which is more than double what is prevalent in the other countries. However, the country generates little or no income from their activities since they are hard to track and monitor. Again, having many professionals and self-employed people means more opportunities for moving expenses from consumption to production, deducting them from taxes, simplifying bookkeeping, and making it simpler to collude with clients. Self-employed activities are usually associated with non-filing of tax returns and failure to keep records. According to Wondimu and Birru (2020), the underground economy is positively related to the rate of self-employed people in the country. Therefore, in the MIMIC model, the rate of self-employed people in Ghana is expected to relate positively to the underground economy.

Agricultural Sector Employment

Over the years, the agricultural sector in Ghana has contributed significantly to the overall growth of the economy. Currently, the agriculture sector employs about 30 per cent of the country's labour force, contributing 40 per cent to the GDP (World Bank, 2021). Agriculture, fishing, fish processing, and agro-based processes provide for 75 per cent of informal sector jobs in rural

areas of the country (GSS, 2008). The size of the agricultural sector contributes significantly to the informal sector and has, over the years, been used as a proxy for the informal sector due to reasons such as; (1) lack of formal regulations in the sector, this is because the informal economy is a sector that produces legal goods, but does not comply with government regulations (Trebicka, 2014). An increase in the agricultural sector employment tends to increase the underground sector activities because most agricultural products are on a small scale and for home consumption in Ghana. Moreover, their activities are mostly done at the blindsight of the tax authorities. Again, workers in Ghana's agricultural sector are mostly engaged in indecent work since they do not contribute towards any social security. Thus, although these workers make some profits and benefits, they mostly do not contribute anything to the tax authorities regarding tax or social security. Therefore, it is expected that the agricultural employment size will positively affect the underground economy. Thus, the study expects that increasing employment in the agricultural sector will increase the underground economy's activities.

Institutional Quality

According to Dell'Anno (2003), Institutional barriers, burdensome bureaucracy, and socio-cultural barriers are significant reasons for most businesses to operate in the underground economy (Dobson and Ramlogan-Dobson, 2012). According to Amuedo- Dorantes (2004), the prevalence of the informal sector is due to the complexity of the registration process, corruption, high registration costs, excessive regulation, and information obstacles. Corruption remains one crucial determinant of underground economic activities. The ability of the government to control its public funds and

corruption has the tendency to influence the size of the agricultural sector. According to Fijnaut (2002), corruption is an umbrella concept, covering all or most types of integrity violations or unethical behaviour. Therefore, government integrity is used to proxy the quality of state institutions in the study. Government integrity is the extent to which a state is free from corruption (Fredriksson, Neumayer, & Ujhelyi, 2007). According to the OECD (2013), government integrity is the alignment of government and public institutions with larger principles and norms of behaviour that protect the public interest while avoiding corruption. Thus, government integrity is measured by the effectiveness with which a country's rules and regulations are enforced (La Porta, Lopez-de-Silanes, Shleifer, & Vishny, 1998; Rothstein & Teorell, 2008). Hence it is a public perception based on formal institutions' efficiency or inefficiency.

The effect of government integrity and the size of the underground economy could be seen to have a bi-causal relationship between them. Thus, considering, for instance, corruption, Nchor (2015) argues that an increase in corruption and its related activities is due to the underground economy's hidden nature. This is because any activity that is not registered increases the tendency for malpractices. Again, people are engaged in the informal sector because of weak government regulatory laws. Weak institutions, such as a lack of respect for the law or high levels of corruption, would encourage informal activities (Medina and Schneider, 2019). According to Wondimu and Birru (2020), institutional quality negatively affects the size of the underground economy estimations. Thus, according to Wondimu and Birru (2020), an improvement in the quality of state institutions or the increase in the fight against corruption in

a given country will reduce the sizes of informal economic activities. institutional quality, as weak institutions, such as lack of respect for the law or high levels of corruption, would encourage informal activities. Therefore, government integrity is expected to negatively affect the size of Ghana's underground economy.

Inflation

The role of inflation in affecting the presence and growth of the underground economy over the years has been underestimated. However, the literature suggests that inflation plays a significant role in affecting the size of the underground economy. In Crane and Nourzad (1986) study, the effect of inflation upon aggregate tax evasion was examined. And from the study, it was evident that inflation rates were found to positively influence tax evasion and underground economy participation. This is because when prices of goods and services keep increasing, the individual will intend to conceal some of his income to still keep up with the bundle of goods and services he or she can purchase. Therefore, inflation is expected to affect the underground economy's size positively.

Indicator Variables

Real Gross Domestic Product (Variable of Scale)

Real GDP in this study is chosen as a reference variable for identification purposes and its theoretical implications. The relationship between real GDP and the underground economy is ambiguous and cannot be determined a priori (Dell'Anno, 2003). In situations of depression or economic downturn, the most immediate effect on the formal economy is the loss of jobs. This has the tendency to drive most of the individuals into the informal or the

underground economy. According to Schneider and Enste (2002), this is significant because the underground economy's size increases significantly in times of crisis. Thus, it serves as a "life jacket" for firms and individuals in financial troubles and for that reason, it increases when the GDP decreases. However, due to the decrease in GDP, the demand for goods and services within the underground economy may also decrease, eventually offsetting the earlier effect. However, some found a negative effect of the underground economy on the GDP. The argument is that as the underground economy grows, public services will be less readily available to the official economy and less effective when they are needed.

Normalizing the value of the real GDP was because to estimate not only the relative size of the parameters but also their levels, it is necessary to fix a scale for the unobserved variable. This is done by fixing one non-zero coefficient to the reduced form equation (3). However, the choice of sign (i.e., positive or negative) is based on theoretical and empirical motivations. Therefore, considering the works of Weck-Hannemann (1984), the study assigns an initial value of "minus one" (-1) to the real GDP variable.

Currency in circulation outside of banks

Undoubtedly, most transactions within the underground economy are only done with cash or kind as a medium of exchange. In other words, payment for goods and services within the underground economy is only made with cash and no forms of cheque or credit card to avoid any auditing controls. Due to this assumption, the underground economy size can be estimated by comparing the actual demand for cash with the expected demand for cash in situations with no underground economy. It is expected that the presence of the underground

economy will affect the currency in circulation outside the banks or the demand for money positively.

Labor participation rate

The labor force participation rate is the percentage of the population aged 15 and up who are economically active (ILO, 2020). Thus, these are individuals who supply labor for the production of goods and services over a given time period (ILO, 2020). Labor participation is used as an indicator for the presence and growth of the underground economy because studies like Cappiello (1986), Lubell (1991), Pozo (1996), Bartlett (1998) and Tanzi (1999) have shown that in situations of depression or economic downturn the most immediate effect on the formal economy is loss of jobs and this has the tendency of driving most of the individuals into the informal or the underground economy. Therefore, a decline in the official labor force participation rate could indicate an increase in the size of the underground sector. In other words, the growth of the underground economy is an indication that the country's labor force in the official economy is low. Therefore, the underground economy is expected to negatively affect labor participation in the official system.

Control Variables

Public Sector Savings

Public sector savings, or government savings, refer to the amount of money the government saves after meeting all of its expenditures. These savings can have both positive and negative impacts on economic growth. On the one hand, public sector savings can contribute to economic growth by increasing the availability of funds for investment. When the government saves money, it can use those savings to finance infrastructure projects, research and development,

and other investments that can stimulate economic activity. This can lead to increased employment, higher productivity, and overall economic growth.

On the other hand, public sector savings can also have negative effects on economic growth. When the government saves too much money, it may reduce public spending on critical areas such as education, healthcare, and social services, which can lead to lower quality of life and decreased productivity among the population. Moreover, excessive public sector savings may decrease demand, which can lead to lower economic growth. Therefore, although public sector savings can positively and negatively affect economic growth, I expect a positive effect on economic growth.

Foreign Direct Investment

Foreign direct investment (FDI) refers to an investment made by a company or individual in one country into a company or business in another country to establish a lasting interest or a significant degree of influence over the foreign business. FDI can have both positive and negative effects on economic growth. One of the main ways that FDI can positively affect economic growth is by providing capital for investment and increasing the competitiveness of local firms. When foreign companies invest in a country, they bring resources, technology, and management expertise that can help local firms expand, innovate, and become more productive. This can lead to increased employment opportunities, higher incomes, and higher economic growth. FDI can also have a positive impact on a country's balance of payments by generating export earnings and reducing imports. This can improve the current account balance, which is an important indicator of a country's economic health. However, FDI may result in a transfer of profits and technology from the host

country to the foreign investor, reducing the benefits the host country receives from the investment. In addition, there is a risk that the foreign investor may have too much influence over the local economy, which can result in market distortions and negative externalities. However, in this study, FDI is expected to positively affect economic growth.

Development expenditure in the health sector

The development in the health sector can significantly impact economic growth, both directly and indirectly. In addition, the development of the health sector can have a range of positive impacts on economic growth. By improving health outcomes, increasing life expectancy, driving innovation, increasing access to education, and improving infrastructure, the development of the health sector can contribute to a more productive and prosperous society. Therefore, growth in the health sector is expected to have a positive effect on economic growth.

Enrollment in Tertiaries Education

Enrollment in tertiary education, such as universities, colleges, and vocational schools, can significantly impact economic growth. This is because it tends to increase the skill level of the workforce, foster entrepreneurship and innovation, increase income, improve quality of life, and attract foreign investment. Also, enrollment in tertiary education can contribute to a more productive and prosperous society. Hence it is expected to have a positive coefficient on economic growth

Estimation Techniques

The study employs Structural Equation Modelling (SEM) to estimate the underground economy's size for research objective one. This is necessary

because values may not be directly observed for the very nature of the underground economy but depend on the simultaneous interactions between some causal and indicator variables. Thus, once these indicators have been identified, a structural equation model that estimates the relationship between the indicators and the size of the underground economy is created. This model can be used to estimate the magnitude of the underground economy, and also to identify factors that contribute to its growth or contraction. The SEM method is based on the maximum likelihood (ML) estimator. This method obtains parameter estimates by maximizing the likelihood function derived from the multivariate normal distribution.

Maximum Likelihood (ML) estimation is a commonly used statistical method for estimating the parameters of a statistical model. The ML estimator seeks to find the parameter values that maximize the likelihood function, which is the probability of obtaining the observed data given a specific set of parameter values. The ML estimator is particularly useful in situations where the distribution of the data is known, or can be assumed. For example, if we assume that a set of data follows a normal distribution, we can use the ML estimator to estimate the mean and variance of the distribution. To find the ML estimator, the study begins by specifying the likelihood function for the data, which is a function of the model parameters. The derivative of the likelihood function with respect to each parameter was then obtained after the resulting equations were set to equal zero and solved for the parameter values that maximize the likelihood function. The ML estimator has several desirable properties, including efficiency and asymptotic normality. Efficiency means that the ML estimator has the smallest variance of all unbiased estimators. Asymptotic

normality means that as the sample size approaches infinity, the distribution of the ML estimator approaches a normal distribution.

For objectives three and four, the study employed the Ordinary Least Square (OLS) technique in estimating the long-run effect of tax evasion on economic growth and the effect of the underground economy on economic growth. Given the assumptions of the classical linear regression model, the OLS estimator has minimum variance in the class of linear estimates. The OLS estimators are Best Linear Unbiased Estimators (BLUE). The OLS method is beneficial in time series analysis for several reasons: First of all, it can provide estimates of the coefficients that describe the relationship between the dependent variable and one or more independent variables. These estimates can be used to make predictions about future values of the dependent variable. Secondly, the OLS method provides a way to identify the statistically significant predictors of the dependent variable. This is important in time series analysis because it can help to identify the factors that are driving the changes in the dependent variable over time. Lastly, the assumptions underlying the OLS method are well-established, and the results are easy to interpret. This makes it possible to communicate findings to a broader audience.

Unit Root Tests

Unit root tests are important in time series analysis because they help to determine whether a series is stationary or not. If a series is non-stationary, then it can be difficult to estimate accurate models or make reliable forecasts, as the series may exhibit spurious regression or produce forecasts that are not meaningful. Therefore, unit root tests are useful tools for identifying the appropriate time series models and forecasting techniques to use for a given

dataset. Several approaches are used to ensure that a non-stationary series becomes cointegrated or stationary. However, the most widely used is by differencing the series. This study uses the ADF (Dickey and Fuller, 1979) and the PP tests (Philips-Perron, 1988) method in testing for stationarity or a unit root. The ADF test is a popular test for unit roots in time series data. It is based on the augmented Dickey-Fuller regression model, which is a first-order autoregressive (AR) model that includes a lagged dependent variable and a lagged difference of the dependent variable. The null hypothesis of the ADF test is that the time series contains a unit root, while the alternative hypothesis is that the series is stationary. The PP test is a modification of the ADF test that accounts for autocorrelation in the error terms. It is a non-parametric test that does not assume a specific distribution for the error terms. Upon rejection of the null hypothesis, the series reaches stationarity. The first difference was taken if stationarity cannot be reached at level. If the first difference, however, is not stationary, we continue to take the difference and run the ADF test. The Akaike Information Criteria (AIC) and Schwarz Bayesian Criteria tests are used to determine the proper lag length (SBC).

T-Test

The t-test was used in this study to investigate the significance and reliability of the individual parameters on the model. This is done by comparing their associated Probability value (P-value) to the significance level. The study tested the null hypothesis of $\beta_i = 0$, thus the coefficient of the individual explanatory variable is equal to zero (0) against an alternative hypothesis of $\beta_i \neq 0$, thus the coefficient of the individual explanatory is not equal to zero (0). The implication is that when the null hypothesis is rejected, that particular

variable is statistically not equal to zero hence significant in the model. However, when we fail to reject the null hypothesis, it implies that the individual parameter or variable is statistically equal to zero and hence not significant in the model.

Wald Test

Again, the significance and reliability of the entire model were tested using the Wald test. The Wald test is used in linear regression models, where the null hypothesis is usually that the coefficients of the independent variables are equal to zero. The test statistic is calculated as the ratio of the difference between the estimated coefficient and the hypothesized value of the coefficient, divided by the standard error of the estimated coefficient. The resulting test statistic is compared to a critical value based on the chi-squared distribution with degrees of freedom equal to the number of parameters being tested. If the calculated test statistic exceeds the critical value, then the null hypothesis is rejected, indicating that the coefficients are significantly different from zero. Conversely, if the calculated test statistic is less than the critical value, then the null hypothesis is not rejected, indicating that the coefficients are not significantly different from zero. It is particularly useful in situations where the number of observations is relatively small, as it allows researchers to test multiple coefficients simultaneously without the need for multiple tests. The test was conducted based on the hypothesis that:

$$H_0: \beta_1 = \beta_2 = \beta_3 = 0$$

$$H_1: \beta_i \neq \beta_j \neq 0 \text{ for some } i \neq j$$

Durbin Watson (Dw) Test

The Durbin Watson (DW) test was employed to determine the existence of autocorrelation in the error term. When autocorrelation is present, then the values and the standard errors of the parameter estimates will be affected. When the values of the error term are correlated, the predictions based on the OLS estimates will be inefficient. They will have larger variances compared with predictions based on the estimates obtained from other econometric techniques. A DW test value of zero means that there is perfect autocorrelation, and a DW test value of 4 means that there is negative autocorrelation. While a DW test value of 2 means that there is no presence of autocorrelation. When calculated or computed, the DW test statistic should be approximately equal to 2 in the absence of autocorrelation.

Coefficient of Determination

The overall fitness of the estimated model will be evaluated using the R-Squared, which is the coefficient of determination and it measures the overall fitness of the model. The R^2 has its limits to be 0 and 1. The closer the R-Squared is to 1, the better fit is the model. The R-Square shows the percentage of the total variation in the dependent variable that the independent variable can explain. Thus, it describes the portion of the dependent variable which is attributable to the independent variables. Since the study uses a sample data size to represent the entire population data, we report on the R-square Adjusted.

Chapter Summary

The chapter discussed the methodology for the study. Data for the study was obtained from secondary sources and covers the years 1990 through 2020. The study adopts the Multiple Indicators Multiple Cause (MIMIC) model with

seven (7) casual variables and three (3) indicator variables to estimate the size of the underground economy. The extent of tax evasion from the size of the underground economy was estimated by multiplying the size of the underground economy by the average tax rate (ATR). The Ordinary Least Square method was used to examine the effect of the underground economy and tax evasion on economic growth respectively. Furthermore, to ensure the reality and consistency of the model, several post-estimation techniques were used.



CHAPTER FOUR

RESULTS AND DISCUSSION

Introduction

This section presents in detail the results and discussions emanating from the analysis carried out based on the objectives. The study presents the descriptive statistics of relevant variables, and the size of Ghana's underground economy using the MIMIC model is discussed accordingly. This chapter also analysed and presented the extent of tax evasion due to the presence of the underground economy and its effect on economic growth and the formal sector. These results are discussed in connections to the hypotheses of the study. The data used for the study is annual and spans from 1990 to 2022.

Descriptive Statistics

Table 1 presents the descriptive statistics of some relevant variables used in the study. The results indicated that, on average, GHC 3774.9439 million are in circulation outside the bank domain with a standard deviation of GHC 3962.6907. Over the years, currency outside the banks has been used to proxy the existence of the underground economy, where higher deviations represent a higher underground economy (Amoh and Adafula, 2019). According to the currency demand approach, people mostly use cash in their economic transactions to evade taxes on their underground economic activities. Therefore, such an average and standard deviation would imply that there is much money in circulation in Ghana outside the banks, which may influence the size of the underground economy.

Table 1: Descriptive Statistics

Variable	Mean	Std. Dev	Min	Max
Currency	3774.943977	3962.6907	110.787	11705.5
Outside Bank				
GDP per Capita	2652.305445	3842.3227	13.0018	12341.5000
Labor Force	72.83258065	2.62224963	69.21	75.750
Participation				
Government	6008212574.19	8645215981.778	17885500	30702325200
Final				
Consumption				
Tax Burden	78.3185	5.409	66.3	86
Government	41.598	10.3745	32.2	70
Integrity				
Employment in	49.7334	8.609	29.75	57.733
the Agricultural				
Sector				
Self-	83.1079	5.4356	72.25	89.5599
Employment				
Unemployment	6.1	1.6876	4.120	10.360
Inflation	19.7	13.13	59.4615	4.865
Gross Capital	21.5170	2.46843	17.1345	24.9605
Formation				
Tax Revenue to	14.3717	2.9359	10.6718	21.752106
GDP				

Source: Author's computation, 2022

Again, Table 1 reveals that GDP per capita has an average of GHC 2652.305445 with a standard deviation of GHC 3842.3227. Furthermore, the labor force participation rate in the formal economy in Ghana has an average of 72.83, with a standard deviation of 2.622. Again, it was evident from the summary statistics above that in Ghana, the tax burden on citizens is 78.3185 per cent on average, with a standard deviation of 5.409 per cent, indicating higher taxes on individuals in the country. A higher tax burden generally means that taxpayers are required to pay a larger percentage of their income or wealth in taxes to the government which affect their available money to spend or save. Tax revenue to GDP, a proxy for the average tax rate in Ghana, has an average of 14.3717 per cent of GDP with a standard deviation of 2.9359 per cent of GDP. From Table 1, the study realises that the agricultural sector employment, on average, constitutes 49.73 per cent of the total employment in the country, with a standard deviation of 8.609 per cent. This implies that, under the years of consideration, almost half of the total employment in Ghana can be seen in the agricultural sector. The mean for unemployment and self-employment is 6.1 per cent and 83.107 per cent, respectively, with a standard deviation of 1.6876 and 5.4356 per cent, respectively. Government Integrity was found to be 41.598 per cent on average, with a standard deviation of 10.3745. Government integrity is the ability of government to fight corruption and corrupt practices. The score of government integrity ranges between 100 and 0 inclusive, where 100 indicates very little corruption and 0 indicates a very corrupt government. Therefore, a mean of 41.59 suggests the government is doing quite well when it comes to corruption, although it is not totally eradicated in the country.

Again, from Table 1 above, the inflation rate had a mean of 19.7 per cent and a standard deviation of 13.13 per cent.

Correlation Analysis

The study proceeded to examine the relationship between the causal variables to estimate the size of Ghana's underground economy. The study used the Pearson pairwise correlation coefficient, and the results are presented in a correlation matrix in Table 2.



Table 2: Correlation Matrix

	Tax Burden	Government consumption	Unemployment	Self-employed	Employment in agriculture	Government Integrity
Tax Burden	1					
Government final consumption	0.50774*** (0.0069)	1				
Unemployment	-0.55893*** (0.0024)	-0.4509** (0.0124)	1			
Self-employed	-0.72568*** (0.0000)	-0.94819*** (0.0000)	0.411138** (0.0267)	1		
Employment in agriculture	-0.53636*** (0.0047)	-0.98662*** (0.0000)	0.378243** (0.0431)	0.946956*** (0.0000)	1	
Government Integrity	-0.42565** (0.0269)	-0.31677 (0.1074)	0.061755 (0.7596)	0.351749* (0.0780)	0.270736 (0.1810)	1
Inflation	-0.50269*** (0.0075)	-0.42621** (0.0168)	0.392916** (0.0317)	0.472977*** (0.0096)	0.382295** (0.0407)	0.536154*** (0.0039)

* p<0.1, ** p<0.05, *** p<0.01

Source: Author's computation, 2022

From Table 2, it was realised that there is a significant positive relationship between tax burden and government final consumption. Although this relationship is moderate, it implies that an increase in government spending may increase the tax burden on individuals. Although Buchanan, Wagner et al. (1978) view that higher taxes which will eventually lead to a high tax burden, will imply less government spending has been violated. This data supports Friedman's hypothesis that increased taxes will cause an increase in government expenditure hence a direct relationship between taxes burden and government spending (Anderson, Wallace, & Warner, 1986). However, the relationship between tax burden and final government consumption is not always straightforward, and there are many other factors that can influence this relationship. For example, government policies, economic conditions, and political factors can all affect the level of government spending and taxation within a country. In general, it can be said that a high tax burden can potentially limit economic growth and reduce consumer spending, which can impact government final consumption. Conversely, suppose government final consumption is too high. In that case, this may lead to a higher tax burden, creating economic inefficiencies and reducing incentives for businesses and individuals to invest and innovate.

Moreover, tax burden appears to have a significant inverse relationship with the other causal variables, i.e. unemployment, self-employment, employment in the agricultural sector, inflation and government integrity. The unemployment rate and tax burden are inversely related because a decrease in the unemployment rate in the country will mean that government spending is increasing by employing more people and paying for wages and salaries. This

can be seen from the negative relationship between government consumption and unemployment in Table 2. Therefore, when the government spends more by employing more people, it reduces the unemployment rate. This expenditure by the government will eventually lead to an increase in taxes, as indicated earlier with the relationship between government spending and tax burden, hence impacting the tax burden on the citizens directly. Furthermore, a higher tax burden reduces the amount of income available for businesses and individuals to invest, spend and hire. This is because a high tax burden reduces the disposable income of both businesses and individuals, which can lead to a decrease in demand for goods and services and, ultimately, a reduction in employment opportunities.

Government integrity and tax burden were found to be negatively related. This is because a government perceived as corrupt or lacking in integrity may face challenges in implementing and enforcing tax policies effectively. For example, if citizens do not trust the government to use tax revenue responsibly and equitably, they may be less willing to pay taxes or seek ways to evade them. This can lead to a lower tax base and reduced government revenue. Conversely, a government with a high level of integrity may be more successful in implementing and enforcing tax policies. Citizens are more likely to comply with tax laws and pay their fair share when they trust that their tax dollars are being used wisely and for the public good. Hence higher

The negative relationship between self-employment and the level of the tax burden is that individuals will feel and appreciate the high taxes imposed on them when they are not working. Again, according to Long (1982), the income tax from self-employment activities is at a relatively lower effective rate than

wages and salaries. Therefore, lowering its impact on the individuals. For instance, many new set up businesses and entrepreneurs in Ghana enjoy significant tax reliefs and tax incentives, hence warranting the inverse relationship with the tax burden. Government integrity is seen to relate to self-employment and agricultural sector employment directly. For instance, a country with a high level of government integrity may have more opportunities for individuals to start and run their own businesses. This is because a government that is perceived as fair and transparent is likely to have more stable and predictable regulations and policies, which can create a favorable business environment. Additionally, a government with high integrity may be more effective in enforcing contracts, protecting property rights, and providing access to credit and other important resources for entrepreneurs. Conversely, in a country where corruption is widespread, self-employment may be more difficult or risky. Entrepreneurs may face more bureaucratic hurdles, encounter bribery or other forms of corruption, and have less legal recourse if they are mistreated or defrauded. Also, the inflation rate in Ghana appears to have a direct relationship with unemployment, self-employment and agricultural sector employment.

In Table 2, it was evident that self-employment and agricultural sector employment in Ghana is directly related, such that an increase in agricultural sector employment will potentially increase the number of self-employed citizens in the country. This is evidently the case in the country over the years. The agriculture sector in Ghana is primarily owned and operated by private individuals. Again, the Planting for Food and Job Programme has enrolled many private businesses into the agricultural supply chain, increasing agricultural

sector employment. However, Table 2 shows that government consumption representing the public sector spending is seen to have a strong and negative influence on self-employment and agricultural sector employment. Thus, as government spending increases, there is a high possibility of decreasing Ghana's private sector and agricultural employment. This is due to the crowding-out effect hypothesis, which stipulates that rising public sector spending drives down private sector spending.

Stationarity test

The stationary properties of the variables were verified to avoid spurious regression estimates. The study used the Augmented Dickey-Fuller (ADF) and the Phillip Perron (PP) approach both at levels and differenced to examine the order of integration in the data. The results are presented in Table 3 and Table 4.

Table 3: Unit root test at Levels

Variable	Critical Values			Levels	
	1%	5%	10%	ADF test Statistic	PP test statistics
CurrencyOutside	-3.716	-2.986	-2.624	-1.049	-1.346
GDPPC	-3.716	-2.986	-2.624	-1.447	-1.519
LaborforceParticipation	-3.716	-2.986	-2.624	0.645	0.108
Tax Burden	-3.716	-2.986	-2.624	-1.412	-1.310
GovernmentIntegrity	-3.716	-2.986	-2.624	-1.663	-1.615
Unemployment	-3.716	-2.986	-2.624	-1.444	-1.878
Self-employment	-3.716	-2.986	-2.624	-1.338	-1.350
Inflation	-3.716	-2.986	-2.624	-3.477	-3.492
Agricemployment	-3.716	-2.986	-2.624	2.527	1.571
Govern'tConsumption	-3.716	-2.986	-2.624	6.569***	8.151***

* p<0.1, ** p<0.05, *** p<0.01

Source: Author's computation, 2022

Table 3 shows the results from the stationarity test conducted using the lead variables. The study compared the test statistic value of the variable to the critical values and made the decision in relation to the null hypothesis of no unit root in the data. From the table, all the test static values from both the ADF test and PP test are, in absolute terms, less than all the critical values except that of government consumption which is greater than the critical values. Therefore, since the static test values are less than the critical values except that of government consumption, the null hypothesis is rejected and conclude that the data is not stationary at their levels except for government consumption, which has a unit root at their level data. Thus, currency outside banks, GDP per capita, labor force participation, Government integrity, Unemployment, self-employment, inflation, and agricultural sector employment are not stationary at their levels. The study proceeded further to check the data's stationarity when the variables have been differenced. The result is presented in Table 4.

Table 4: Unit root test at Difference

Variable	Critical Values			Difference	
	1%	5%	10%	ADF test Statistic	PP test statistics
CurrencyOutside	-3.716	-2.986	-2.624	-4.049***	-4.093***
GDPPC	-3.716	-2.986	-2.624	-4.647***	-4.623***
LaborForcePR	-3.716	-2.986	-2.624	-4.049***	-4.093***
Tax Burden	-3.723	-2.986	-2.625	-5.600***	-5.675***
GovernmentIntegrity	-3.716	-2.986	-2.625	-5.860***	-5.879***
Unemployment	-3.716	-2.986	-2.624	-2.681*	-2.682*
Self-employment	-3.716	-2.986	-2.624	-2.766*	-2.864*
Inflation	-3.716	-2.986	-2.624	-6.372***	-7.246***
Agricemployment	-3.716	-2.986	-2.624	-2.746*	-2.861*
Govern'tConsumption	-3.716	-2.986	-2.624	-2.063	-2.017

*** p<0.01, ** p<0.05, * p<0.1.

Source: Author's computation, 2022

When the data was differenced, it was clear from the results as shown in Table 4, that all the variables except government consumption became stationary, with their test statistic being greater than the critical values. Thus, currency outside banks, GDP per capita, labor force participation, Government integrity, Unemployment, self-employment, inflation, and agricultural sector employment have their statistical properties to be constant when their differences are taken.

MIMIC model estimates

In order to estimate the size of the underground economy, the study used the MIMIC model to examine the structural and measurement model for the underground economy. There were seven (7) casual variables to predict the country's underground economy with three (3) indicator variables. The results from the Maximum Likelihood Estimator (MLE) are presented in Table 5.

Table 5: Estimates from the MIMIC Model

		Estimate	S.E.	C.R.	P
Structural					
Underground	Self-employment	-1.389	.655	-2.121	.034**
	Government Consumption	0.189	.083	2.275	.023**
	Unemployment	-7.877	2.491	-3.163	.002***
	Government integrity	-0.267	.112	-2.377	.017**
	Inflation	-0.144	.093	-1.553	.121
	Taxburden	2.213	.728	3.038	.002***
	Employment in agriculture	-2.290	1.079	-2.124	.034**
Measurement					
GDP per capita	<-- underground	1.000			
Currency Outside Bank	<-- underground	2.535	1.068	2.374	.018**
Labor Force Participation	<- underground	-1.765	.565	-3.123	.002***
Chi-square = 48.738		Probability = 0.081	GFI=0.905	CFI = 0.76	

* p<0.1, ** p<0.05, *** p<0.01
Source: Author's computation, 2022

The quality of the hypothesized model to the data was checked using the Chi-square, Comparative Fit Index (CFI) and the Goodness of Fit Index (GFI). Since the probability value of 0.081 is greater than the alpha level of 0.05, the null hypothesis of good fit is rejected and conclude that there is a relatively good fit between the hypothesized model and the observed data. This conclusion is supported by the Comparative Fit Index (CFI) value of 0.76 and the Goodness of Fit Index (GFI) value of 0.905. The conclusion was based on the suggested cutoffs of 0.9 stipulated by Hu and Bentler (1999) and Kenny, Kaniskan and McCoach (2014).

In Table 5, the study found that the effect of the tax burden on the underground economy achieved its positive expected sign. This means that an increase in the level of the tax burden on the citizens will increase underground economy activities. Likewise, a decrease in tax burden will cause a significant decrease in underground economy activities. This is because higher tax burdens are a result of higher taxes (Feige, 1990), and when the burdens of taxes are high on individuals, their only weapon to mitigate this burden is to conceal their economic activities from government authorities to avoid paying those taxes which will eventually increase the underground economy activities. It was evident from the results present in Table 5 that this causal effect of the tax burden on the underground economy participation is significant at the 1 per cent level because its p-value of 0.002 associated with the test statistic is less than the conventional 5 per cent alpha level. This conclusion is consistent with the Srinivasan (1973) and Yitzhaki (1974) model, suggesting that higher taxes will lead to more people participating in the underground economy. Again, the study is consistent with several empirical studies, such as Clotfelter (1983), Poterba

(1987), Feinstein (1991), Crane and Nourzad (1986), Feige (1990), Song and Yarbrough (1978), Friedland, Maital and Rutenberg (1978).

The tax burden remains a primary determinate of the underground economy in the literature. Because when citizens are paying a greater portion of taxes, there is a high propensity not to comply or evade these huge taxes. It is clear from the findings that the extent of the underground economy and the tax burden are strongly correlated. It was evident from the study that a percentage change in the tax burden will cause almost a double and half percentage change in underground economy activities. This confirmed the studies of Emerta (2010), Savasan (2003), Dell'Anno et al. (2007), and Amoh (2019) when they concluded that an increase in tax burden would lead to a high underground economy. According to Bekoe (2012) and Amoh & Adafula (2019), when individuals feel that the tax they are paying are high and pose a huge burden on them, they are encouraged now by either not making their activities known to the tax authorities or underreporting their revenue to attract less tax. This decision will eventually increase the underground economy.

For instance, available data from the Bank of Ghana shows that, after the announcement of the imposition of the Electronic Transfer Levy (E-Levy) in November 2021, the value of transactions done using the mobile money platform declined drastically from GHC86.1 billion at the time of announcement to GHC76.2 billion as at January 2022 indicating a drop of GHC9.9 billion in value. According to the Bank of Ghana, the value will further decrease after the implementation because individuals feel that using the online payment platform will be costly due to the high taxes and charges, the burden will be high, and therefore, they will now have no option but to move out of that

platform and find another way to still operate without not paying the huge taxes, which will eventually increase the size of the underground economy. Thus, taxpayers may be encouraged to engage in tax-evading activities as long as the tax burden is huge (Amoh, 2019).

From the results presented in Table 5, the study realise that final government consumption, which was set as a proxy for the public sector size, attained its expected positive sign with the hidden economy. Thus, it is evident that increasing government spending or the size of the public sector will eventually increase the underground economy. According to the findings, the underground economy will significantly grow by 18.9 per cent for every 1 per cent increase in the size of the public sector. This result was in line with research by Aigner et al. (1988), who hypothesized that a rise in the size of the public sector and the level of economic system regulation would give a pertinent incentive for people to engage in the underground or hidden economy. According to Frey and Weck-Haneman (1984) and Giles and Tedds (2002), huge regulation burden tends to affect the hidden economy positively. As a result, "more State" in the market will lead to greater regulation, eventually encouraging people to work in the underground economy. Another way to view this is that increasing the state interference will crowd out the private sector by forcing them to increase their participation in the underground economy.

From the study, the coefficient on government integrity attends its negative expected sign with the size of the underground economy. In other words, it was evident from the study that government integrity is inversely linked to Ghana's underground economy's size. If government integrity increases by one percentage point, then there will be an inverse response on the

underground by decreasing its size by 26.7 per cent. Increasing government integrity will mean an increase in transparency and the government's ability to fight corruption and corrupt individuals. However, when governments cannot be trusted to deal with corruption, transparency and accountability, it loses their integrity in the sights of the citizens, which will eventually encourage more people to evade taxes due to the government, hence increasing the size of the underground economy. The study results are consistent with the conclusions from Medina and Schneider (2019) and Wondimu and Birru (2020). In situations where corruption is rampant, for example, businesses may have to pay bribes to public officials in order to obtain licenses, permits, or contracts. This creates a disincentive for businesses to operate in the formal economy, as the cost of compliance with regulations and taxes is perceived as too high. As a result, many businesses may choose to operate in the underground economy, where they can avoid taxes and regulations altogether.

According to Wondimu and Birru (2020), institutional quality negatively affects the size of the underground economy estimations. Wondimu and Birru (2020) contend that a country's informal economic activity will shrink as its formal institutions get better and its efforts to combat corruption grow. Again, people are engaged in the informal sector because of weak government regulatory laws. Weak institutions would facilitate illegal activity, such as when there is little regard for the law or a lot of corruption (Medina and Schneider, 2019). A recent survey by Afrobarometer (2021) concluded that when Ghanaians believe the government is providing essential services and combating corruption, they are more likely to pay taxes. This is to say that majority will conceal their economic activities from the government by

participating in the underground when they do not trust that the government can deliver on its promise. According to the study, if the government is not transparent with citizens on these compulsory payments and what they are used for, it can negatively affect tax administration efforts (Afrobarometer, 2021).

In a democracy, the people's trust in their public institutions is essential to running the state machinery. Thus to ensure tax compliance and administration, Citizens must have confidence that tax authorities will operate in the public's best interests and will not engage in corrupt or self-serving behavior. Studies like Bătrâncea & Nichita (2013) and Wahl, Kastlunger, & Kirchler (2010) have concluded that when citizens trust the tax authority and the government, it enhances voluntary compliance with tax laws, therefore decreasing their participation in the underground economy. Corruption, a chronic problem that can stymie growth in developing countries, is one element weakening public trust. Bertinelli, Bourgain, and Léon (2020) found that tax officers' involvement in receiving bribes from small businesses resulted in a considerable decline in tax compliance in Mali. Although the government and other previous governments have declared a zero-tolerance to corruption, the majority (84%) of Ghanaians, according to the Afro barometer survey, still postulate that tax officials are corrupt and will, for that matter, not pay their taxes to corrupt individuals. With this distrust in the tax process and officials, there is a higher indication of an increase in Ghana's underground economy size, as indicated in Table 5.

Institutions are responsible and mandated to ensure that citizens and businesses comply with tax and auditing principles. As said earlier, the quality of institutions has a high tendency to decrease tax evasion and underground

economic activities. Studies like Witte and Woodbury (1985) have argued that when institutions take responsibility for auditing people and prosecuting them for civil fraud and imposing a penalty on them, it has a high deterrent effect which will eventually push many people out of participating in the underground economy.

Again, it can be seen from Table 5 that the size of agricultural employment is negatively related to the underground economy size in Ghana. Thus, an increase in the size of the agricultural sector in Ghana will decrease the country's underground sector. Although this was not the expected sign, the effect appears to be significant in explaining the size of the underground in Ghana. This is because Ghana's agricultural sector has gone through several transformations and modernization over the years. With several programmes that are specific to the sector, like Cocoa Life and Planting for Food and Jobs, among others, the sector has received formal recognition from the government and serves as an avenue for job creation and employment for many. This has tend to reduce people's participation in underground economic activities. Also, most agricultural sector workers receive a lot of incentives and subsidies like free provision of seedlings, fertilizers, and even scholarship education for their relatives from the government. Such provisions decrease the tax burden on the participants in the agricultural chain industry, eventually decreasing participation in the underground economy. Also, in most cases, before these incentives and packages are rolled out to the industry players, they are registered, and records are taken to make their business and operation formal to the government.

Self-employment is frequently associated with underdeveloped countries, and such activities are counted as formal employment, provided they are registered. Inadequate control of such self-employment operations, on the other hand, could lead to an increase in underground economic activity (Nchor and Adamec, 2015). Self-employment was also seen to have an inverse relationship with the underground sector in Ghana. This is primarily because there is a positive relationship between agricultural sector employment and self-employment in Ghana, as shown in Table 2. The agriculture sector in Ghana is primarily owned and operated by private individuals. Again, the Planting for Food and Job Programme has enrolled many private businesses into the agricultural supply chain, increasing agricultural sector employment (Tanko, Ismaila & Sadiq, 2019). Therefore, warranting the inverse effect on the underground economy. Unemployment and inflation rate was found to affect the underground economy negatively. Although the effect of inflation on the underground economy is not significant, that of unemployment is significant. Although the effect of unemployment on the size of the underground economy is unclear in literature, it was evident from the study that there is an inverse relationship in Ghana. However, the results from this study contradict the findings of Amoh and Adafula (2019) when they found a positive relationship between unemployment and the underground economy in Ghana. However, according to Tanzi (1999), this effect will only be true if people in the workforce who are traditionally known as unemployed make a living through unreported activities. If not, according to Tanzi (1999), this effect will be a result of a measurement problem. The conclusion from this current study confirms Tanzi (1999) and Giles and Tedds (2002) findings when they argue that an increase in

unemployment will decrease the underground economy since the underground economy is positively related to GDP growth. Moreover, according to Tanzi (1999), the official unemployment rate is less correlated with the underground economy because of the heterogeneous compositions of the labor force within the underground economy.

From Table 5, the money in circulation outside the domain of banks in Ghana was found to be a significant indicator of the presence of the underground economy. Thus, it is evident from Table 5 that there is a positive relationship between the currency in circulation and the size of the underground economy. This means that as the presence of the underground increases, the money in circulation outside banks also increases. It is prudent to note that these findings are consistent with several studies like Nchor and Konderla (2016), Nchor and Adamec (2015), Schneider and Buehn (2016), and Amoh and Adafula (2019). This is so because most transactions within the underground economy are primarily done with cash or kind as the medium of exchange, and it is mainly outside the banks or institutions to avoid taxes. In Ghana, for instance, the growing nature of our digital space and the use of mobile money for business transactions has led to the drastic increase in our currency in circulation outside the bank's domain. Available data from the Bank of Ghana (BoG) shows that in 2020, the total volume of mobile money transactions was over \$99 billion (GH¢561 billion), while the volume of cheques and cash transactions in the country stood at \$29 billion. This means that a more significant percentage of the financial transactions in the country were done outside the banks. Furthermore, since these transactions did not pass through the banks, there is a higher tendency of evading taxes either by underreporting or not reporting at

all, which will eventually increase the underground economy participation. Therefore, the growing currency demand outside the financial institutions is a strong indication of the presence of the underground economy (Feige, 1979, 1980).

The labor force participation in the formal economy was found to be a significant indicator of the presence of the underground economy in Ghana. Thus, the study shows that labor force participation in the formal economy negatively affects the underground economy. Such that when employment in the formal economy increases, it will significantly decrease the size of the underground economy. And when people lose their jobs in the formal sector, their immediate way of surviving is to engage in underground economic activities. These findings is consistent with Nchor and Konderla (2016), Nchor and Adamec (2015), Schneider and Buehn (2016) and support the hypothesis of Martino (1981) when he concluded that the lower labor force participation in the formal sector is as a result of the thriving underground economy.

When labor force participation in the formal economy is low, it can create incentives for individuals to engage in informal, unreported economic activities to earn income. This can increase the size of the underground economy and result in lost tax revenue for the government. On the other hand, when labor force participation in the formal economy is high, it can reduce the size of the underground economy by providing individuals with legal employment opportunities and reducing the incentives to participate in informal economic activities. This can result in increased tax revenue for the government and a more stable and productive economy.

Policies that promote labor force participation in the formal economy can help reduce the size of the underground economy. For example, policies that improve access to education and job training, increase the availability of legal employment opportunities, and reduce the regulatory and tax burdens on businesses can all encourage more people to participate in the formal economy. Additionally, policies that improve the efficiency of government services, reduce corruption, and enhance the rule of law can help increase trust in the formal economy and reduce the incentives to engage in informal economic activities.

Estimation of the underground economy

In order to estimate the underground economy's size as a percentage of GDP, the study used an exogenous value of 45 per cent as the base year, which was obtained from the study of Medina and Schneider (2019). Table 6 presents the summary statistics of Ghana's underground economy.

Table 6: Descriptive Statistics of the Underground Economy percentage of GDP

Parameter	Estimates
Mean	44.00505
Standard Error	0.848691
Median	46.83005
Standard Deviation	4.725314
Sample Variance	22.32859
Kurtosis	-1.73328
Skewness	-0.33996
Range	12.74284
Minimum	37.21967
Maximum	49.96251
Sum	1364.157
Count	31
Confidence Level (95.0%)	1.733259

Source: Author's computation, 2022

From Table 6, the study found that in Ghana, on average, the underground economy constitutes about 44 per cent (46.83, -0.339) of the official GDP of the economy, with a standard deviation of 4.7 per cent. This suggests that a significant proportion of economic activity is taking place outside the formal sector and is not being captured by official statistics. The standard deviation of 4.7 per cent suggests that there is some variation in the size of the underground economy across different sectors or regions within the economy. This variation could be due to factors such as differences in tax rates, enforcement efforts, or cultural attitudes towards informal economic activity. This result is relatively consistent with the estimates from Medina and Schneider (2019) and Schneider, Buehn and Montenegro (2010), who recorded an average of 40.7 per cent of the official economy from 1999 to 2007. The maximum value of the underground economy is 49.96 per cent of GDP, and the minimum value is 37.22 per cent of GDP. Figure 4 presents the trends in the underground economy over the years.

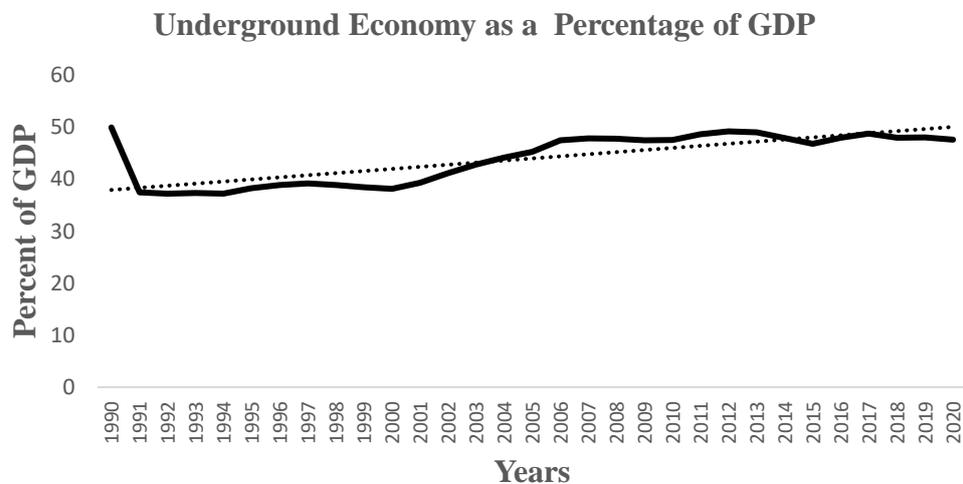


Figure 4: Trend in the size of the underground economy in Ghana, 1990 – 2020

Source: Author’s computation, 2022

Figure 4 shows that Ghana's underground economy has not been constant but has increasingly varied across the years. The highest values of the underground economy were obtained in 1990 and 2012, while the lowest value was obtained in the year 2000. The estimates from this study seem to be higher than the values obtained by Amoh and Adafula (2019), and Ocran (2018) but seems to be consistent with the estimates of Asante (2012) and Scheider (2005). This discrepancy between the estimate from Amoh and Adafula (2019), and Ocran (2018) and this current study is largely due to the methodological approach used by these studies. Amoh and Adafula (2019) and Ocran (2018) assume that the size of Ghana's underground sector is affected by the tax burden alone in their currency demand approach. However, it was realised that other factors such as government integrity, employment in the agricultural sector, the size of the public sector, self-employment, unemployment and corruption affects the size of Ghana's underground economy. Therefore, by including these other factors in the estimation of the underground economy, the values will be higher than the values reported in the studies of Amoh and Adafula (2019) and Ocran (2018). Again, from the estimation, the underground economy's size for the past five years (since 2016) has been declining at a decreasing rate.

Tax Evasion

The study proceeded to examine the extent of tax evasion or revenue loss due to the presence of the underground economy. The underground economy participation is primarily associated with tax evasion. According to Pyle (1989), people participate in this sector by either not reporting all their income to the tax authority to attract the appropriate tax or to avoid some labor

market regulations. Table 7 presents the summary statistics of tax evasion in Ghana due to the underground economy was estimated.

Table 7: Tax Evasion as a percentage of GDP

Parameter	Estimates
Mean	6.287954
Standard Error	0.232594
Median	5.992363
Standard Deviation	1.295029
Sample Variance	1.677099
Kurtosis	1.347749
Skewness	1.11481
Range	5.639741
Minimum	4.008059
Maximum	9.6478
Sum	194.9266
Count	31
Confidence Level (95.0%)	0.47502

Source: Author's computation, 2022

From Table 7, it is evident that in Ghana, the value of tax evasion due to the presence of the underground economy is 6.28 per cent of GDP annually on average, with a deviation of 1.29 per cent. In other words, the amount of revenue the country losses on average is about 6.28 per cent of the total size of the economy. This means that a substantial amount of economic activity is occurring outside the formal sector, without being reported to the government or being taxed. Again, it is evident from the study that the level of tax evasion in Ghana rages from 4 per cent of GDP to 9.6 per cent of GDP. This result relatively seems to confirm the findings of Asante (2012), who found out that tax evasion in Ghana ranges from 4 per cent to about 14 per cent of GDP, with an average of 7 per cent of GDP. For countries like Ghana, this amount lost may

be very significant in contributing to the nation's development. The trend in the value of tax evasion as a result of the underground economy is presented in Figure 5.

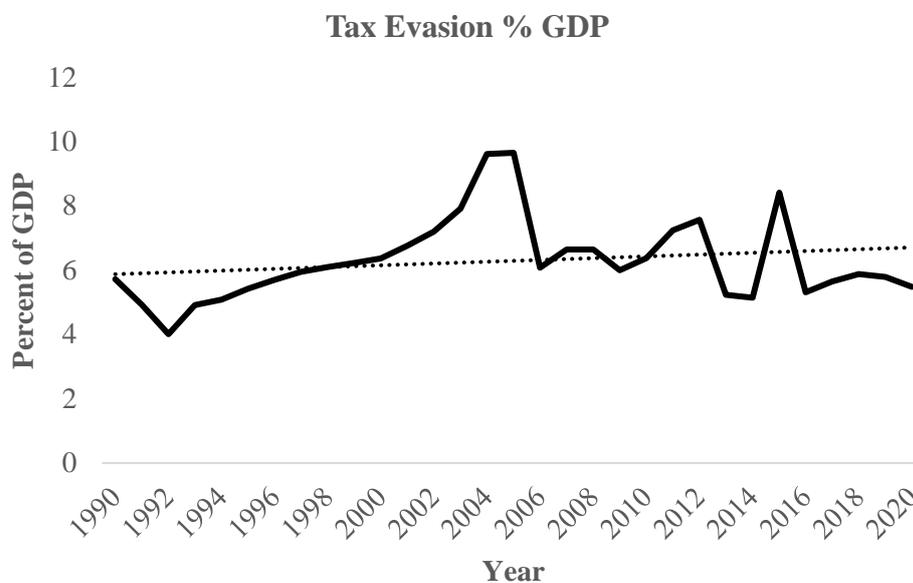


Figure 5: Trend in Tax Evasion in Ghana, 1990 – 2020

Source: Author’s computation, 2022

In Figure 5, the study found some fluctuations in the trends of tax evasion in Ghana. The amount of tax evasion increased from its lowest value of 4 per cent of GDP in 1992 to its highest values of 9.61 and 9.64 per cent of GDP in 2004 and 2005, respectively. However, the value of tax evasion later declined drastically in 2006 from the 9.64 per cent of GDP attained in 2005 to 6 per cent of GDP in 2006. This decline in the level of tax evasion was because the country then was beginning to reap the benefits of macroeconomic and structural reforms and nearly fifteen years of political stability (OECD, 2006). There was significant growth in domestic revenue mobilization, efficient expenditure management, and debt relief granted under the Heavily Indebted Poor Countries (HIPC) debt relief programme, as well as debt reduction promises from the G8,

all helped to strengthen the government's fiscal condition at the time (OECD, 2006).

Again, the study realised that the amount of revenue loss to the state, although it has been fluctuating over the last decade, is around the average of 6.4 per cent of GDP. In contrast, the amount of tax evasion in the country for the last four years, thus from 2016 to 2020, has fallen below the average of 6.4 per cent of GDP. This is because of the performance of the revenue authority in increasing its domestic revenue mobilization through the implementation of digital systems at most of the revenue collection checkpoints to reduce corruption. Also, the declining trend in the level of tax evasion ratio to GDP since 2016 is mainly due to the rapid economic growth experienced by the country at that point.

Relationship between Tax Evasion and Underground Economy

The relationship between tax evasion and the underground economy has received much scholarly work across several jurisdictions. This is because embedded in the definition of the underground economy is a principal motive of evading taxes by concealing activities from tax authorities (Pyle, 1989). Therefore, to add to the literature, the study examined the relationship between tax evasion, the underground economy, and tax revenue to GDP in the country. The results from the correlation analysis are presented in Table 8 below.

Table 8: Correlation between Tax Evasion, Tax Revenue, and the Underground Economy

	Tax Evasion	Tax Revenue to GDP
Tax Revenue to GDP	0.8736*** (0.0000)	1
Underground Economy	0.2275 (0.2184)	-0.270618376 (0.1409)

*** p<0.01, ** p<0.05, * p<0.1.

Source: Author’s computation, 2022

Table 8 shows a positive relationship between tax evasion and the size of the underground economy in Ghana. Although this relationship is insignificant, it means that as the size of the underground economy increases (decreases), the value of tax evasion will also increase (decreases). This finding confirms the hypothesised definitions of Pyle (1989). Thus, according to Pyle (1989), “*the underground economy may consistently perfectly legitimate activities, resulting in transactions (either in kind or for payment) between individuals, which are then hidden from the authorities, principally the tax authorities*”. Therefore, activities within the underground economy are primarily undertaken to evade the payment of various direct and indirect taxes that their notification to the tax authority would generally imply. Therefore, underground economy participation and tax evasion will always have a positive relationship. Again, this current study provides enough confirmation for several empirical works, such as Jung (1994), Blackburn et al. (2012), Emerta (2010), Nchor and Konderla (2016), and Amoh and Adafula (2019), concerning the relationship that exists between the size of the underground and the level of tax

evasion. Furthermore, according to Bekoe (2012), tax evasion can erode the equity of a tax system by making honest taxpayers feel disappointed and enticed to join the decision to evade and engage in underground activities.

Also, the study found out that there is an inverse relationship between the size of the underground economy and tax revenue in Ghana. Although this relationship may be insignificant, it implies that an increase (decrease) in the underground economy participation will decrease (increase) the amount of revenue available to the state. The study also realised a positive relationship between tax evasion and tax revenue in Ghana. If tax revenue increases (decreases), tax evasion has a higher propensity to increase (decrease). In Ghana, an increase in tax revenue does not necessarily mean an increase in the number of people who pay taxes but an increase in the tax rate or the number of taxes to be paid. And as suggested by the theoretical model of Allingham and Sandmo (1972) and Srinivasan (1973), a progressive tax rate tends to affect evasion positively. Therefore, although the revenue might increase due to the rise in the tax rate, it will eventually cause some economic agents to evade these taxes.

Effect of tax evasion on economic growth

In order to address the third objective of the study, the effect of tax evasion on economic growth was examined. The results obtained from the regression analysis are presented in Table 9. The model appears to be significant at 1% significance levels with explanatory powers of 99.4 per cent and a constant variance.

Table 9: Effect of Tax Evasion on Economic Growth

GDPPC	Coef.	Std. Err.	T	P>t	[95% Conf.	Interval]
TEGDP	-.0531352	.0251484	-2.11	0.046**	-.1051586	-.0011117
FDI	.0474447	.0146975	3.23	0.004***	.0170405	.0778488
IRS	-1.406892	.5291217	-2.66	0.013**	-2.496638	-.3171452
D.GNS	-.010815	.0062877	-1.72	0.099	-.023822	.002192
INF	-.2694962	.3407124	-0.79	0.437	-.9743134	.4353211
PSI	.8496219	.0198895	42.72	0.000***	.8084773	.8907665
_cons	-11.69387	.4815346	-24.28	0.000***	-12.69	-10.69774
N	30		R-square	0.9941		
F(6, 23)	818.90		Breusch-	0.32		
p-value	0.0000***		Pagan	0.5710		
			p-value			

*** p<0.01, ** p<0.05, * p<0.1.

Source: Author’s computation, 2022

From Table 9, it was evident that the coefficients of the variables are, in general, very small and largely conform to theoretical expectations. As evident from the table, only two variables, namely, gross national savings and inflation, were not significant, although they attained their expected sign. This means that foreign direct investment (FDI) has a significant positive effect on economic growth in Ghana. Also, the interest rate in the end tends to negatively affect the country’s economic growth. This means that for the country to experience adequate and significant growth, some measures must be implemented to reduce the rate of interest in the country. The size of the public sector savings achieved its expected positive sign on economic growth. Indicating that as the savings from the public sector increase, it will force economic growth to increase.

Tax evasion tends to affect economic growth negatively. Thus, from Table 9, it was evident that a unit increase in the level of tax evasion will cause economic growth to decrease by 5 per cent. However, when there is a percentage point decrease in tax evasion, economic growth is expected to increase by 5 per cent. This effect of tax evasion on economic growth is significant at a 5 per cent significance level and is consistent with the findings of several studies like Bekoe (2012), Roubini and Sala-i-Martin (1995), Mironov's (2010), Cerqueti and Coppier (2011), and Omodero (2019). Firms that evade taxes may have a cost advantage over firms that operate legally, which can lead to market distortions and the displacement of legal businesses (OECD, 2004). This can harm economic growth by discouraging legitimate businesses from investing and expanding.

According to Roubini and Sala-i-Martin (1995), where tax evasion is perceived to be high, the government's optimal policy is to suppress the financial sector to increase the face value of taxation. Such a government policy will reduce the efficiency of the financial sector, increase intermediation costs, reduce the amount of investment and eventually reduce the rate of economic growth. Hence, tax evasion affects the economic growth of a country negatively. Furthermore, the findings of this study are consistent with Lin and Yang's (2001) conclusion that public goods are not productive in and of themselves. According to Lin and Yang (2001), when tax rates are high, resources are shifted from the inefficient public sector to the productive private sector to enhance economic growth. However, the government receives little benefit from these growths from the private sector.

Furthermore, tax evasion will negatively affect economic growth because tax evasion has the propensity to reduce any government's potential revenue generation capacity and restrict expenditure outlays (Bekoe, 2012). Like tax holidays and concessions, taxes avoided or evaded serve as an indirect public expenditure which will not correspond to any direct revenue or productivity to the public sector. It reduces the tax base and impairs higher tax rates on individuals and businesses loyal to honouring their tax obligations, forcing them to reduce their expenditure to still be in business. Also, Mironov (2010) argues that tax evasion will negatively affect economic growth because evaders will experience a decline in productivity because they will not get access to the capital financial market.

Effect of the underground economy on the growth of the official economy

The underground economy has been chiefly hypothesized to be an alternative place of survival for most individuals who do not find their feet in the official economy (Ahn, 1997). Again, to keep up with growing expenses, individuals can work in the underground economy although they may have a job in the official economy. Therefore, it appears that the presence and existence of the underground economy may have a bearing on the official growth of the economy. In view of this, the study examined the effect of Ghana's underground economy on the growth of the official economy. The results obtained from the analysis are presented in Table 10. The model appears to be statistically significant at 1% significance levels with explanatory powers of 95.5 per cent. Indicating that 95.5 per cent of the changes in economic growth can be attributed to the selected independent variables used in the model. The model reveals a constant variance; hence, the results are consistent and can be reliable for

predictions. Also, all the variables, expect interest rate, bore the expected signs and were significant at either 1%, 5% or 10%.

Table 10: Effect of the Underground Economy on Economic Growth

GDPPC	Coef.	Std. Err.	T	P>t	[95% Conf.	Interval]
UE	3.342121	1.539656	2.17	0.041**	.1571007	6.527142
GCF	0.015557	0.0073278	2.12	0.045**	0.0307157	0.0003983
DEVHEXP	16.28413	7.277417	2.24	0.035**	1.229642	31.33861
TERENROL	8.600086	1.155303	7.44	0.000***	6.210159	10.99001
INF	-0.991405	0.5663376	-1.75	0.093*	-2.162964	.1801536
IR	2.751637	0.8532623	3.22	0.004***	0.9865292	4.516744
_cons	4.452639	0.6101472	7.30	0.000***	3.190454	5.714825
N	30			R-square	0.9553	
F(6, 23)	121.19			Breusch-Pagan	0.452	
p-value	0.0000***			p-value	0.7710	

*** p<0.01, ** p<0.05, * p<0.1.

Source: Author’s computation, 2022

The study shows that total investment, development in the health sector, enrollment in tertiary schools, and interest rate positively affect economic growth in Ghana. At the same time, the Inflation rate in Ghana has a negative effect on economic growth.

From Table 10, it is evident that the size of the underground economy in Ghana has a positive effect on the growth of the official economy. Thus, the study found that a unit increase (decrease) in the underground economy's size will cause a 3.34 unit increase (decrease) in economic growth. This effect was found to be statistically significant at a 5% level. Several reasons can be attributed to this effect. The positive effect of the underground economy on economic growth found in this study is consistent with the findings of Schneider

and Hametner (2007), Kemal (2007), and Dell' Anno (2008) when they examined the effect of the shadow economy on GDP growth in Columbia, Pakistan and Latin American Countries respectively. According to Busato and Chiarini (2004), goods produced in the underground economy are identical to those produced in the regular economy. Therefore, their prices must be the same at equilibrium and contribute positively to economic growth.

Again, one primary reason why Ghana's underground economy may relate to economic growth positively is due to the fact that Ghana's underground economy serves as a surviving avenue for most skilled labors who may either be employed or unemployed. Thus, as said earlier, to keep up with growing expenses, individuals in Ghana sometimes work in the underground economy, although they may have a job in the official economy. According to Medina & Schneider (2019), the underground economy stimulates economic activity by providing jobs to the unemployed and providing services in the far-flung areas of an economy where the official sector has not yet reached. In other words, officially unemployed individuals will find means to earn income while staying hidden from the government documentation. This can help to reduce poverty and increase economic participation, leading to higher levels of human capital and economic growth.

According to the endogenous growth theory, one of the positive effects of the underground economy is its potential to serve as a source of innovation and entrepreneurship. The underground economy can provide a fertile ground for the development of new businesses and innovative practices that can eventually spill over into the formal economy. Entrepreneurs who operate in the underground economy may learn valuable skills and develop innovative

strategies that can be applied in the formal economy, leading to productivity growth and economic development.

Chapter Summary

The chapter dealt with the results and discussion of the study based on the objectives. The descriptive statistics of relevant variables were presented, and the size of Ghana's underground economy was estimated using the MIMIC model. The stationary properties of the variables were verified using the Augmented Dickey-Fuller (ADF) and the Phillip Perron (PP) approach. Using the maximum likelihood estimator, the study found in Ghana, on average, the underground economy constitutes close to half of the official GDP of the economy. The extent of revenue loss due to the presence of the underground economy and its effect on economic growth and the formal sector were also analysed and presented in this chapter. By multiply the average tax rate by the size of the underground economy it was evident that the amount of revenue loss on average is about 6.28 per cent of the total size of the economy. The OLS results shows that, while tax evasion negatively affects economic growth, the underground economy's size positively affects economic growth.

CHAPTER FIVE

SUMMARY CONCLUSIONS AND RECOMMENDATIONS

Introduction

This chapter summarises findings from the study and conclusions drawn from the data analyzed and provides recommendations for future research and policy implications.

Summary

The existence of the underground economy is a matter of serious concern for the government and policymakers. Moreover, to deal with this issue, it is prudent that policymakers understand the dynamics within this sector. The underground economy has become one of the topical issues of concern not because of its difficulty to observe but because it has a significant bearing on the growth and development of the country. In view of this, the objective set out in this study was to determine the size of the underground economy and the extent of tax evasion in Ghana. Precisely, the study sought to; (1) estimate the size of Ghana's underground economy, (2) estimate the extent of tax evasion from the size of the underground economy, (3) examine the effect of tax evasion on economic growth, and (4) examine the effect of the underground economy on the growth of the official economy. The Multiple Indicator Multiple Cause (MIMIC) model was used to estimate the size of the underground economy in Ghana. Also, the extent of tax evasion from the size of the underground economy was estimated by multiplying the average tax rate in Ghana by the size of the underground economy. The third and fourth objectives were examined using the Ordinary Least Square (OLS) estimator. The data used for the study is annual and spans from 1990 to 2022.

The study found that tax burden and government integrity have a negative effect on the size of the underground economy. While self-employment, government consumption, unemployment, inflation, and employment in the agricultural sector positively affected the size of the underground economy. The tax burden had the most significant effect on the size of the underground economy. This is because higher tax burdens result from higher taxes and when the burdens of taxes are high on individuals, they tend to conceal their economic activities from government authorities to avoid paying those taxes. After calibrating for the size of the underground economy, the study realised that in Ghana, on average, the underground economy constitutes close to half of the official GDP of the economy. Again, the underground economy's size, since 2016, has been declining at a decreasing rate. This was attributed to several factors, such as introducing technology in most government and public institutions to reduce corruption and some other government policies like the Planting for Food and Jobs.

Also, the study revealed that in Ghana, due to the presence of the underground economy, the amount of tax evasion on average is about 6.28 per cent annually of the total size of the economy. Also, it was evident from the study that there is a significant positive relationship between tax evasion and the size of the underground economy in Ghana. Also, size of the underground economy was found to relate with tax revenue in Ghana negatively.

The study found that although there is a positive relationship between tax evasion and the size of Ghana's underground economy, its effect on economic growth is not the same in the long run. Thus, while tax evasion negatively affects economic growth, the underground economy's size positively

affects economic growth. This is so because tax evasion has the propensity to reduce the government's potential revenue generation capacity and restrict expenditure outlays. At the same time, the underground economy will stimulate economic activity by providing jobs to the unemployed and providing services in the far-flung areas of an economy where the official sector has not yet reached.

Conclusions

Imperatively, the study wishes to stress that this current study presents a new method of estimating the underground economy in Ghana. Thus, the novelty of the study with respect to those available in the literature lies in its use of structural equation modelling in estimating the size of Ghana's underground economy. Like many other developing countries, the growing nature of the underground economy in Ghana should be treated with utmost concern because such a large underground economy is itself an indicator of the prevailing corruption on the part of the public administration. Moreover, it tends to cause large fiscal losses to the economy and causes inefficiencies in public administration. However, it is prudent to note that although the presence of the underground economy affects government revenue by increasing tax evasion, it contributes significantly to the economic growth in Ghana by providing jobs and income for many individuals both in the formal and informal sectors. Moreover, because the underground economy has a positive effect on economic growth in Ghana, it suggests that if there had been no underground economy, the actual GDP per capita would have been lower.

Addressing the underground economy in Ghana requires a multifaceted approach that includes improving tax compliance, strengthening regulatory systems, increasing access to formal credit, formalizing the informal sector, and addressing corruption. It should be emphasized that although these factors trigger the underground economy and tax evasion in Ghana, the tax burden due to higher taxes plays a significant role. This could be seen in the relationship between tax revenue and tax evasion in Ghana. Thus, tax revenue appears to correlate positively with tax evasion in Ghana, which theoretically may not necessarily be correct. However, it is so because, in Ghana, an increase in tax revenue does not necessarily mean an increase in the number of people who pay taxes but an increase in the tax rate or the number of taxes to be paid. And when this happens, although the revenue might increase due to the rise in the tax rate, it will eventually cause some economic agents to evade these taxes.

Again, one cannot ignore the fact that the issue of tax evasion and the size of the underground economy significantly impact the country's growth. Although some amount due the government may be lost due to improper documentation and auditing associated with the underground economy, with regards to some individuals, it serves as a surviving ground to find jobs and earn income.

Recommendations

Based on the findings and conclusions, the study made several policy recommendations. First of all, to eliminate tax evasion and the growing nature of the underground economy, the government and its tax agencies, like the Ghana Revenue Authority, must commit policies to reduce the tax and regulatory burden in the country. This is because high tax burden, regulatory

quality and government integrity are critical variables in explaining the underground in Ghana. Therefore, by reducing the tax and regulatory burden, governments can incentivize more people to participate in the formal economy, which can lead to increased revenue collection and improved economic growth. Additionally, the government ought to make an effort to loosen some business laws that drive private companies underground and prevent them from declaring income that should be taxed. This means that corruption should be reduced or eliminated in all forms among government personnel, especially those tasked with monitoring the activities of the underground economy and ensuring that tax obligations are met.

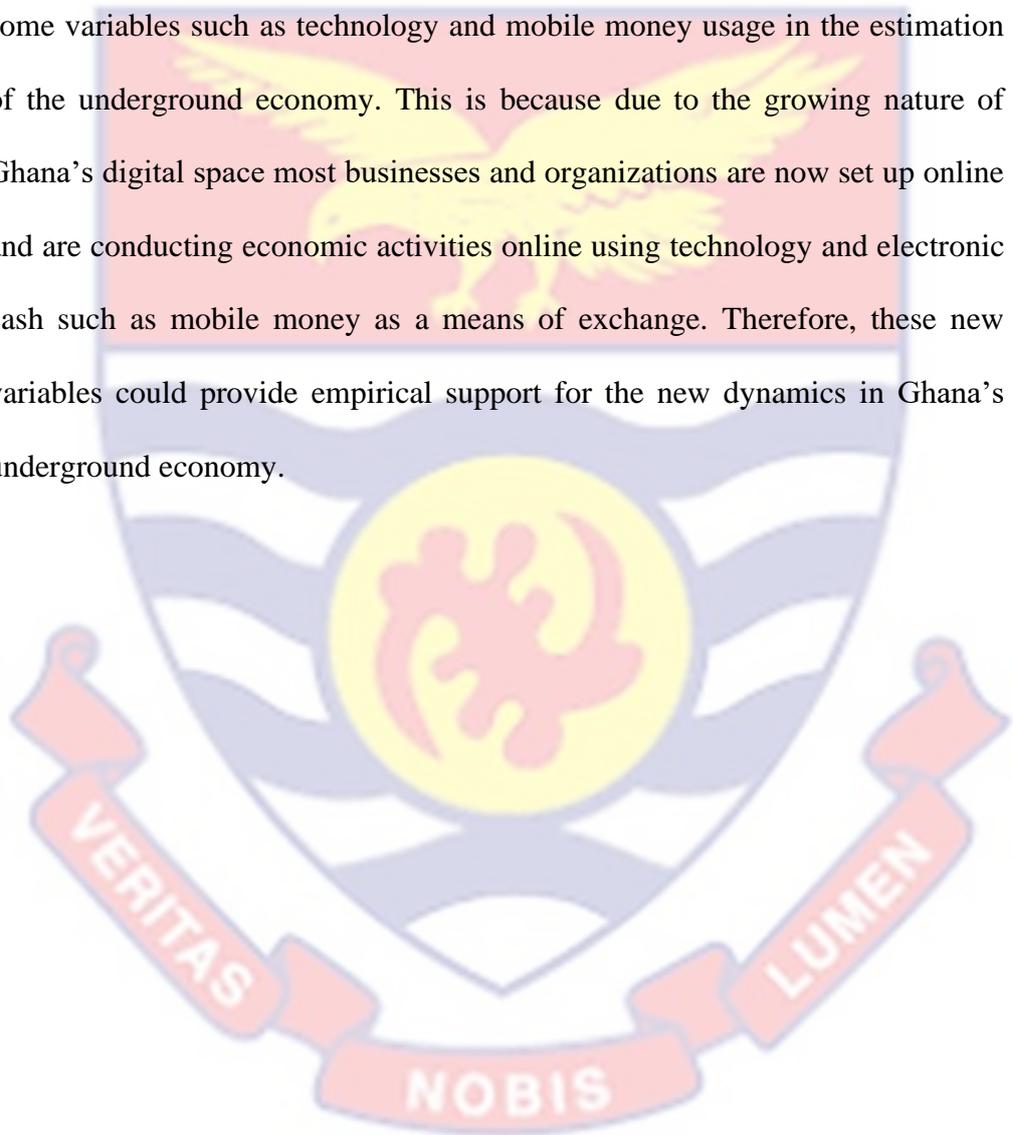
Secondly, to achieve economic growth, the study recommends that the government ensure a fair, equitable and simplified tax system while encouraging innovation and entrepreneurship. It is believed this will significantly reduce the tax burden and promote tax compliance which will eventually combat tax evasion. A healthy tax system is essential for economic growth, and policies that promote both tax compliance and economic growth should be pursued.

Lastly, the study recommends that since the underground economy, to some extent, provides job security to some individuals within the country, which enhances economic growth in the long run, their activities must be formalized by ensuring proper documentation. Thus, the government should introduce innovative ways and policies that will help formalize the economic activities of the underground economy or the informal sector and not necessarily try to bring them out entirely into the formal sector or the white colour jobs. For instance, the government can institute an insurance or pension scheme for all local

artisans and ensure that before any member is registered on this scheme, proper documentation of their business is carried out, like business registrations and filing of taxes.

Suggestions for Further Research

For further research in this area, the study recommends the inclusion of some variables such as technology and mobile money usage in the estimation of the underground economy. This is because due to the growing nature of Ghana's digital space most businesses and organizations are now set up online and are conducting economic activities online using technology and electronic cash such as mobile money as a means of exchange. Therefore, these new variables could provide empirical support for the new dynamics in Ghana's underground economy.



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APPENDIX

