SHADOW ECONOMY AND FINANCIAL DEVELOPMENT: EVIDENCE FROM DEVELOPED AND DEVELOPING COUNTRIES

CHAN ZI KANG
CHONG WEN RUI
CHONG XIAN MING
MAK CHI LING
TAN CHEE SHEUN

BACHELOR OF FINANCE (HONS)

UNIVERSITI TUNKU ABDUL RAHMAN

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BY

CHAN ZI KANG
CHONG WEN RUI
CHONG XIAN MING
MAK CHI LING
TAN CHEE SHEUN

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DECLARATION

We hereby declare that:

(1) This undergraduate FYP is the end result of our own work and that due acknowledgement has been given in the references to ALL sources of information be they printed, electronic, or personal.

(2) No portion of this FYP has been submitted in support of any application for any other degree or qualification of this or any other university, or other institutes of learning.

(3) Equal contribution has been made by each group member in completing the FYP.

(4) The word count of this research report is 15,184.

Name of Student:	Student ID:	Signature:
1. Chan Zi Kang	17ABB04829	
2. Chong Wen Rui	17ABB02521	
3. Chong Xian Ming	17ABB03441	
4. Mak Chi Ling	17ABB01694	
5. Tan Chee Sheun	17ABB02590	

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LIST OF ABBREVIATIONS

AR	Autoregressive Model
FD	Financial Development
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GMM	Generalized Method of Moments
HC	Human Capital
LM	Lagrange Multiplier
MIMIC	Multiple Indicators, Multiple Causes
NR	Natural Resources
OIC	Organization of the Islamic Cooperation
SE	Shadow Economy
TI	Technology Innovation
TO	Trade Openness
TTP	Third-Party Payments
WDI	World Development Indicator

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ABSTRACT

Shadow economy is a serious issue in every nation's economy in the world. Shadow economy is an unregulated economic activity such as corruption, tax evasion and money laundering that can hinders the development of financial sector of a country. Hence, the purpose of this paper is to study the impact of shadow economy on financial development for 33 developed countries and 124 developing countries over the period of 1991 - 2017 with Two-Step Robust System Generalized Method of Moments (GMM) dynamic panel estimators. There are control variables such as natural resources, trade openness, technological innovation and human capital were used in study. The results summarized that shadow economy has a negative relationship on financial development in both developed countries and developing countries. Natural resources showed insignificant connection on financial development for developed and developing countries, while trade openness and technological innovation showed significant connection on financial development for developed and developing countries. For human capital, it showed a positive relationship with financial development in developed countries. However, it showed a negative relationship with financial development on developing countries.

CHAPTER 1: INTRODUCTION

1.0 Introduction

In this chapter, we are going to discuss the research background and research problems related to the impact of the shadow economy towards financial development in developing and developed countries. Besides, we also discuss the research questions, research objectives and significance of study for our research study.

1.1 Background of study

This study provides the evidence of the impact of shadow economy on the development of financial sector in both developed and developing countries. Research study is focus on 157 countries which included developing and developed countries over the period of 1991-2017. According to Majaski (2020), the researcher did explain on requirements for country whether it is in developed or developing condition. It stated that the country should have more than 25,000 GDP per capital together with 0.80 or more for human development index (HDI) in order to determine a country is a developed country.

Financial development can be defined as “backbones” of a country's economic development. It is called financial resources in terms of domestic credit given by financial corporations to private sectors. Financial development consists of trade credits, loans, non-equity securities and others. As well, McKinnon (1973) also mentioned the importance of financial development in contribution to economic development. They explained that progress of financial development determines the performance of the economy. Nowadays, financial development is used as an indicator to examine the development of the economy for a country by measuring Gross Domestic Product (GDP) per capita in current practice. While for shadow economy, it can be explained as an illegal activity such as: unreported business

transactions and untaxed goods and services where individuals or firms work for underground that have abilities to weaken the economic situation of the country (Berdiev & Saunoris, 2016). In other words, the shadow economy also can be defined as unregulated or black markets (Mitchell, 2020).

Schneider and Enste (2000) expressed that the size of the shadow economy is a major trouble for a country's economy. Shadow economy significantly impacts the value of the human capital market and affects financial development, especially it creates an unfair competition in business transaction and industries production. For instance, market player who do not place their priority on business ethics will join immoral business competition such as: hire unlicenced labour with cheaper cost (Kubiczek, 2014). They create the encumbrance to monopoly the market share and to hinder their competitor. Thus, these illegal activities can weaken the financial system and limit the improvement of a country economy growth. Elgin and Uras (2013) described the presence of shadow economy in the market can limit the growth of financial development in the country. Moreover, Elgin and Uras (2013) also further mentioned that size enlargement of the shadow economy can worsen performance of a country’s financial development.

According to Habibullah, Baharom, Din, & Furuoka (2017), shadow economy and financial development seems to have an inverse relationship. For example, the inverted U-shape curve has been used to describe the impact of the shadow market in the economy and affection towards the financial development situation in Malaysia, where when countries their economy have a expansion on size of shadow economy will increase a lower financial development. Based on the International Monetary Fund, a strict laws and complicated tax compliance are the main drives which result a greater size of shadow economy for a country (Enste & Schneider, 2003). Irrational tax policy leads industry players to seek opportunities for a cheaper financing costs from underground activities which can solve their tax burden (Schneider, 2005). As well, market players tend to be more participated actively in doing shadow economy activity as few regulations and restriction will burden and limit business improvement (Becker,1968).

There are some cases shown that shadow economy brings some affect to the nation's economic condition. For example, the size expansion in the shadow economy has a linkage which led to Malaysia's economic collapse. (Tan, Habibullah, & Yiew, 2016) In the years 1980-1985, the commodity price became volatile, and oil shock happened which triggered the Maminco crisis. Within those years, the tin market also faced failure and lead to few companies in this sector bankruptcy. Moverover, this occasion led many people lost their main income sources and affect the unemployment rate. For other example, country such as: Latvia overall economy performance consists 42.9% shadow economy in year 2012, where it included undefined business income and unauthorized human capital (Gharleghi & Jahanshahi, 2020).

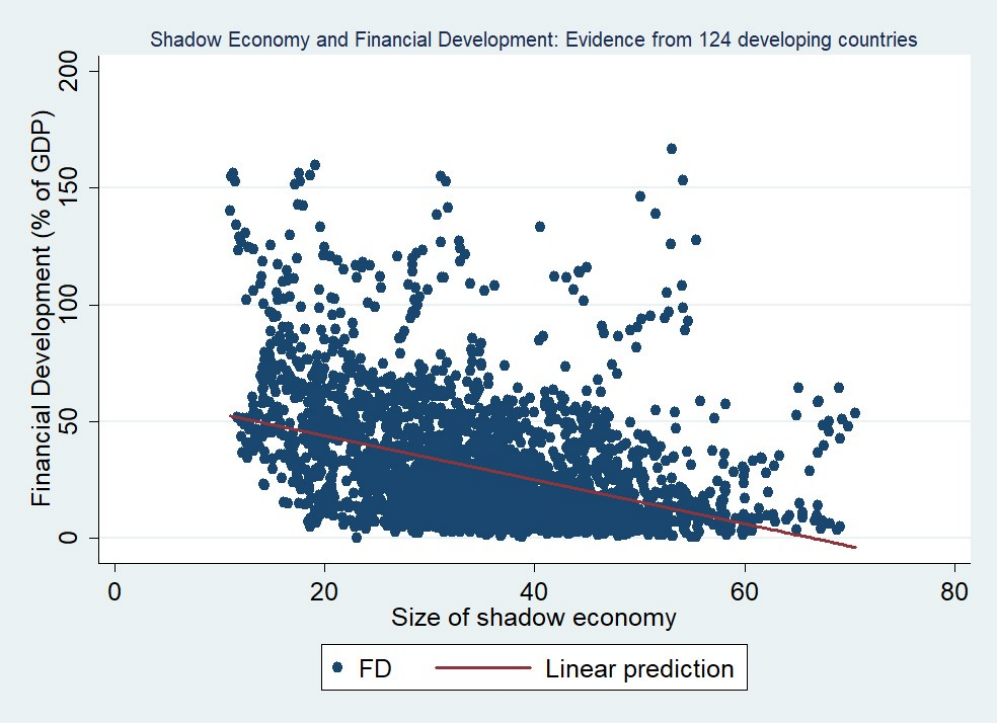

Figure 1.1: The Impact of Shadow Economy on Financial Development in 124 Developing countries (1991-2017)

As shown in Figure 1.1, there are 124 developing countries among year 1991-2017. Based on the scatter plot graph for 124 developing countries group, those countries have downward trends for financial development and size of shadow economy.

Most of the developing countries' size of shadow economy in scatter plot graph remain value at 20% to 80% among these years and their financial development maintains at the range value approximately from 5% to 150%.

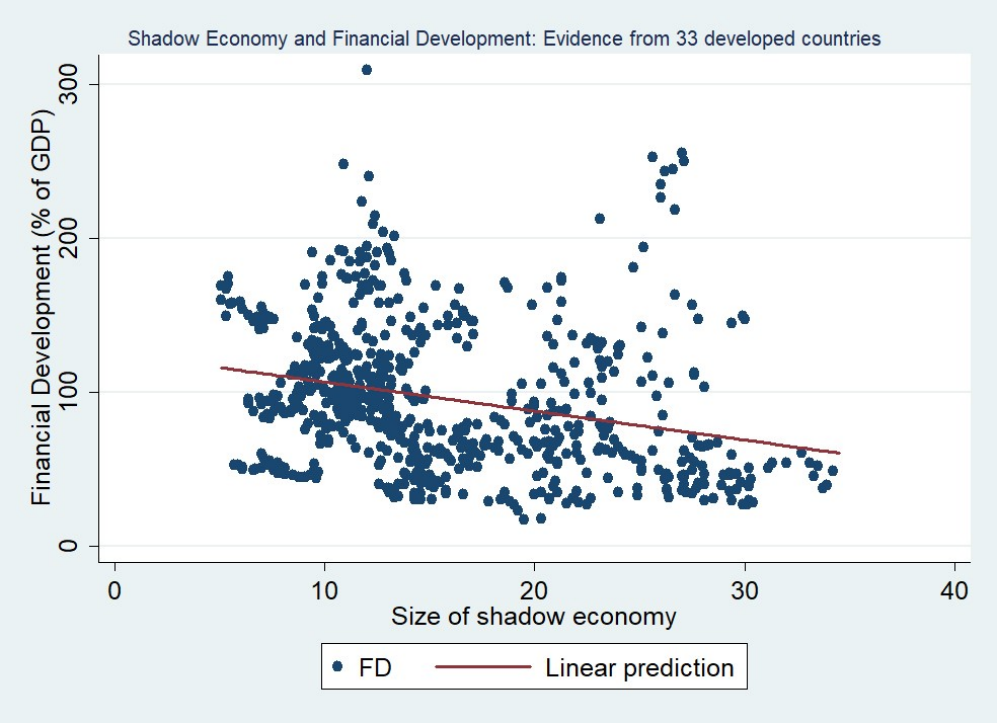

Figure 1.2: The Impact of Shadow Economy on Financial Development for 33 Developed countries (1991-2017)

Based on Figure 1.2, there are 33 developed countries among year 1991-2017. The size of the shadow economy and the financial development for developed countries tend to have a downward trend. Based on the scatter graph plot for developed countries, these 33 developed countries able to maintain the shadow economy in 4% to 36% among year 1991 to year 2017. The developed countries also maintain their financial development percentage in range value of 25% to 250% among these years.

To conclude, for comparison between two categories in year 1991 to year 2017 which is developing countries and developed countries. The developing countries maintain higher value in shadow economy and lower financial development value compare to developed countries. In addition, developed countries maintain higher

value in financial development but lower shadow economy value compared to developing countries.

1.2 Problem Statement

Shadow economy commonly is determined as unregistered economics activities that has contribute to official Gross National Product which defined by Feige (1989, 1994), Schneider (1994, 2003, 2005, 2011), and Frey and Pommerehne (1984). The economic activities of shadow economy intend to hide or avoid from the official authorities and regulation. Because those activities normally engage in offence or crime. For instance, tax evasion, avoid governmental bureaucracy or regulatory framework, corruption, money laundering and fail to comply with law by individuals or firms (Schneider & Enste, 2000). This will affect the economic growth in directly and indirectly. With direct effect, the informal sector will inability the formal sector to raise fund or to available for community, whereas indirect effect occurs due to the impacts of informal sector which caused tax revenues reduced and lead to less public goods and services over time (Hassan, 2017).

A robust shadow sector would impact economic growth as well as financial development by the impacts on investment in the long run. Due to the underground firms are not eligible to obtain financing in the formal sector and end up paying higher interest charges in the informal sector which cause their operating costs to increase. This is the limitation to the underground firms which cause inability to expansion and potential synergies with the official sector. Therefore, the economic will be collapse of the country since it will affect the tax revenues and distribution of capital that used to stimulate the economic growth and financial development. For example, the Nigeria country has negative relationship between both shadow economy and corruption to the tax revenue performance. This implicate that as the government losses revenue due to shadow economy and corruption, it gives room for insufficient provision of public goods and services and will lead to poor economy growth and financial development. For instance, Schneider and Enste

(2002) argued that control low level of shadow economy will increase tax revenues and will lead to increase on public spending, in the end stimulate overall economic growth. The reasons why the public would engage in informal sector to speculate profit or reduce the costs (Allingham & Sandmo, 1972). Thus, shadow economy is harmful to the economic because it will increase the statutory tax burden and weaken the enforcement of compliance in the country (Loayza, 1996).

Financial development is one of crucial roles to stimulate economic growth of the country in the long run (bist,2018). According to The World Bank, it's mentioned that better financial development will improve the economy by gathering capital and technological methods. It will enhance the distribution of capital and promote foreign capital flow into our market hence stimulating the economic growth of the country. Shadow economy literature argues that financial development is an important component of the overall institutional framework because it helps to provide financial funds for official economic activities of the country (Blackburn et al., 2012). Therefore, financial development will be implicated with a smaller shadow economy. Moreover, financial development assists to monitor the economic transactions for tax collection (Berdiev and Saunoris, 2016), and consequently raises the opportunity cost of firms that are operating in the informal sector, inducing economic agents involved in official sectors (Capasso and Jappelli, 2013). Hence, the development of financial sectors will reduce the shadow economy's size in a direct way (Berdiev and Saunoris, 2016).

Conversely, if the country is experiencing high shadow economy, the country is associated with a small financial development. Normally, it will cause by weak institutional quality (La Porta et al., 1999) as well as tax evasion (Tanzi, 1999). When the country is lacking institutional quality or complicated regulations would increase the cost of labour in the official economic activities (Nguyen et al., 2018c; Phuc Canh, 2018; Schneider and Enste, 2000). Consequently, it will encourage economic agents to engage in illegal activities in informal sectors due to the higher labour costs for the formal sectors (Friedman et al., 2000). Besides that, there are others whose previous studies (Dreher et al., 2009; Torgler and Schneider, 2009) have the same point to support this statement too. Other than that, there is research

from (e.g. Berdiev et al., 2018; Enste, 2018) approved that the crucial role of institutional quality will give impact to the shadow economy.

The following reason is tax evasion theory, this theory explains that the dynamics of the shadow economy depends on taxpayer behavior. For example, if the taxes become higher, taxpayers will not willing pay high tax to the government, therefore the tax evasion exists in the country and economic agents tend to move to unofficial sectors (Tanzi, 1982; Tanzi and Davoodi, 1998). There are several studies (Bittencourt et al., 2014; Schneider, 2015a) have agreed that the statement of tax evasion causes the shadow economy. Recent studies have extended the theory which includes tax morale (Araujo and Rodrigues, 2016) and penalty rates (Schneider and Enste, 2000). Nevertheless, tax evasion is the major factor that impacts the shadow economy (Dell'Anno and Davidescu, 2019). Due to the shadow economy, the financial developments will be unfavorable and lead to failure of tax collection of economic transactions and might encourage economic agents involved in the shadow economy transaction for their own purpose. Hence, it will affect the stimulation of economic growth and financial development to be reduced indirectly.

Therefore, it shows that the shadow economy will have a negative effect on financial development in the countries. It's important to the countries to maintain the shadow economy in a low level because it will reduce the growth of the countries in terms of financial or economy. This also is the reason why we are motivated to investigate the impacts of shadow economy towards financial development to the developed and developing countries. This is because the size of the shadow economy may have different levels of impact in both developing and developed countries. For example, according to the finance minister of Malaysia Lim Guan Eng, Malaysia is a developing country which has an uncommonly high shadow economy which Malaysia has around 20% of shadow economy contributing to the gross domestic products and it exceeds the average of 12 % of shadow economy in developing countries. Shadow economy is an important issue because it could lead to corruption and smuggling which distrust the government and its financial institutions behind the strong shadow economy. For example, the case of 1MDB happened in Malaysia, it causes the countries to suffer from RM 52 billion in debt to Malaysia as reported by the Star.

Other than that, all the country most likely will experience a shadow economy as Scheneider and Enste in 2000 found that the shadow economy involves almost 75% of production in developing countries and about 10% in developed countries. It acts as a barrier toward the financial development of the country. We can observe that the shadow economy really affects the financial development of the country through the findings of Leandro Medina and Friedrich Schneider in 2018. In their reports, it is showing that the shadow economy becomes more serious in developing countries compared to developed countries. The developed countries would have better financial development against the shadow economy, but the developing countries would not have the same criteria as developed countries. Therefore, we separate the developed and developing countries to investigate the impact of shadow economy to financial development.

1.3 Research Question

1.3.1 General Research Question

- What factors will affect financial development in 157 countries including both developing and developed countries?

1.3.2 Specific Research Question

- What is the impact of shadow economy on financial development in 33 developed countries?

- What is the impact of shadow economy on financial development in 124 developing countries?

1.4 Research Objective

1.4.1 General Research Objectives

- To identify the factors that will affects the development of financial sector in 157 countries including both developing and developed countries.

1.4.2 Specific Research Objectives

- To examine the impact of shadow economy on financial development in 33 developed countries.

- To examine the impact of shadow economy on financial development in 124 developing countries.

1.5 Significance of Study

In this study, we obtained the data from World Development Indicator (WDI) to examine the relationship of dependent variable and independent variables to improve the accuracy of our findings and consistent with theory introduced by the scholars in journals and research reports. Firstly, we wish to provide more understanding to policymakers and government about the impact of shadow economy towards financial development in developing and developed countries. People tend to involve in the shadow economy activities to avoid tax payment, and some of the companies will hire illegal workers to achieve tax evasion. The government might have an idea and framework to enhance the punishment or rules and regulation to reduce the size of shadow economy and avoid the increase of tax evasion through this study. As a result, the participants of the shadow economy will find it difficult to escape from the law and regulation, and therefore they still need to pay tax to the government. Consequently, the financial development of the

country would be better as the government and policymakers have a better idea to resolve the issue.

Secondly, this study would contribute more information and knowledge regarding the shadow economy related to local or foreign investors. Shadow economy would not take into account the GDP of the country, and thus it will reduce the confidence of the investors for the particular country. Through this study, the investors would acknowledge the concept of the shadow economy with a better understanding about the linkage between the shadow economy and financial development. As a result, it would provide those investors a more precise guideline to do their investment to minimize the risk. This is because the financial development would worsen if the country has a higher shadow economy activity.

CHAPTER 2: LITERATURE REVIEW

2.0 Introduction

In this chapter, we are going to carry out the literature review comprise of analysis and theoretical model that have been introduced by numerous scholars. This chapter involved the discussion about the theories, concepts, and model briefly with the relevant past studies and the gap of the studies.

2.1 Foundation of Topic

In this paper, we are going to discuss and examine the impact of shadow economy towards financial development in developed and developing countries which is supported by theory of the empirical past studies. In the past decades, numerous researchers have been examined and concluded the theory on the impact of shadow economy towards financial development. Financial development is one of the development strategies to stimulate economic growth and it is able to reduce the poverty of a country and enhance the financial ability in a country. Financial development includes many financial sectors such as financial intermediaries, financial markets, and financial instruments and each of them works efficiently to reduce the costs of information and improve the transactions. A well systematic and efficient financial sector plays a vital role in driving and boosting the economic growth of a country. However, there are also illegal activities involved in a country such as drug dealing, trade in stolen goods, smuggling, illegal gambling, fraud and tax evasion which will reduce the amount of the revenue necessary for the government to provide public goods (Schneider and Enste, 2000; Gërxhani, 2004). In short, shadow economy may have a direct impact on the financial development of a country and hence, we started the thorough studies.

2.2 Theoretical Review

2.2.1 Theory of Shadow Economy

Shadow economy indicates an underground or hidden economy that includes illegal economic activities of a country such as an investor investing in illegal schemes or even criminal activities by the citizens. It could damage a country's reputation, economic and financial sector. But somehow, some researchers found out that the shadow economy might also stimulate financial development as well as economic growth. Becker (1968) introduced the theory about financial development and shadow economy could be an influential study on economies of crime. He argues that individuals are rational, and they would assess the benefits of illegal activities. Followed by rational entrepreneurs, they might seek the advantages of operating informally such as avoiding the tax burden and regulation from the government against the financial costs and opportunity costs. These illegal activities are getting more prevalent and causing the size of the shadow economy to become larger and hence give impact to the financial development.

Straub (2005) agrees with Becker's theory as he discovered a theoretical model where showing the entrepreneurs take into consideration pros and cons regarding operating in the shadow economy. The benefit of the official economy is using public resources that assess from the financial institution. He argues that the financial market is a platform to let the entrepreneurs and firms make a productive investment, but it might be costly to participate in the official economy. Therefore, entrepreneurs should maintain a minimum level of initial assets as collateral in order to involve in the financial system and acquire potential capital to make a productive investment. However, other entrepreneurs who are unable to afford the requirements of initial assets might continue to be involved in the informal sector to avoid high costs (Straub, 2005) and this may cause the size of the shadow economy to become larger.

According to Ihrig and Moe (2004), when there is an increase in the size of the shadow economy it will lead to a series of consequences. Firstly, it will lead to a reduction in the government tax revenue and hence reduce the public expenditures which may directly affect the development in the financial and economic sector of a country. In this situation, the government has to find other ways to increase its revenue which is through debt financing. However, this will lead to an increase in the level of public indebtedness as well as sovereign risk, hence hindering financial development of a country. In this situation, the country will have high default risk in public debts and most probably it will lead to financial stress. Besides, the performance of government bonds also will be affected due to interest rate volatility. Hence, it is likely that the size of the shadow economy tends to negatively affect financial development (Elgin & Uras, 2013).

2.3 Literature review

2.3.1 The Relationship Between Shadow Economy and Financial Development

There are many researchers who have done the studies related to the relationship between shadow economy and financial development of countries. Based on the past studies we have reviewed, most of the researchers found that there is a negative relationship between shadow economy and financial development (Berdiev and Saunoris, 2016; Capasso & Jappelli, 2013; Bayar & Ozturk, 2016). Capasso & Jappelli (2013), Berdiev (2016) and Saunoris (2016) have reached a similar conclusion that a low level of financial development and a high level of underground activities are interrelated, but it is no reliable evidence indicates that low financial development will lead to an increase in shadow economy activities. Besides, the increasing size of shadow economy also has a significant impact on not only the development of the financial sector, but also the

economic sector; as it will slow the investment rate, reduce the adoption of new technologies and the government's ability to raise enough funds or resources. The negative relationship between economic development and financial development of a country has been proved by Mutlugün (2014), indicating that the economic sector is also considered as a main driver to the development of the financial sector of a country.

Furthermore, Elgin and Uras (2012) also found that the size of the shadow economy tends to negatively affect the development of the financial sector. According to their research, they found that an increase in the size of the shadow economy will cause a reduction in government tax revenue. In this situation, the government will have to find another way to increase their revenue otherwise it will affect the country's development. One of the ways to increase government tax revenue is through debt financing. In the long term, this might not be the perfect way to resolve the problem since until a certain level it will lead to a high level of public indebtedness. Followed by, this could lead to high default risk in public debts and bring financial stress to the country as well, hence hindering the financial development of the country.

2.3.2 The Relationship Between Natural Resources and Financial Development

Some of the researchers argued that the financial sector in the countries with abundant natural resources is generally under-developed (Corden & Neary, 1982; Gelb, 1988; Sachs & Warner, 2001; Mehlumn et al., 2006; Elbadawi and Soto, 2016). In line with the findings of Smith (1776) and Ricardo (1911), they suggest that the expansion of a country is associated with abundant natural resources. This might indicate that the countries with abundant natural resources tend to promote the financial development as well as economic development of a country (Smith, 1776 & Ricardo, 1911). However, the problem of resources curse and rent for resource development

in some countries with abundant natural resources will more likely to extend the opportunities for rent-seeking (Yuxiang and Chen, 2010), resulting in corruption (Diaz-Briquets & PérezLópez, 2006), deindustrialization (Davis, 1995), and high poverty rates (Ross, 2003), thus hinders the development of the financial sector of a country. This is mainly due to over-dependence on the natural resources, causing the economic activities to slow down.

Some past studies found that abundant natural resources can bring a positive impact to a sustainable growth in the economic and financial sector in a country with rich natural resources notwithstanding abundant natural resources may lead to a resource curse (Moradbeigi & Law, 2017). In some circumstances, the abundant natural resources bring a positive impact to the development of financial markets as it helps to extend the level of financing and liquidity of the markets, hence increasing the money supply and promoting the development of the financial sector of a country. This is due to the progress to obtain bank financing become easier as the financial system of the country is stable enough (La Porta et al., 2005; Amin and Djankov, 2009). If the natural resources can be utilized efficiently, the revenue of the country would increase by exporting. Shahbaz, Naeem, Ahad and Tahir (2018) proved that natural resources abundance would stimulate the economy activity in reducing the unemployment rate and raising the GDP among the country by increasing income among people. Through stimulating economic activities, the investment activities would strengthen and demand for financial services would increase and this will directly bring a positive impact to financial development. According to the findings of Mehlum et al. (2006), financial development of a country can be improved by ensuring the quality of institutions which can help to reduce the problem of resource curse.

Besides, Khan, Hussain, Shahbaz, Yang, and Jiao (2020) discovered that there is a negative connection between natural resources and financial development, and this is mostly due to the financial crisis of 2007-2008. This can be supported by Beck (2002) who stated that abundant natural resources tend to reduce the activities in the financial sector as they are more

concentrated on the sector of natural resources. This causes the demand for the financial sector and the savings rates decrease, hence hampering the development of the financial sector of a country.

2.3.3 The Relationship Between Technological Innovation and Financial Development

According to the finding of Aghion et al. (2009), Hsu et al. (2014) and Laevan et al. (2015), technological innovation is considered as one of the drivers to promote financial development of a country as it strengthens the competitive advantage of firms, which will lead to higher profits. There is a case study from China; the researchers have proved that the innovation of payment methods tends to promote the development of financial markets. The researchers also predict that the positive relationship between third-party payments (TTP) and the development of the financial sector will remain stationary in the long run (Yao, Di, Zheng, & Xu, 2018).

Based on the findings of Khan, Hussain, Shahbaz, Yang, and Jiao (2020), they found that technological innovation is one of the leading factors to promote financial development. This positive relationship is mainly due to the government's implementation of markets based on economic reforms. Besides, online finance has also become famous and is growing rapidly in recent years since it can improve the competitive advantage of firms. Other than that, it is also because the government strongly advertises and encourages the implementation of policy to promote the development of the financial sector of a country.

At the same time, financial markets are playing an important role in diversifying and managing the risk of uncertainties especially for the technology industry since technological innovation is often a risky project as it engaged the process of designing, developing, introducing new products and improving the process of manufacturing. This process often

required knowledge from the scientific and technological field (Holmstrom, 1989). In this situation, Levine (2005) and Bravo-Biosca (2007) argued that financial sectors become extremely important as it helps to mitigate the risk of uncertainties by shifting the portfolio into another which provides higher returns. Other than that, equity markets are also able to provide higher share prices especially for technology firms (Kapadia, 2006).

2.3.4 The Relationship between Trade Openness and Financial Development

Theoretically, openness to international trade helps to enhance the development of the financial sector of a country. Some researchers have studied the relationship between trade openness and financial development. According to the findings of Khan, Hussain, Shahbaz, Yang, and Jiao (2020), they found that trade openness has a significant impact on financial development as it increases the financial development by 0.49%-0.95%. This indicates that trade openness tends to promote the development of the financial sector and this is matched with the findings of Baltagi et al. (2009), Ibrahim and Sare (2018) and Zhang et al (2015).

The positive relationship between trade openness and financial development can be supported by the findings of Rajan and Zingales (2003). They mentioned that when the level of trade openness increases, it will attract foreign direct investment to the countries. This will then increase the market competition, improve the production process as well as bring in more external financing into the host countries, hence contributing a growth to the financial sectors (Rajan & Zingales, 2003). Besides, Ashraf (2018) suggested that there is a negative relationship between trade openness and cost of credit, which means whenever there is an increase in trade openness it will lead to a decrease in cost of credit. In this situation, the financial development of a country can be enhanced since banks and financial institutions are paying less cost in obtaining financing. Moreover, higher

trade openness also tends to increase the amount of bank credit and reduce the risk of bank sectors by providing risk diversification opportunities, hence resulting in a higher level of financial development of a country (Ashraf, 2018). Another finding from Ibrahim and Sare (2018) suggested that the increase in trade openness will create new demand for external finance and this will also lead to higher development in the financial sector. To sum up the findings of Ashraf (2018), Ibrahim and Sare (2018), trade openness not only will lead to a decline in the cost of credit, but also it will increase the demand for external finance; both effects could lead to higher levels of development in the financial sector.

However, Zhang, Zhu and Lu (2015) found that there is a negative relationship between trade openness and financial development in China and this finding is in contrast with the findings of Ashraf (2018) and Ibrahim and Sare (2018) as they found that trade openness as well as financial openness can improve the development of banking sector. Zhang, Zhu and Lu (2015) argued that this might be due to an unbalanced development between trade openness and the development of the financial sector and this can lead to financial repression as well. When there is an increase in the trade openness, it will lead to an increase in the export activities, hence the demand for financial resources may increase as well (Zhang, Zhu and Lu, 2015). However, it could be difficult for the private companies in China to obtain loans from banks because of the control of the government over the financial institutions in China. Besides, the banks in China think that lending money to those private companies is much riskier than other types of companies in China. This could explain the negative relationship between trade openness and financial development in China since the issue of mismatch of financial resources has occurred over the past decade (Zhang, Zhu and Lu, 2015). From this, we can observe that different cultures or policies in a country will bring different impacts to financial development when trade openness rises.

2.3.5 The Relationship between Human Capital and Financial Development

Human capital is the most important factor that drives a country to grow, leading to a higher economic and financial development. According to Tiba and Frikha (2019), more educated labor could help to utilize the natural resources a country possessed in a more effective and efficient way, hence turning the curse into blessing and stimulating the development of the economic sector as well as the financial sector to grow further. Besides, educated people tend to have more understanding regarding financial knowledge. Because of this, they will have the intention to participate in the financial activities and be able to access various financial services in an easier way, hence promoting the financial sectors to grow (Sun, Ak, Serener & Xiong, 2020). Ang (2008) argued that the provision of credit facilities will promote the human capital accumulation and development of technology-intensive industries due to people will borrow funds to extend the knowledge and develop more advanced technology which utilizes the fund which will achieve an efficient financial system. It has the same concept as Mishkin (2007), he stated that the countries which experience highly developed human capital are likely to benefit more from financial globalization. In this situation, it indicates that the relationship between human capital and financial development tend to be positive (Khan, Hussain, Shahbaz, Yang, & Jiao, 2020).

There have many scholars put efforts to interpreting the relationship between the financial development and human capital in the literature such as De Gregorio (1992), Pagano (1993), De Gregorio (1996), Outrivelle (1999) and Evans et al (2002) Papagni (2006). Most of them argued that the human capital will have a direct positive relationship to financial development. However, except for Evans et al (2002) and Outrivelle (1999) because they investigate the liquidity constraints on human capital accumulation and argue that the borrowing constraints will reduce the human capital accumulation and lead to negative effects on growth of the

country. In contrast, Papagni (2006) conducts the research of liquidity constraints and has different arguments with Evans et al (2002) and Outrivelle (1999). The researchers go further to argue that when parents help to reduce the liquidity constraints of the youths with their income, the human capital accumulation will continue to increase and improve and hence stimulate the growth of the financial sector and economy.

According to Rodrik (2007), when a country's trade openness increases, it is not only that it will attract the foreign direct investment to the countries but also encourage physical exchange, human capital exchange as well as technology exchange. Due to this behavior, the countries will have more potential to grow further since the countries now have more manpower with education which can help to promote the financial sector of a country. Moreover, Diamond and Dybvig (1993) noted that a well-developed financial system is an important role to foster the development of human resources in the growth process. Based on the literature of human capital, the more educated people tend to be less risk averse by high information and high savers. Consequently, the people who initiate to improve educational level will provide new opportunities to people empowerment because education allows them to involve in formal sector opportunities and enables them to access the formal financial services. The human capital accumulation will increase through credit channels of financial sector development and stimulate economic growth as well. Hence, human capital is said to promote the development of the financial sector as well as the economic sector (Rodrik, 2007).

2.4 Finding the Gaps

After reviewing the previous studies, we discovered that various explanatory variables with different countries and time period will have different impacts on the financial development either directly or indirectly. As the research that done by Zeeshan Khan, Muzzammil Hussain, Muhammad Shahbaz, Siqun Yang, Zhilun

Jiao (2020), they conclude that the natural resources abundance is negatively related the financial development in China. Technological innovation, human capital and trade openness is positively related to the financial development which indicates that it tends to promote the financial development. Other than that, the interaction term for human capital and technological innovation also have positive impact on the financial development after conducted the several test. This result also found similar as the research done by Syed Anees Haider Zaidi, Zixiang Wei, Ayfer Gedikili, Muhammad wasif Zafar, FujunHou, YaserIftikhar (2019). Their studies are about the impact of globalization, natural resources abundance, and human capital on financial development by using the data from 1990-2016 of 31 OECD countries. They argued that relationships among globalization, natural resources and human capital will increase the financial development in the long run. However, both studies without consider the important factor in the existing world which is shadow economy because it will affect the impact of trade openness, technological innovation and even natural resources on the financial development. For example, the higher the size of shadow economy may reduce the development of financial sector and hence reduce the ability to adopt new technology, trade openness for the country. Based on the research that done by Salvatore Capasso, TullioJappelli (2012), they stated that the underground economy is strongly negatively correlated with financial development, even they tried to solve the endogeneity of the financial development. Therefore, in this study the factor of shadow economy should be taken into account to study how those variables going to affect the development of financial sector.

CHAPTER 3: METHODOLOGY

3.0 Introduction

In this chapter, we are going to discuss the research design, research framework, hypothesis development, data descriptions, empirical model, and empirical methodology.

3.1 Research design

In this study, descriptive research is going to be used and the data collected is quantitative in nature. The type of data used in this study is secondary data and most of it can be obtained from World Development Indicators (WDI), excepted for the data for shadow economy. The data for the size of shadow economy are obtained from the journal named "Shedding Light on the Shadow Economy: A Global Database and the Interaction with the Official One" written by Medina and Schneider (2019). By using descriptive research method, it enables us to investigate whether the size of shadow economy is going to affect the development of financial sectors in both developing and developed countries in a more accurate way.

3.2 Research Framework

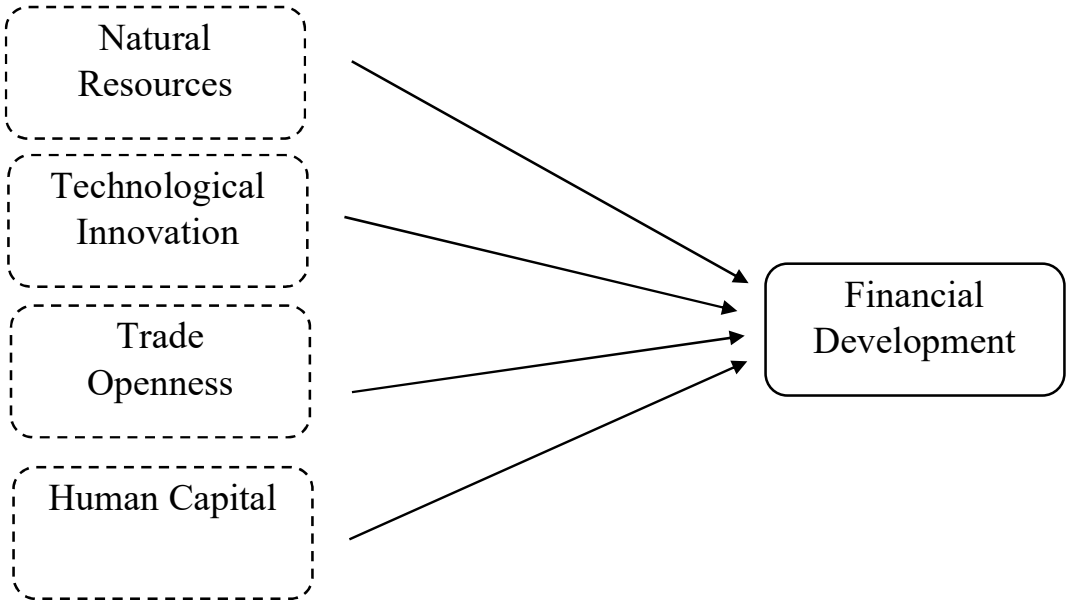

Figure 3.1: Factors that affects financial development. Adapted from Khan, Z., Hussain, M., Shahbaz, M., Yang, S., & Jiao, Z. (2020). Natural resource abundance, technological innovation, and human capital nexus with financial development: a case study of China. *Resources Policy*, *65*, 101585

Figure 3.1 is showing the factors that will influence the financial development including natural resources, technological innovation, trade openness, and human capital, which is originated from the journal named "Natural Resource Abundance, Technological Innovation, and Human Capital Nexus with Financial Development: A Case Study of China" done by (Khan, Hussain, Shahbaz, Yang, & Jiao, 2020). The scholars had conducted the research to figure out how these factors will impact the development of the financial sector differently. However, we realized that there is one more important variable that would instantly affect financial development which is the shadow economy. In the last decades, numerous researchers and scholars examine the relationship between the shadow economy and financial development as well as how the shadow economy has impacted financial development. There are different ideas and results carried out by the researchers and scholars about this topic. Therefore, we would include the new factors of shadow economy in our study to observe the impact of shadow economy together

with the factors proposed by Khan, Hussain, Shahbaz, Yang, and Jiao (2020) towards financial development as the figure 3.2 below.

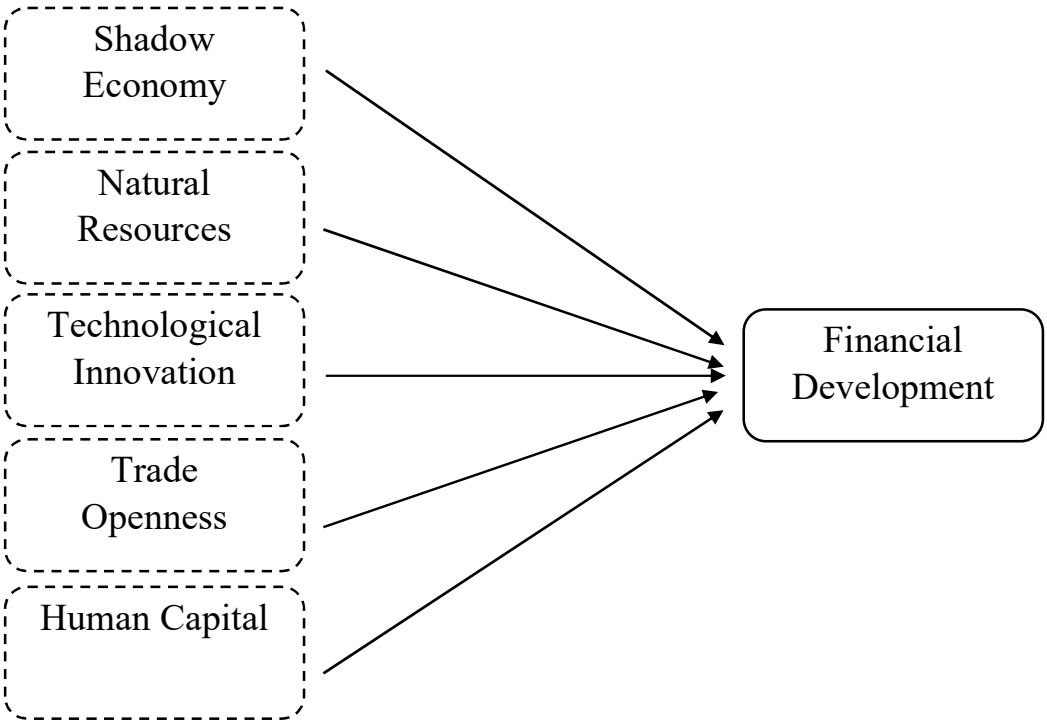

Figure 3.2: Independent variables that contribute to Financial Development

3.2.1 Shadow Economy and Financial Development

According to Becker (1968), the researcher argued that rational individuals tend to gain advantages from the informal economy sector as well as rational entrepreneurs, they also tend to operate informally to avoid tax burden. This will lead to an increase in the size of shadow economy, hence hampering the development of financial sector. Firms and businesses make productive investment by obtaining capital or funding from the financial institutions, but sometimes obtain funding from official economy sector could be costly. This will lead to an increase in the size of informal economy since firms and businesses must prepare a minimum level of initial assets as collateral in order to participate into the financial system and obtain capital to make

productive investment. Because of this, some firms and businesses who unable to meet the minimum level of initial assets will tend to involve in the informal sector to avoid the high costs incurred in the formal sector. However, obtain funding from financial institutions may bring some advantages to the firms and businesses such as reduce in the interest rate. When the firms and businesses tend to involve in the formal sector to take advantages, this will lead to a decrease in the size of shadow economy and leading to a higher development of financial sector.

On the other hand, an increase in the size of shadow economy will lead to a decrease in the development of financial sector as well (Straub, 2005). This can be supported by Ihrig and Moe (2004), when there is an increase in the size of shadow economy it will lead a reduction in government tax revenue. In this situation, it will increase the government debts since government have to find ways to increase its revenue and one of the ways is through issuing bonds to public. This will increase the government default risk in public debts and bring financial stress to the country as well, hence hindering the financial development (Ihrig & Moe, 2004). Hence, we expected that there is an inverse or negative relationship between shadow economy and financial development in both developing and developed countries.

3.2.2 Natural Resources and Financial Development

According to Smith (1776) and Ricardo (1911), they argued that natural resources abundance is considered as an important factor for a country to do expansion and this could indirectly promote the development of the financial sector as well as the economic growth of a country. However, there is an argument saying that a country with abundant natural resources may lead to resource curse (Moradbeigi & Law). Resource curse is a situation when a country that has abundant natural resources is experiencing stagnation in economic growth frequently. The reason for resource curse is

mainly due to the behavior of rent-seeking, failure of economic policy, weak political and financial institutions in a country (Sachs & Warner, 1995; Rosser. 2006; Caselli and Cunningham, 2009; Van der Ploeg & Venables, 2009). The problem of resource curse can be solved if a country is able to utilize the natural resources more efficiently and this is mainly attributable to the educational level.

In developing countries, there is more likely a negative relationship to be found between natural resources and financial development (Sachs & Warner, 1995). This may be due to lack of educational people in developing countries, causing the natural resources are not being utilized efficiently (Lederman & Maloney, 2007; Gylfason, 2001). Besides, the negative relationship between natural resources and financial development also may occur when the financial system is less developed. (Zoega & Gylfason, 2001). These two scenarios often occurred in developing countries, hence we expect that the relationship should be negative in developing countries.

In developed countries, the relationship between natural resources and financial development is found to be positive since there are more educated people. In this situation, they are able to allocate and use the resources in a more efficient and effective way which will promote the development of the financial and economic sector of a country (Hatemi-J & Sham-suddin, 2016; Barro & Lee, 2013). Based on the findings of Shahbaz, Naeem, Ahad & Tahir (2018), they found that a country with abundant natural resources tends to stimulate the economy growth by reducing the unemployment rate and increasing the income level of people. When the income level increases, investment activities will increase as well, hence promoting the development of the financial sector of a country. In this situation, we expect that the relationship between the natural resources and financial development tend to be positive in developed countries.

3.2.3 Technological Innovation and Financial Development

Technological innovation is considered as one of the important factors to boost up the development of the financial sector of a country. This is because it can help to improve and strengthen the financial system of a country as well as ensuring its stability by strengthening the competitive advantage of firms (Aghion et al., 2009; Hsu et al., 2014; Laevan et al., 2015). There is more likely that technological innovation tends to promote financial development if a country possesses more educated or skilled workers. Hence, the impact of technological innovation could be more significant in developed countries as compared to developing countries. This is related to human capital a country possesses since they are able to use their specialization and skills to contribute to a higher level of technological innovation, hence leading to a more developed financial system (Sibel, Kadir, Ercan, 2015). In this situation, we expect that the relationship between technological innovation and financial development should be positive in both developing and developed countries.

3.2.4 Trade Openness and Financial Development

Trade openness is found to promote the financial development of a country by Baltagi et al. (2009), Ibrahim and Sare (2018) and Zhang et al (2015). With supporting evidence by Ashraf (2018), the researcher stated that when trade openness increases, cost of credit for bank to obtain required financing will be lower, hence leading to a higher level of financial development. Moreover, an increase in the level of trade openness can help to promote the development in financial sector in several ways. Firstly, it will attract foreign direct investment to the countries and increase the market competition. Secondly, it will improve the production process and increase external financing which will contribute rapid growth to the financial development (Rajan & Zingales, 2003).

However, there are also some researchers found that trade openness brings negative impact to financial development of a country (Zhang, Zhu & Lu, 2015). According to their findings, they stated that this is due to an unbalanced development between trade openness and the development of financial sector in China, causing private banks in China difficult to obtain financing and this may lead to financial repression as well. This is due to the cultures and policies could be different in various countries. Hence, we proposed that the relationship between trade openness and financial development to be positive since the case of unbalanced development in China is subject to its own cultures and policies.

3.2.5 Human Capital and Financial Development

Human capital is a significant driver to boost the development of financial sector in a country. Well-educated worker tends to be more efficient in utilizing the natural resources possessed by a country in order to avoid the situation of resource curse, hence enhancing and promoting the development of financial sector of a country (Tiba & Frikha, 2019). This is because they possess more knowledge regarding to various aspects and these could help to speed up the financial development as well as economic development of a country by utilizing their specialization. Besides, Sun, Ak, Serener and Xiong (2020) also mentioned that well-educated people also tend to have better financial knowledges which will also useful in helping a country to boost the development of financial sector.

According to Outreville (1999), the researcher mentioned that strong human capital is considered as an important driver in promoting the financial development of developing countries. This is due to more human capital tend to increase the productivity level of a country in both direct and indirect way, leading to higher development in the economic sector (Sun, Ak, Serener & Xiong, 2020). When a country achieves a higher level of economic development, it could create positive impact to the development

of financial sector as well. Hence, we expect that the relationship between human capital and financial development should be positive in developing countries as well as developed countries.

3.3 Hypothesis Development

Table 3.1:

Hypothesis Development

Variables	Abbreviation	Definition	Expected Sign (Developing countries)	Expected Sign (Developed countries)	Data Source
Financial Development	FD	Financial resources provided to the private sector by financial corporations such as loans, purchases of non-equity securities, and trade credits and other accounts receivable, that establish a claim for repayment.	-	-	The World Bank's World Development Indicators (WDI)
Shadow Economy	SE	Variation of the size of shadow economy according to different countries.	Negative	Negative	Sources from journal named "Shedding Light on the Shadow Economy: A Global

					Database and the Interaction with the Official One" by Medina & Schneider (2019).
Natural Resources	NR	Sum of oil rents, natural gas rents, coal rents (hard and soft), mineral rents, and forest rents.	Negative	Positive	The World Bank's World Development Indicators (WDI)
Technological Innovation	TI	A patent provides protection for the invention to the owner of the patent for a limited period, generally 20 years.	Positive	Positive	The World Bank's World Development Indicators (WDI)
Trade Openness	TO	Sum of exports and imports of goods and services measured as a share of GDP.	Positive	Positive	The World Bank's World Development Indicators (WDI)
Human Capital	HC	The sum of the working age population with an advanced education level who are in the labor force which comprised of short-	Positive	Positive	The World Bank's World Development Indicators (WDI)

	cycle tertiary education, bachelor's degree, master's degree, and doctoral degree.

3.4 Data Description

Quantitative data is something that can be measured, counted, and expressed in term of numbers. In our research study, the data that we collected to conduct the study is quantitative in nature which included financial development, the size of shadow economy, natural resources abundance, technological innovation, trade openness and human capital. The endogenous variable of this study is financial development (FD) and the exogenous variables will be the size of shadow economy (SE), natural resources (NR), technological innovation (TI), trade openness (TO) and human capital (HC).

Secondary data was used in this study and it is collected from World Development Indicator (WDI) except the data for the size of shadow economy. The data for the size of shadow economy could not be directly obtained from the World Development Indicator (WDI) as it requires some specific calculations or approaches to estimate the size of shadow economy and this process is complicated all the way. According to Medina & Schneider (2019), they are using the Multiple Indicators, Multiple Causes (MIMIC) approach to estimate the size of shadow economy since it taken into account the various causes that caused the size of shadow economy to increase rather than only considering one indicator. In this situation, the MIMIC approach is the most suitable to be used in estimating the size of shadow economy. In our study, we decided to obtain the data for the size of shadow economy from the journal named "Shedding Light on the Shadow Economy: A Global Database and the Interaction with the Official One" which is done by Medina & Schneider (2019) to study the effect of the shadow economy and

other explanatory variables towards the development of financial sectors in 157 countries for the period of 1991-2017.

3.5 Empirical Model

3.5.1 Generalized Method of Moments (GMM) Estimation

In our study, we employed dynamic panel data Generalized Method of Moments (GMM) estimation in this research. GMM estimator estimates the parameters of the selected sample which are as close as possible to the population data. There are two GMM estimators, namely difference GMM and system GMM. Difference GMM estimator was introduced by Arellano-Bond in 1991 whereas Arellano-Bover (1995) and Blundell-Bond (1998) revealed and revised the difference GMM estimator and fully developed it which was named as system GMM. According to Bond (2002), difference GMM referred as original estimator while system GMM defined as level estimator. Both GMM estimators would use xtabond2 to command their test and model. There are six situation that formulated for difference GMM and system GMM which are:

1. Few time periods data incorporate with a large individual, which described as “small T, large N”;
2. A linear relationship for the functional model;
3. Response variable is dynamic as it relies on its previous observation;
4. Explanatory variables might be endogenous i.e. the explanatory variables could be influenced by the previous and current observation of the error;
5. Distributed fixed individual effect;
6. There might be heteroscedasticity and autocorrelation founded within individuals but not across them.

The general model:

$FD = f(SE, NR, TI, HC, TO)$

The initial model of GMM:

$lnFD_{it} = \propto + \emptyset\, lnFD_{it-1} + \beta_1 lnSE_{it} + \beta_2 lnNR_{it} + \beta_3 lnTI_{it} + \beta_4 lnHC_{it} + \beta_5 lnTO_{it} + \varepsilon_{it}$

$\varepsilon_{it} = \varepsilon_i + \mu_{it}$

Whereby,

FD_{it}= Financial development

SE_{it} = The size of shadow economy

NR_{it} = Abundant natural resources

TI_{it} = Technological innovation

HC_{it}=Human Capital

TO_{it} = Trade openness

ε_{it} = Error term which combine between the time span and individuals

ε_i =Individual-specific error term

3.5.1.1 Difference GMM Estimator

Difference GMM was proposed to correct the endogeneity by removing the fixed effects as well as remodeling the variables through differencing. There was a weakness by using difference GMM estimator which would expand the gaps in unbalanced panels by removing the past observations from contemporary observation and might lead to the issue of loss data. As a result, the endogeneity still remains in this estimator. Difference GMM emphasized on the standard movement conditions from the absence of further requirements. (Blundell & Bond, 1998). Difference GMM is derived for two categories which are one-step difference GMM and two-step difference GMM. According to Roodman (2009), one-step difference GMM plays as an initial model for the estimator. Based on previous studies, we could use one-step difference GMM estimator instead of two-step while the itis serial uncorrelated or homoscedasticity. However, according to

Windmeijer (2005) proposed, two-step GMM estimator would provide lower standard errors and biased standard errors in finite samples and resulting it would correct the finite sample. Two-step difference GMM would fit towards the heteroscedasticity and serial correlation problem compared to one-step difference GMM estimator. (Roodman, 2009).

3.5.1.2 System GMM Estimator

System GMM estimator corrects endogeneity through transforming the instrument variables in order to eliminate the correlation with the fixed effects. System GMM estimator would adjoin more instrument variables to enhance the efficiency of the estimator. System GMM estimator would remove the mean of future observation instead of removing the past observation from contemporary. Subsequently, it would diminish from the loss of data as it is able to determine all observations. System GMM estimator could resolve the problem which experienced in difference GMM estimator. In general, those previous studies report that the system GMM estimator is more accurate to implement to the model compared to the difference GMM estimator. System GMM estimator would be categorized into one-step and two-step estimators which are similar to difference GMM estimator. One-step system GMM estimator applies more instrument variables compared to one-step difference GMM estimator whereas the two-step system GMM enhances the efficiency and robustness towards the heteroscedasticity and serial correlation. (Roodman, 2009). According to Hayakawa (2007), system GMM estimator utilizes the weighted sum of bias with negative directions of the first differencing GMM. The weighted sum of bias is dominant to alter the difference of the gaps of the bias. The verity of the biases in the estimator is associated with the overidentifying restrictions, and thus diagnostics checking is essential to test the validity of the model through Sargan-Hansen test and cross-sectional dependence test which estimates the variety of instruments.

3.6 Empirical Methodology

3.6.1 Sargan Test

The Sargan test is a statistic test that was proposed by John Denis Sargan in 1958. The purpose of this test is to test the validity of over-identifying restriction in the statistic model and it is a special case of Hansen J test on the assumption of conditional homoscedasticity situation (Baum., Schaffer., & Stillman, 2003). Sargan test is good for the one-step GMM criterion function to minimize the value. The sargan test is not robust when the heteroscedasticity and autocorrelation problem occur in the model. The Sargan test would fail to reject the null hypothesis and thus to give a strong support for the instrument variables. In other words, the validity of the estimators would be mistrusted if there is a strong evidence to reject the null hypothesis.

3.6.2 Hansen Test

Hansen J test is a standard specification test for the two-step GMM and it is automatic shown by all popular implementations of the differences and system GMM (Roodman, 2007). It is proposed by Lars Peter Hansen in 1982 and he is re-worked through the derivation and prove Hansen test can extend to popular non-linear GMM. Hansen test is used to minimized the value of the two-step GMM criterion function that bases for estimation and it is robust. The researcher is often argument for the validity of their GMM result during a high p value on the Hansen test. Based on the research of Bowsher (2002) and Anderson and Sorenson (1996) shown that, the test can be vitiating when the instrument is proliferation. Therefore, the research need to follow the rule of thumb which is the instrument cannot over the number of group and maintain it under a specific number in the model (Mileva, 2007). Hence, the sargan test is still needed, as the Hansen test will weaken the robustness when the instrument is too large. Besides, all

instrument is under the null joint validity when the empirical moment has zero expectation, thus the Hansen J test is distributed with the degree of freedom same to degree of over-identification. The null hypothesis and rejection of null hypothesis are stated below:

H_0: The over identifying restrictions are valid / all instruments are valid
H_1: The over identifying restrictions are invalid / all instruments are invalid

3.6.3 Cross-Sectional Dependence Test

Cross-Sectional Dependence test may arise due to spatial effects or spillover effects, or to common factors that are not observed or cannot be observed. For example, the degree of cross-sectional correlation and the nature of cross-sectional dependence itself. Based on the research of Forni and Lippi (2001), the cross-sectional dependence can be separate into two type which is common factor (strong dependence) and idiosyncratic (weak dependence). A definition of strong and weak cross-sectional dependence due to spectral density eigenvalues is proposed. The dimension reduction is the purpose of the work and do not study the big sample properties of slope parameter in the panel data model. Besides, cross-sectional dependence test is a problem in the panel data when there is long time series. However, it is suitable for large number of case or company in the data. We can test the error cross-sectional dependence through the Pesaran CD test and Lagrange multiplier (LM) test. According to the research of De Hoyos & Sarafidis (2006), the Pesaran CD test is a general diagnostic test for the cross-sectional dependence in panel data and it developed by Pesaran in 2004. It can be used to test the cross-sectional dependence when there are large number of observation and small-time span in the panel data. On the other hand, Lagrange multiplier (LM) test was proposed by Breusch and Pagan in 1980 and it is used when the time span is larger than the observation (T$>$ N).

CHAPTER 4: DATA ANALYSIS

4.0 Introduction

In the previous chapter, we have discussed about research design, research framework, hypothesis development, data description, empirical model and empirical methodology. This chapter discussed about the significancy of the impact of independent variables (shadow economy, trade openness, technological innovation, natural resources and human capital) towards the dependent variable (financial development) in both developing and developed countries.

4.1 Descriptive Statistics

4.1.1 Descriptive Statistics for Developed Countries

Table 4.1:

Descriptive Statistics for Developed Countries

Variables	Observations	Mean	Standard Deviation	Minimum	Maximum
FD	700	96.0106	46.61077	17.1625	308.9784
SE	864	15.9412	6.887698	5.1	34.5
TO	851	107.9952	84.68589	16.01388	442.62
TI	691	43798.44	105652.4	3	606956
NR	837	4.695146	10.80908	0.0003131	62.04703
HC	471	80.38554	4.210261	62.7392	90.2874

Notes. FD = Financial Development, SE = Shadow Economy, TO = Trade Openness, TI = Technological Innovation, NR = Natural Resources, HC = Human Capital

Table 4.1 shows the descriptive statistics for 33 developed countries from 1991-2017. The mean for Financial Development (FD), Shadow Economy (SE), Trade Openness (TO), Technological Innovation (TI), Natural Resources (NR) and Human Capital (HC) are 96.0106, 15.9412, 107.9952, 43798.44, 4.695146 and 80.38554 respectively. TI has the highest standard deviation of 105652.4 while HC has the lowest standard deviation of 4.210261. As for the rest, the standard deviation for FD, SE, TO and NR are 46.61077, 6.887698, 84.68589 and 10.80908 respectively. Among all the variables, NR has the minimum value of 0.0003131 while TI has the maximum value of 606956.

Table 4.2:

Correlation Relationship for Developed Countries

Variable	FD	SE	TO	TI	NR	HC
FD	1.0000					
SE	0.1970	1.0000				
TO	0.1863	-0.0388	1.0000			
TI	-0.2830	-0.2577	-0.2823	1.0000		
NR	-0.0064	-0.0812	-0.1797	-0.0515	1.0000	
HC	0.0949	0.0504	-0.1256	-0.2703	0.2513	1.0000

Notes. FD = Financial Development, SE = Shadow Economy, TO = Trade Openness, TI = Technological Innovation, NR = Natural Resources, HC = Human Capital

Table 4.2 reveals that the correlation relationship between the variables including Financial Development (FD), Shadow Economy (SE), Trade Openness (TO), Technological Innovation (TI), Natural Resources (NR) and Human Capital (HC) in 33 developed countries for the past 27 years. TI and NR were the variables which have the negative relationship with each variable. Moreover, TO is negatively related with SE which means that when the TO increase by 1%, the SE would decrease by 0.0388%, ceteris paribus. As well as the relationship of HC towards TI and TO, when the HC

increased by 1%, the TI and TO would decrease by 0.2703% and 0.1256% respectively, ceteris paribus. Among the variables, the relationship between HC and NR has the strongest positive correlation while for the TO and TI has the strongest negative correlation.

4.1.2 Descriptive Statistics for Developing Countries

Table 4.3:

Descriptive Statistics for Developing Countries

Variable	Observation	Mean	Standard Deviation	Minimum	Maximum
FD	3067	29.8049	26.2850	.1862	166.5037
SE	3321	34.8143	11.1268	11	70.5
TO	3061	76.4747	37.0773	.1674	311.3541
TI	1634	8309.066	68438.67	1	138159
NR	3245	8.9893	11.0152	0	68.7783
HC	776	78.9951	6.8203	42.0136	95.4616

Notes. FD = Financial Development, SE = Shadow Economy, TO = Trade Openness, TI = Technological Innovation, NR = Natural Resources, HC = Human Capital

Table 4.3 shows the descriptive statistics for developing countries from 1991 to 2017 which include of six variables. The mean of financial development (FD), shadow economy (SE), trade openness (TO), technologic innovation (TI), natural resources (NR), and human capital (HC) are 29.8049, 34.8143, 76.4747, 8309.066, 8.9893, and 78.9951 respectively. TI has the highest standard deviation which is 68438.67 and HC has the lowest standard deviation of 6.8203. TI has the maximum value of 138159 and minimum value of 1.

Table 4.4:

Correlations Relationship for Developing Countries

Variable	FD	SE	TO	TI	NR	HC
FD	1.0000					
SE	-0.3502	1.0000				
TO	0.3494	-0.3304	1.0000			
TI	-0.0140	0.0116	-0.2926	1.0000		
NR	-0.1207	-0.0443	-0.1496	0.1790	1.0000	
HC	0.0856	0.0037	-0.0932	-0.0480	-0.0417	1.0000

Notes. FD = Financial Development, SE = Shadow Economy, TO = Trade Openness, TI = Technological Innovation, NR = Natural Resources, HC = Human Capital

Table 4.4 show the correlations relationship between the variable of financial development (FD), shadow economy (SE), trade openness (TO), technologic innovation (TI), natural resources (NR), and human capital (HC) in developing countries for the past 27 year. Firstly, TI had negative relationship with the variable FD and TO while TI had positive relationship with SE. Besides, SE was negatively related with the FD it means that if the SE increase by 1%, the FD will decrease by 0.3502%, ceteris paribus. As well as, the relationship between the TO and SE, when the TO increase by 1%, SE will decrease 0.3304%, ceteris paribus. Moreover, the relationship between TO and FD had shown the largest positive correlation while SE and FD had the strongest negative correlation.

4.2 Diagnostic Checking

Sargan-Hansen test and the Arellano-Bond Serial Correlation had been conducted in our study in order to examine whether the model able to meet with the required significance level. This is also to ensure the accuracy and reliability of our study.

4.2.1 Sargan-Hansen Test

Table 4.5:

Sargan Test for Developed and Developing Countries

Sargan test	P-values
Developed countries	1
Developing countries	0

Sargan-Hansen test used to inspect the validity of the overidentifying restrictions in both models. Based on the results, null hypothesis of Sargan test in developed countries is accepted because it is more than significant level which is 0.1. It represents that the instruments variables are valid. In contrast, the null hypothesis Sargan test in developing countries is rejected because it is smaller than the significant level. However, validity of Sargan test is mistrusted due to the estimator's robustness on examine the autocorrelation problem in the models.

Table 4.6:

Hansen Test for Developed and Developing Countries

Hansen test	P-values
Developed countries	0.660
Developing countries	0.929

For the results of Hansen test, it shown that both model for developed and developing countries are significant and valid. It is because of their P-values for developed countries and developing countries are greater than the significant level which is 0.1

4.2.2 Arellano-Bond Serial Correlation

Table 4.7:

Arellano-Bond Serial Correlation for Developed and Developing Countries

Arellano-Bond Serial Correlation	Developed Countries	Developing Countries
AR (1)	0.092	0.099
AR (2)	0.446	0.481

For Arellano-Bond Serial Correlation, it is used to detect autocorrelation problem in the panel data model. The first tests of Arellano-Bond for autocorrelation or also known as first-order auto regressive AR (1). Based on the result table, the p-value of AR (1) for both developed and developing countries are 0.092 and 0.099 respectively. In other words, these p-values are lower than the significant level which is 0.1. First-order auto regressive AR (1) normally will reject null hypothesis because it shows that autocorrelation of order1 in both models. The reason is due to the impact brought by the lagged period in our research (Baum, 2013). In addition, for second tests of Arellano-Bond or called as second-order auto regressive AR (2). The purpose of using AR (2) is to study the presence of the serial correlation in null hypothesis (Roodman, 2017). So, the p-value of AR (2) in developed and developing countries are 0.446 and 0.481 respectively. These results are greater than significant levels which is 0.1. It meant that no existence of autocorrelation of order 2 in these both models.

4.2.3 Fixed Effect Regression Model

The fixed effect regression model is used to examine the influence of the variables toward the model over the years. The assumption of this fixed

effect regression is to have time effect and the error term in model is correlated with other independent variables (Torres-Reyna, 2007).

Table 4.8:

Fixed Effect Regression Model for Developed Countries

Fixed effect regression model for developed countries	**P-values**
Shadow Economy	0.000
Trade Openness	0.274
Technology Innovation	0.180
Natural Resources	0.000
Human capital	0.000

While fixed effect regression model result for developed countries, trade openness and technology innovation have to reject H_0. It is because they do not have effect on the financial development for developed countries. The reason is both variable's p-values is greater than the significant level which is 0.1.

Table 4.9:

Fixed Effect Regression Model for Developing Countries

Fixed effect regression model for developing countries	**P-values**
Shadow Economy	0.000
Trade Openness	0.005
Technology Innovation	0.190
Natural Resources	0.004
Human capital	0.061

According to the Stata fixed effect regression model result, only one variable which is technology innovation has to reject H_0. As it does not have effect on the financial development for developing countries. It is because

the p-values of the technology innovation which is 0.190 is greater than the significant level which is 0.1.

4.2.4 Cross-sectional Dependence Test

Cross-sectional dependence is an important test for panel data model. The Pasaran Cross-sectional dependence test is implemented to test our model cross dependency due to number of observations (N) is greater than period (T) in our panel data.

Table 4.10:

Cross-sectional Dependence Test for Developed Countries

Cross-sectional dependence test for developed countries	**P-values**
Financial Development	0.000
Shadow Economy	0.000
Trade Openness	0.000
Technology Innovation	0.000
Natural Resources	0.000
Human Capital	0.000

H_0 =The error term in developed countries has weak dependency

H_1= The error term in developed countries has strong dependency

Based on the result for developed countries above, the cross-sectional dependence test for all variables shown 0 and it indicated that they strongly reject the null hypothesis. It meant that the error term in model for developed countries has a strong dependency because it is lower than the significant level which is 0.1.

Table 4.11:

Cross-sectional Dependence Test for Developing Countries

Cross-sectional dependence test for developing countries	**P-values**
Financial Development	0.000
Shadow Economy	0.000
Trade Openness	0.000
Technology Innovation	0.000
Natural Resources	0.000
Human Capital	0.000

H_0 =The error term in developing countries has weak dependency

H_1= The error term in developing countries has strong dependency

Based on the result for developing countries above, cross-sectional dependence test for all variables shown 0 and it indicated they strongly reject the null hypothesis. It meant that the error term in model for developing countries has a strong dependency because it is lower than the significant level which is 0.1.

4.3 The Difference and System GMM Approach

4.3.1 The Results of Difference and System GMM Approach for Developed Countries

Table 4.12:

Result of Dynamic Panel GMM Estimation for Developed Countries

	(1) One-Step Difference GMM	(2) Two-Step Difference GMM	(3) Two-Step Robust Difference GMM	(4) One-Step System GMM	(5) Two-Step System GMM	(6) Two-Step Robust System GMM
FD	4.300	4.349	4.349	0.984***	1.013***	1.013***
	(0.12)	(0.24)	(0.22)	(4.06)	(10.90)	(7.19)
SE	-0.329	-0.0304	-0.0304	-0.188	-0.278***	-0.278*
	(-0.03)	(-0.01)	(-0.01)	(-0.40)	(-3.17)	(-1.92)
TO	-1.939	-1.903	-1.903	0.152	0.182**	0.182**
	(-0.10)	(-0.20)	(-0.19)	(0.37)	(2.58)	(2.23)
TI	0.635	0.665	0.665	0.0227	0.0251***	0.0251**
	(0.09)	(0.18)	(0.17)	(0.39)	(2.94)	(2.00)
NR	-0.349	-0.336	-0.336	0.00375	-0.0136	-0.0136
	(-0.11)	(-0.19)	(-0.18)	(0.10)	(-1.27)	(-0.98)
HC	-3.332	-2.514	-2.514	1.554	2.300***	2.300***
	(-0.06)	(-0.10)	(-0.09)	(0.70)	(4.95)	(3.09)
_CONS				-7.113	-10.48***	-10.48***
				(-0.64)	(-4.46)	(-2.99)
AR1	-0.19(0.846)	-0.34(0.736)	-0.33(0.743)	-3.82(0)***	-1.71(0.087)*	-1.69(0.092)*
AR2	0.18(0.854)	0.24(0.809)	0.24(0.814)	0.45(0.651)	0.76(0.446)	0.76(0.446)
Sargan Test	0.01(0.936)	0.01(0.936)	0.01(0.936)	0.62(1.000)	0.62(1.000)	0.62(1.000)
Hansen Test		0.05(0.831)	0.05(0.831)		6.78(0.660)	6.78(0.660)
N	273	273	273	297	297	297

Notes. FD = Financial Development, SE = Shadow Economy, TO = Trade Openness, TI = Technological Innovation, NR = Natural Resources, HC = Human Capital

** Indicates statistically significant at 10% ** Indicates statistically significant at 5% *** Indicate statistically significant at 1%*

Table 4.12 indicates the results of dynamic panel GMM estimations for financial development (FD) in developed countries. Based on the results above, the results of system GMM seems more significant as compared to the results of difference GMM. As discussed in the previous chapter, system GMM tends to be more accurate and reliable as compared to difference GMM.

According to the results of two-step robust system GMM, it shows a negative relationship between shadow economy and financial development which indicates that whenever there is 1% increase in the size of shadow economy, on average financial development will be decreased by 0.278%, ceteris paribus. This result in lines with the findings of Elgin and Uras (2012) as they stated that increase in the size of shadow economy will affects the government tax revenues. Some of the reasons for firms and entrepreneurs to involve in informal economy is to avoid tax burden and regulations of the government (Becker, 1968), leading to a reduction in government tax revenue. In this situation, government will need to seek ways to increase its revenue such as debt financing. By using debt financing, it will increase the public indebtedness, leading to a high default risk in public debts, putting the country into financial stress as well as affecting the performance of government securities. Thus, the increase in the size of shadow economy is going to hinder the financial development of a country (Elgin & Uras, 2012).

For trade openness, it has a positive relationship with financial development indicates that trade openness tends to promote the financial development in developed countries. Based on the results, it shows that when trade openness

increased by 1%, on average, financial development will be increased by 0.182%, holding other variables constant. According to Rajan and Zingakles (2003), an increase in the level of trade openness will attract foreign direct investment (FDI) into the countries, boosting the economic activities. This will lead to an increase in the market competition, production process as well as external financing, hence boosting the development of financial sector of the country (Rajan & Zingakles, 2003).

The results for technological innovation show that it has a positive relationship with financial development in developed countries. Its means that when technological innovation increased by 1% in developed countries, on average, financial development will be increased by 0.0251%, ceteris paribus. The results are consistent with the theory that we found. For instance, the research from Aghion et al. (2009), Hsu et al. (2014) and Laevan et al. (2015), they stated that technological innovation is the main factor that to improve financial development of a country as well as the finding of Khan, Hussain, Shahbaz, Yang, and Jiao (2020) also found that the technological innovation is the leading factors to promote the financial development. This is because technological innovation brings in more advance technologies and educated or skilled workers in a country. Therefore, it will significantly improve the country's specialization skills and knowledges towards the financial system (Sibel, Kadir, Ercan, 2015).

Natural resources are indicating the availability of resources to the countries that used for expansion. Based on the results we found, its show that negative relationship between natural resources towards the financial development. When the natural resources increased by 1% in developed countries, on average, financial development of developed countries will be decreased by 0.0136%, ceteris paribus. We expected that there is a positive relationship between natural resources and financial development in developed countries with the specialization skilled and knowledges to utilize the natural resources. However, the results that we found show a negative relationship and it is not significant might due to the research is selected 157 countries to examine the results compare to theory with only

China (Khan, Hussain, Shahbaz, Yang & Jiao, 2020). Some researchers found that abundant natural resources can bring a positive impact to a sustainable growth in economic and financial sector in country but also may lead to a resources curse (Moradbeigi & Law, 2017). The problem of resources curse will more likely to extend the opportunities for rent-seeking (Yuxiang and Chen, 2010), resulting in corruption (Diaz-Briquets & PérezLópez, 2006), deindustrialization (Davis, 1995), and high poverty rates (Ross, 2003), thus causing the countries development to be slowed down in the aspect of economic and financial sector. The resources curse commonly happened when the countries over-dependence on the abundant natural resources lead to slow economic growth.

The last factors will mainly drive the financial development which is human capital of the countries. According to the results of two-step robust system GMM, it shows that the human capital has positive relationship towards the financial development. Based on the results, if human capital for developed countries increased by 1%, on average, the financial development of developed countries will be increased by 2.3%, ceteris paribus. Based on the research of Tiba and Frikha (2019), most of the time educated or specific skilled labor could help to utilize the natural resources of a country efficiency and effectiveness, hence it solve the problem of resources curse and stimulating the development of economic sector as well as financial sector to sustain. For instance, educated people will utilize their knowledges to improve the efficiency and effectiveness of the system with their profession such as financial sector. They could improve the accessibility of various financial services such as ATM (automated teller machine) which benefits human-beings to a next level of convenience, hence promoting the growth of financial sectors (Sun, Ak, Serener & Xiong, 2020).

4.3.2 The Results of Difference and System GMM Approach for Developing Countries

Table 4.13:

Result of Dynamic Panel GMM Estimation for Developing Countries

	(1) One-Step Difference GMM	(2) Two-Step Difference GMM	(3) Two-Step Robust Difference GMM	(4) One-Step System GMM	(5) Two-Step System GMM	(6) Two-Step Robust System GMM
FD	0.276***	0.289***	0.289	0.345***	0.416***	0.416***
	(10.09)	(6.44)	(1.34)	(16.46)	(12.16)	(4.71)
SE	-1.613***	-1.556***	-1.556***	-0.933***	-1.001***	-1.001***
	(-9.13)	(-8.49)	(-3.76)	(-10.68)	(-7.92)	(-2.85)
TO	-0.0857	-0.103***	-0.103	0.312***	0.160***	0.160*
	(-1.50)	(-3.44)	(-1.53)	(6.44)	(4.20)	(1.82)
TI	0.00226	0.00303	0.00303	-0.0185	-0.00808	-0.00808
	(0.11)	(0.31)	(0.14)	(-1.36)	(-0.87)	(-0.31)
NR	-0.144***	-0.144***	-0.144**	-0.00799	-0.0661***	-0.0661
	(-4.02)	(-5.01)	(-2.35)	(-0.91)	(-2.66)	(-1.04)
HC	-0.369	-0.288	-0.288	-1.841***	-1.792***	-1.792*
	(-0.66)	(-0.76)	(-0.33)	(-5.00)	(-4.26)	(-1.85)
_CONS				12.35***	12.80***	12.80**
				(6.48)	(7.15)	(2.56)
AR1	0.33(0.744)	0.23(0.818)	0.07(0.946)	-1.76(0.079)*	-2.14(0.033)**	-1.65(0.099)*
AR2	-1.07(0.286)	-0.94(0.350)	-0.81(0.419)	-0.40(0.691)	-0.73(0.466)	-0.71(0.481)
Sargan Test	42.73(0.021)**	42.73(0.021)**	42.73(0.021)**	306.69(0)***	306.69(0)***	306.69(0)***
Hansen Test		23.44(0.608)	23.44(0.608)		21.13(0.929)	21.13(0.929)
N	492	492	492	549	549	549

Notes. FD = Financial Development, SE = Shadow Economy, TO = Trade Openness, TI = Technological Innovation, NR = Natural Resources, HC = Human Capital

** Indicates statistically significant at 10% ** Indicates statistically significant at 5% *** Indicate statistically significant at 1%*

Table 4.13 indicates the results of dynamic panel GMM estimations for financial development (FD) in developing countries. Based on the results above, the results of system GMM seems more significant than the results of difference GMM.

Based on the results of two-step robust system GMM shown, shadow economy has a negative relationship with the financial development which indicates that the increasing of 1% of the size of shadow economy, on average, financial development will be dropped by 1.001%, ceteris paribus. According to Capasso and Jappelli (2013), shadow economy is a large burden for every country especially in developing countries as it represents 30-40% of GDP in those countries. For example, according to the study of Schneider (2007) shown, Panama and Bolivia, which are developing countries consisted a large size in shadow economy that about 70% hidden in GDP. The shadow economy would become a major barrier for government specifically for those developing countries. This is because government would lack of revenue and subsequently it would lower down the development of financial sector and causes the country into financial difficulty (Berdiev & Saunoris, 2016).

The result of trade openness shown that it has a positive and significant relationship with financial development which indicates that trade openness increased by 1%, on average, financial development will increase to 0.160%, ceteris paribus. Ibrahim and Sare (2018) had stated that trade openness would increase the domestic credit and benefit to domestic financial sector development. According to Ashraf (2018), starting up of a country to involve trading among internationally would enhance the development on

financial sector especially developing countries. This is because trade openness would reorganize the domestic financial sector e.g., enhancing the superiority of the rules and regulations (or framework as well), bank privatizations, interest rate floating based on market or plan to build the securities market such as stock market. Through the opening and liberalizing of the trade, it would help to increase the demand of financial services (Owusu-Agyei, Okafor, Chijoke-Mgbame, Ohalehi & Hasan, 2020).

Meanwhile, the result of two-step system GMM technology innovation shown that it has a negative relationship with financial development which opposite with our expected result. However, it was insignificant impact on financial development due to additional barriers in developing countries. Patnaik and Bhowmick (2019) reported that some of the developing countries are still experiencing the society problems such as poverty, unemployment, income inequality and unable to obtain the basic needs; hence, technology is failure to utilize in those developing countries. According to Niebel (2018) studied, the selected developing and emerging countries were representing a larger GDP compare to others; thus, the selection bias might occur which use to investigate technology innovation in developing countries because of the results were only valid for certain range. Therefore, our result is insignificant and negative correlated as our studies include with 123 developing countries while the past research only consisted 30 countries.

Besides, the result of natural resources shows that it was insignificant impact on financial development in developing countries. Faisal, Sulaiman and Tursoy (2019) studied that impact of natural resources on financial development was insignificant and negative correlated in a long run. Based on Beck (2011) study, he stated that the impact of natural resources abundance on financial development might be clarified through the supply and demand of the market. Erum and Hussain (2019) had reported that the impact on natural resources on financial development might not be explained separately. For example, some of the OIC members such as

Nigeria, Yemen, Seri Leon, Syria and Sudan are rich in natural resources, but it cannot use to evaluate the impact on financial development due to other factors such as high level of corruption, poor supervision, natural disaster and etc. Therefore, the results of the natural resources abundance would be more sensitive to explain in a rich-resources country and well-developed financial countries (Beck 2011; Faisal, Sulaiman & Tursoy, 2019).

An increase of 1% of human capital, on average, financial development will decrease by 1.792%, by holding other variables constant. It shows that human capital was negative correlated with financial development. The results of our study regarding the impact of human capital on financial development might differ with some of the past studies; however, Benhabib and Spiegel (1994) and Pritchett (2001) studied that there is negative relationship between the measurers of human capital, financial development as well as economic growth. It is difficult to evaluate the results of human capital i.e. education might alter from one period to another period. According to Marquez-Ramos and Mourelle (2019), the periods (or stages) play an important role to interpret the result as the nexus between human capital and financial development is non-linearities. This is because the employed data might be affected the results especially with time dimensions and data issue might occurred as well (Atkinson & Brandolini, 2001; De la Fuente & Doménech 2006). According to Abdullah (2013), the negative nexus between human capital and financial development is a not a new finding for the study as high-educated people might involve themselves in the underground activities which will hinder the financial development and countries growth. Besides, human capital would negatively correlate to the growth of the countries while ignoring the differences of the feature composition of human capital due to estimation bias (Islam, 1995).

4.4 Comparison of The Results for Developed Countries and Developing Countries

Based on the result of two-step robust system GMM estimation, there were totally different result for both developed and developing countries. According to the results in developed countries, only FD and HC shown statistically significant at 1% significance level. Besides, TO and TI shown statistically significant at 5% significance level while for SE, it shown statistically significant at 10% significance level. Lastly, NR was the only independent variable that showed statistically insignificant in developed countries.

Based on the results in developing countries, FD and SE were statistically significant at 1% significance level. In addition, TO and HC shown statistically significant at 10% significance level. However, TI shown statistically insignificant in developing countries which is in contrast with the results in developed countries. While for NR, it shown statistically insignificant in developing countries as well which is similar with the results in developed countries.

Other than that, the sign for these variables in both developed and developing countries were different. As for developed countries, TO, TI and HC have a positive relationship with the independent variables which is financial development (FD). While SE and NR shown a negative relationship with FD in developed countries. For developing countries, TO also shown positive relationship with FD which is similar with the sign in developed countries. While the remaining variables such as SE, TI NR and HC shown a negative relationship with FD which is in contrast with the sign in developed countries. However, the negative relationship between FD and TI as well as the FD and NR were statistically insignificant.

Comparison between both developing and developed countries, only shadow economy (SE) and natural resources (NR) shown a negative connection on financial development (FD) for both developed and developing countries. Moreover, only trade openness (TO) and technological innovation (TI) indicated a positive connection on financial development (FD) for both developed and developing countries. Furthermore, human capital (HC) shown a different connection on

financial development for both developing and developed countries which it shown a negative relationship with FD in developing countries while in developed countries, it shown a positive relationship with FD.

CHAPTER 5: DISCUSSION, CONCLUSION, AND IMPLICATIONS

5.0 Introduction

In this chapter, major findings, policy implications, limitations of the study and recommendations for future research will be discussed. This chapter also summarizes and discusses about the findings regarding the impact of the size of shadow economy towards financial development in 33 developed countries and 124 developing countries over the period of 1991-2017.

5.1 Discussions of Major Findings

Financial development can be defined as “backbones” of a country's economic development. A better financial development will boost economic growth by pooling capital and technology method such as enhance the distribution of capital and also promote foreign capital flow into the market. Besides, financial development also can provide investors with information and good risk management tools, and thus can improve the income of companies, households or investors. During the research we found that the size of shadow economic and other controlled variables may affect the financial development.

However, there may be a lack of research in both developing and developed countries to examine the relationship between the financial development and the dependent variables. Therefore, this research is to explore the impact of shadow economy, trade openness, technologic innovation, natural resources, and human capital on financial development and focus on 157 countries which included developing and developed countries over the period of 1991 to 2017.

We employed dynamic panel data Generalized Method of Moments (GMM) estimation in this research. There are two GMM estimators, namely difference

GMM and system GMM. Based on our result, system GMM tends to be more accurate and reliable as compared to different GMM in both developing and developed countries.

Last but not least, the results of developed countries show that shadow economy and natural resources have a negative impact on financial development while trade openness, technologic innovation and human capital are positively correlated with financial development. They have a significant impact on financial development except natural resources. For developing countries, shadow economy and human capital negatively impact on financial development whereas trade openness shows that it is positively correlation impacts on financial development. Three of them are significant. Nevertheless, technologic innovation and natural resources are insignificant and negatively affect financial development.

5.2 Implications of the Study

5.2.1 For Government Bodies

The growth of the shadow economy will trigger a destruction cycle to the financial sector. The government and policy makers are playing a major role in controlling and reducing the growth of the shadow economy. Since the transactions in the shadow economy can evade taxation, thereby making tax revenues lower than the normal. Through the result of this research, the government and policy makers can obtain and understand more information on the significance of the relationship between financial development and shadow economy. Consequently, government bodies can employ new frameworks and strategies as well as improve their performance to reduce the size of shadow economy and subsequently to enhance the financial development. The government can encourage people on electronic payment, as cash is reducing registration of transactions and cause tax avoidance. While electronic payments can solve this problem by guaranteeing that the transaction has been registered. (Bruchert, 2017). Besides, policy makers

can simplify tax payment and encourage enterprise formalization to reduce the size of shadow economy. Reducing the complexity of the tax system and introducing tax measures through both policy and administrative can help to control and limit the size of shadow economy effectively. (Bruchert, 2017; Awasthi, 2016).

5.2.2 For Domestic or Foreign Investors

Through this research, investors would more understand and realize the impact of shadow economy on financial development. It could be a guidance for the investors to understand the relationship between the variables with financial development, and thus they can invest in a reliable country. Investors need to take into account those variables in research which might impact on financial development for consideration to do their investment plan in certain countries such as foreign direct investment (FDI), stock market debt instruments. (Chen, 2020). A poor performance of the financial development would reduce the confidence of the investors, and subsequently the economy of the particular country will slow down. This is because investors would choose a stable and sophisticated financial economy country to do their investment plan instead of an unreliable country. Foreign investors will divest in an unsound economy country to protect their capital or fund. (Nofsinger & Kim, 2003). Hence, it is important for the investors to understand the nexus on how those variables affect financial development.

5.2.3 For Future Researchers

After completion of our study, there are some arguments in our topic. The result of size of shadow economy impact on the financial development is matched with our expected result and major findings as well. In contrast, the result of controlled variables such as technology innovation, natural

resources and human capital impact on financial development is different from other past studies, especially developing countries. This might because we had captured different time periods and the number of countries to apply in our research compared to past research. (Atkinson & Brandolini, 2001; De la Fuente & Doménech 2006). Therefore, future researchers could focus on the time dimension and countries to further explain the impact on financial development, and the nexus between time period and findings. Also, there are other omitted variables that might affect the financial development in different countries. Hence, future researchers can use this research findings as a reference to explore more relevant research such as to study other variables such as inflation, interest rate, politics etc. which might affect financial development.

5.3 Limitations of the Study

After observed the results of our research, there is some limitations found in the data collection process as well as the proxy used in this study. The insufficient of data was found throughout the study when considering more explanatory variable and number of observations. Hence, it required to obtain the same time frame and range of data which causes the range of our research become limited. In the research, the data only applicable to obtain 27 years (1991-2017) for all 157 countries. For instance, the natural resources showed insignificant in the model might due to the limited time frame of the data applied to the model and observed from 157 countries compared to the research of Khan, Hussain, Shahbaz, Yang, & Jiao (2020). Hence, in the two-step robust system GMM, variable of natural resources showed insignificant as a factor to affect the financial development.

On the other hand, most of the model showing the results is unfavourable using dynamic panel GMM estimation due to limited data collected in the research. Besides that, the proxy applied for technological innovation is not consistent with the journal since the proxy is unavailable from the Word Development Indicators (WDI). Therefore, the data of technological innovation is obtained by totalling up

different proxies which are patent application of residents and non-residents. In short, all these limitations will cause the results to be different and difficult to obtain a precise result.

5.4 Recommendations for Future Research

Based on the limitations that we identified, there are few recommendations in order to enhance the efficiency and effectiveness of the future research. Firstly, the researchers are recommended to include more independent variables since there are still many factors that will affect the financial development either directly or indirectly such as economic growth, income level and et cetera. In this case, the researchers will be able to obtain more comprehensive and accurate results in studying the impacts towards financial development. Other than that, future researchers are also recommended to measure the latest data for the size of shadow economy since the data for shadow economy is only up to 2017. The data for shadow economy could not be found in the World Development Indicators (WDI) as it requires a series of complicated ways of measurement.

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APPENDICES

Appendix 4.1 Descriptive Analysis for Developing Countries

```
    Variable |       Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
          fd |      3067    29.80487    26.28497   .1861522   166.5037
          se |      3321     34.8143    11.12676         11       70.5
          to |      3061     76.4747    37.07728   .1674176   311.3541
          ti |      1634    8309.066    68438.67          1    1381594
          nr |      3245    8.989253    11.01519          0   68.77825
-------------+--------------------------------------------------------
          hc |       776    78.99511    6.820334    42.0136    95.4616
(obs=580)
```

Appendix 4.2 Correlation Relationship for Developing Countries

```
             |       fd       se       to       ti       nr       hc
-------------+------------------------------------------------------
          fd |   1.0000
          se |  -0.3502   1.0000
          to |   0.3494  -0.3304   1.0000
          ti |  -0.0140   0.0116  -0.2926   1.0000
          nr |  -0.1207  -0.0443  -0.1496   0.1790   1.0000
          hc |   0.0856   0.0037  -0.0932  -0.0480  -0.0417   1.0000
```

Appendix 4.3 Descriptive Analysis for Developed Countries

```
    Variable |       Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
          fd |       700     96.0106    46.61077    17.1625   308.9784
          se |       864     15.9412    6.887698        5.1       34.5
          to |       851    107.9952    84.68589   16.01388     442.62
          ti |       691    43798.44    105652.4          3     606956
          nr |       837    4.695146    10.80908   .0003131   62.04703
-------------+--------------------------------------------------------
          hc |       471    80.38554    4.210261    62.7392    90.2874
```

Appendix 4.4 Correlation Relationship for Developed Countries

```
             |       fd       se       to       ti       nr       hc
-------------+------------------------------------------------------
          fd |   1.0000
          se |   0.1970   1.0000
          to |   0.1863  -0.0388   1.0000
          ti |  -0.2830  -0.2577  -0.2823   1.0000
          nr |  -0.0064  -0.0812  -0.1797  -0.0515   1.0000
          hc |   0.0949   0.0504  -0.1256  -0.2703   0.2513   1.0000
```

Appendix 4.5 One-Step Difference GMM Result for Developing Countries

```
Favoring speed over space. To switch, type or click on mata: mata set matafavor
>  space, perm.
Dynamic panel-data estimation, one-step difference GMM
------------------------------------------------------------------------------
Group variable: code                            Number of obs      =       492
Time variable : year                            Number of groups   =        55
Number of instruments = 32                      Obs per group: min =         0
Wald chi2(6)  =    439.87                                      avg =      8.95
Prob > chi2   =     0.000                                      max =        21
------------------------------------------------------------------------------
```

```
         lfd |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         lfd |
         L1. |    .275903   .0273518    10.09   0.000     .2222945    .3295116
             |
         lse |   -1.61269   .1766335    -9.13   0.000    -1.958885   -1.266494
             |
         lto |
         L3. |  -.0856963   .0571208    -1.50   0.134     -.197651    .0262583
             |
         lti |
         L2. |   .0022643   .0200348     0.11   0.910    -.0370031    .0415317
             |
         lnr |  -.1442578    .035874    -4.02   0.000    -.2145695   -.0739461
         lhc |  -.3686579   .5611272    -0.66   0.511    -1.468447    .7311312
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(year lnr)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/6).(lfd lse lto lti lnr lhc) collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =   0.33  Pr > z =  0.744
Arellano-Bond test for AR(2) in first differences: z =  -1.07  Pr > z =  0.286
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(26)   =  42.73  Prob > chi2 =  0.021
  (Not robust, but not weakened by many instruments.)
Difference-in-Sargan tests of exogeneity of instrument subsets:
  iv(year lnr)
    Sargan test excluding group:     chi2(24)   =  40.26  Prob > chi2 =  0.020
    Difference (null H = exogenous): chi2(2)    =   2.47  Prob > chi2 =  0.291
```

Appendix 4.6 Two-Step Difference GMM Result for Developing Countries

```
Favoring speed over space. To switch, type or click on mata: mata set matafavor
>  space, perm.
Dynamic panel-data estimation, two-step difference GMM
------------------------------------------------------------------------------
Group variable: code                            Number of obs      =       492
Time variable : year                            Number of groups   =        55
Number of instruments = 32                      Obs per group: min =         0
Wald chi2(6)  =    181.87                                      avg =      8.95
Prob > chi2   =     0.000                                      max =        21
------------------------------------------------------------------------------
         lfd |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         lfd |
         L1. |   .2886794   .0448603     6.44   0.000     .2007548     .376604
             |
         lse |  -1.556368    .183282    -8.49   0.000    -1.915594   -1.197142
             |
         lto |
         L3. |  -.1026217   .0298105    -3.44   0.001    -.1610492   -.0441943
             |
         lti |
         L2. |   .0030281    .009925     0.31   0.760    -.0164246    .0224808
             |
         lnr |  -.1439074    .028713    -5.01   0.000    -.2001838    -.087631
         lhc |  -.2884612    .379885    -0.76   0.448    -1.033022    .4560996
------------------------------------------------------------------------------
Warning: Uncorrected two-step standard errors are unreliable.

Instruments for first differences equation
  Standard
    D.(year lnr)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/6).(lfd lse lto lti lnr lhc) collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =   0.23  Pr > z =  0.818
Arellano-Bond test for AR(2) in first differences: z =  -0.94  Pr > z =  0.350
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(26)   =  42.73  Prob > chi2 =  0.021
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(26)   =  23.44  Prob > chi2 =  0.608
```

```
  (Robust, but can be weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  iv(year lnr)
    Hansen test excluding group:     chi2(24)   =  22.64  Prob > chi2 =  0.541
    Difference (null H = exogenous): chi2(2)    =   0.80  Prob > chi2 =  0.670
```

Appendix 4.7 Two-Step Robust Difference GMM Result for Developing Countries

```
Favoring speed over space. To switch, type or click on mata: mata set matafavor
>  space, perm.

Dynamic panel-data estimation, two-step difference GMM
------------------------------------------------------------------------------
Group variable: code                            Number of obs      =       492
Time variable : year                            Number of groups   =        55
Number of instruments = 32                      Obs per group: min =         0
Wald chi2(6)  =     33.33                                      avg =      8.95
Prob > chi2   =     0.000                                      max =        21
------------------------------------------------------------------------------
             |              Corrected
         lfd |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         lfd |
         L1. |   .2886794   .2151411     1.34   0.180    -.1329894    .7103481
             |
         lse |  -1.556368   .4134173    -3.76   0.000    -2.366651   -.7460847
             |
         lto |
         L3. |  -.1026217   .0672386    -1.53   0.127     -.234407    .0291635
             |
         lti |
         L2. |   .0030281   .0212435     0.14   0.887    -.0386084    .0446646
             |
         lnr |  -.1439074   .0612899    -2.35   0.019    -.2640334   -.0237813
         lhc |  -.2884612   .8856201    -0.33   0.745    -2.024245    1.447322
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(year lnr)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/6).(lfd lse lto lti lnr lhc) collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =   0.07  Pr > z =  0.946
Arellano-Bond test for AR(2) in first differences: z =  -0.81  Pr > z =  0.419
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(26)   =  42.73  Prob > chi2 =  0.021
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(26)   =  23.44  Prob > chi2 =  0.608
  (Robust, but can be weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  iv(year lnr)
    Hansen test excluding group:     chi2(24)   =  22.64  Prob > chi2 =  0.541
    Difference (null H = exogenous): chi2(2)    =   0.80  Prob > chi2 =  0.670
```

Appendix 4.8 One-Step System GMM Result for Developing Countries

```
Favoring speed over space. To switch, type or click on mata: mata set matafavor
>  space, perm.
Dynamic panel-data estimation, one-step system GMM
------------------------------------------------------------------------------
Group variable: code                            Number of obs      =       549
Time variable : year                            Number of groups   =        57
Number of instruments = 39                      Obs per group: min =         1
Wald chi2(6)  =   2723.99                                      avg =      9.63
Prob > chi2   =     0.000                                      max =        22
------------------------------------------------------------------------------
         lfd |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
```

```
         lfd |
         L1. |    .345496   .0209926    16.46   0.000     .3043513    .3866408
             |
         lse |  -.9332551   .0873454   -10.68   0.000    -1.104449   -.7620613
             |
         lto |
         L3. |   .3123137   .0485313     6.44   0.000     .2171941    .4074333
             |
         lti |
         L2. |  -.0184922   .0136101    -1.36   0.174    -.0451674    .0081831
             |
         lnr |  -.0079922   .0088046    -0.91   0.364     -.025249    .0092645
         lhc |  -1.841223   .3679163    -5.00   0.000    -2.562326   -1.120121
       _cons |   12.35275   1.905612     6.48   0.000     8.617823    16.08768
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(year lnr)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/6).(lfd lse lto lti lnr lhc) collapsed
Instruments for levels equation
  Standard
    _cons
    year lnr
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.(lfd lse lto lti lnr lhc) collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -1.76  Pr > z =  0.079
Arellano-Bond test for AR(2) in first differences: z =  -0.40  Pr > z =  0.691
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(32)   = 306.69  Prob > chi2 =  0.000
  (Not robust, but not weakened by many instruments.)

Difference-in-Sargan tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Sargan test excluding group:     chi2(26)   =  71.70  Prob > chi2 =  0.000
    Difference (null H = exogenous): chi2(6)    = 234.99  Prob > chi2 =  0.000
  iv(year lnr)
    Sargan test excluding group:     chi2(30)   = 272.31  Prob > chi2 =  0.000
    Difference (null H = exogenous): chi2(2)    =  34.37  Prob > chi2 =  0.000
```

Appendix 4.9 Two-Step System GMM Result for Developing Countries

```
Favoring speed over space. To switch, type or click on mata: mata set matafavor
>  space, perm.
Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: code                            Number of obs      =       549
Time variable : year                            Number of groups   =        57
Number of instruments = 39                      Obs per group: min =         1
Wald chi2(6)  =    528.19                                      avg =      9.63
Prob > chi2   =     0.000                                      max =        22
------------------------------------------------------------------------------
         lfd |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         lfd |
         L1. |   .4157567   .0341984    12.16   0.000     .3487291    .4827843
             |
         lse |  -1.001386   .1263609    -7.92   0.000    -1.249048   -.7537227
             |
         lto |
         L3. |   .1596466   .0380451     4.20   0.000     .0850796    .2342135
             |
         lti |
         L2. |  -.0080842   .0092461    -0.87   0.382    -.0262063    .0100379
             |
         lnr |  -.0661193   .0248897    -2.66   0.008    -.1149023   -.0173363
         lhc |  -1.792362    .421222    -4.26   0.000    -2.617942    -.966782
       _cons |   12.79912   1.789669     7.15   0.000     9.291432    16.30681
------------------------------------------------------------------------------
Warning: Uncorrected two-step standard errors are unreliable.

Instruments for first differences equation
  Standard
```

```
    D.(year lnr)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/6).(lfd lse lto lti lnr lhc) collapsed
Instruments for levels equation
  Standard
    _cons
    year lnr
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.(lfd lse lto lti lnr lhc) collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -2.14  Pr > z =  0.033
Arellano-Bond test for AR(2) in first differences: z =  -0.73  Pr > z =  0.466
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(32)   = 306.69  Prob > chi2 =  0.000
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(32)   =  21.13  Prob > chi2 =  0.929
  (Robust, but can be weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(26)   =  14.37  Prob > chi2 =  0.968
    Difference (null H = exogenous): chi2(6)    =   6.75  Prob > chi2 =  0.344
  iv(year lnr)
    Hansen test excluding group:     chi2(30)   =  20.48  Prob > chi2 =  0.903
    Difference (null H = exogenous): chi2(2)    =   0.65  Prob > chi2 =  0.724
```

Appendix 4.10 Two-Step Robust System GMM Result for Developing Countries

```
Favoring speed over space. To switch, type or click on mata: mata set matafavor
>  space, perm.
Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: code                            Number of obs      =       549
Time variable : year                            Number of groups   =        57
Number of instruments = 39                      Obs per group: min =         1
Wald chi2(6)  =     99.96                                      avg =      9.63
Prob > chi2   =     0.000                                      max =        22
------------------------------------------------------------------------------
             |              Corrected
         lfd |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         lfd |
         L1. |   .4157567   .0882717     4.71   0.000     .2427473    .5887662
             |
         lse |  -1.001386   .3508717    -2.85   0.004    -1.689082   -.3136896
             |
         lto |
         L3. |   .1596466   .0879448     1.82   0.069    -.0127221    .3320152
             |
         lti |
         L2. |  -.0080842   .0262533    -0.31   0.758    -.0595398    .0433714
             |
         lnr |  -.0661193   .0633999    -1.04   0.297    -.1903808    .0581422
         lhc |  -1.792362   .9682056    -1.85   0.064     -3.69001    .1052863
       _cons |   12.79912   4.996002     2.56   0.010     3.007135     22.5911
------------------------------------------------------------------------------
Instruments for first differences equation
  Standard
    D.(year lnr)
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L(2/6).(lfd lse lto lti lnr lhc) collapsed
Instruments for levels equation
  Standard
    _cons
    year lnr
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL.(lfd lse lto lti lnr lhc) collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -1.65  Pr > z =  0.099
Arellano-Bond test for AR(2) in first differences: z =  -0.71  Pr > z =  0.481
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(32)   = 306.69  Prob > chi2 =  0.000
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(32)   =  21.13  Prob > chi2 =  0.929
```

```
  (Robust, but can be weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(26)   =  14.37  Prob > chi2 =  0.968
    Difference (null H = exogenous): chi2(6)    =   6.75  Prob > chi2 =  0.344
  iv(year lnr)
    Hansen test excluding group:     chi2(30)   =  20.48  Prob > chi2 =  0.903
    Difference (null H = exogenous): chi2(2)    =   0.65  Prob > chi2 =  0.724
```

Appendix 4.11 One-Step Difference GMM Results for Developed Countries

```
Favoring space over speed. To switch, type or click on mata: mata set matafavor
speed, perm.
Instructions for levels equations only ignored since noleveleq specified.

Dynamic panel-data estimation, one-step difference GMM
------------------------------------------------------------------------------
Group variable: code                            Number of obs      =       273
Time variable : year                            Number of groups   =        24
Number of instruments = 7                       Obs per group: min =         1
Wald chi2(6)  =      0.21                                      avg =     11.38
Prob > chi2   =     1.000                                      max =        19
------------------------------------------------------------------------------
         lfd |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         lfd |
         L1. |   4.299696   35.21354     0.12   0.903    -64.71758    73.31697
             |
         lse |   -.328759   10.70329    -0.03   0.975    -21.30681    20.64929
         lto |  -1.939013   18.91731    -0.10   0.918    -39.01627    35.13824
             |
         lti |
         L3. |   .6348072   7.352087     0.09   0.931    -13.77502    15.04463
             |
         lnr |
         L5. |  -.3491141   3.202578    -0.11   0.913    -6.626052    5.927824
             |
         lhc |   -3.33209   51.43331    -0.06   0.948    -104.1395    97.47535
------------------------------------------------------------------------------
Instruments for first differences equation
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L15.(lfd lse lto lti lnr lhc code) collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -0.19  Pr > z =  0.846
Arellano-Bond test for AR(2) in first differences: z =   0.18  Pr > z =  0.854
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(1)    =   0.01  Prob > chi2 =  0.936
  (Not robust, but not weakened by many instruments.)
```

Appendix 4.12 Two-Step Difference GMM Results for Developed Countries

```
Favoring space over speed. To switch, type or click on mata: mata set matafavor
speed, perm.
Instructions for levels equations only ignored since noleveleq specified.

Dynamic panel-data estimation, two-step difference GMM
------------------------------------------------------------------------------
Group variable: code                            Number of obs      =       273
Time variable : year                            Number of groups   =        24
Number of instruments = 7                       Obs per group: min =         1
Wald chi2(6)  =      1.18                                      avg =     11.38
Prob > chi2   =     0.978                                      max =        19
------------------------------------------------------------------------------
         lfd |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         lfd |
         L1. |   4.349484   18.50069     0.24   0.814    -31.91121    40.61017
             |
         lse |  -.0303739     5.5984    -0.01   0.996    -11.00304    10.94229
         lto |  -1.903364   9.404405    -0.20   0.840    -20.33566    16.52893
             |
```

```
         lti |
         L3. |   .6646176   3.740609     0.18   0.859    -6.666842    7.996077
             |
         lnr |
         L5. |  -.3355217   1.751771    -0.19   0.848    -3.768931    3.097887
             |
         lhc |  -2.513738   24.98218    -0.10   0.920    -51.47791    46.45043
------------------------------------------------------------------------------
Warning: Uncorrected two-step standard errors are unreliable.

Instruments for first differences equation
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L15.(lfd lse lto lti lnr lhc code) collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -0.34  Pr > z =  0.736
Arellano-Bond test for AR(2) in first differences: z =   0.24  Pr > z =  0.809
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(1)    =   0.01  Prob > chi2 =  0.936
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(1)    =   0.05  Prob > chi2 =  0.831
  (Robust, but can be weakened by many instruments.)
```

Appendix 4.13 Two-Step Robust Difference GMM Results for Developed Countries

```
Favoring space over speed. To switch, type or click on mata: mata set matafavor
speed, perm.
Instructions for levels equations only ignored since noleveleq specified.

Dynamic panel-data estimation, two-step difference GMM
------------------------------------------------------------------------------
Group variable: code                            Number of obs      =       273
Time variable : year                            Number of groups   =        24
Number of instruments = 7                       Obs per group: min =         1
Wald chi2(6)  =      1.21                                      avg =     11.38
Prob > chi2   =     0.976                                      max =        19
------------------------------------------------------------------------------
             |              Corrected
         lfd |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         lfd |
         L1. |   4.349484   19.71408     0.22   0.825    -34.28939    42.98836
             |
         lse |  -.0303739   5.655721    -0.01   0.996    -11.11538    11.05464
         lto |  -1.903364   10.18657    -0.19   0.852    -21.86868    18.06195
             |
         lti |
         L3. |   .6646176   3.908625     0.17   0.865    -6.996146    8.325382
             |
         lnr |
         L5. |  -.3355217   1.883165    -0.18   0.859    -4.026458    3.355414
             |
         lhc |  -2.513738   26.76042    -0.09   0.925     -54.9632    49.93572
------------------------------------------------------------------------------
Instruments for first differences equation
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L15.(lfd lse lto lti lnr lhc code) collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -0.33  Pr > z =  0.743
Arellano-Bond test for AR(2) in first differences: z =   0.24  Pr > z =  0.814
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(1)    =   0.01  Prob > chi2 =  0.936
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(1)    =   0.05  Prob > chi2 =  0.831
  (Robust, but can be weakened by many instruments.)
```

Appendix 4.14 One-Step System GMM Results for Developed Countries

```
Favoring space over speed. To switch, type or click on mata: mata set matafavor
speed, perm.

Dynamic panel-data estimation, one-step system GMM
```

```
------------------------------------------------------------------------------
Group variable: code                            Number of obs      =       297
Time variable : year                            Number of groups   =        24
Number of instruments = 16                      Obs per group: min =         2
Wald chi2(6)  =    397.14                                      avg =     12.38
Prob > chi2   =     0.000                                      max =        20
------------------------------------------------------------------------------
         lfd |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         lfd |
         L1. |   .9843215   .2423126     4.06   0.000     .5093974    1.459245
             |
         lse |  -.1883198   .4735672    -0.40   0.691    -1.116494    .7398549
         lto |   .1520704    .406368     0.37   0.708    -.6443962     .948537
             |
         lti |
         L3. |   .0226624   .0587787     0.39   0.700    -.0925417    .1378665
             |
         lnr |
         L5. |   .0037537   .0387229     0.10   0.923    -.0721417    .0796491
             |
         lhc |   1.553549   2.208047     0.70   0.482    -2.774143    5.881241
       _cons |   -7.11277   11.09263    -0.64   0.521    -28.85392    14.62838
------------------------------------------------------------------------------
Instruments for first differences equation
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L15.(lfd lse lto lti lnr lhc code) collapsed
Instruments for levels equation
  Standard
    _cons
    lti year
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL14.(lfd lse lto lti lnr lhc code) collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -3.82  Pr > z =  0.000
Arellano-Bond test for AR(2) in first differences: z =   0.45  Pr > z =  0.651
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(9)    =   0.62  Prob > chi2 =  1.000
  (Not robust, but not weakened by many instruments.)

Difference-in-Sargan tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Sargan test excluding group:     chi2(3)    =   0.19  Prob > chi2 =  0.979
    Difference (null H = exogenous): chi2(6)    =   0.43  Prob > chi2 =  0.999
  iv(lti year, eq(level))
    Sargan test excluding group:     chi2(7)    =   0.57  Prob > chi2 =  0.999
    Difference (null H = exogenous): chi2(2)    =   0.05  Prob > chi2 =  0.974
```

Appendix 4.15 Two-Step System GMM Results for Developed Countries

```
Favoring space over speed. To switch, type or click on mata: mata set matafavor
speed, perm.
Warning: Two-step estimated covariance matrix of moments is singular.
  Using a generalized inverse to calculate optimal weighting matrix for two-step
estimation.
  Difference-in-Sargan statistics may be negative.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: code                            Number of obs      =       297
Time variable : year                            Number of groups   =        24
Number of instruments = 16                      Obs per group: min =         2
Wald chi2(6)  =    204.74                                      avg =     12.38
Prob > chi2   =     0.000                                      max =        20
------------------------------------------------------------------------------
         lfd |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         lfd |
         L1. |   1.012533   .0929035    10.90   0.000     .8304455    1.194621
             |
         lse |  -.2781411   .0877795    -3.17   0.002    -.4501858   -.1060965
         lto |   .1823744   .0705825     2.58   0.010     .0440352    .3207136
             |
         lti |
```

```
         L3. |   .0250675   .0085198     2.94   0.003      .008369     .041766
             |
         lnr |
         L5. |  -.0136318   .0107323    -1.27   0.204    -.0346667    .0074031
             |
         lhc |   2.300498   .4643511     4.95   0.000     1.390387     3.21061
       _cons |  -10.47892   2.348163    -4.46   0.000    -15.08123   -5.876604
------------------------------------------------------------------------------
Warning: Uncorrected two-step standard errors are unreliable.

Instruments for first differences equation
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L15.(lfd lse lto lti lnr lhc code) collapsed
Instruments for levels equation
  Standard
    _cons
    lti year
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL14.(lfd lse lto lti lnr lhc code) collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -1.71  Pr > z =  0.087
Arellano-Bond test for AR(2) in first differences: z =   0.76  Pr > z =  0.446
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(9)    =   0.62  Prob > chi2 =  1.000
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(9)    =   6.78  Prob > chi2 =  0.660
  (Robust, but can be weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(3)    =   1.93  Prob > chi2 =  0.587
    Difference (null H = exogenous): chi2(6)    =   4.85  Prob > chi2 =  0.563
  iv(lti year, eq(level))
    Hansen test excluding group:     chi2(7)    =   5.96  Prob > chi2 =  0.545
    Difference (null H = exogenous): chi2(2)    =   0.82  Prob > chi2 =  0.663
```

Appendix 4.16 Two-Step Robust System GMM Results for Developed Countries

```
Favoring space over speed. To switch, type or click on mata: mata set matafavor
speed, perm.
Warning: Two-step estimated covariance matrix of moments is singular.
  Using a generalized inverse to calculate optimal weighting matrix for two-step
estimation.
  Difference-in-Sargan statistics may be negative.

Dynamic panel-data estimation, two-step system GMM
------------------------------------------------------------------------------
Group variable: code                            Number of obs      =       297
Time variable : year                            Number of groups   =        24
Number of instruments = 16                      Obs per group: min =         2
Wald chi2(6)  =    134.92                                      avg =     12.38
Prob > chi2   =     0.000                                      max =        20
------------------------------------------------------------------------------
             |              Corrected
         lfd |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         lfd |
         L1. |   1.012533   .1408413     7.19   0.000     .7364892    1.288577
             |
         lse |  -.2781411   .1449993    -1.92   0.055    -.5623345    .0060522
         lto |   .1823744   .0817727     2.23   0.026     .0221027     .342646
             |
         lti |
         L3. |   .0250675   .0125052     2.00   0.045     .0005577    .0495773
             |
         lnr |
         L5. |  -.0136318   .0138713    -0.98   0.326    -.0408192    .0135555
             |
         lhc |   2.300498   .7454043     3.09   0.002     .8395327    3.761464
       _cons |  -10.47892    3.50321    -2.99   0.003    -17.34508   -3.612752
------------------------------------------------------------------------------
Instruments for first differences equation
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    L15.(lfd lse lto lti lnr lhc code) collapsed
```

```
Instruments for levels equation
  Standard
    _cons
    lti year
  GMM-type (missing=0, separate instruments for each period unless collapsed)
    DL14.(lfd lse lto lti lnr lhc code) collapsed
------------------------------------------------------------------------------
Arellano-Bond test for AR(1) in first differences: z =  -1.69  Pr > z =  0.092
Arellano-Bond test for AR(2) in first differences: z =   0.76  Pr > z =  0.446
------------------------------------------------------------------------------
Sargan test of overid. restrictions: chi2(9)    =   0.62  Prob > chi2 =  1.000
  (Not robust, but not weakened by many instruments.)
Hansen test of overid. restrictions: chi2(9)    =   6.78  Prob > chi2 =  0.660
  (Robust, but can be weakened by many instruments.)

Difference-in-Hansen tests of exogeneity of instrument subsets:
  GMM instruments for levels
    Hansen test excluding group:     chi2(3)    =   1.93  Prob > chi2 =  0.587
    Difference (null H = exogenous): chi2(6)    =   4.85  Prob > chi2 =  0.563
  iv(lti year, eq(level))
    Hansen test excluding group:     chi2(7)    =   5.96  Prob > chi2 =  0.545
    Difference (null H = exogenous): chi2(2)    =   0.82  Prob > chi2 =  0.663
```

Appendix 4.17 Fixed Effect Regression Model for Developed Countries

```
Fixed-effects (within) regression               Number of obs      =       333
Group variable: code                            Number of groups   =        24

R-sq:  within  = 0.4722                         Obs per group: min =         2
       between = 0.0128                                        avg =      13.9
       overall = 0.0021                                        max =        25

                                                F(5,304)           =     54.40
corr(u_i, Xb)  = -0.7796                        Prob > F           =    0.0000

------------------------------------------------------------------------------
         lfd |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         lse |  -.6824004   .1766138    -3.86   0.000    -1.029941     -.33486
         lto |    .196296    .178948     1.10   0.274    -.1558376    .5484296
         lti |  -.0524864   .0390937    -1.34   0.180    -.1294149     .024442
         lnr |   .1914496   .0248864     7.69   0.000     .1424782    .2404209
         lhc |  -3.493482   .6791023    -5.14   0.000    -4.829818   -2.157146
       _cons |   21.44703   3.365488     6.37   0.000     14.82443    28.06963
-------------+----------------------------------------------------------------
     sigma_u |  .68230733
     sigma_e |  .22144052
         rho |  .90470679   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(23, 304) =    39.53             Prob > F = 0.0000
```

Appendix 4.18: Cross-sectional Dependence Test for Developed Countries

```
Cross Sectional Dependence Test for Financial Development
Pesaran (2015) test for weak cross-sectional dependence.
Unbalanced panel detected, test adjusted.

H0: errors are weakly cross-sectional dependent.
        CD = 34.392
   p-value = 0.000

Cross Sectional Dependence Test for Shadow Economy
Pesaran (2015) test for weak cross-sectional dependence.
Unbalanced panel detected, test adjusted.

H0: errors are weakly cross-sectional dependent.
        CD = 18.345
   p-value = 0.000

Cross Sectional Dependence Test for Trade Openness
Pesaran (2015) test for weak cross-sectional dependence.
```

```
Unbalanced panel detected, test adjusted.

H0: errors are weakly cross-sectional dependent.
        CD = 33.224
   p-value = 0.000

Cross Sectional Dependence Test for Technological Innovation
Pesaran (2015) test for weak cross-sectional dependence.
Unbalanced panel detected, test adjusted.

H0: errors are weakly cross-sectional dependent.
        CD = 25.528
   p-value = 0.000

Cross Sectional Dependence Test for Natural Resources
Pesaran (2015) test for weak cross-sectional dependence.
Unbalanced panel detected, test adjusted.

H0: errors are weakly cross-sectional dependent.
        CD = 6.898
   p-value = 0.000

Cross Sectional Dependence Test for Human Capital
Pesaran (2015) test for weak cross-sectional dependence.
Unbalanced panel detected, test adjusted.

H0: errors are weakly cross-sectional dependent.
        CD = 20.068
   p-value = 0.000
```

Appendix 4.19 Foxed Effect Regression Model for Developing Countries

```
Fixed-effects (within) regression               Number of obs      =       580
Group variable: code                            Number of groups   =        58

R-sq:  within  = 0.1912                         Obs per group: min =         2
       between = 0.1915                                        avg =      10.0
       overall = 0.1638                                        max =        25

                                                F(5,517)           =     24.44
corr(u_i, Xb)  = -0.6885                        Prob > F           =    0.0000

------------------------------------------------------------------------------
         lfd |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
         lse |  -1.685599    .206367    -8.17   0.000     -2.09102   -1.280178
         lto |   .3917323   .1400912     2.80   0.005     .1165144    .6669503
         lti |  -.0476344   .0362584    -1.31   0.190    -.1188663    .0235976
         lnr |  -.2028635   .0702982    -2.89   0.004    -.3409688   -.0647583
         lhc |    .854696   .4548084     1.88   0.061    -.0388039    1.748196
       _cons |   4.444937   2.250401     1.98   0.049     .0238821    8.865992
-------------+----------------------------------------------------------------
     sigma_u |  .69961185
     sigma_e |  .35592516
         rho |  .79439279   (fraction of variance due to u_i)
------------------------------------------------------------------------------
F test that all u_i=0:     F(57, 517) =    19.06             Prob > F = 0.0000
```

Appendix: 4.20 Cross-sectional Dependence Test for Developing Countries

```
Cross Sectional Dependence Test for Financial Development
Pesaran (2015) test for weak cross-sectional dependence.
Unbalanced panel detected, test adjusted.

H0: errors are weakly cross-sectional dependent.
        CD = 70.680
   p-value = 0.000

Cross Sectional Dependence Test for Shadow Economy
Pesaran (2015) test for weak cross-sectional dependence.
```

```
Unbalanced panel detected, test adjusted.

H0: errors are weakly cross-sectional dependent.
        CD = 65.339
   p-value = 0.000

Cross Sectional Dependence Test for Trade Openness
Pesaran (2015) test for weak cross-sectional dependence.
Unbalanced panel detected, test adjusted.

H0: errors are weakly cross-sectional dependent.
        CD = 69.739
   p-value = 0.000

Cross Sectional Dependence Test for Technological Innovation
Pesaran (2015) test for weak cross-sectional dependence.
Unbalanced panel detected, test adjusted.

H0: errors are weakly cross-sectional dependent.
        CD = 71.530
   p-value = 0.000

Cross Sectional Dependence Test for Natural Resources
Pesaran (2015) test for weak cross-sectional dependence.
Unbalanced panel detected, test adjusted.

H0: errors are weakly cross-sectional dependent.
        CD = 72.341
   p-value = 0.000

Cross Sectional Dependence Test for Human Capital
Pesaran (2015) test for weak cross-sectional dependence.
Unbalanced panel detected, test adjusted.

H0: errors are weakly cross-sectional dependent.
        CD = 69.819
   p-value = 0.000
```