

Measuring the Shadow Economy in the ASEAN Nations: The MIMIC Approach

Duc Hong Vo^{1,2} & Thinh Hung Ly²

¹ Economic Regulation Authority, Perth, Australia

² Open University of Ho Chi Minh City, Vietnam

Correspondence: Duc Hong Vo, Economic Regulation Authority, Perth, Australia. Tel: 618-6557-7900. E-mail: Duc.Vo@erawa.com.au

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Abstract

The purpose of this empirical study is to estimate the size of the shadow economy and its trend for countries in the Association of the South East Asian Nations (ASEAN), except Singapore and Brunei, for the period from 1995 to 2014. While other approaches, which can be used for the same purpose, such as a monetary demand approach or an electricity consumption approach only focus on one indicator/factor, an extensive economic literature review indicates that the shadow economy is affected by various factors such as production, labour and monetary market. In this study, a MIMIC approach is adopted to estimate the size of the shadow economy and its trend for the ASEAN nations including Vietnam. The findings from this study indicate that the shadow economy of Viet Nam lies between 25 per cent and 30 per cent of the official economy for the period from 1995 to 2014, given the base year estimate of 15.8 per cent in 1999 being adopted. A deep concern is that this size of the shadow economy in Vietnam has been on a rise at a more significant level over the last 20 years, from 1995 to 2014 in comparison with other countries in the sample. Findings from this study also present evidence that tax rate, labour freedom, and business freedom have provided significant effect to the shadow economy of the ASEAN countries. Implications for macroeconomic policies in Vietnam, in particular, and for other ASEAN nations, in general, are that reducing the shadow economy of the ASEAN nations requires a larger degree of labour and business freedom. In addition, the government may also need to consider lowering the tax rate in the economy.

Keywords: shadow economy, size, trend, MIMIC approach, ASEAN

1. Introduction

Measuring a shadow economy is a complicated issue because activities from businesses and individuals in this shadow sector are hidden. However, policymakers do need to estimate the size of the shadow economy to formulate an effective economic policy taking into account the presence of a shadow sector. Moreover, size and trend of the shadow economy should be taken into consideration in economic policies to ensure that this shadow sector is kept under control. As such, measuring the shadow economy is an unavoidable task.

The presence of the shadow economy is unavoidable regardless of the level of economic development of a country. In particular, for developing countries such as most of the ASEAN economies, the presence of the shadow economy heavily affects tax collection which is very limited in those countries. In addition, the presence of a shadow economy affects the validity and enforcement of the national legal system.

While many researches have been conducted in developed nations, empirical studies designed for the ASEAN nations are very limited. A direct comparison of the shadow economy of Vietnam and those of other comparable countries in the region is important to provide the Government of Vietnam with an empirical evidence in the process of formulating laws and regulations. This study is conducted to fill in this gap.

2. A MIMIC Approach

Among various approaches which can be used to estimate the size of the shadow economy, a MIMIC approach is classified as a model approach which can be used to estimate the size and the trend of the shadow economy. While some methods such as a *monetary demand approach* or an *electricity consumption approach* only focus on one indicator to estimate the size of the shadow economy, an extensive economic literature review indicates

that the shadow economy is influenced by various factors such as production, labour and monetary market. This approach focuses on causes and consequences of the shadow economy simultaneously. This approach is based on the DYMIC (dynamic multiple-indicators multiple-causes) model which includes two different models: (i) *measurement model* which is used to link observable indicators to the size of the shadow economy; and (ii) *a structural equation model* which is used to present the link between causes and consequences among various indicators. An extensive literature research indicates that three causes lead to the presence of the shadow economy: (i) *taxation burden* (Tanzi, 1999; Schneider & Enste, 2000); *constitution, regulation* (Schneider & Enste, 2000; Johnson, Kaufmann, & Andrei, 1997; Friedman, Johnson, Kaufmann, & Zoido-Lobaton, 1999); and *morality of taxation*. In addition, three consequences arise when the shadow economy cannot be well managed: (i) *an increase in money supply*; (ii) *effects to the labour market*; and (iii) *effects to production market* (Loayza, 1996). This model approach is argued to be a more comprehensive approach than other previous models. However, a limitation of this approach is that it requires a large amount of data which may not be available in the developing countries.

In this study, a MIMIC model is adopted—a type of the structural equations model (SEM) to estimate the size of the shadow economy for ASEAN nations, including Vietnam. A key contribution of the SEM is to link and investigate the relationship between latent variables and observable variables by using the covariance matrix. In the MIMIC model, a shadow economy is an unobservable variable which can be analysed based on observable variables. For this purpose, first of all, a variable representing a shadow economy is linked to observable variables in the factor analytical model, or to be named *a measurement model*. After that, a relationship between a variable proxied for a shadow economy and explanatory variables is determined using *the structural equation model*. As such, a MIMIC model is to use both models including factor model and a structural equation model.

A structural equation model can be expressed as below:

$$\eta = \gamma'X + \zeta \quad (1)$$

where: $X = (x_1, x_2, \dots, x_q)$ is a $(q * 1)$ vector and each $x_i, i = 1, \dots, q$ is a potential cause of the latent variable η and $\gamma' = (\gamma_1, \gamma_2, \dots, \gamma_q)$ is a $(1 * q)$ vector of coefficients describing the relationships between the latent variable and its causes. As such, the latent variable η is determined by a set of exogenous causes.

A measurement model can be expressed as below:

$$y = \lambda\eta + \varepsilon \quad (2)$$

Where: $y = (y_1, y_2, \dots, y_p)$ is a $(p * 1)$ vector of several indicator variables. λ is the vector of regression coefficients, and ε is a $(p * 1)$ vector of white noise disturbances.

When equations (2) and (3) are combined, a multivariate regression model is formed in which endogenous variables $y_j, j = 1, \dots, p$ are *indicator variables* of a shadow economy variable η and exogenous variables $x_i, i = 1, \dots, q$ are *cause variables* of a shadow economy variable η . A general equation can be expressed as below:

$$\text{From (3)} \Leftrightarrow \eta = \lambda^{-1}(y - \varepsilon),$$

From (2) and (3):

$$\begin{aligned} \gamma'X + \zeta &= \lambda^{-1}(y - \varepsilon) \\ \Leftrightarrow y &= \lambda\gamma'X + \lambda\zeta + \varepsilon \\ \Leftrightarrow y &= \Pi X + z \end{aligned} \quad (3)$$

For simplicity, Figure 1 below presents a general structure of the MIMIC model.

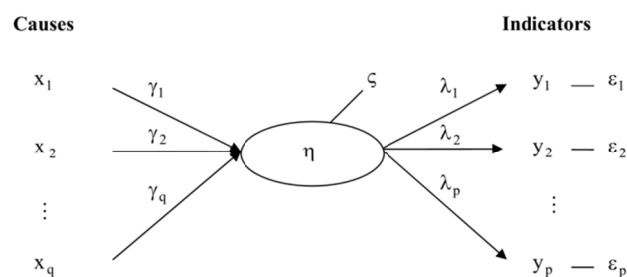


Figure 1. General structure of a MIMIC model

In summary, a MIMIC approach to estimating the shadow economy is to determine a hypothesis on a relationship between shadow economy (latent variable) and observable variables including causes and indicators. However, this approach is only to produce a *relative estimate* of the size of the shadow economy in comparison with a shadow economy at base value in a particular *base year*. As a result, this study will use benchmarking to estimate an absolute value of the shadow economy from this relative estimate.

3. Causes Affecting the Shadow Economy

Literature presents the following causes which affect significantly to the size of the shadow economy.

3.1 Tax and Social Security Contribution Burdens

In previous empirical studies, one of the most important and significant causes for an existence and growth of a shadow economy is an increase in tax and social security contribution burdens (Tanzi 1999; Schneider & Enste, 2000). A higher a tax rate, a lower a *morality of taxation*; encouraging people working in a shadow economy to evade taxes (Torgler & Schneider, 2009; Alm & Torgler, 2006; Alm, Martinez, & Torgler, 2006). Various studies concluded that a higher a net income in the (official) economy, a lower a level of labour joining a shadow economy. In addition, a gap between gross income and net income increases, more and more people will join to work in a shadow economy. As such, it is argued that a difference between a gross income and a net income depending heavily on tax and social security contribution burdens. In this study, a tax burden and a social security contribution burden are used as proxies for causes of a shadow economy for the ASEAN countries.

- *A tax rate*: a tax rate is used to determine a tax liability to be paid to the government.
- *A fiscal freedom index*: this index measures directly an extent to which regulations from the government affect individuals and businesses in the economy. This index is one of many indices calculated and made it available to the public by the Heritage Foundation. The index varies within the range from 0 and 100 in which 0 represents a lowest level of a fiscal freedom and 100 represents for a highest level of the freedom (Heritage Foundation, 2014).

3.2 Intensity of Regulation

Schneider and Enste (2000) argued that an increase in intensity of regulation will reduce choices for individuals in the official economy (Note 1). An intensity of regulations generally measures a number of regulations, required certificates to work or operate, regulations for a labour market. In Germany, Deregulation Commission (1991) and Monopol-kommission (1998) concluded that various regulations from the government contribute to the cost for labour in the official economy. In response to these increases in labour costs, businesses will reduce a number of jobs required for their businesses. As a result, workers join a shadow economy where these costs can be avoided. A model developed by Johnson, Kaufmann and Andrei Shleifer (1997) predicts that, inter alia, countries with more general regulation applied to economic activities in their economies tend to have a higher share of the unofficial economy in the total GDP. A study by Friedman, Johnson, Kaufmann and Zoido-Lobaton (1999) provides the same conclusion.

On the ground of previous studies, two variables representing as causes of a shadow economy are adopted in this study to represent an intensity of regulations across countries in ASEAN:

- *A business freedom index*: this index measures an extent to which individuals can establish and run a business without heavily reported to the government. Unnecessary and unreasonable regulations will no doubt increase costs for businesses. These regulations will play as a barrier for business activities to enter into the official economy. These regulations will increase costs and as a result, products and services provided by businesses in the official economy become less competitive in the market place. This index also varies within the range of 0, being the lowest level, and 100, being the highest level of a freedom (Heritage Foundation, 2014).
- *A labour freedom*: this index measures an extent to which individuals can work anywhere without any regulations from the government. This index is considered one of the most important indices developed by the Heritage Foundation. It is argued that when a labour freedom increases, businesses will have more capacity to offer jobs to workers. As a result, an unemployment rate is expected to be lower. This is an important mechanism to improve productivity and to ensure economic growth for a nation because labour market is as important as a good and service market (Heritage Foundation, 2014).

3.3 Public Sector Services

A study by Johnson, Kaufmann and Zoido-Lobaton (1998) indicates that an increase in a size of a shadow economy will be associated with a loss of government revenue. In return, a quantity and quality of public goods and services provided are lower. To ensure a quality and quantity of public goods and services being provided to

the economy, an increase in tax on the official sector is expected. This increase in tax burdens will result in an increase of economic activities taking place in the shadow economy and individuals and businesses have now more incentive to join the unofficial economy. This study also presents evidence to support the view that a smaller size of the shadow economy is in relation with a country with a large revenue collection, lower intensity of regulations, and lower level of bribe and corruption.

As such, on a ground of this study, *government spending* is used as an indicator to represent a capacity of a government in providing public goods and services. *Government spending* measures a total spending of a government in comparison with total expenditure of the national economy which generally includes public and private spending. Government spending can be classified into different categories: government investment (infrastructure, research funds or human capital investment) and provision of public goods and services. The Heritage Foundation also produces the index representing a level of government spending across nations. As usual, this index varies within the range of 0 and 100 (Heritage Foundation, 2014).

3.4 The Official Economy

It is argued that a prevailing condition of the official economy will determine the choice of individuals and businesses to join a shadow economy or an official economy (Bajada & Schneider, 2005; Feld & Schneider, 2010). In an economic expansion period where individuals can find jobs easily within the official economy, they have no incentive to join a shadow economy. However, this choice may not be available when the economy faces its down turn. Individuals may decide to join a shadow economy to find work. On the ground of this consideration, *an unemployment rate* will be used in this study.

4. Consequences of the Shadow Economy

A size of a shadow economy cannot be directly measured. As such, the approach adopted in this study is to link some observable variables with the size of a shadow economy. Based on previous empirical studies, some indicators below are used in this study.

4.1 Money Market

A money market is considered through some indicators such as total money supply into the economy. A money supply M_0 represents a level of the monetary base (cash which can be spent instantly) and M_1 represents a total of a money supply M_0 and deposits. Individuals and businesses joining a shadow economy generally avoid using transactions through banks because their activities may be noticed by the government. As a result, cash is a preferred means of settlement for transactions in the shadow economy.

4.2 Labour Market

A labour market index is used to measure a ratio of people joining a labour force. This is an index to represent a proportion of total population joining in economic activities to produce and provide goods and services in a specified period of time (World Bank, 2014).

4.3 Tax Revenue

A tax revenue for any government is a total of compulsory collections from individuals and businesses in the form of tax. For any government, a tax revenue is one of the most important factors for the government to determine a level of goods and services provided to the economy. Empirical studies indicate that a presence of a shadow economy will negatively affect tax collection for the government. As such, tax revenue is used as a proxy for a consequence of a shadow economy in this study.

4.4 An increase of GDP per Capita

It is argued that economic activities taking in a shadow economy will contribute to the official economy. Money earned from activities taking place in a shadow sector is argued to be spent in the official sector. As such, an increase of GDP per capita will be used as an index to measure an effect from the shadow economy to the official economy.

5. Data and Research Methodology

This study uses data for countries with low and average GDP per capita in the ASEAN nations including: Vietnam, Laos, Cambodia, Indonesia, Malaysia, Thailand, Myanmar and the Philippines for the period from 1995 to 2014. Singapore and Brunei are not included in the sample because these two countries are at a high income level. East Timor is not included in the sample because of missing data for the research period. A MIMIC model is adopted in this study which can be illustrated as Figure 2 below.

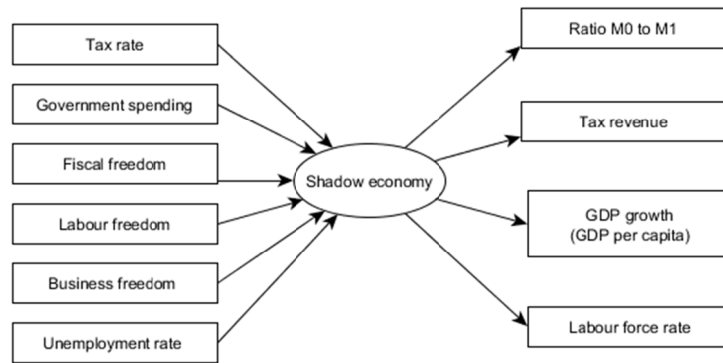


Figure 2. A model to estimating the shadow economy—a MIMIC approach

In this study, cause variables causing shadow economy are called the exogenous variables whereas indicator variables of the shadow economy are called endogenous variables. Table 1 and table 2 present a summary of statistics for cause variables and indicator variables.

Table 1. A summary of statistics for cause variables

	Business freedom	Fiscal freedom	Tax rate (% of revenue)	Government spending	Labour freedom	Unemployment rate (% of population)
Mean	54.14	76.64	37.59	87.65	55.3	4.28
Median	55	77.65	37.5	89.3	53.8	3.84
Maximum	85.6	91.7	52.7	98.7	79.3	11.82
Minimum	20	32.2	21.4	66.5	20	0.1
Std. Dev.	15.07	11.8	8.79	6.35	16.88	2.85
Skewness	-0.12	-2.02	-0.09	-0.77	-0.72	0.84
Kurtosis	2.77	8.21	2.680	3.37	2.87	3.01
Jarque-Bera	0.73	290.69	0.94	17.04	14.15	18.97
Observations	160	160	160	160	160	160

Source: Authors' calculations.

Table 2. A summary of statistics for consequences variables

	Growth of GDP per capita (%)	Money supply ratio M0/M1 (%)	Labour force rate (% population)	Tax revenue (% GDP)
Mean	8.27	12.24	73.67	10.21
Median	9.36	0.54	76.2	11.77
Maximum	45.18	96.96	85.8	19.75
Minimum	-56.39	0.19	59.1	0
Std. Dev.	12.67	31.12	7.88	5.64
Skewness	-1.23	2.27	-0.22	-0.59
Kurtosis	8.27	6.15	1.76	2.15
Jarque-Bera	226.17	204	11.53	14.16
Observations	160	160	160	160

Source: Authors' calculations.

6. Findings

Once the MIMIC model is used to measure the size of the shadow economy, the estimated coefficients are presented as below:

Table 3. Estimated coefficients

<i>Cause variables</i>	
Tax rate (Note 2)	1
Fiscal freedom	0.124 (2.596)***
Government spending	-0.131 (2.909)***
Labour freedom	-0.453 (4.865)***
Business freedom	-0.444 (6.097)***
Unemployment rate	-0.338 (6.876)***
<i>Indicator variables</i>	
Money supply ratio M0/M1 (Note 3)	1
Tax revenue	-0.988 (11.391)***
Growth of GDP per capita	0.172 (2.129)**
Labour force rate	0.768 (9.203)***
<i>Goodness-of-fit statistics</i>	
RMSEA (p-value)	0.037 (0.96)
Chi-square (p-value)	482.085 (0.00)
Observations	160
Degrees of freedom	21

Note. *** p < 0,01; ** p < 0,05; * p < 0,10.

Source: Authors' calculations.

These estimated coefficients are then substituted into *the structural equation* (1), the following equation is achieved to measuring the shadow economy for the ASEAN nations:

$$\tilde{\eta}_t = x_{1t} + 0.124 * x_{2t} - 0.131 * x_{3t} - 0.453 * x_{4t} - 0.444 * x_{5t} - 0.338 * x_{6t} + \zeta, \quad (4)$$

It is noted that only a relative size of the shadow economy is estimated when the MIMIC model is adopted. As a result, an absolute level representing for the shadow economy must be estimated based on the comparison with its level at a base value. The technique in which the relative level is converted into the absolute level of the shadow economy is called benchmarking. There are various techniques to benchmarking. It is expected that the absolute level of the shadow economy given the same relative level of the shadow economy will be different when different benchmarking techniques are adopted. There is no theory to guide the benchmarking technique which should be followed. This study follows the benchmarking adopted in Schneider (2010) which is widely used in other empirical studies on shadow economy. The shadow economy of the ASEAN nations at a base year in Schneider (2010) is presented as below.

Table 4. Size of the shadow economy of the ASEAN nations in 1999

Country	Size of the shadow economy in 1999 (%GDP)
Vietnam	15.8
Cambodia	50.4
Indonesia	19.3
Laos	30.9
Malaysia	31.7
Thailand	52.9
The Philippines	43.8
Myanmar	51.9

Source: Schneider (2010).

In this study, base value is the year of 1999 which was adopted to estimate the shadow economy for 162 nations for the period from 1999–2007 using MIMIC. This is the first study in which all ASEAN nations were included in the sample. In this study by Schneider (2010), Vietnam had a lowest level of the shadow economy in 1999 in comparison with other ASEAN countries. Thailand had the highest level of the shadow economy of 52.9 per cent of its GDP in 1999.

An absolute level which is converted from the relative level of the shadow economy $\hat{\eta}_t$ at time t is defined as

follows:

$$\widehat{\eta}_t = \frac{\widetilde{\eta}_t}{\widetilde{\eta}_{1999}} \eta_{1999}^* \tag{5}$$

In which, $\widetilde{\eta}_t$ is a relative index of the shadow economy at time t which is estimated using the MIMIC approach, $\widetilde{\eta}_{1999}$ is a relative index of the shadow economy at base value 1999 and η_{1999}^* is an estimate based on estimated coefficients from equation (3).

For example, once values x_i ($i = 1, \dots, 6$) are *tax rate, fiscal freedom, government spending, labour freedom, business freedom and unemployment rate* for Vietnam in 2013 and base year 1999 are substituted into equation (4):

$$\begin{aligned} \widetilde{\eta}_{1999}(VN) &= 39.9 + 0.124 * 43 - 0.131 * 81.4 - 0.453 * 64.1 \\ &\quad - 0.444 * 40 - 0.338 * 6.74 = -14.51. \end{aligned} \tag{6}$$

$$\begin{aligned} \widetilde{\eta}_{2013}(VN) &= 35.2 + 0.124 * 75.6 - 0.131 * 72.4 - 0.453 * 65.5 \\ &\quad - 0.444 * 63.8 - 0.338 * 4.46 = -24.42. \end{aligned} \tag{7}$$

From equations (6) and (7), substitute $\widetilde{\eta}_{2013}(VN) = -24.42$ and $\widetilde{\eta}_{1999}(VN) = -14.51$ into equation (5), with $\eta_{1999}^* = 15.8$ (Schneider, 2010). We have:

$$\widehat{\eta}_{2013} = \frac{\widetilde{\eta}_{2013}}{\widetilde{\eta}_{1999}} \eta_{1999}^* = 26.6 (\%GDP) \tag{8}$$

The value $\widehat{\eta}_t$ can be positive (+) or negative (-) depending on estimated coefficients from equation (4) and data for year t . However, by design, values of various $\widehat{\eta}_t$ will have the consistent signs (positive or negative) across years during the research period. As a result, the absolute value of the shadow economy will also be a positive number.

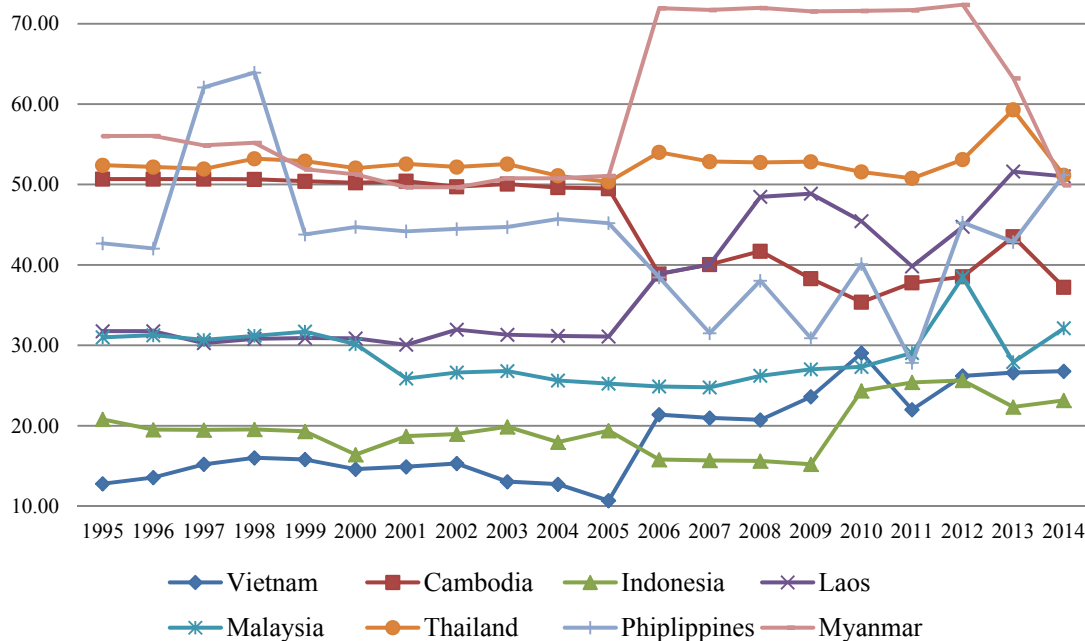


Figure 3. Shadow economy (%GDP) of the ASEAN nations

Source: Authors' calculations.

In the base year 1999, Vietnam had a smallest level of the shadow economy compared with all other ASEAN nations based on Schneider (2010). It is noted that the size of the shadow economy of the ASEAN nations in this study heavily depends on the size of their shadow economy in base year 1999 which was estimated in Schneider (2010). The choice of Schneider (2010) study for the base value of the shadow economy of the ASEAN nations is arbitrary. However, it is noted that the other widely used approach, a monetary demand approach developed

by Tanzi also assumed that the size of the shadow economy at base year is 0, which is probably wrong. As a result, in measuring how sensitive the estimate of the shadow economy is during the period from 1995 to 2014 for the ASEAN nations, it is assumed that the shadow economy for each and every one nation of the ASEAN nations will be the same with the size of the shadow economy of Vietnam at base year 1999, which is 15.8 per cent (the shadow economy for Vietnam in 1999 based on Schneider 2010). In this case, the size of the shadow economy for all countries of the ASEAN nations for the period from 1995 to 2014 is presented below. It is noted that, with this assumption, Vietnam has the largest shadow economy of 27 per cent in 2014.

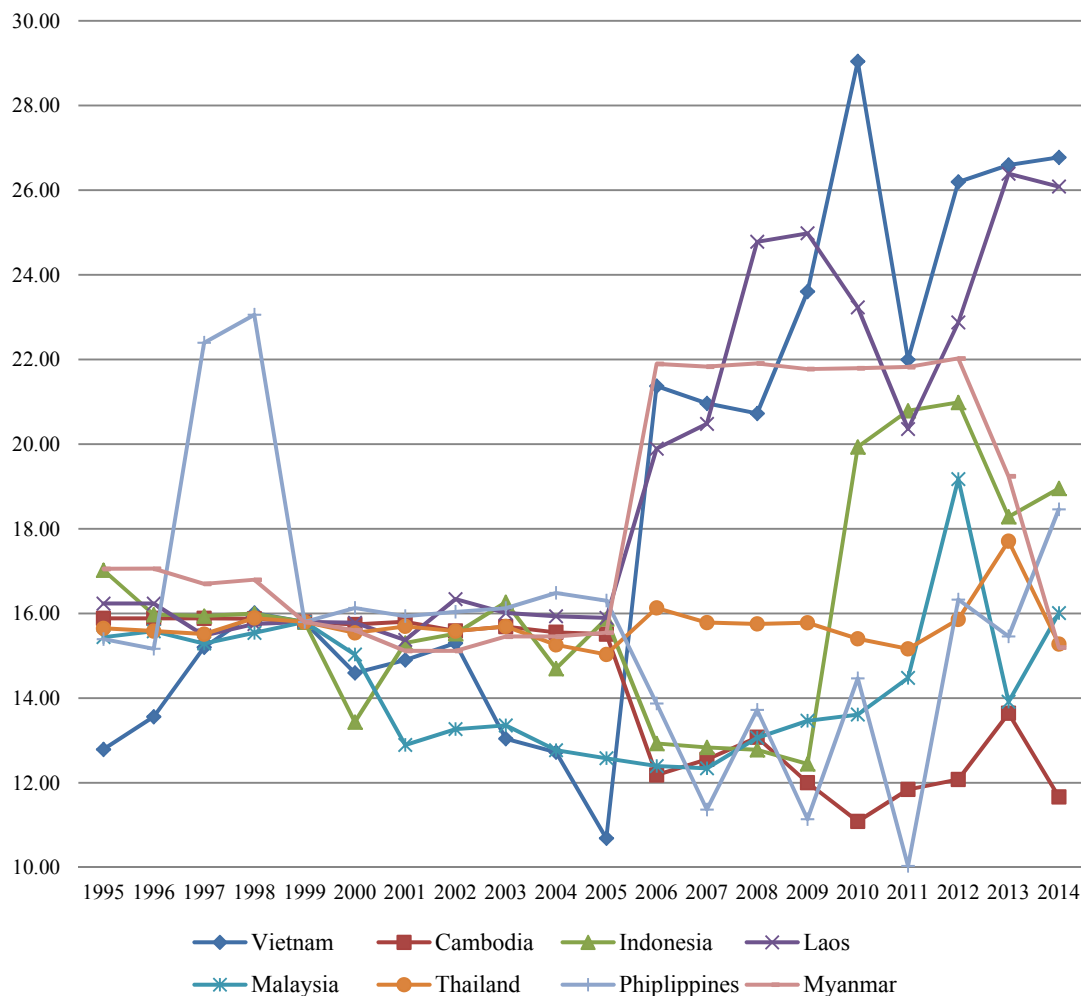


Figure 4. Shadow economy (%GDP) of all ASEAN nations, 1995–2014 using the assumed value of 15.8 per cent in 1999

Source: Authors' calculations.

7. Concluding Remarks and Policy Implications

An existence and growth of the shadow economy is unavoidable regardless of a level of economic development for any nation. Over the last 20 years, the size of the shadow economy of the ASEAN nations have generally increased.

Using the MIMIC approach to estimating the shadow economy, the size of the shadow economy of Vietnam is relatively low in comparison with other countries in ASEAN. However, this result should be interpreted with caution. The reason for this view is that the estimates of the shadow economy heavily depends on the assumed size at the base year of 1999 which was estimated in Schneider's study in 2010. When the same size of the shadow economy in the base year of 1999 is assumed, Vietnam has had the largest shadow economy among all ASEAN nations in 2014. This finding confirms that Vietnam's shadow economy has increased more

significantly than any other ASEAN nations over the period from 1995 to 2014.

In relation to the relationship between causes and size of the shadow economy, this study provides evidence to confirm that *labour freedom* and *business freedom* are important to reduce the size of the ASEAN shadow economy. The relationship is negative. As a result, reducing the shadow economy of the ASEAN nations requires a larger degree of labour and business freedom. In addition, the government may also need to consider to improve the unemployment rate and to lower the tax rate in the economy. Empirical evidence from this study also confirms that high tax rate is one of the fundamental factors which leads to an increase of the shadow economy of the ASEAN nations over the last three decades, 1995 to 2014. An interesting result from this study is that lowering unemployment rate is not enough to ensure a lower level of the shadow economy. Policies target to improve workers' income and/or to decrease burdens on workers are necessary. As a result, a system of consistent regulations on freedom for labour and business, together with a fair tax system, is required to ensure that the growth of the shadow economy can be under control for a better prospect of an economic growth and development of the official economy.

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Notes

Note 1. Schneider và Enste (2000) uses the multidisciplinary approach.

Note 2. The tax rate variable is assuming positive relationship with shadow economy.

Note 3. According to the MIMIC models identification rule, one indicator has to be fixed to an a priori value. We choice the *ratio* M_0 to M_1 variable with respect to existing empirical investigations in the literature.

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