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Shadow Economy in Malaysia: A State Level Analysis

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ABSTRACT

Literature on the estimation of the size of shadow economy at national level is well studied. However, estimation of the size of shadow economy at state level is still scarce. This study attempts to estimate the size of shadow economy to state GDP ratio for the states of Malaysia by employing the Multiple – Indicators – Multiple – Causes (MIMIC) model using panel data from 13 states of Malaysia from 2006 to 2013. Additionally, the relationship between size of state shadow economy and other state level variables was investigated and analysed. Several findings were obtained. First, rural population and rural labour play significant roles in contributing to the development of shadow economy in the states of Malaysia. Second, smaller and more advanced states have smaller shadow economy to state GDP ratio, while the two East Malaysia states, Sabah and Sarawak, are by far the states with the largest shadow economy to state GDP ratio among all Malaysia states. Third, shadow economy is positively affected by crime index and primary sector productions, and negatively affected by state GDP growth. State shadow economy decreases if the state is ruled by opposition party. This study suggests better regulations in rural economy, rural labour, criminal activities and primary sector contributions to reduce shadow economy activities in the states of Malaysia.

Keywords: Malaysia, MIMIC, state shadow economy

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INTRODUCTION

Estimation on the size of shadow economy has been well studied using various methods. Most of these studies focus on the estimation of ratio of shadow economy to GDP at national level[1] using various direct and

[1]Refer Schneider and Enste (2002), Giles (1999a) among others

indirect estimation techniques. However, to date, very few studies have focused on estimating the size of shadow economy at state level. This is due to reasons such as lack of available data, lack of appropriate estimation techniques, lack of research interest and also problems in identifying causes attributable to the determination of shadow economy at state level.

Since 1957, Malaysia's poverty rate has reduced from 50% to 0.6% in 2014[2], while GDP per capita has increased from about USD 250 to USD 10933, a year-on-year increase of over 73%. Despite that, around 55%t of the population and 78% of the rural population earn less than USD 1250, about one ninth of the per capita income.[3]

It is important to note that the economic structure of the states in Malaysia is vastly different. According to the official data from the Department of Statistics Malaysia from 2006 to 2013, Pulau Pinang had the highest average annual per capita GDP at RM44,847, followed by Sarawak at RM44,012 and Selangor at RM42,611. Kelantan had the lowest average annual per capita GDP at RM12,075 followed by Kedah at RM18249 and Sabah at RM19,734. Melaka, Pulau Pinang and Selangor are the states with the lowest unemployment rate at 7%, 17%and 25%, respectively, while Sabah, Perak and Sarawak are the states with the highest unemployment rate at 52%, 39% and 38%, respectively. A similar scenario also applied to the ratio of low-skilled labours to total labour force. Selangor, Melaka and Penang are the states with the lowest ratio of low-skilled labours at 11.4%, 13.7% and 13.9%, respectively, while Sabah, Sarawak and Pahang ranked the worst for low-skilled labour at 37.6%t, 30% and 23.1%, respectively. As for the ratio of rural population to overall population, Selangor, Pulau Pinang and Melaka were the states with the lowest ratio of rural population with 7.3%, 15.5% and 15.7%, respectively, while Sarawak, Kelantan and Sabah were the states with the highest ratio of rural population at 64.8%, 59.4% and 53.1%, respectively.

This study aimed to determine the size of state level shadow economy (ratio to state GDP) of the states of Malaysia. Its relationships with other economic variables would be studied once the size of shadow economy had been obtained.

The size of global shadow economy is still relatively high. Hassan and Schneider (2016) estimated that the average size of the global shadow economy in 2013 was at 35.45%. Schneider (2012) estimated that the average size of the global shadow economy in 2007 was at 29.6%. Elgin and Oztunali (2012) estimated the size of the global shadow economy at 30.9% in 2008, while Alm and Embaye (2013) estimated the size of the global shadow economy at 31.01 percent in 2006. Such research showed that around 30% of the world economy was operating in the shadow.

[2]http://www.themalaymailonline.com/malaysia/article/poverty-rate-down-to-0.6pc-parliament-told

[3]Latest (2014) data from Economic Planning Unit

For Malaysia, Hassan and Schneider (2016) estimated that the size of shadow economy in 2013 was at 37.35%, while Schneider (2012) estimated the size of shadow economy was at 29.6% in 2007. Meanwhile, Elgin and Oztunali (2012) estimated the size of shadow economy in Malaysia at 29.34% in 2008, and Alm and Embaye (2013) estimated the size of shadow economy in Malaysia at 30.7% in 2006. The average size of shadow economy stood at around 30% in the period from 2006 to 20013, very similar to the world average.

According to the official informal employment information by the Department of Statistics of Malaysia in 2013, 1.3 million labours or 9.7% of total labour force in Malaysia engaged in shadow economy activities, an increase of 1.5% from the previous year. Nonetheless, such shadow economy ratio was much smaller than previously estimated by Schneider and Enste (2000), Abdul (2001), OECD (2002), Schneider (2012), Hassan and Schneider (2016), etc. State-wise, nominally, Selangor contributed the highest informal labours at 15.2%, followed by Johor at 11.8% and Sabah at 11.5%.

The first regional informal economy estimation was done by Williams and Windebank (1998) using direct approach. As expected, they found that households with no income earner were more likely to accept shadow works and high income group was more likely to supply the opportunity of shadow activities.

The first literature in the state-level shadow economy estimation using the MIMIC approach was done by Chaudhuri, Schneider, and Chattopadhyay (2006) on the states of India. Unlike the national level estimation, they used state GDP growth rate and total employees in the manufacturing industries as their indicator variables. Causes selected were state budgetary variables such as ratio of capital account developmental expenditure to state GDP, ratio of capital account non-developmental expenditure to state GDP and state revenue (tax and non-tax).

Besides that, to date, only two other literature studied the state-level estimation of size of shadow economy. Buehn (2012) used state (GDP) growth rate and new entrepreneurial activities as his indicators in determining the size of shadow economy in German regions. Causes selected were municipality trade tax rate, enforcement of tax rules and regulations, change of state government, share of low-skilled labour, unit labour cost, unemployment rate, patent density, new business registration, average distance to next high-order central place, and disposable per capita income.

Meanwhile, Herwartz, Tafenau, and Schneider (2015) employed the same variables used by Dell'Anno, Gómez-Antonio and Pardo (2007) in their state-level estimation of the European Union region (NUTS2), real GDP per capita and labour force participation ratio. For that purpose, they selected direct and indirect taxes, social

security distribution, unemployment rate and self-employment ratio as their causes.

MATERIALS AND METHODS

Annual data on all 13 states of Malaysia from 2006 to 2013 were gathered for this study[4]. State budgetary data were obtained from the state annual audit reports from the National Audit Department under the Ministry of Finance Malaysia. Unemployment rate and other labour market data, as well as data on rural population, rural labours, state primary sector productions, and state GDP growth were obtained from the Department of Statistics Malaysia, while state crime index was obtained from the Royal Malaysia Police (PDRM).

This study used the Multiple–Indicators–Multiple Causes (MIMIC) method to estimate the size of shadow economy in the states of Malaysia. It consists of structural equations and measurement equations. The structural equation defines the relationship between the selected causes and the latent variable (size of state level shadow economy). It is given by:

$$\eta = \gamma' x + \zeta \qquad [1]$$

where η is the latent variable (size of state shadow economy), γ is (q×1) vector of parameters describing the relationships between the shadow economy, η, and its causes $x = (x1, x2, \ldots xq)$, while ζ is (q×1) vector of the random errors.

The measurement equation defines the relationship between the latent variable and the selected indicators. It is given by:

$$y = \lambda \eta + \epsilon \qquad [2]$$

Where, $y = (y_1, y_2, \ldots, y_p)$ is a vector of indicators of the shadow economy (η), λ is (p×1) vector of parameters describing the relationships between the latent variable and its indicators, and ϵ is a (p×1) scalar of random errors.

By substituting [1] into [2], we can get:

$$y = \lambda(\gamma' x + \zeta) + \epsilon$$
$$= \Pi x + v \qquad [3]$$

Where, $\Pi = \lambda\gamma'$, $v = \lambda\zeta + \epsilon$

As all the parameters λs and γs cannot be estimated individually, normalisation condition for one of the indicator's coefficients (λ=1/-1) is included. According to Tedds (2005), the choice of which λ to normalise "is arbitrary as the normalization does not identify the dependent variable in any formal or causal sense. The relative impacts of η on the other indicator variables are then measured relative to this pre-assigned value". Based on previous literature, the growth rate of GDP is usually chosen as the normalised variable by fixing its coefficient at (-1).

[4]Data for all states before 2006 are unavailable. Wilayah Persekutuan Kuala Lumpur, Wilayah Persekutuan Labuan and Wilayah Persekutuan Putrajaya were omitted due to issue of data availability

With three indicators (y_1, y_2, and y_3) and with normalizing $\lambda 1 = -1$, the model consists of the following two reduced equations:

$$y_{1t} = \gamma' x_t + v_{1t} \quad [5a]$$

$$y_{2t} = \lambda 2 \gamma' x_t + v_{2t} \quad [5b]$$

$$y_{3t} = \lambda 3 \gamma' x_t + v_3 t \quad [5c]$$

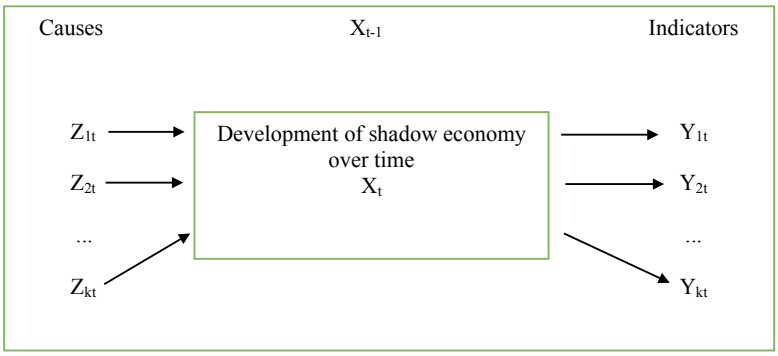

Figure 1. General Structure of a MIMIC Model

The Causes and Indicators of the State Level Shadow Economy

As mentioned earlier, due to the lack of data availability, selection of the variables is particularly difficult. For the purpose of this study, the variables used in the previous literature on national level shadow economy estimation such as Schneider and Enste (2000) as close as possible and use proxies, should there be issue of regional data availability. These methods were chosen due to two reasons: 1) most literature in national level shadow economy estimation follows the same variables selection method, and 2) most problems rose by critics such as statistical accuracy problem and reliability problem have been addressed[5].

[5]See Dell'Anno and Schenider (2006) and Elgin and Schneider (2013)

Based on previous literature such as Chaudhuri et al. (2006) and Buehn (2012), causes of state level shadow economy were grouped into three categories: size of state government, state labour market variables and demographic indicators. Meanwhile, demographic indicators (not included in Enste and Schneider, 2000, and all available literature) were included due to the significant disparity in wealth distribution and social diversity in the states of Malaysia, as stated earlier.

The Causes of the State Level Shadow Economy Estimation

Almost all previous literatures ascertained that overall, tax burdens are among the main causes for the development of shadow

economy[6]. As taxes affect the choice of labours and stimulate labour supply in the shadow economy, the distortions in the tax burden may have significant impact to the size of shadow economy. According to Schneider et al. (2010), the bigger the difference between the total cost of labours in the formal economy and the after-tax earnings (from work), the greater the incentive to avoid this difference and to work in the shadow economy. Empirical findings from almost all the previous literature found a significant positive relationship between taxation and the development of shadow economy.

As tax rate is unified across all the states in Malaysia, variables in states budgetary data were used as proxies similar to the previous literature in the state level estimation of the size of shadow economy such as in Chaudhuri et al. (2006) and Buehn (2012). The variables included were state tax revenue, state non-tax revenue, state non-tax receipt, state government operating spending and state government development spending. As tax increases, firms and labours are more encouraged to involve in shadow economy due to greater tax burden. Inversely, if state governments increase both operating and development spending, quality and quantity of public infrastructure will improve, reducing the appetite for firms and labours to join shadow economy. Hence, state tax revenue, state non-tax revenue and state non-tax receipt should be negatively related to state shadow economy, while state government operating spending and state government development spending should be positively related to state shadow economy.

Labour market variables may be strong causes or drivers for the development of shadow economy as argued by Schneider et al. (2010). During recession with high unemployment rate, labours are more encouraged to be shadow workers as unemployed individuals have less disposable income for basic necessities in the formal economy, especially low-skilled labours. The same conclusion had been made by Dell'Anno et al. (2007) for the cases of Spain, Greece and France. According to Chen (2012), labours, particularly low-skilled labours, may be forced to join shadow works due to problems of qualification, friction, or recession. Labour market regulations lead to a substantial increase in labour costs in the formal economy. In order to avoid such problems, self-employed labours either directly volunteer for shadow works or involve in shadow works indirectly. Unemployment rate and ratio of low-skilled labours are expected to be negatively related to the size of shadow economy while ratio of self-employment labours is expected to be positively correlated with the size of state shadow economy.

[6]See Thomas (1992); Lippert and Walker (1997); Schneider (1994a,b, 1997, 1998a,b, 2000, 2003b, 2005, 2007); Johnson, Kaufmann, and Zoido-Lobatón (1998a,1998b); Tanzi (1999); Giles (1999a); Mummert and Schneider (2001); Giles and Tedds (2002) and Dell'Anno (2003), as well as Feld and Schneider (2010), among others

Two demographic variables (namely, ratio of rural population to total population and ratio of rural labours employed to total labours) were included as the causes. As employment opportunity is scarcer in rural areas compared to urban area, high ratio of rural population often means some labours are left with no alternative but to engage in shadow activities to earn their living (Bhattacharya, 2011). Hence, this variable was expected to be positively related to shadow economy. As for the ratio of rural labours employed to total labours, rural labours are more likely to involve in shadow activities. Hence, the high ratio of rural labours employed signals less labours are involved in the shadow economy, vice versa. Ratio of rural labours employed are expected to be negatively related to shadow economy.

The Indicators of the State Level Shadow Economy

In this study, three indicators were selected: growth rate of state GDP per capita for the entire period of study (gdp), growth rate of the total state labour force (l), and state labour market participation rate (lp).

The MIMIC technique requires estimation of more than one model specification to obtain the best fitting model. In this study, it was started with 10-1-3 specification and insignificant variables were omitted to reach the best fitting model for Malaysia.

As the most prominent measurement of (past) prosperity, economic growth serves as the best benchmark for any economies. A higher growth rate indicates that this state contributes significantly to the creation of value, and thus potentially offers significant employment opportunities in the formal economy for a large share of a region's population. With such importance, it is used as indicators in almost all literatures on shadow economy estimation. Buehn (2012) concluded that shadow economy and GDP growth were negatively related, while Schneider and Enste (2000) argued that shadow economy contributed positively to GDP growth as shadow labours spent two third of their income immediately in the formal economy.

The growth rate of total state labour force reflects the overall state labour market condition and serve as the overall indicators of labours involvement in formal economy, which is expected to be negatively correlated with size of state shadow economy as high growth rate of total state labour force indicates a high involvement of labours in formal economy.

The state labour market participation rate provides an overall picture of the state labours that are active in the formal economy, while those inactive in the formal economy are likely to be either looking for work in the formal economy or engage in shadow economy activities. A low participation rate indicates many labours are not in the formal economy, thus the size of shadow economy is large. Hence, state labour market participation rate is expected to be negatively related to shadow economy.

With such causes and indicators selected, equations [5a], [5b] and [5c] can be combined into:

$$y^*_{1t} = \gamma' x^* t + v^*_{1t} \quad [6]$$

where, y* represents growth rate of state GDP per capita for the entire period of study (GDP), growth rate of the total state labour force (l), and state labour market participation rate (lp), while x* represents ratio of state tax revenue to state GDP (t), ratio of state non-tax revenue to state GDP (nt), ratio of non-tax receipt to state GDP (ntr), ratio of state government operating spending to state GDP (os), ratio of state government development spending top state GDP (ds), state unemployment rate (u), ratio of self-employment labours to total labour force (sl), ratio of low-skilled labours to total labour force (ll), Ratio of low-skilled labours to total labour force (ll) and ratio of rural population to overall population (r).

For benchmarking process, the average rate of the shadow economy was used as a percent of GDP in Malaysia for the year 1999, from Schneider (2007) and Schneider et al. (2010); which equalled to 30% of GDP as a reference indicator to benchmark (calibrate) the estimated annual cardinal indexes of the shadow economy in Malaysia. The process of benchmarking procedure by Dell'Anno (2007) and Schneider (2009) was used in the present study.

The Relationship between State Shadow Economy and State Economic Variables

After the ratio of state shadow economy to state GDP (SE) has been obtained, further investigation was done for its relationship with selected state economic variables so as to identify the "contributors" of state shadow economy activities. The basic model is given:

$$SE_{it} = \alpha + \gamma\,(Crime_{it}) + \delta\,(Primary_{it}) + \zeta\,(Gov_{it}) + \lambda\,(Growth_{it}) + u_{it} \quad [7]$$

where *Crime* is the state crime index, *Primary* is the ratio of state primary sector production to state GDP, *Gov* is the dummy variable for state government coalition with 1(0) if the state government is Barisan Alternative (Barisan National), and *Growth* is the state GDP growth. Meanwhile, u is the error term and time variable is added to control aggregate shock. The Hausman test will be used to determine whether the fixed effect model or random effect model is preferred.

Crime index is expected to be positively linked to state's shadow economy. Such relationship exists as rise in crime index tends to increase the unemployment rate, forcing labours to engage in shadow economy activities[7]. Crime diverts productive resources, increases costs for businesses, represents a threat to private property, and discourages domestic and international investment due to the deterioration of investment climate (Enamorado, López-Calva, & Rodríguez-Castelán, 2014). Such problems not only force firms and

[7]Refer Baharom and Habibullah (2008), Poutvaara and Priks (2011)

labours into shadow economy, but serves as encouragement as more resources are diverted to shadow economy, providing better returns for shadow productions and works[8]. Robles, Calderón and Magaloni (2013) also found that violence crime reduces labour force participation and increases unemployment rate.

The agriculture sector may play a significant role in affecting the development of shadow economy. Vuletin (2008) found that the shadow economy was significantly affected by the agriculture sector in South America and Caribbean countries. A similar finding was also obtained by Wedderburn, Chiang and Rhodd (2011) in Jamaica and Angel-Urdinola and Tanabe (2012) in Yemen and Morocco. Such a relationship can be explained by the difficulty of enforcement and weak government control in agricultural productions, especially as most agricultural productions are located in the rural areas. Hence, the ratio of primary sector contributions and shadow economy should have a positive relationship.

Moreover, the government coalition affects shadow economy by influencing the level of trust among labours and firms to the government. Shadow economy increases the lack of trust in institutions and feeds resentment among citizens (Dell'Anno et al., 2007). People who have higher trust in the government tend to stay in the formal economy and not involve in any shadow economy activities (Knack & Keefer, 1997; Zak & Knack, 2001; Beugelsdijk, De Groot & Van Schaik, 2004; Tabellini, 2010). As public trust decreases, the size of shadow economy will rise (D'Hernoncourt & Méon, 2012). Hence, in the case of low level of public trust to the national ruling party (Barisan National), the states ruled by national opposition party (Barisan Alternative) should have smaller size of shadow economy, vice versa.

RESULTS AND DISCUSSION

The MIMIC model begins with 10 causes and 3 indicators (10-1-3 specifications), as shown in Table 1 below. Two causes (state government operating spending and self-employed labours) were insignificant and thus excluded from the second estimation.

For the second estimation (8-1-3 specification), two more causes were dropped; state non-tax revenue and unemployment rate. Hence, third estimation begins with six causes and three indicators (6-1-3 specification). This time, there was only one insignificant cause: state non-tax receipt.

Finally, the fourth estimation was executed (5-1-3 specification). Five causes and three indicators are significant. These causes are the ratio of state tax revenue to state GDP, ratio of state government development spending to state GDP (state budgetary causes), ratio of low-skilled labours to total labour force (labour market

[8]see Fajnzylber et al. (1998), Londoño and Guerrero (2000), Demombynes and Ozler (2002), Stone (2006), Powell et al. (2010), Cardenas and Rozo (2008), Detotto and Otranto (2010)

causes), ratio of rural population to overall population and ratio of rural labours employed to total labour force (demographic causes).

Table 1
MIMIC model estimation for state shadow economy with demographic variables (10-1-3)

Model	10-1-3	8-1-3	6-1-3	5-1-3
	Causes			
Ratio of state tax revenue to state GDP (t)	-0.16 (-4.13)	-0.14 (-3.67)	-0.14 (-3.48)	-0.13 (-3.24)
Ratio of state non-tax revenue to state GDP(nt)	-0.07 (-2.06)	-0.05 (-1.43)		
Ratio of state non-tax receipt to state GDP (ntr)	-0.24 (-3.12)	-0.19 (-2.49)	-0.07 (-1.90)	
Ratio of state government operating spending to state GDP (os)	0.02 (0.22)			
Ratio of state government development spending to state GDP (ds)	0.12 (2.56)	-0.12 (-2.59)	0.11 (2.37)	0.11 (2.15)
State unemployment rate (u)	4.8188 (2.17)	3.8997 (1.70)		
Ratio of self-employed labours to total labour force (sl)	3.3523 (-1.59)			
Ratio of low-skilled labours to total labour force (ll)	7.4606 (-4.13)	7.0359 (-3.96)	6.3390 (-3.59)	5.7622 (-3.26)
Ratio of rural population to overall population (rp)	40.8061 (-8.16)	44.6865 (-8.70)	44.7595 (-8.73)	45.5681 (-8.81)
Ratio of rural labours employed to total labour (rl)	-43.1788 (8.41)	-46.3072 (8.66)	-46.5226 (8.70)	-47.5198 (8.79)
	Indicators			
Growth rate of state GDP per capita (gdp)	1.00	1.00	1.00	1.00
Growth rate of the total state labour force (l)	0.39 (3.54)	0.33 (3.26)	0.32 (3.15)	0.30 (3.04)
State labour market participation rate (lp)	0.87 (4.44)	0.86 (4.40)	0.84 (4.36)	0.83 (4.32)
	Goodness of fit indices			
Degree of freedom	20	16	12	10
Chi-square	24.96	15.31	13.08	11.71
AGFI	0.902	0.900	0.904	0.907
RMSEA	0.049	0.000	0.029	0.040
P-Value for Test of Close Fit (RMSEA < 0.05)	0.78	0.740	0.588	0.509

Note: The numbers in the parentheses are t-statistics. AGFI larger than 0.90 and RMSEA smaller than 0.05 indicate a good fit

Based on the estimation, as expected, state tax revenue is inversely related to state shadow economy, the finding which is consistent with the previous literature such as Chaudhuri et al. (2006). As more labours and firms engage in shadow activities, the state revenue will then decrease.

As for labour market causes, similar to Buehn (2012), low-skilled labours are positively related to size of shadow economy. As low-skilled labours are more likely to be discriminated and underpaid, they have greater risk of cyclical unemployment in the formal economy; thus, they are expected to engage in shadow activities more than skilled labours.

As for the total rural population, it is positively related to state shadow economy. Rural population is generally more likely to engage in shadow works due to lower availability of job opportunity in the rural area. As for rural labours employed, it is negatively related to state shadow economy.

Using the results from last estimation specification (model 5-1-3), the size of state shadow economy can be estimated. The underlying time series are multiplied with the corresponding, estimated coefficients. This results in an index value of the latent variable for each of the 13 states in Malaysia. In order to convert this index into state shadow economy estimates, an exogenous estimate was for the size of the shadow economy in Malaysia. This exogenous estimate was taken from Schneider (2007) and Schneider et al. (2010), where the average size of shadow economy in Malaysia was 30% of the official GDP in 2006.

With such benchmark, the size of shadow economy to the official GDP in the states of Malaysia from 2006 to 2013 is shown in Table 2 and Figure 2. Melaka is

Table 2
Shadow economy for states of Malaysia from 2006 to 2013

	2006	2007	2008	2009	2010	2011	2012	2013	Average
Johor	25.33	20.75	22.41	21.83	18.46	17.56	17.37	16.40	20.01
Kedah	29.02	27.81	30.17	28.02	17.10	24.60	24.41	18.11	24.91
Kelantan	23.42	26.10	22.76	16.74	19.16	12.09	17.10	15.80	19.15
Melaka	15.82	17.99	14.11	16.30	14.12	11.14	12.65	12.47	14.33
Negeri Sembilan	32.74	25.23	22.51	27.55	24.69	17.94	22.57	22.19	24.43
Pahang	28.90	36.89	28.53	31.03	24.77	20.23	22.03	26.24	27.33
Pulau Pinang	18.81	17.29	17.31	18.11	17.09	14.73	15.75	15.43	16.82
Perak	35.93	26.76	28.55	23.22	21.85	20.77	20.55	20.26	24.74
Perlis	26.99	20.86	15.63	16.96	18.22	23.32	20.37	17.40	19.97
Selangor	17.11	17.47	18.84	16.71	17.37	17.27	15.42	13.79	16.75
Terengganu	30.45	23.88	26.89	26.64	21.62	18.84	18.28	21.84	23.56
Sabah	58.60	57.96	54.75	55.62	59.26	60.01	52.74	51.73	56.33
Sarawak	46.86	45.28	53.38	44.11	45.64	36.56	35.49	35.47	42.84
Average	30	28.02	28.37	26.37	24.56	22.70	22.67	22.09	

Note: percentage of state shadow economy to GDP

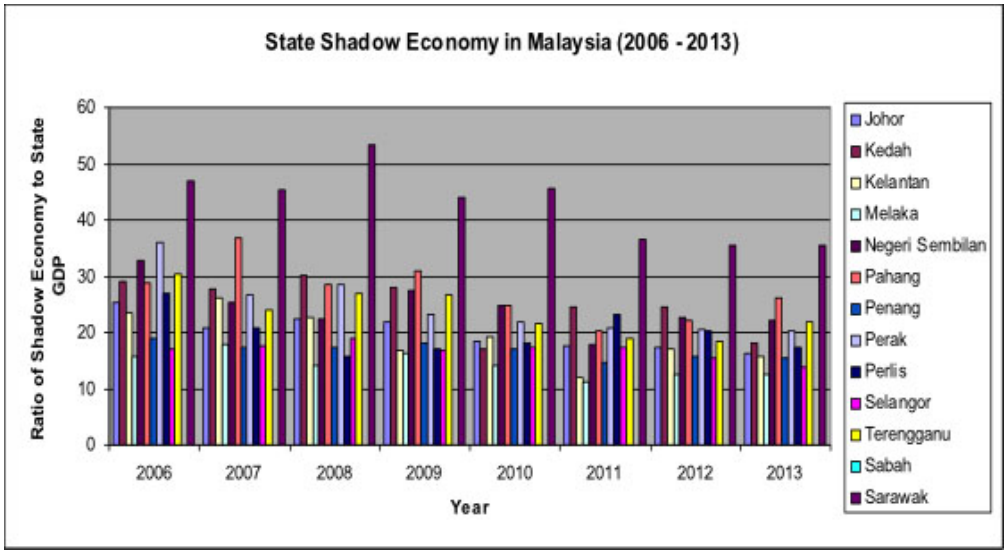

Figure 2. State shadow economy as ratio to state GDP

the state with the smallest shadow economy, except for one year (2007), ranging from 11.14% of GDP to 17.99% of GDP. This was followed by Selangor, which is the state with the second smallest shadow economy, with the average between 13.79% of GDP and 18.84% of GDP. Meanwhile, Pulau Pinang ranked the third, ranging from 14.73% of GDP to 18.81% of GDP.

As expected, Sabah and Sarawak ranked the bottom two for all eight years (i.e., from 2006 to 2013) due to poor regulation and size of rural population. Sabah ranked thirteenth with the range of 51.73% of GDP to 60.01% of GDP, while Sarawak ranked twelve with the range of 35.47% of GDP to 53.38% of GDP. The average size of shadow economy for all the thirteen states of Malaysia showed a downtrend from 30% of GDP in 2006 to 22.09% of GDP in 2013.

The actual size of state shadow economy in Ringgit term, as shown in Table 3 and Figure 3, is worrying and it deserves the attention from regulators. The state with the smallest shadow economy in Ringgit term was Perlis, ranging from RM507.84 million in 2008 to RM794.94 million in 2006, with the average of RM655.81 million from 2006 to 2013. Melaka, the state with the smallest average ratio of shadow economy to GDP, had RM2745.93 million average of shadow economy, with the lowest at RM2281.07 million in 2011 and highest at RM3010.01 million in 2009. Selangor, the state with the highest GDP in Malaysia, had an average of RM25,090.36 million of shadow economy, with the lowest at RM20,332.38 million in 2006 and highest at RM28,431.92 million

Table 3
State shadow economy in Ringgit

Year	2006	2007	2008	2009	2010	2011	2012	2013	Total	Average
Johor	13309.24	11349.17	12769.05	12065.97	11200.65	11339.66	11946.87	11850.52	95831.14	11978.89
Kedah	5587.07	5849.69	6399	5909.31	3760.732	5869.49	6177.90	4786.28	44339.51	5542.43
Kelantan	2261.93	2735.52	2549.52	1914.49	2297.29	1543.51	2302.05	2206.67	17811.02	2226.37
Melaka	2584.57	3134.34	2575.22	3010.01	2779.94	2281.07	2777.39	2824.91	21967.49	2745.93
Negeri Sembilan	7057.33	5722.61	5324.02	6558.01	6216.52	4737.56	6255.21	6367.	48238.3	6029.78
Pahang	7136.99	9298.49	7550.32	8130.95	6807.58	5904.55	6775.07	8524.81	60128.8	7516.1
Pulau Pinang	8164.33	7994.35	8436.98	7900.02	8229.77	7368.91	8273.16	8480.5	64848.05	8106
Perak	10619.05	8307.42	9437.05	7594.00	7554.32	7680.10	8143.27	8467.17	67802.42	8475.30
Perlis	794.94	658.630	507.845	537.043	604.618	788.773	720.017	634.675	5246.55	655.81
Selangor	20332.38	22395.42	26354.11	23267.48	27050.75	28431.92	27172.4	25718.42	200722.9	25090.36
Terengganu	5136.13	4326.95	4974.32	4720.44	3997.57	3573.17	3588.76	4488.65	34806.03	4350.75
Sabah	20054.84	20469.79	21414.06	22798.06	24948.8	25604.26	23435.14	23688.14	182413.1	22801.64
Sarawak	28242.71	29560.51	34950.96	28308.9	30553.36	25895.23	25506	26561.14	229578.8	28697.35
Total	131281.6	131802.9	143242.5	132714.7	136002	131018.2	133073.3	134598.9		
Average	10098.58	10138.69	11018.65	10208.83	10461.69	10078.33	10236.41	10353.76		

Note: RM Million GDP at constant price 2005

in 2011. As expected, Sabah and Sarawak had very high shadow economy in Ringgit term, with Sarawak edging slightly ahead. Sarawak had an average of RM28,697.35 million of shadow economy with the lowest at RM34,950.96 million in 2008 and the highest at RM25,506 million in 2012. Sabah had an average of RM22,801.64 million of shadow economy with the lowest at RM20,054.84 million in 2006 and highest at RM25,604.26 million in 2011.

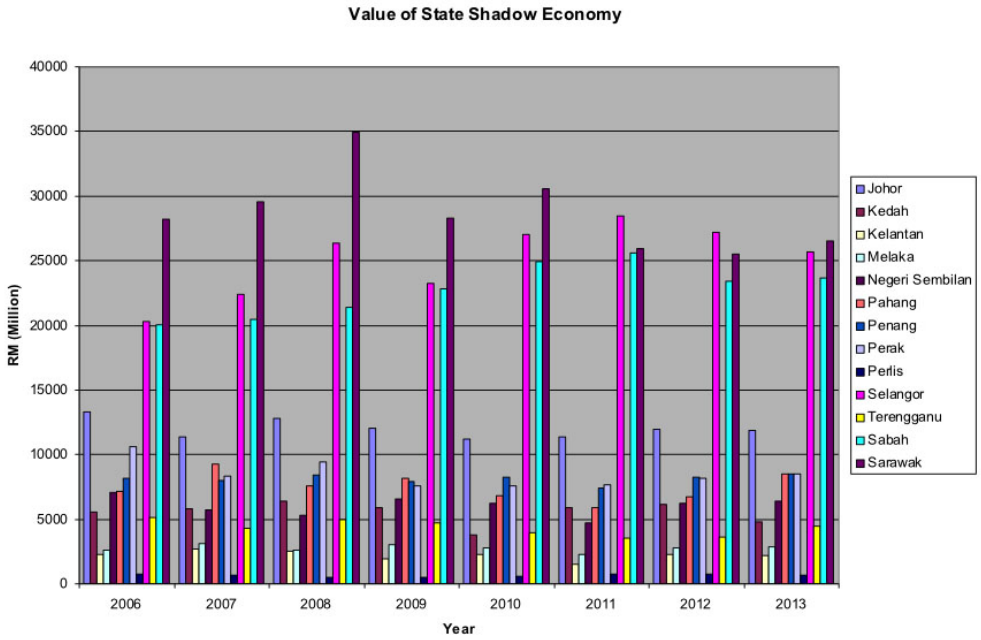

Figure 3. State shadow economy in Ringgit

Table 4 shows the relationships between state shadow economy and selected state variables. The P-value obtained from Hausman Test is insignificant ($p > 0.05$), which fails to reject the null hypothesis that the model is random, indicating that random effect estimator is preferred in this study. All the variables are significant at 99% confidence level, except for the coalition of government (*Gov*) which is at 95% confidence level. As expected, crime index is positively linked with state's shadow economy. Such relationship exists as a rise in crime index tends to increase the unemployment rate, forcing labours to engage in shadow economy activities[9]. Ratio of primary sector production is positively affecting the size of state's shadow

[9]Refer Baharom and Habibullah (2008), Poutvaara and Priks (2011)

Table 4
Regression Result: Growth in the Size of State Shadow Economy

Independent Variable	Fixed effect	Random Effect (preferred)
Crime	1.7916	2.5345***
	(0.7147)	(5.2816)
Primary	-0.0521	0.5012***
	(-0.2001)	(11.6178)
Gov	2.6132**	-1.6103**
	(2.0126)	(-1.8610)
Growth	-9.0359*	-20.9015***
	(-1.9427)	(-2.3461)
Year	-1.1531***	-0.8224***
	(-5.9649)	(-6.2381)
Cons	23.2455***	16.3719***
	(5.7336)	(6.1571)
Number of observation	104	104
R^2	0.8496	0.809201
Hausman Test (p-value)	0.2236	
Breusch-Pagan LM (p-value)	0.1987	0.2270

Notes: The dependent variable is SE. The numbers in the parentheses are t-statistics. *** = 1% significance, ** = 5% significance and * = 10% significance

economy. Interestingly, the state's coalition government dummy yields negative result, suggesting that state ruled by opposition party (formerly known as Barisan Alternatif) has smaller shadow economy. Such a relationship can be explained by the low level of public trust to the ruling national party, Barisan National; as the size of shadow economy rises, the public trust also decreases (D'Hernoncourt & Méon, 2012). Meanwhile, the growth rate of state's GDP is negatively related with state shadow economy, as more advanced states were found to have smaller size or lower rate of shadow economy.

CONCLUSION

As shadow economy exceeds 30% of world GDP in 2013[10], it is important to understand the structure of the shadow economy at state level in order to have effective policy against it. This study attempted to estimate the size of shadow economy at state level in Malaysia using the estimation technique developed for shadow economy at country level by previous literature such as Giles (1999) and Schneider and Enste (2002).

From 2006 to 2013, Melaka had the smallest shadow economy compared to all other states in Malaysia, with the average ratio of 14.33% to state GDP; followed by Selangor with the average ratio of 16.75% to state GDP and Penang with the average ratio of 16.82 to state GDP during the same period. These three states were ranked the highest due to their size in terms of high levels of modernisation and urbanisation. On the other end, unsurprisingly, Sabah and Sarawak had the largest shadow economy among all states in Malaysia by significant margins. Sabah had the largest shadow economy with the average ratio of 56.33% to state GDP, followed by Sarawak with the average ratio of 42.84% to the state GDP during the same period. These two states had such large shadow economy activities due to their large land size, high ratio of rural population to urban population and high amount of unskilled labours.

[10]Hassan and Schneider (2016)

The actual value of state shadow economy is similar to the previous analysis, with Melaka having a relatively small value of shadow economy with an average of RM2745.93 million during the same period. Perlis had the smallest average value of shadow economy at RM507.84 million. On the contrary, as expected, Sabah and Sarawak had the highest average values of shadow economy at RM22,801.64 million and RM28,697.35 million, respectively.

State shadow economy is positively related to crime index and primary sector productions, while negatively related to state's GDP growth. The states ruled by the opposition party have smaller shadow economy.

Based on the results obtained, it is clear that the states with high ratio of rural population tend to have greater size of shadow economy and vice versa. Policy makers should either improve the process of urbanisation or deploy more economic resources to rural populations to encourage shadow labours from the rural area to join the formal economy. Policy makers should also improve the productivity of low-skilled labours through various human development programmes since these will allow these labours to compete in the formal economy with higher wages and better safety working environment.

In addition, crime rate should be reduced as well. Eliminating criminal activities will reduce the size of shadow economy, allow the economic resources to be used in the formal productions and increase growth. Thus, regulators should also reduce the economic dependency of primary sector productions and relocate the economic resources from the primary sector to secondary or tertiary sector to increase the productivity of economic resources, higher growth and reduce the size of shadow economy.

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