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RE-ESTIMATION AND MODELLING SHADOW ECONOMY IN MALAYSIA: DOES FINANCIAL DEVELOPMENT MITIGATE SHADOW ECONOMY?

Badariah Haji Din
Universiti Utara Malaysia

Muzafar Shah Habibullah[♣]
Universiti Putra Malaysia
and
Putra Business School

Baharom Abdul Hamid
International Centre for Education in Islamic Finance (INCEIF)

ABSTRACT

The purpose of this study is to re-estimates the size of shadow economy in Malaysia and investigates the role play by the financial sector development in mitigating the size of shadow economy. Our results suggest that individual income tax burden has an impact on shadow economy in Malaysia; indicating that lower personal tax rate discourages people from participating in the shadow economy in Malaysia. On the other hand, increase in national income and government consumption also reduce shadow economy; while increase in misery increases shadow economy in Malaysia. One policy implication from this study is that the Malaysian government should embark on programs that can reduce the size of the shadow economy by removing barriers for easy access to the credit market and further reform of the financial sector should be the focus.

Keywords: Shadow economy; Financial sector development; Tax burden; Malaysia

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1. INTRODUCTION

There is a plethora of empirical studies estimating the size of shadow economy in various countries all over the world. The work is important because the presence of shadow economy in any nation affects the economic decision of the government and the welfare of the public (Schneider & Enste, 2000). Furthermore, studies have shown that shadow economy is also related to criminal activities (Naylor, 1996; Habibullah & Eng, 2006). In terms of economic growth, Eilat & Zinnes (2002) posit that shadow economy may cripple an economy by reducing the tax base and eventually reduces overall tax revenue which is much needed for government expenditure on public infrastructure and enhancing economic development. On the other hand, by excluding shadow

[♣]Corresponding author: Institute of Agricultural and Food Policy Studies, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia. Tel: +603 9769 7635. Email: muzafar@upm.edu.my; Putra Business School, 43400 UPM Serdang, Selangor, Malaysia. Tel: +603 9769 8819. Email: muzafar@putrabs.edu.my

economy from the official gross domestic product (GDP) statistics, the official GDP statistics will provide wrong indicators for macroeconomic policy decisions. Furthermore, in the labor market, since firms participate in the shadow economy are not subjected to labor regulations, workers are exploited and have to endure unhealthy and unsafe working conditions, receiving very low wages and with no job security (see Eilat & Zinnes, 2002). Thus, fighting shadow economy should be an important agenda for any government.

There are many reasons as to why peoples or firms participate in the shadow economy. Schneider (2005), Dell'Anno and Solomon (2008), and Bajada and Schneider (2005) posit that tax burden either direct or indirect taxation, social security contribution, regulation, tax morale, unemployment rate, GDP per capita are important factors pushing people into the shadow economy. Other variables such as government spending or consumption (Vo & Ly, 2014; Wang, Lin, & Yu, 2006; Buehn & Schneider, 2012); weak government and bad governance (Friedman, Johnson, Kaufman, & Zoido-Lobaton, 2000; Manolas, Rontos, Sfakianakis, & Vavouras, 2013); lack of trust for the government (D'Hernoncourt & Meon, 2012); crime rate (Wang et al., 2006); and inflation (Bittencourt, Gupta, & Stander, 2014); are all contributed in increasing the size of the shadow economy.

Nonetheless, economists have also recognized that the lack of access to the financial or credit market could encourage people to participate in the shadow economy. The proponents of this strand of studies postulate that with the absence of asymmetric information, individual or firm will have easy access to the credit market and will benefited by increasing their output through the use of the borrowed financing. Bose, Capasso and Wurm (2012) argue that in higher level of financial sector development, firms have easy access to external financing, however, borrowers have to declare their income and/or assets and this can be used as collateral or to gauge their creditworthiness but in doing so they will subject to tax liability. But, since the value provided by the financial sector is considerable (Gordon & Li, 2009), there is less incentive to evade tax and the need to participate in the shadow economy is minimal. On the contrary, for countries with lower level of financial development, where there is limited access to the credit market due to shortage of loanable funds, asymmetric information and high cost of borrowings; borrowers have less incentive to declare income and/or assets. In such environment, tax evasion is substantial and shadow economy is also larger. Thus, Bose et al. (2012) contend that improvement in the development of the banking sector as well as the depth and the efficiency of the banking sector contribute to smaller shadow economy.

The contention made by Bose et al. (2012) is supported by Blackburn, Bose and Capasso (2012) who explained the connection between shadow economic activity and the credit market development using a simple model of tax evasion and financial intermediation. According to Blackburn et al. (2012) potential borrowers are required to declare their income or wealth in order to acquire a loan to finance their investment. The amount of wealth will determine the amount of collateral for securing a loan and also the type of terms and conditions of the loan contract made available to them. The less wealth been declared, the less collateral to secure the required loan, and the worse will be the terms and condition of the loan contract. As a consequence, the credit arrangement is worsen in a country with low level of financial development. Thus, the benefit of wealth disclosure increases with the level of financial development with the implication that individual or firm participate in the shadow economy decline as the economy moves from a low to high level of financial development.

On one hand, Capasso and Jappelli (2013) put forward that for a firm to earn high-return technology investment, firms have to acquire external funding. However, this kind of investment is expensive and costly. Nevertheless, firm can reduce the cost of funding by disclosing part or all of their assets and pledging them as collateral. The disclosure decision, however, also involves higher tax payments and reduces tax evasion. Their model predict that financial development (a reduction in the cost of credit) induces firm to disclose more assets and to invest in a high-tech project, and an improvement in the judicial efficiency reduces the cost of credit and the size of the shadow economy. Bittencourt et al. (2014), on the other hand, argue that countries with higher level of financial development will have a lower cost of monitoring provided that borrowers are willing to declare their income to the bank. However, borrowers that choose to undeclared their income to the bank will be subjected to higher costs of access to and conditions of obtaining loans. These higher costs and with lower level of financial development, will provides an incentive for borrowers to participate in the shadow economy.

Thus, the purpose of this paper is to re-estimate the size of the shadow economy in Malaysia for the period 1970 to 2013 and further to determine factors affecting shadow economy. Our focus is to test the conjecture made by Bose et al. (2012) and Blackburn et al. (2012) on the role of the financial sector development as a vehicle to reduce shadow economy. Other variables included in the study are national income, tax burden, government consumption, and misery index. The period of the study is from 1970 to 2013.

2. ESTIMATES OF SHADOW ECONOMY IN MALAYSIA

Activities in the shadow economy are hidden and participants in every each way avoid detection, and given the lack of resources to monitor their activities, the authorities have a daunting task to identify and estimate the size of the shadow economy (Singh, Jain-Chandra, & Mohommad, 2012). In the case of Malaysia, there were efforts by several researchers to estimate the size of the shadow economy. The first effort to estimates the size of shadow economy in Malaysia was due to Kanbur, Majid and Muhamad (1993). They estimate that the size of shadow economy in Malaysia ranges from 0.23% to 1.20% of GDP for the period 1980 to 1985 (cited in Mohamed, 2012; Kasipillai, Baldry, & Rao, 2000). Mahfar (1994) and Abdul (2001) estimate the size of Malaysia's shadow economy to be 30% and 29%, respectively; while Aziz (2004) came up with estimates of 19.7% to 13.2% between the years 1987 to 1997 (see Mohamed, 2012). According to an expert opinion surveyed by Kasipillai (1998) in 1995, the construction sector contributes the highest hidden income; while Mohammad (2004) reports that the services sector in 2002 formed the largest percentage of informal sector relative to the formal sector with an estimated ratio of 4.2%. However, the 2006 statistics provided by Kamaruddin and Ali (2006) suggest that 24% of firms in the information technology industry operate underground, and this is followed by manufacturing (3.5%) and service industry (3%).

Table 1: Estimates of the Size of the Shadow Economy in Malaysia by Different Authors, 1970-2015

Year	Kasipillai et al. (2000)	Elgin & Oztunali (2012)	Mohamed (2012)	Alm & Embaye (2013)	Tan et al. (2017)	Medina & Schneider (2017)	Our study
1970		60.46					18.14
1971	8.1	59.41					21.14
1972	7.62	57.79					27.58
1973	7.36	56.49					38.38
1974	8.35	54.75					49.80
1975	7.87	52.29					55.77
1976	8.11	51.31					58.77
1977	8.22	50.3					65.73
1978	8.61	48.98					66.62
1979	8.54	47.84					67.24
1980	8.76	46.55	10.92				71.75
1981	8.48	45.13	10.92				66.97
1982	8.31	43.66	10.92				67.88
1983	8.53	42.2	10.92				66.05
1984	8.43	30.97	10.92	28.8	18.9		65.63
1985	6.84	39.78	12.19	28.9	21.9		64.44
1986	6.78	39.29	12.19	28.2	19.7		68.40
1987	6.21	39.11	12.19	25.1	16.8		68.84
1988	6.15	39.07	12.19	31.1	17.5		69.73
1989	5.91	38.86	12.19	34	17.5		62.97
1990	5.19	38.45	17.17	35.4	17.5		58.50
1991	4.69	37.97	17.17	36.5	17.6	37.47	58.99
1992	4.72	36.91	17.17	36.6	18	37.3	47.58
1993	3.7	36.08	17.17	33.3	14.7	36.79	36.49
1994	3.73	35.06	17.17	31	15.7	35.04	37.23
1995		34	23.19	30.6	16.1	33.22	35.89
1996		32.82	23.19	26.8	16.1	30.58	33.54
1997		31.85	23.19	27.1	19	30.37	34.07
1998		30.7	23.19	25.1	21.5	32.1	44.06
1999		30.61	23.19	26.9	14.6	31.63	48.56
2000		30.8	18.31	27.9	14.6	31.1	37.34
2001		30.5	18.31	31.5	19.3	32.27	31.78
2002		30.38	18.31	31.5	15.4	32.65	29.87
2003		30.2	18.31	30.5	15	32.03	30.20
2004		30.1	18.31	31.1	16.8	30.59	28.42
2005		29.9	12.83	29.8	18.1	29.77	27.05
2006		29.8	12.83	30.7	17.9	29.21	26.85
2007		29.6	12.83		15.3	29.23	25.63
2008		29.34	12.83		16.4	30.03	26.23
2009			12.83		17.4	31.71	24.99
2010					12.4	30.17	24.38
2011					15.4	29.82	23.99

Year	Kasipillai et al. (2000)	Elgin & Oztunali (2012)	Mohamed (2012)	Alm & Embaye (2013)	Tan et al. (2017)	Medina & Schneider (2017)	Our study
2012					14.9	29.78	22.48
2013						29.84	21.95
2014						26.41	
2015						27.87	

Sources: Kasipillai et al. (2000), Elgin and Oztunali (2012), Mohamed (2012), Alm and Embaye (2013), Tan, Habibullah, Kaliappan and Radam (2017) and Medina and Schneider (2017).

Table 1 reports the time series estimates of the size of the shadow economy by different authors for Malaysia. These estimates were derived either from a single country estimates or a panel setting framework. For example, Kasipillai et al. (2000) estimate the size of the Malaysian shadow economy for the period 1971-1994 using the standard currency demand approach; ranging from 8.1% to gross national product in 1971 to 3.73% in 1994; averaging 7.1% over the 24 years period. Elgin and Oztunali (2012) estimate the magnitude of the shadow economy involving 161 countries by employing the two-sector dynamic general equilibrium model over the period 1955-2008; with Malaysia's shadow economy averages 47% during that period. Using the non-tax compliant method, Mohamed (2012) compute the average size of shadow economy in Malaysia to be 10.92% for 1980-1984, 12.19% for 1985-1989, 17.17% for 1990-1994, 23.19% for 1995-1999, 18.31% for 2000-2004, and 12.83% for 2005-2009. Alm and Embaye (2013) estimate the size of the shadow economy for 111 countries using the generalized method of moments for the period 1984-2006 and the estimated size for Malaysia's shadow economy averages 30.4% for the period. Tan et al. (2017) estimate the size of shadow economy for a panel of 80 countries using the pooled mean group (PMG) estimator and the estimate for Malaysia's shadow economy averages 17% for the period 1984 to 2012. On the other hand, Medina and Schneider (2017) by using a combination of the multiple indicators multiple causes (MIMIC) procedure and the currency demand models; they have estimated the size of the shadow economy for 158 countries including Malaysia for the periods 1991 to 2015. For the 25 years period, Malaysia's shadow economy averages 31.5% of the official GDP.

Although it is recognized that there is no one method that is ideal to estimate the size of the shadow economy exists (Berger, Pickhardt, Pitsoulis, Prinz, & Sarda, 2014), in this study we endeavor to re-estimate the size of shadow economy for Malaysia using the modified-cash-deposit-ratio procedure proposed by Pickhardt and Sarda (2011, 2015). Pickhardt and Sarda (2011, 2015) claim that their approach offers a 'reasonable' estimate of the shadow economy and it do not subject to the Breusch and Ahumada critiques. According to Breusch (2005a, 2005b, 2005c) the weaknesses of the MIMIC model approach widely used to estimate the size of the shadow economy suffers from serious econometrical and mathematical flaws. On the other hand, Ahumada, Alvaredo and Canavese (2007, 2008) point out that the estimates of the size of the shadow economy using the currency demand approach is correct only if the long-run elasticity of income is unity, but, in most cases this is not the case.

Thus, following Pickhardt and Sarda (2011, 2015) the ratio of shadow economy income to official income for Malaysia is computed using the modified-cash-deposit-ratio as (see also Habibullah, Din, Yusof-Saari & Baharom, 2016),

$$\frac{CC_t - CC_0}{CC_0 + DD_t} = \frac{Y_{Ut}}{Y_{Lt}} \quad (1)$$

where CC_t denotes currency in circulation at the end of year t; CC_0 is currency in circulation at the end of base year, here 1969; DD_t represents demand deposits at the end of year t; Y_{Lt} and Y_{Ut} denote the size of the legal and shadow economy respectively. Thus, Y_{Ut}/Y_{Lt} measures the share of shadow economy to the legal economy (official GDP).

The estimated size of Malaysia's shadow economy for the period 1970 to 2013 is presented in the last column in Table 1. For the 44 years period, the average size of shadow economy in Malaysia is about 44.5%. Despite the differences in the data coverage, methods employed, the assumptions made and the variant estimates in the magnitude of the shadow economy in Malaysia, the estimated size of the shadow economy in Table 1 clearly shows that shadow economy in Malaysia, in general, is on a declining trend, in particularly after 1990. In fact, our estimates of the size of shadow economy coincide with several episodes of economic hardships and financial crises in Malaysia during those periods. Shadow economy has been increasing since the first oil shock of 1973/74; reaching the highest level during the second oil shock of 1979/81; reach another peak during the commodity price collapse of 1985/86; another sharp increase during the Asian financial crisis of 1997/99 –all these episodes have probably pushed peoples into the shadow economy.

3. MODELLING DETERMINANTS OF SHADOW ECONOMY IN MALAYSIA

Following the work by Schneider (2005), Dell'Anno and Solomon (2008), Bajada and Schneider (2005), Vo and Ly (2014), Buehn and Schneider (2012), and Bittencourt et al. (2014), in this study we specify the long-run model for shadow economy in Malaysia as,

$$lshadow_t = \theta_0 + \theta_1 lincome_t + \theta_2 lgovtconsp_t + \theta_3 lfinancial_t + \theta_4 lfinancial_t^2 + \theta_5 lmisery_t + \theta_6 ltaxburden_{jt} + \varepsilon_{jt} \quad (2)$$

where $lshadow_t$ is the size of shadow economy as calculated as per Table 1; $lgovtconsp_t$ is the ratio of government consumption to gross domestic product (GDP); $lincome_t$ is real GDP per capita to measure economic development or income; $lmisery_t$ is the misery index calculated as inflation rate plus unemployment rate, and $ltaxburden_{jt}$ is the ratio of taxation to GDP (j=total tax revenue, direct taxation, indirect taxation, corporate tax, personal income tax, and sales and service tax); $lfinancial_t$ is financial sector development measured by ratio of domestic credit to private sector to GDP; while $lfinancial_t^2$ is financial sector development squared to establish whether the relationship between shadow economy and financial sector development is non-linear.

If our data support the contention made by Blackburn et al. (2012) and Bose et al. (2012) in which the relationship between shadow economy and financial development exhibit an inverted U-shape curve, we would expect a *priori* that $\theta_3 > 0$ and $\theta_4 < 0$. This will imply that at lower stage of financial development shadow economy is increasing until at some turning point after which at higher level of financial development shadow economy starts to decrease. For the other variables, it is expected that the parameters, $\theta_5, \theta_6 > 0$ and $\theta_1, \theta_2 < 0$. The error term, ε_{jt} is expected to be well behave with mean zero and constant variance. All variables are in natural logarithm which is denoted by l.

Estimating the long-run model as per Equation (2) is a challenge as we are dealing with time series variables which are normally non-stationary. Running Equation (2) using ordinary least square (OLS) will result in spurious regression unless we can establish that there is cointegration among the variables (i.e. long-run relationship among the variables). The most common method to test for cointegration is the Engle-Granger two-step procedure. However, to employ this cointegration procedure we must establish that all variables in their level are in the same order of integration, that is, they are all I(1); meaning that the series will becomes stationary (i.e. I(0)) after first-differencing. To test whether the series is I(0) or I(1) in their level, we need to employ the unit root test. The most common unit root test is the augmented Dickey-Fuller (Dickey and Fuller, 1981) unit root test. However, in this study we will employ a more efficient unit root test proposed by Elliot, Rothenberg and Stock (1996). According to Elliott et al. (1996) their modified Dickey-Fuller (DF) test statistic by using a generalized least squares (GLS) rationale has the best overall performance in terms of small-sample size and power, conclusively dominating the standard Dickey-Fuller test. In particular, Elliott et al. (1996: 813) found that their "DF-GLS test has substantially improved power when an unknown mean or trend is present."

3.1 Sources of Data

In this study data on gross domestic product (GDP), real GDP per capita, government consumption, domestic credit to private sector, inflation and unemployment rates (for misery index) were collected from the World Development Indicators published online and accessible at the World Bank database (see http://data.worldbank.org/indicator). Government consumption and domestic credit to the private sector are express as a ratio to GDP; while misery index equals to inflation rate plus unemployment rate. Misery index will measure the "hardship" of the population of a country. On the other hand, data for all categories of tax burden such as the total tax revenue, total direct taxation, total indirect taxation, corporate taxation, individual taxation and total sales and services taxation were collected from various issues of the Monthly Statistical Bulletin published by the Bank Negara Malaysia. All these tax variables were deflated by GDP.

4. THE EMPIRICAL RESULTS

The unit root test results using the DF-GLS procedure are presented in Table 2. Results in Table 2 clearly indicate that all variables are I(1), that is the series achieved stationarity after differencing once. These results clearly suggest that all variables are non-stationary in levels and their first-differences are stationary, that is, they are I(0). A consequence of regressing integrated variables will produce spurious regression results. Spurious regression results will imply that inferences cannot be made and hypothesis testing will be invalid. Thus, estimating Equation (2) using OLS will result in spurious regression unless the variables are cointegrated. A cointegrating regression implies a long-run model for the shadow economy as specified in Equation (2). It also implies that there are long-run relationships between shadow economy and its determinants. Since all variables are I(1), that is they are of the same order of integration we can then proceed for cointegration test by employing the Engle-Granger two-step procedure.

Table 2: Results of DF-GLS Unit Root Tests

Series	**Level:**		**First-difference:**	
	Constant	**Constant & trend**	**Constant**	**Constant & trend**
$lshadow_t$	-1.60 (3)	-1.77 (3)	-3.87*** (0)	-5.37*** (0)
$lincome_t$	0.76 (1)	-1.74 (0)	-5.71*** (0)	-6.00*** (0)
$lgovtconsp_t$	-1.60 (1)	-2.72 (0)	-7.90*** (0)	-7.95*** (0)
$lfinancial_t$	-0.25 (3)	-1.00 (0)	-2.39** (2)	-6.66*** (0)
$lfinancial_t^2$	-0.24 (0)	-1.12 (0)	-2.41** (2)	-6.27*** (0)
$lmisery_t$	-1.39 (2)	-2.79 (2)	-8.27*** (0)	-7.78*** (1)
$ltotaltax_t$	-1.73 (0)	-2.21 (0)	-9.09*** (0)	-9.40*** (0)
$ldirectax_t$	-0.98 (0)	-2.49 (0)	-7.55*** (0)	-7.70*** (0)
$lindirectax_t$	0.21 (0)	-1.85 (0)	-7.73*** (0)	-8.15*** (0)
$lcorporatetax_t$	-1.57 (2)	-2.82 (2)	-7.62*** (0)	-7.61*** (0)
$lindividualtax_t$	-1.44 (0)	-2.21 (0)	-6.01*** (0)	-6.32*** (0)
$lsaleservicetax_t$	-1.24 (0)	-1.69 (0)	-3.32*** (0)	-5.05*** (0)

Notes: Variables *shadow, income, govtconsp, financial, misery, totaltax, directax, indirectax, corporatetax, individualtax* and *saleservicetax* denote respectively, ratio of shadow economy to GDP, real GDP per capita, ratio of government consumption to GDP, ratio of domestic credit to private sector to GDP, misery index (inflation + unemployment rates), total tax revenue to GDP ratio, direct taxation to GDP ratio, indirect taxation to GDP ratio, corporate tax to GDP ratio, individual income tax to GDP ratio, and sales and service tax to GDP ratio. l denotes natural logarithm. Asterisks (***), (**), (*) denote statistically significant at 1%, 5% and 10% level, respectively. The optimal lag length in round brackets, (.) was chosen based on Schwarz criterion (SC) throughout the analysis.

To test for cointegration and to estimate the long-run model, in the first step, we apply OLS with robust standard error due to Newey-West (Newey and West, 1987) heteroskedasticity and autocorrelation consistent (HAC) estimates of the standard error on Equation (2). An important property of robust standard errors is that the form of the heteroskedasticity and/or autocorrelation does not need to be specified. The residual of the estimated regression are then saved. In the second step, we test the residual for unit root. This is the conventional Engle and Granger (1987) two-step procedure for testing the null hypothesis of non-cointegration or the present of unit root in the residuals. We test the residual whether they are I(0) or I(1) using the standard augmented Dickey-Fuller unit root test. If the residual is stationary or I(0), we can conclude that there is cointegration implying that there is long-run relationship between shadow economy and its determinants. Table 3 presents the results of the cointegration tests as well as the estimated long-run models for Malaysian shadow economy for all six categories of tax burden. Model 1 was estimated without any tax variable; while Model 2 to Model 7 respectively represents model that include total taxation, total direct taxation, total indirect taxation, corporate taxation, individual taxation and total sales and services taxation.

Table 3: Results of Long-Run Model for Shadow Economy in Malaysia

Independent variables	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**
$constant$	1.0474	1.0470	2.4815	0.3558	0.9008	1.8339	3.6336
	(0.3801)	(0.3832)	(0.9605)	(0.1074)	(0.3239)	(0.7864)	(1.3905)
$lincome_t$	-1.2104***	-1.2105***	-1.2537***	-1.1167***	-1.2222***	-1.1236***	-1.3004***
	(8.9870)	(8.4957)	(8.9877)	(5.7242)	(8.6993)	(9.2441)	(10.422)
$lgovtconsp_t$	-0.6228**	-0.6226*	-0.7620**	-0.5863**	-0.6617**	-0.6664***	-0.6869**
	(2.2879)	(1.9687)	(2.5761)	(2.0721)	(2.1974)	(3.1631)	(2.5599)
$lfinancial_t$	6.9599***	6.9608***	6.4206***	6.7722***	7.0868***	6.2036***	6.3080***
	(6.5511)	(6.8918)	(7.4045)	(7.3732)	(6.2998)	(8.8472)	(5.7886)
$lfinancial_t^2$	-0.7757***	-0.7758***	-0.7187***	-0.7563***	-0.7936***	-0.7010***	-0.6954***
	(5.7779)	(6.2306)	(6.6873)	(6.3797)	(5.5351)	(7.9320)	(5.0890)
$lmisery_t$	0.2086**	0.2086**	0.2193**	0.2010**	0.2124**	0.2527***	0.1068*
	(2.3567)	(2.2389)	(2.4609)	(2.1556)	(2.3691)	(3.1944)	(1.7176)
$ltotaltax_t$		-0.0004					
		(0.0012)					
$ldirectax_t$			0.2538				
			(1.3565)				
$lindirectax_t$				0.0845			
				(0.5305)			
$lcorporatetax_t$					0.0939		
					(0.7427)		
$lindividualtax_t$						0.3737**	
						(2.0218)	
$lsaleservicetax_t$							-0.1104
							(0.9474)
R^2	0.9036	0.9036	0.9084	0.9046	0.9045	0.9170	0.9225
Adjusted R^2	0.8906	0.8875	0.8932	0.8887	0.8886	0.9032	0.9093
SER	0.1366	0.1385	0.1350	0.1378	0.1379	0.1285	0.1217
Schwarz criterion	-0.7678	-0.6804	-0.7322	-0.6906	-0.6898	-0.8307	-0.9330
$E-G\ test$:	-3.74***	-3.74***	-4.07***	-3.59***	-3.85***	-4.32***	-3.66***

Notes: Asterisks (***), (**) and (*) denote statistically significant at 1%, 5% and 10% level respectively. SER denotes standard error of regression. For the long-run models (Models 1 – 7), figures in round brackets (.) are *t*-statistics. For the cointegration tests (with null hypothesis of non-cointegration), the *E-G* test denotes the DF *t*-statistics on the cointegrating regression's residual, and the calculated statistics are those computed in MacKinnon (1996).

As shown in Table 3 (refer to last row), the null hypothesis of non-cointegration can be rejected at the 1% level as shown by the $\mathrm{E}-\mathrm{G}$ tests. We can therefore conclude that there is cointegration among the variables. Since the estimated Equation (2) exhibit cointgeration it also implies that there is long-run relationships between the shadow economy and its determinants and as such the estimated long-run model for shadow economy is non-spurious. In fact, in all cases, the estimated long-run models of the shadow economy suggest that generally; income, government consumption, financial development, tax burden and misery index are important determinants affecting Malaysia's shadow economy. This is evident where all variables are statistically significant at least at the 10% level. The negative relationship between shadow economy and income (or real GDP per capita, $lincome_t$) suggest that an increase in national income or economic development will

lead to a reduction in the size of the shadow economy. Increase in the wealth of the nation gives more opportunity for individuals as well as firms to seek and earn higher income in the formal economy. Thus, people or firm will shift out of the shadow economy and contribute into the formal economy.

Government consumption ($lgovtconsp_t$) show negative relationship with the shadow economy. The inverse relationships between government consumption and shadow economy would suggest people's satisfaction with the way government revenues has been spent appropriately. When people trusted their government, tax morale will be higher. Torgler (2005) argues that people will be more prone to pay taxes if they trust their fellow tax-payers to do the same, and if they trust the government to use tax revenues to finance public goods. In this situation high level of trust lead to high tax morale and consequently tax evasion (also shadow economy) will be low.

As for the tax variables, we have estimated the models with six measures of taxes, however, only individual income tax is statistically significant from zero as shown by Model 6. Other tax measures are insignificant at the conventional level. The positive relationship between shadow economy and tax burden as shown by individual income tax ($lindividualtax_t$) indicate that increasing individual income tax will encourage people to participate in the shadow economy. Thus, direct taxation such as individual income tax is a burden to the Malaysian population. This will imply that reduction in individual tax rate will help to mitigate shadow economy in Malaysia. Misery index measures the hardship of the people due to both inflation and unemployment rates, and therefore another form of burden to the Malaysian population. In the worst scenario, an increase in both inflation and unemployment rates will increase the misery (hardship) index and consequently will increase the size of the shadow economy. As shown in Table 3, the misery index ($lmisery_t$) indicates a positive effect on the shadow economy in Malaysia. The combined effect of both inflation and unemployment rates will push people into the shadow economy seeking for employment in order to substantiate their income as well as looking for cheaper goods and services. Thus, government program that could provide more job opportunity as well business opportunity and low level of inflation rate will induce people to participate in the official economy.

Nevertheless, our main interest that emerges from this study is the non-linear relationship shown between shadow economy and financial development in Malaysia. As indicated by the sign of θ_3 being positive while θ_4 is negative in all estimated models, this would suggest an inverted U-shape curve – a non-linear relationship between the shadow economy and financial development in Malaysia. The inverted U-shape curve suggests that as financial development progress in Malaysia from lower to higher level, shadow economy at first increases and after a certain optimal point, thereafter shadow economy decreases as financial development increases. Our findings support the contention made by Bose et al. (2012), Blackburn et al. (2012) and Bittencourt et al. (2014) that access to finance is difficult at lower level of financial development and players seek alternative financing and participate in the shadow economy; but as financial sector develops and becomes more sophisticated (in particular in terms of information sharing that will reduce asymmetric information between participants), access to finance will be much easier, cost of financing becomes cheaper, players willing to participate in the formal economy as the opportunity cost in participating in the shadow economy increases.

5. CONCLUSION

In this study, we have re-estimated the size of the shadow economy for Malaysia for the periods 1970 to 2013. After which we have examined the factors affecting shadow economy in Malaysia during the same period. We relate the size of shadow economy with its determinants – income, government consumption, financial development, tax burden and "hardships" measured by the misery index. Our estimated long-run models suggest that declining income (say, economic recessions) and increase in individual income tax rate, increases the size of the shadow economy. Our results further suggest that government spending mitigate the size of the shadow economy in Malaysia. When people perceived that tax revenue has been spent appropriately and for good used, probably on public infrastructure and services, satisfied population refrain from participating in the shadow economy. Further, miserable life experience by the people as they are unemployed but at the same time facing higher inflation rate will also lead them into the shadow economy.

Importantly, our study reveals that the relationship between shadow economy and financial development in Malaysia is nonlinear and exhibit an inverted U-shape curve; suggesting that shadow economy increases at lower level of financial development but as financial development increases further, shadow economy ultimately decreases. Thus, our findings support the earlier work of Bose et al. (2012), Blackburn et al. (2012) and Bittencourt et al. (2014). An important policy implication is that the Malaysian government as well as Bank Negara Malaysia should embark on programs that can discourage people or firm from participating in the shadow economy. Programs on financial inclusion and further reform of the financial sector should be the focus. For example, by providing avenue for easy access to the credit market and further reform of the capital market sector. Since Malaysia practice dual banking system by having both conventional banks and Islamic banks; Islamic banks and Islamic capital markets can play a pivotal in the effort to enhance financial inclusion to the "unbanked" population especially among the rural and "hardcore" religious community that refused the conventional banks that practice usury. Islamic finance can also play an important role in providing finances to the small and medium enterprises that could not access the conventional banks for credit.

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