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Does Economic Development Mitigate Tax Evasion? Evidence from Evasional Kuznets Curve

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ABSTRACT

The purpose of this study is to estimate the size of the shadow economy in Malaysia for the period 1983 to 2013 using the currency demand approach (CDA). We employ the nonlinear autoregressive distributed lag (NARDL) modeling approach and calculate the loss in tax revenue (tax evasion) as a result of the presence of the shadow economy. We analyse factors determining tax evasion in Malaysia and our results suggest that tax evasion exhibit an inverted-U shape curve (nonlinear) with the level of economic development and positive relationship with various measures of tax burden in Malaysia during the period under study. We conclude that increasing the level of economic development and reducing the various tax rates will able to reduce tax evasion in Malaysia.

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INTRODUCTION

Tax evasion remains one of the most common and persistent problem for any nations. It is a growing concern to the government as the tax revenue loss has serious economic consequences (Cerqueti and Coppier, 2011). By evading taxes the government are deprived from providing adequate financing for public services, infrastructure, human capital development, best health care services and other facilities that would benefit the society (Johnson et al., 2000). Furthermore, large tax evasion signifies that the country having large shadow economy compared to the developed world (Fuest and Riedel, 2009). Franzoni (1998) asserts that the loss of tax revenue may result in slow economic growth, upsetting the proper functioning of the government as the ability to finance its basic expenses is threatened. Thus, fighting tax evasion should be an important agenda for any government.

The Tax Justice Network (2011) reports that the estimated total tax evasion for 145 countries around the world is in excess of US$3.1 trillion or about 5.1% of world GDP. Europe experienced tax losses of US$1.5 trillion, followed by Asia US$666 billion, North America US$453 billion, South America US$376 billion, Africa US$79 billion while the Oceania US$46 billion. Among the ASEAN-5 economies Malaysia ranked fourth with a total tax evaded of US$11.2 billion; after Thailand US$25.8 billion, Indonesia US$17.8 billion and the Philippines US$11.7 billion. On the other hand, Singapore experience tax losses of only US$4.1 billion.

The report further point out that the loss from tax evading activity occurs as a result of shadow economic activities existed in all economies as well as due to tax haven activity. Tax haven countries are those countries characterize of having low or non-existent tax rates on some types of income, lack of transparency, bank secrecy, lack of information sharing, and requiring no economic activity for an entity to obtain legal status (Gravelle, 2015). Zucman (2013) estimates that bank deposits in Switzerland constitute about one third of the global stock of household offshore wealth and it is believed that a fraction of this wealth escapes home country taxation (offshore tax evasion). Johannesen (2014) reports that most of this wealth is owned by the very richest households and that it is largely escapes taxation. In tax haven countries with strict bank secrecy rules, banks do not generally report the investment income earned by their clients to the tax authorities, and therefore escape paying taxes.

One fundamental question that is relevant to tax evasion is: why people evade tax? According to Hanousek and Palda (2015, 2004), people did not just evade taxes in order to enrich themselves but also as a means of signaling their discontent with the quality of government services they received. Their study on the transition economies found some evidence that when people believe the quality of government services to be poor, they will evade taxes in response. In fact, Feige (1990) contends earlier that a rising public dissatisfaction with the performance of government and/or a growing public distrust and resentment may potentially contribute to the size of the shadow economy, and economic activities in the shadow economy will be tax evading (Tax Justice Network, 2011).

The purpose of the present paper is to determine factors affecting tax evasion in Malaysia. According to Schneider (2012), shadow economy and tax evasion is not congruent, however, activities in the shadow economy in most cases imply the evasion of direct or indirect taxes, such that the factors affecting tax evasion will most certainly also affect the shadow economy. In this study we emphasis on the role of economic development as a vehicle to reduce tax evasion in Malaysia. As relevant control variable for tax evasion, we have included various measures of tax burden in the study.

The paper is organized as follows. In the next section we review some related literature on factors affecting tax evasion. In section 3, we discuss the model and method used to estimates tax losses through estimating the size of shadow economy in Malaysia. In section 4, we discuss the empirical results. The last section contains our conclusion.

REVIEW OF RELATED LITERATURE

In Malaysia, the Malaysian Income Tax Act 1967 and Service Tax Act 1975 make clear that any non-declared, under-reporting as well as concealment of income are considered evading taxes (see Noor et al., 2013). In a study by Fatt and Ling (2008), Malaysians evade tax by not declaring their dividend income, rental income earned not in their name but in their parent’s name, claim parents’ maintenance expenses as salary paid to employees, and submitting tax return on time without tax payment.

On the empirical perspectives, a cross-country study by Richardson (2006: and the references therein) posits that age, education, employment in the services sector, fairness and tax morale affect tax evasion in 45 countries investigated[1]. Study by Crane and Nourzad (1986) reveal that inflation, marginal tax rate, probability of detection, penalty rate, proportion of wages to income and real income influence tax evading behavior in the U.S. The role of inflation in stimulating tax evasion is further supported by Caballe and Panades (2004).

In two studies on tax evasion in Switzerland, Feld and Frey (2006) and Kirchgassner (2010) contend that the probability of detection, penalty rate, marginal tax rate, tax procedures, democracy, income, age, type of employment, language, and population are important determinants of tax compliance. For the OECD countries, Kafkalas et al. (2014) found that apart from income and tax rate, government effectiveness (quality of government) and tax monitoring expenses influence tax evasion. On the other hand, studies by Cebula (1998) and Cebula and Foley (2010) indicate that income tax rate, unemployment, interest rate, audit and penalty rate affect tax compliance in the U.S.

On another strand of studies, researchers have investigated the role of financial sector as determinant of tax evasion. According to Bose et al. (2012), in developed economies characterized by high level of financial development, individual or firm have easy access to the credit market. 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. Since the value provided by the financial intermediation is considerable (Gordon and Li, 2009), there is less incentive to evade tax and the need to participate in the shadow economy is minimal.

Nonetheless, there are many reasons as to why peoples or firms participate in the shadow economy in order to avoid paying tax. 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 that led people to evade tax and pushing people into the shadow economy. Of these, tax burden is often cited as the most prevalent factor behind the emergence of the shadow economic activities. The high tax and social security contribution burdens encourage individuals to evade the current system through under paying their tax and social security premiums (Carolina and Pau, 2007). Other variables such as government spending or consumption (Vo and Ly, 2014; Wang et al., 2006; Buehn and Schneider, 2012); weak government and bad governance (Friedman et al., 2000; Manolas et al., 2013); lack of trust for the government (D'Hernoncourt and Meon, 2012); crime rate (Wang et al., 2006); and inflation (Bittencourt et al., 2014); are all contributed in increasing the size of the shadow economy. The larger the size of the shadow economy the greater is tax evasion.

METHODOLOGY

Estimating tax evasion in Malaysia

In this study, following the work by Richardson (2006), Kafkalas et al. (2014), Kirchgassner (2010), and Feld and Frey (2006), we specify a simple model for determinants of tax evasion for Malaysia as follow,

$$\mathrm{LTAXEVASION_t} = \gamma_0 + \gamma_1 \mathrm{LRGDPPC_t} + \gamma_2 \mathrm{LRGDPPC_t^2} + \gamma_3 \mathrm{LTAXBURDEN_t} + \omega_t \qquad (1)$$

Where L denotes variable in natural logarithm and ω is the error term. Variable $\mathrm{TAXEVASION_t}$ is measured by the ratio of tax evasion to GDP, $\mathrm{TAXBURDEN_t}$ is the tax rate proxy by the ratio of tax revenue to GDP, and $\mathrm{RGDPPC_t}$ is real GDP per capita to measure the level of economic development or national income; and $\mathrm{RGDPPC_t^2}$ is the square of the real GDP per capita. In this study the tax burden ($\mathrm{TAXBURDEN_t}$) variable is disaggregated into total tax revenue ($\mathrm{TAX_t}$), direct taxation ($\mathrm{DIRECTTAX_t}$), indirect taxation ($\mathrm{INDIRECTTAX_t}$), corporate taxation ($\mathrm{CORPORATETAX_t}$), and personal taxation ($\mathrm{PERSONALTAX_t}$). With respect to the relationship between tax evasion and economic development, the expected sign for γ_1 and γ_2 are ambiguous. It is expected a *priori* that $\gamma_1 > 0$ and $\gamma_2 < 0$, thus we conjecture a nonlinear (or an inverted-U shape curve) relationship between tax evasion and economic development. This relationship implies that at lower stages of economic development tax evasion are increasing while at higher level of economic development tax evasion tends to be lower.

[1]The theoretical analysis of tax evasion can be traced back to the work of Allingham and Sandmo (1972).

Recent study by Hanousek and Palda (2015: 7) on Czech Republic, contend that "the evasional Kuznets curve may be a curve along which evasion rises as taxes increase, summed with a curve along which evasion falls as governments become less corrupt and people stop curtail that part of their evasion which acted as a form of political protest". The inverted-U shape curve between tax evasion and economic development show that the marginal rate has a positive influence on evasion as tax increases people tend to evade tax; but at the same time people perceived the government effort to increase the quality of the government services and therefore, perceived quality has a negative effect. Hanousek and Palda (2015: 8) point out that the people of the Czech Republic that they surveyed believe that "it is immoral to evade and that family reactions to evasion are becoming increasingly negative. If both taxes and quality were rising and working against each other in their effect on evasion, the sum of their opposite influences might have given rise to an evasional Kuznets curve".

On the other hand, the expected sign for the impact of tax burden on tax evasion is positive, that is, $\gamma_3 > 0$. The increase in tax rate whether it is from direct taxation, indirect taxation, corporate taxation or personal taxation, we would expect that it will have an adverse effect on tax evasion that is, tax evasion will increase. Another questions remain: Does people in Malaysia who evade tax are more responsive to direct taxation or indirect taxation? Does firms or individuals are more responsive to evade tax in Malaysia? This study will be able to answer these questions.

Nevertheless, the validity of the estimated long-run Equation (1) can be determined by employing the cointegration test; and before proceeding to conduct the cointegration test, all variables in Equation (1) need to be tested for the order of integration, that is, whether they are I(0), I(1) or I(2). The purpose of the testing for the order of integration as well as for cointegration is to account that Equation (1) is non-spurious.

Estimating shadow economy in Malaysia

However, to estimate the revenue from tax losses ($\mathrm{TAXEVASION_t}$) it is imperative to estimate the extent of the size of the shadow economy. Although it is recognized that there is no one method that is ideal to estimate the size of the shadow economy exists (Berger et al., 2014), in this study we endeavor to estimate the size of shadow economy for Malaysia using the currency demand approach (CDA). The estimated currency demand will then be used to calculate the size of the shadow economy for Malaysia. CDA is considered as one of the most well-recognized and popular methods in estimating the size of the shadow economy[2]. The idea behind this approach assumes that shadow economic transactions are undertaken in the form of cash which leave no trace or trail. Transactions involve cash are difficult to trace as compared to those activities using other assets or registered in any financial institutions. A rise in the tax burden implies stronger incentive to engage in cash-intensive underground economic activities, and hence increase the demand for cash. In other words, the CDA provides an indirect measure of the shadow economy by estimating how much cash used for shadow transactions with the assumption that the velocity between the cash used in the unofficial and the official economy are equal (Tanzi, 2002).

Since currency in circulation is a subset of the money demand, thus, the currency demand is modeled as a function of a scale variable (for example, see Alm and Embaye, 2012) often measured by real income to account for transactions demand; the opportunity cost of holding currency which is represented by interest rate, and additional variables that might influence the behavior of currency holdings. Following Tanzi (1983) and other subsequent studies (Dell'Anno and Halicioglu, 2010; Dobre and Davidescu, 2013; Kiani et al., 2015), the general specification for our long-run currency demand function is specified as follow:

$$\mathrm{LCM_t = \theta_0 + \theta_1 LTAX_t + \theta_2\, LR_t + \theta_3 LY_t + e_t} \qquad \mathrm{t = 1, \ldots, T} \tag{2}$$

where L is the natural logarithm, $\mathrm{CM_t}$ is the ratio of currency in circulation to broad money supply $(\mathrm{M2})$, $\mathrm{TAX_t}$ is the ratio of total tax revenue to GDP, $\mathrm{R_t}$ is the real interest paid[3], $\mathrm{Y_t}$ is real GDP per capita, and e is the error term. The sign of the estimated coefficient for θ_1 is expected to be positive, while the parameter estimates for real interest rate (θ_2) and real GDP per capita (θ_3) are expected to be negatively related with currency holdings.

The conventional assumption on the relationship between tax rate and currency demand is linear. However, Giles et al. (2001) have suggested that an increase in the tax rate has larger influence on the underground

[2]Other methods that can be used to estimate the size of the shadow economy include the MIMIC model approach, direct approach by using surveys on illegal markets, discrepancies in official statistics and the electricity approach.
[3]Real interest rate equals nominal interest rate paid on saving deposits minus the inflation rate (growth in the GDP deflator).

economy than a decrease in the tax rate. In addition to this, Wang et al. (2012) also suggested that there exists asymmetric response of the underground economy to effective direct or indirect tax rates in Taiwan from 1962 to 2003. Taking these views into account, in this study we endeavor to estimate the size of the shadow economy with the underline assumption that the relationship between currency demand and tax rate is nonlinear.

The nonlinear autoregressive distributed lag (NARDL) model

In order to account for the nonlinearity of the tax effects on currency demand, we employ the nonlinear autoregressive distributed lag (NARDL) model approach which is a new technique and recently proposed by Shin et al. (2014) and is an extension of the traditional linear ARDL model (Pesaran et al., 2001; Pesaran and Shin, 1999). The NARDL allows for estimating asymmetric effects in the short-run as well as in the long-run among variables examined. Following Equation (2), the asymmetric long-run equation can be specified in the following form:

$$\mathrm{LCM}_t = \theta_0 + \theta_1^{+}\mathrm{LTAX}_t^{+} + \theta_2^{-}\mathrm{LTAX}_t^{-} + \theta_3\,\mathrm{LR}_t + \theta_4\mathrm{LY}_t + e_t \qquad (3)$$

where $\theta = (\theta_0, \theta_1^{+}, \theta_2^{-}, \theta_3, \theta_4)$ is a cointegrating vector. In Equation (3), LTAX_t can be decomposed as:

$$\mathrm{LTAX}_t = \mathrm{LTAX}_0 + \mathrm{LTAX}_t^{+} + \mathrm{LTAX}_t^{-} \qquad (4)$$

where LTAX_0 is the initial value, LTAX_t^{+} and LTAX_t^{-} are partial sums of positive and negative changes in LTAX_t as follow:

$$\mathrm{LTAX}_t^{+} = \sum_{i=1}^{t}\Delta\mathrm{LTAX}_i^{+} = \sum_{i=1}^{t}\max(\Delta\mathrm{LTAX}_i, 0) \qquad (5)$$
$$\mathrm{LTAX}_t^{-} = \sum_{i=1}^{t}\Delta\mathrm{LTAX}_i^{-} = \sum_{i=1}^{t}\min(\Delta\mathrm{LTAX}_i, 0) \qquad (6)$$

Following Shin et al. (2014), Equation (3) is then associated with the linear ARDL(p, q, r, s) model (Pesaran et al., 2001; Pesaran and Shin, 1999) becomes NARDL(p, q, r, s) model, and can be specified as:

$$\Delta\mathrm{LCM}_t = \gamma_0 + \beta_0\mathrm{LCM}_{t-1} + \beta_1^{+}\mathrm{LTAX}_{t-1}^{+} + \beta_2^{-}\mathrm{LTAX}_{t-1}^{-} + \beta_3\,\mathrm{LR}_{t-1} + \beta_4\mathrm{LY}_{t-1} + \sum_{i=1}^{p}\alpha_{0i}\Delta\mathrm{LCM}_{t-i} + \sum_{i=0}^{q}(\alpha_{1i}^{+}\Delta\mathrm{LTAX}_{t-i}^{+} + \alpha_{2i}^{-}\Delta\mathrm{LTAX}_{t-i}^{+}) + \sum_{i=0}^{r}\alpha_{3i}\Delta\mathrm{LR}_{t-i} + \sum_{i=0}^{s}\alpha_{4i}\Delta\mathrm{LY}_{t-i} + \mu_t \qquad (7)$$

where $\theta_1^{+} = -\frac{\beta_1^{+}}{\beta_0}$ and $\theta_2^{-} = -\frac{\beta_2^{-}}{\beta_0}$ represent long-run impacts of tax burden increase and tax burden decrease on the currency holdings; while $\sum_{i=0}^{q}\alpha_{1i}^{+}$ and $\sum_{i=0}^{q}\alpha_{2i}^{-}$ measure the short-run effects of an increase in tax burden and a decrease in tax burden, respectively on currency in circulation.

Conducting empirical analysis for the NARDL model involves the following steps. The first step is to estimate asymmetric error correction model (AECM) of Equation (7) using the standard Ordinary Least Square (OLS). Secondly, we identify the existence of a long-run level cointegrating relationship between levels of the variables $\mathrm{LCM}_t, \mathrm{LTAX}_t^{+}, \mathrm{LTAX}_t^{-}, \mathrm{LR}_t,$ and LY_t using a bound testing approach of Pesaran et al. (2001) and Shin et al. (2014). With the modified F-test, the null hypothesis for all the long-run coefficients is jointly equal to zero $(\text{i.e.}\, \beta_0 = \beta_1^{+} = \beta_2^{-} = \beta_3 = \beta_4 = 0)$.

The long-run cointegrating relationship is identified when the computed F-statistic is compared with the bound critical value tabulated by Narayan (2005) for small sample size. The null hypothesis of no cointegration is rejected when the computed F-statistic exceeds the upper bounds of critical value that the variables are cointegrated. On the other hand, the variables are not cointegrated if the null hypothesis of no cointegration is not rejected where the estimated F-statistic falls below the lower bond of critical value. If the calculated F-statistic falls between the upper and lower bounds of critical values, the decision is inconclusive. Lastly, we examine for long-run and short-run symmetry using the standard Wald test. The null hypothesis of long-run symmetry is $\theta_1^{+} = \theta_2^{-}$ or $-\frac{\beta_1^{+}}{\beta_0} = -\frac{\beta_2^{-}}{\beta_0}$ whereas the short-run symmetry restrictions is $\sum_{i=0}^{q}\alpha_{1i}^{+} = \sum_{i=0}^{q}\alpha_{2i}^{-}$[4].

[4]In this study, we exclude the asymmetric dynamic multiplier effects of a unit change in LTAX_t^{+} and LTAX_t^{-}, respectively on LCM_t.

The estimated long-run Equation (3) is used to calculate the estimated currency in circulation. Again, Equation (3) is estimated by setting the tax rate at minimum levels, whilst coefficients for other variables remain unchanged[5]. The difference between the two estimations show an estimate of illegal stock of currency held for the purpose of tax evasion. The illegal stock money is then multiplied by the velocity of money to yield an estimate of shadow economy. Following the work by Bhattacharyya (1990), Bajada (1999), Schneider (2000), Alm and Embaye (2012) and others, it is assumed that velocity of illegal stock money is equal to the velocity of legal money[6].

Sources of data

In this study, we used annual data spanning from the period 1983 to 2013, which consisting of 31 observations. Secondary data on currency in circulation, broad money (M2), and total tax revenue were collected from the various issues of the publication, Key Indicators for the Asia and the Pacific published by the Asian Development Bank (see http://www.adb.org). While other data such as interest rate (on saving deposits), inflation rate (using growth rate in GDP deflator), and real Gross Domestic Product (GDP) per capita were compiled from World Development Indicators (WDI) published in the World Bank database (see https://data.worldbank.org/indicator?tab=all). Data on disaggregated tax burden (as ratio to GDP) such as total direct taxation, indirect taxation, corporate taxation and personal taxation were compiled from the various issues of the Monthly Statistical Bulletin published by the Bank Negara Malaysia.

RESULTS AND DISCUSSIONS

The estimated size of shadow economy in Malaysia

Although the NARDL cointegration test does not require that all variables examined be integrated of I(1), the unit root tests are important to check whether the variables examined are not integrated of I(2). This is because the critical values of the F-statistic for bound tests computed by Pesaran et al. (2001) and Narayan (2005) are based on the assumption that either the variables are I(0) or I(1). Therefore, the F-test will be misleading in the presence of I(2) variables. The results of the augmented Dickey-Fuller (ADF) unit root tests suggest that all variables are I(1) series as presented in Table 1. Hence, it may be worth concluding that none of the variables used in the analysis are I(2) or higher level of integration.

Table 1 Results of ADF unit root test on currency demand variables

	Levels:		First-differences:	
	Intercept	Intercept+trend	Intercept	Intercept+trend
LCM_t	-1.963 (0)	-0.578 (1)	-6.645 (0)	-6.229 (1)
$LTAX_t$	-2.990 (0)	-2.516 (0)	-5.572 (0)	-7.131 (0)
LR_t	-3.523 (1)	-2.090 (0)	-4.270 (1)	-5.131 (0)
LY_t	-1.566 (0)	-0.581 (0)	-4.438 (0)	-6.265 (0)

Notes: Asterisks (**) denotes statistically significant at 5% level. The figures in round bracket are lag length truncated.

The result of the bounds test for cointegration is shown in Table 2. Using the asymptotic critical value computed by Narayan (2005) for small sample size, the result reveals that the null hypothesis of no cointegration is rejected at 5% significance level. The computed F-statistic of 6.832 is greater than the upper bound of critical value of 4.774, leading to conclude that there exists a long-run relationship between $LCM_t, LTAX_t^+, LTAX_t^-, LR_t$ and LY_t. Panel A of Table 2 reports the estimates of the nonlinear ARDL regression of Equation (7) by applying the general-to-specific approach to arrive at the final ARDL specification. The maximum lag length order chosen is 3. Subsequently, we apply the standard Wald test for both long-run (W_{LR}) and short-run (W_{SR}) in order to examine for symmetry. For the long-run, the null hypothesis of symmetry between positive and negative components of the considered variables is rejected. As can be seen, the standard Wald test (W_{LR}) is found to be 7.210 (p-value =0.007). Similarly , the results suggest that rejection of the null hypothesis of the short-run

[5]A number of studies set the tax rate at zero. However, we assume the tax rate at minimum level which is similar to Hernandez (2009) due to the estimation of NARDL involves the partial sums of positive and negative changes in $LTAX_t$.

[6]Gadea and Serrano-Sanz (2002) and Hill and Kabir (2000) allows for different velocities of circulation in the underground economy. The velocity of money is obtained by dividing nominal GDP with total currency in this study.

symmetry impacts against the alternative of asymmetry. However, we can only reject the null hypothesis of a symmetric short-run relationship at 10% level (W_{SR}=3.066, p-value = 0.080). Furthermore, the estimated equation past all the diagnostic tests on no serial correlation and homoscedasticity of residuals; and the cumulative sum of recursive residual (CUSUM) and cumulative sum of squares of recursive residuals (CUSUMSQ) tests also suggest stability of parameter estimates for NARDL model.

Table 2 Nonlinear ARDL estimation results and long-run relations.

Dependent variable	Independent variables:						
Panel A: Nonlinear ARDL-Unrestricted ECM model							
ΔLCM_t	Constant	LCM_{t-1}	$LTAX^+_{t-1}$	$LTAX^-_{t-1}$	LR_{t-1}	LY_{t-1}	ΔLCM_{t-1}
	6.487	-1.761***	1.034**	2.741***	-0.496	-0.928*	0.805**
	(1.940)	(5.146)	(2.514)	(3.990)	(1.688)	(2.046)	(2.904)
	ΔLCM_{t-2}	ΔLCM_{t-3}	$\Delta LTAX^+_t$	$\Delta LTAX^+_{t-1}$	$\Delta LTAX^-_t$	$\Delta LTAX^-_{t-1}$	$\Delta LTAX^-_{t-2}$
	0.422	0.209	0.917*	-0.140	0.958**	-0.834	-0.639
	(1.906)	(1.023)	(2.348)	(0.366)	(3.085)	(1.943)	(1.732)
	$\Delta LTAX^-_{t-3}$	ΔLR_t	ΔLR_{t-1}	ΔLR_{t-2}	ΔLR_{t-3}	ΔLY_t	
	-0.725*	-0.265	0.350*	0.201	0.257*	0.961**	
	(2.260)	(1.838)	(2.040)	(1.677)	(2.381)	(2.485)	
R^2 = 0.943	LM(1)=1.028 [0.311]		ARCH(1)=1.130 [0.288]		Bounds test: 6.832**		
	W_{LR}=7.210*** [0.007]		W_{SR}=3.066* [0.080]				
Panel B: Long-run relation							
LCM_t	Constant	$LTAX^+_t$	$LTAX^-_t$	LR_t	LY_t		
	3.6833*	0.5873**	1.5564***	-0.2817	-0.5267**		
	(2.3613)	(3.4256)	(4.6300)	(1.5534)	(2.5611)		

Notes: Asterisks ***, ** and * indicate significant at 1%, 5%, and 10% significance level, respectively. The superscript "+" and "-" denote positive and negative partial sums, respectively. W_{LR} refer to the Wald test for the long-run symmetry, $-\frac{\beta_1^+}{\beta_0} = -\frac{\beta_2^-}{\beta_0}$. W_{SR} refer to the Wald test for the short-run symmetry, $\sum_{i=0}^{q} \alpha_{1i}^+ = \sum_{i=0}^{q} \alpha_{2i}^-$. LM(.) and ARCH(.) are Lagrange multiplier test for residual serial correlation and ARCH test for heteroscedasticity. The critical values for the Bounds test are from Narayan (2005) with 95% lower bound 3.354 and 95% upper bound 4.774. Figures in round (.) brackets are *t*-statistics, and figures in square [.] brackets are *p*-values.

We further proceed to the analysis of the long-run asymmetric presented in Panel B, in Table 2. All the long-run estimated coefficients have the expected sign, which is in line with the theoretical considerations and the parameters are statistically significant except interest rate. This indicates tax rate for both positive component $(LTAX^+_t)$ and negative component $(LTAX^-_t)$ as well as income per capita are the key determinants of currency ratio. Tax rate is considered as the most important factor, where a higher tax rate increases the opportunity of evading taxes. Thus, people who wish to engage in the underground activities by under reporting their taxes will use more currency. Turning to our interest, we notice that the asymmetric long-run relationship between the tax rate and currency ratio, with a 10% increase in the tax rate is associated with a 5.9% rise in currency ratio. In contrast, the size of the long-run parameter on $LTAX^-_t$ is relatively larger, implying that a 10% decrease of tax rate resulting in a decrease of 15.6% in currency ratio. Hence, it suggests that the negative changes of tax rates have a sizeable effect on the currency ratio as compared to the positive changes.

Determinants of tax evasion in Malaysia

Once the estimates of the size of the shadow economy for Malaysia has been computed based on the estimated long-run Equation (3) above; the estimates of the tax evasion (ratio to GDP) are then calculated as the tax revenue multiply with the ratio of shadow economy to the official GDP. The estimated size of the shadow economy and tax evasion to the ratio of GDP are presented in Table A1 in the Appendix.

However, as the conventional practice, before estimating Equation (1) for cointegration, we test for the order of integration of all variables involved in the analysis. The results of the unit root test are presented in Table 3. The results clearly suggest that all variables are I(1) in levels and need to be differenced once to achieve stationarity. On the other hand, for the test of cointegration, in this study we have employed four estimators (for robustness of the results), namely; the Engle and Granger (1987) two-step procedure (E-G), dynamic OLS (DOLS), fully modified OLS (FMOLS), and canonical cointegrating regression (CCR) (see Stock and Watson, 1993; Phillips and Hansen, 1990; Park, 1992). The use of DOLS, FMOLS and CCR estimators are robust to small sample and simultaneity biases. In Tables 4 to 8, we present the results of the cointegration tests as well as the estimated long-run models for Malaysia's tax evasion; with tax burden (as ratio to GDP) - total tax revenue

($\mathrm{LTAX_t}$), direct taxation ($\mathrm{LDIRECTTAX_t}$), indirect taxation ($\mathrm{LINDIRECTTAX_t}$), corporate tax ($\mathrm{LCORPORATETAX_t}$), and personal taxation ($\mathrm{LPERSONALTAX_t}$), respectively. For OLS we used the conventional Engle and Granger two-step procedure for testing the null hypothesis of non-cointegration or the present of unit root on the residuals. On the other hand, we also report the $\mathrm{L_c}$-statistics, the test for the null hypothesis of cointegration for FMOLS, DOLS and CCR.

Table 3 Results of ADF unit root test on tax evasion variables

	Levels:		First-differences:	
	Intercept	Intercept+trend	Intercept	Intercept+trend
$\mathrm{LTAXEVASION_t}$	-1.177 (0)	-2.878 (0)	-40708** (1)	-4.618** (1)
$\mathrm{LRGDPPC_t}$	-2.166 (0)	-2.293 (0)	-4.566** (0)	-4.952** (0)
$\mathrm{LRGDPPC_t^2}$	-1.962 (0)	-2.288 (0)	-4.680** (0)	-4.981** (0)
$\mathrm{LTAX_t}$	-2.293 (0)	-3.005 (0)	-7.746** (0)	-7.552** (0)
$\mathrm{LDIRECTTAX_t}$	-2.462 (0)	-3.381 (0)	-6.764** (0)	-6.489** (0)
$\mathrm{LINDIRECTTAX_t}$	-0.258 (0)	-3.302 (0)	-6.320** (0)	-6.393** (0)
$\mathrm{LCORPORATETAX_t}$	-2.312 (0)	-2.345 (0)	-5.632** (0)	-5.503** (0)
$\mathrm{LPERSONALTAX_t}$	-2.352 (0)	-2.283 (0)	-5.305** (0)	-5.207** (0)

Notes:Asterisks (**) denotes statistically significant at 5% level. The figures in round bracket are lag length truncated.

Table 4 Estimates of tax evasion long-run models with tax burden.

Estimators\Regressors	Intercept	$LRGDPPC_t$	$LRGDPPC_t^2$	$LTAX_t$
OLS	-235.84***	48.165***	-2.5042***	2.1221***
(robust estimates)	(4.5379)	(4.5501)	(4.6103)	(7.0163)
	E-G test: -3.220***	SER=0.149	adjusted R^2=0.84	JB test: [0.880]
FMOLS	-212.26***	43.353***	-2.2664***	2.3742***
	(4.2831)	(4.2979)	(4.3870)	(5.0967)
	L_c=0.384 [>0.20]	SER=0.176	adjusted R^2=0.78	JB test: [0.685]
DOLS	-212.04**	43.326***	-2.3041***	3.6097**
{lead=1, lag=1}	(3.0129)	(3.0940)	(3.3012)	(2.7591)
	L_c=0.049 [>0.20]	SER=0.152	adjusted R^2=0.83	JB test: [0.001]***
CCR	-251.47***	51.378***	-2.6799***	2.4709***
	(6.0777)	(6.0037)	(6.0580)	(5.2976)
	L_c=0.429 [>0.20]	SER=0.180	adjusted R^2=0.77	JB test: [0.682]

Notes: Asterisks ***, ** and * denote statistically significant at 1%, 5% and 10% level, respectively. The figures in square brackets are the *p*-values. OLS regression was estimated using robust standard error procedure that corrected for autocorrelation and heteroscedasticity by using Newey-West consistent standard error (Newey and West, 1987). *E-G* test denote the DF *t*-statistic on the cointegrating regression's residuals. L_c-statistic measures Hansen (1992) parameter instability test for cointegration. The *E-G* tests with null hypothesis of no cointegration while the Hansen test the null hypothesis of cointegration. SER denotes standard error of regression. JB test denotes Jacque-Bera test for normality of the residuals

Generally, in each table, all four long-run models for tax evasion are valid and free from the problem of spurious regression except for the results using FMOLS in Tables 5 and 7, and CCR in Table 6 in which the null hypothesis of cointegration cannot be rejected at least at the 10% level. Overwhelmingly, our results indicate that all tax burden variables consistently showing positive and are significant at least at the 5% level for all estimators. This implies that increase in tax burden will lead to an increase in tax evasion. For example, from Table 4, the elasticity of tax evasion with respect to tax burden (total tax revenue to GDP) ranges from 2.1 to 3.6; meaning that a 10% increase in tax rate will increase tax evasion by 21% to 36%.

Comparing the results in Table 5 and Table 6, we discover an interesting result between the impact of direct taxation and indirect taxation on tax evasion; where we found that Malaysians are generally more responsive to the increase in direct taxation as compared to indirect taxation. For example, from OLS, a 10% increase in direct taxes will increase tax evasion by 18%, while increase in tax evasion as a result from an increase in indirect taxation is only 12%. Generally, the results indicate that the response to the increase in direct taxation is 50% or more compared to the increase in indirect taxation. Further, segregating direct taxation into corporate and personal taxes and their impact on tax evasion are shown in Table 7 and Table 8, respectively. It is clear that the corporate sector is more responsive to tax rate compared to the personal sector. For example, DOLS results suggest that a 10% increase in the corporate tax rate will increase tax evasion in the corporate sector by 15%; while the same increase in tax rate will only results in a 10% increase in tax evasion by the individuals. Thus, we can conclude that firms in Malaysia are more willing to go underground and evade taxes compared to individuals.

Table 5 Estimates of tax evasion long-run models with direct tax burden

Estimators\Regressors	Intercept	$LRGDPPC_t$	$LRGDPPC_t^2$	$LDIRECTTAX_t$
OLS	-141.98***	30.454***	-1.6503***	1.8143***
(robust estimates)	(2.9994)	(3.1305)	(3.2934)	(8.0096)
	E-G test: -2.903***	SER=0.147	adjusted R^2=0.84	JB test: [0.098]
FMOLS	-85.395*	18.999**	-1.0792**	2.1896***
	(1.9588)	(2.1197)	(2.3512)	(6.2085)
	L_c=0.716* [0.085]	SER=0.184	adjusted R^2=0.76	JB test: [0.371]
DOLS	-125.34*	26.502*	-1.4612**	3.4677**
{lead=1, lag=2}	(2.1287)	(2.2603)	(2.5141)	(3.2026)
	L_c=0.030 [>0.20]	SER=0.098	adjusted R^2=0.93	JB test: [0.207]
CCR	-131.71***	28.514***	--1.5705***	2.3086***
	(3.3260)	(3.4739)	(3.7180)	(5.9423)
	L_c=0.595 [0.148]	SER=0.181	adjusted R^2=0.77	JB test: [0.849]

Notes: As per Table 4 above.

Table 6 Estimates of tax evasion long-run models with indirect tax burden

Estimators\Regressors	Intercept	$LRGDPPC_t$	$LRGDPPC_t^2$	$LINDIRECTTAX_t$
OLS	-41.337	8.1507	-0.4014	1.2014***
(robust estimates)	(1.0900)	(1.0245)	(0.9677)	(9.8563)
	E-G test: -6.198***	SER=0.143	adjusted R^2=0.85	JB test: [0.994]
FMOLS	-55.637*	11.088	-0.5535	1.2768***
	(1.7703)	(1.6863)	(1.6170)	(8.9434)
	L_c=0.603 [0.143]	SER=0.148	adjusted R^2=0.84	JB test: [0.703]
DOLS	-131.89	25.138	-1.1964	1.5631**
{lead=3, lag=0}	(1.2445)	(1.1625)	(1.0881)	(3.4375)
	L_c=0.082 [>0.20]	SER=0.119	adjusted R^2=0.89	JB test: [0.578]
CCR	-75.352**	15.477**	-0.7941**	1.1670***
	(2.5197)	(2.4151)	(2.3340)	(6.5096)
	L_c=0.880** [0.040]	SER=0.166	adjusted R^2=0.80	JB test: [0.456]

Notes: As per Table 4 above.

On the other hand, further interesting results emerge from this study is the nonlinear relationship shown between tax evasion and economic development in Malaysia. We can observe that $\gamma_1 > 0$ and $\gamma_2 < 0$ in all tables are significant at least at the 10% level; except for OLS, FMOLS and DOLS in Table 6; and Table 7 for all estimators. The inverted-U shape curve suggests that as economic development progress in Malaysia from low to higher level, tax evasion at first increases and then after a certain optimal point tax evasion decreases. The nonlinear relationship between tax evasion and economic development in Malaysia support the contention made by Hanousek and Palda (2015). Furthermore, this phenomenon can also be explained according to the public choice argument. Studies by Hanousek and Palda (2004), D'Hernoncourt and Meon (2012), Lassen (2007), and Torgler (2005) posit that trust and tax evasion is negatively related, and trust is related to tax morale. Torgler (2005) argue 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. As argued by Hanousek and Palda (2015) that as the nation wealth increases, people believe and perceived the increase in the quality of government services and will impact negatively on peoples' incentive to evade tax.

Table 7 Estimates of tax evasion long-run models with corporate tax burden

Estimators\Regressors	Intercept	$LRGDPPC_t$	$LRGDPPC_t^2$	$LCORPORATETAX_t$
OLS	-41.893	10.180	-0.5984	1.0746***
(robust estimates)	(0.8093)	(0.9570)	(1.0979)	(5.1265)
	E-G test: -3.531***	SER=0.174	adjusted R^2=0.79	JB test: [0.946]
FMOLS	6.5334	0.6827	-0.1320	1.0240***
	(0.4960)	(0.2524)	(0.9557)	(16.733)
	L_c=32.23*** [<0.01]	SER=0.234	adjusted R^2=0.61	JB test: [0.798]
DOLS	-83.428	17.278	-0.8979	1.5000**
{lead=1, lag=0}	(0.8605)	(0.8757)	(0.8988)	(2.8151)
	L_c=0.054 [>0.20]	SER=0.136	adjusted R^2=0.86	JB test: [0.728]
CCR	-4.9521	2.7890	-0.2328	1.3302***
	(0.0854)	(0.2327)	(0.3785)	(4.1848)
	L_c=0.608 [0.140]	SER=0.190	adjusted R^2=0.74	JB test: [0.904]

Notes: As per Table 4 above.

Table 8 Estimates of tax evasion long-run models with personal tax burden

Estimators\Regressors	Intercept	$LRGDPPC_t$	$LRGDPPC_t^2$	$LPERSONALTAX_t$
OLS	-138.16**	29.732**	-1.5804**	0.9724***
(robust estimates)	(2.5737)	(2.6845)	(2.7732)	(4.7004)
	E-G test: -3.471***	SER=0.175	adjusted R^2=0.78	JB test: [0.462]
FMOLS	-147.52***	31.756***	-1.6890***	0.9335***
	(2.9278)	(3.0649)	(3.1754)	(3.6013)
	L_c=0.434 [>0.20]	SER=0.177	adjusted R^2=0.78	JB test: [0.724]
DOLS	-84.838***	19.088***	-1.0521***	0.9977***
{lead=2, lag=2}	(4.9977)	(5.7735)	(6.5056)	(7.6682)
	L_c=0.204 [>0.20]	SER=0.054	adjusted R^2=0.97	JB test: [0.750]
CCR	-161.51***	34.692***	-1.8428***	0.9151***
	(3.5856)	(3.7162)	(3.8180)	(3.2921)
	L_c=0.505[>0.20]	SER=0.181	adjusted R^2=0.77	JB test: [0.920]

Notes: As per Table 4 above.

CONCLUSION

The purpose of this study is to estimate the size of the shadow economy in Malaysia over the period of 1983-2013 using the traditional currency demand approach (CDA). By estimating the size of the shadow economy will permit the estimation of tax evasion. In this study we proposed a simple model for tax evasion, with economic development and tax burden as regressors. However, in this study we endeavor to test the nonlinear relationship between tax evasion and the level of economic development. Further, we also disaggregate measures of tax burden into – direct, indirect, corporate and personal taxations. Using a battery of estimators, namely OLS, FMOLS, DOLS and CCR, our results suggest that tax evasion increases at lower level of economic development, but as the economy develops and progress to a higher level of development, tax evasion decreases, thus, depicting an inverted-U shape curve, the so-called Evasional Kuznets Curve (EKC) which is consistent with the work by Hanousek and Palda. On the other hand, we can conclude from this study that increase in tax burden is important determinant that lead people to evade tax in Malaysia. Our finding is in line with studies done by Schneider and his colleagues. Furthermore, Malaysians are more responsive to the tax rate changes, in particularly to direct taxation as compared to the indirect taxation. More so, firms are more responsive than individual to evade tax in Malaysia.

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APPENDIX

Table A1 Estimates of the shadow economy and tax evasion in Malaysia

Year	Illegal stock currency (MYR million)	Legal currency (MYR million)	Shadow economy (MYR million)	Shadow economy (% of GDP)	Tax Evasion (MYR million)	Tax Evasion (% of GDP)
1988	5217.16	12622.64	57529.76	62.28	9160.41	9.92
1989	5415.96	15832.74	62124.68	59.04	9843.53	9.35
1990	6177.33	18063.17	73126.68	61.41	13045.87	10.96
1991	6852.54	20050.46	83836.82	62.04	16026.16	11.86
1992	7658.32	22736.78	95039.46	63.07	18147.21	12.04
1993	8752.66	33039.64	111361.69	64.67	20630.53	11.98
1994	10897.03	35573.87	133774.50	68.44	25656.34	13.13
1995	11823.91	40099.99	150493.37	67.65	28188.76	12.67
1996	12922.51	47662.79	172287.44	67.90	32098.36	12.65
1997	15381.96	47983.14	202231.06	71.77	38485.58	13.66
1998	10931.35	43203.35	169693.23	59.91	27161.10	9.59
1999	12237.20	61391.30	148525.62	49.38	22393.21	7.45
2000	91889.79	69327.01	147097.64	41.27	19469.84	5.46
2001	12498.48	68517.68	198969.28	56.43	34701.44	9.84
2002	13346.93	76164.85	214033.94	55.85	37342.93	9.74
2003	10307.43	92133.11	165371.31	39.49	25625.44	6.12
2004	11948.19	102601.95	197925.64	41.75	30082.52	6.35
2005	12543.02	111794.75	225933.14	41.56	33498.20	6.16
2006	13043.85	128323.28	232234.36	38.91	33711.37	5.65
2007	13226.77	155780.63	242786.43	36.49	34727.44	5.22
2008	15566.40	167481.05	296485.60	38.51	43473.39	5.65
2009	18479.78	182436.83	303261.41	42.54	45308.47	6.36
2010	13513.74	210870.26	225958.36	28.34	31036.06	3.89
2011	17599.50	241356.70	291015.04	32.90	44381.54	5.02
2012	20200.30	269535.34	331266.90	35.19	53370.41	5.67
2013	20017.53	307902.57	311492.91	31.64	49345.15	5.01
Average	**12144.19**	**99326.38**	**186302.16**	**50.71**	**29881.20**	**8.52**

Source: Authors' own calculation.

Note: All variables are in nominal values. MYR denotes Malaysian Ringgit.