Tax Evasion and Financial Development in ASEAN-5

Muzafar Shah Habibullah[1], A.H. Baharom[2], Badariah Haji Din[3] & Mansor H. Ibrahim[4]
[1]Faculty of Economics and Management, Universiti Putra Malaysia, Malaysia
[2,4]International Centre for Education in Islamic Finance (INCEIF), Kuala Lumpur, Malaysia
[3]College of Law Government and International Studies, Universiti Utara Malaysia, Malaysia
Email: muzafar@upm.edu.my
DOI: https://doi.org/10.37134/jcit.vol7.3.2017

Abstract

The estimated total tax evasion as reported by the Tax Justice Network in 2011 is in the excess of USD3.1 trillion or about 5.1% of world's GDP. Tax evasion is a crime and tax revenue losses have negative consequences to the government ability to fueled economic growth by providing enough public infrastructure and other services. In this study we have estimated the share of tax evasion to the official economy for five ASEAN economies, namely; Indonesia, Malaysia, the Philippines, Singapore and Thailand for the period 1980-2013. Tax evasion was calculated from the estimated size of the shadow economy using the modified-cash-deposits-ratio (MCDR) approach suggested by Pickhardt and Sardia (2011). We investigate the contention made by Blackburn et al. (2012) and Bose et al. (2012) that financial development can mitigate tax evasion – higher level of financial development lead to lower level of tax evasion. Employing the pooled mean group estimator (PMG), our results show that there is a non-linear long-run relationship between tax evasion and financial development in ASEAN-5 economies, an inverted U-shaped curve, suggesting that at lower (higher) level of financial development commensurate with higher (lower) level of tax evasion. One policy implication from this study is that the financial sector in ASEAN-5 economies can play an important role in reducing tax evasion by improving the accessibility to financing and to the credit market.

Keywords *Tax evasion; Modified-Cash-Deposit-Ratio, Financial Development, ASEAN-5*

1. Introduction

The Tax Justice Network (2011) has reported that the estimated total tax evasion is in the excess of USD3.1 trillion or about 5.1% of world's GDP. Europe experienced tax losses of USD1.5 trillion, followed by Asia USD666 billion, North America USD453 billion, South America USD376 billion, Africa USD79 billion while the Oceania USD46 billion. Among the five Association of Southeast Asian Nations (ASEAN-5) Malaysia ranked fourth with total tax evaded of USD11.2 billion; after Thailand USD25.8 billion, Indonesia USD17.8 billion and the Philippines USD11.7 billion. On the other hand, Singapore experience tax losses of USD4.1 billion.

The report further point that the loss from tax evading activity occurs as a result of shadow economic activities existed in all economies. Nevertheless, tax evasion can also due to tax haven activity, trade mispricing and trade misinvoicing. 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. Henry (2012) reports that it is estimated that the accumulated offshore wealth stock owned by developing country residents worth at least USD6.2 trillion by 2007. This implies that developing countries might be losing as much as USD120-160 billion per year in lost tax revenue on the interest and other income generated by all this unreported anonymous wealth. Henry (2012: p.20) further contends that developing countries as a whole didn't really face a 'debt' problem, but huge 'offshore tax evasion' problem.

On the other hand, Martinez-Vazquez (2011) found that tax burdens in Asia at the regional scale are among the lowest in the world. The average tax-GDP ratio in Asia has been approximately half that of the European Union, and it is also below the ratio for Africa and the Middle East, and for the Americas. However, there are disparities among the ASEAN-5 countries in the tax-GDP ratio with Thailand being the highest (16.3%), followed by Malaysia (15.8%), Singapore (14.1%), the Philippines (13.8%) and Indonesia (13.6%). Nevertheless, the daunting 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 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.

The purpose of the present paper is to estimate tax evasion and further to determine factors affecting tax evasion in the ASEAN-5 economies. Our focus is on the role of financial development as a vehicle to reduce tax evasion in ASEAN-5 economies. Our study concludes that financial development can play an important role in mitigating tax evasion as well as shadow economy in these countries.

The paper is organized as follows. In the next section we modelled tax evasion for the ASEAN-5 economies as well as discuss on the method used to estimates the determinants of tax evasion. In section 3, we discuss the empirical results. The last section contains our conclusion.

2. Modelling Tax Evasion

To estimate the revenue from tax losses it is imperative to estimate the extent 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 take the initiative to estimate the size of the shadow economy using the procedure proposed by Pickhardt and Sarda (2011, 2015) which is free from the Breusch (2005a, 2005b, 2005c) and Ahumada et al. (2007, 2008) critiques. According to Pickhardt and Sarda (2011: 149-150), "all currency in circulation in the base year, C_0, represents the entire cash agents wish to hold in any year after the base year for the set of legal transactions they prefer to carry out in cash." By assuming that all additional transactions in the legal economy are carried out via demand deposits, then by definition, any cash holdings in excess of those in the base year can be fully attributed to the shadow economy. Based on these assumptions and using the Fisher's (1911) quantity theory of money, Pickhardt and Sarda (2011, 2015) arrive at the following modified-cash-deposit-ratio, which equals the ratio of shadow economy income to official income,

$$\frac{C_t - C_0}{C_0 + D_t} = \frac{Y_{Ut}}{Y_{Lt}} \tag{1}$$

where C_t denotes currency in circulation at the end of year t; C_0 is currency in circulation at the end of base year, here 1980; D_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 estimates of the amount of tax evasion are then calculated as tax revenue multiply with the ratio of shadow economy to the official GDP, (Y_{Ut}/Y_{Lt}).

Next we specify the determinants of tax evasion for the ASEAN-5 economies. Numerous studies have indicated that among others, age structure, income, education, financial development can affect people to evade taxes. For example, a cross-country study by Richardson (2006) posit that age, education, employment in the services sector, fairness and tax morale affect tax evasion in 45 countries investigated. 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 distribution, 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 study, researchers have investigated the role of financial sector as determinant of tax evasion. According to Bose et al. (2012) individuals or firms in developed economies have easy access to the credit market as these economies are characterized by high level of financial development. 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.

On the contrary, for developing economies with low level of financial development, 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. Their cross-sectional and panel analyses indicate 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 that more tax compliance is associated with more access to the credit market is also supported by the finding in Gatti and Honorati (2008).

Blackburn et al. (2012) explain the connection between shadow market activity and credit market development using a simple model of tax evasion and financial intermediation. In imperfect financial markets (with asymmetric information) 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. Thus, the less wealth been declared, less collateral to secure the required loan and the worse will be the terms and condition of the loan contract. Blackburn et al. (2012) point out that at low level of financial development, the credit arrangement is worsen. 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. As a result tax evasion will also reduce.

The Estimating Long-run Model of Tax Evasion

In this study we specify the determinants of tax evasion as the following fixed effect equation:

$$ltaxevasion_{it} = \theta_{0i} + \theta_{1i}ltaxburden_{it} + \theta_{2i}lfindev_{it} + \theta_{3i}lfindev_{it}^2 + \theta_{4i}lincome_{it} + \omega_{it} \quad (2)$$

where $\omega_{it} = \mu_i + v_{it}$ and $v_{it} \sim NID(0, \sigma^2)$ and μ_i is country specific effects. Variables in logarithm is denoted by l. $ltaxevasion_{it}$ is measured by the ratio of tax evasion to gross domestic product (GDP); $ltaxburden_t$ is the ratio of tax revenue to GDP; $lfindev_{it}$ is financial development measured by ratio of money supply M2 to GDP; $lfindev_{it}^2$ is the square of $lfindev_{it}$; and $lincome_{it}$ is real GDP per capita to measure economic development or income or wealth. It is expected a *priori* that $\theta_1 > 0$ and $\theta_4 < 0$. An increase in the tax rate will increase tax evasion among the public. On the other hand, an increase in economic growth will reduce shadow economy and therefore, tax evasion. The expected sign for θ_2 *and* θ_3 is ambiguous. However, we would expect that if the data in the ASEAN-5 economies support the contention forwarded by Bose et al. (2012) and Blackburn et al. (2012) that is, as financial development evolves and progresses; lower level of financial development exhibit higher tax evasion but higher level of financial development will mitigate tax evasion, then $\theta_2 > 0$ and $\theta_3 < 0$, demonstrating an inverted U-shaped curve.

Testing for the Order of Integration in Panel

To estimate Equation (2) as a valid long-run model for tax evasion, we first test the order of integration of all variables in the equation. We employed the panel unit root tests proposed by Levin et al. (2002; hereafter LLC), Im et al. (2003: hereafter IPS) and Maddala-Wu (1999). Consider the following equation:

$$\Delta y_{it} = \alpha_i + \beta_i y_{it-1} + \sum_{j=1}^{p} \varphi_{ij} \Delta y_{it-j} + \varepsilon_{it} \quad i = 1,2,3, \dots N, \;\; t = 1,2,3, \dots T \quad (3)$$

where β_i is the autoregressive (AR) coefficient and the error term ε_{it} is assumed to be independent and identically distributed (i.i.d.). In testing for panel unit root, Levin et al. (2002) constrained the AR coefficient in Equation (3) to be homogenous across countries, that is, $\beta_i =$

β for all i. The null hypothesis assumes a common unit root ($H_0{:}\,\beta = 0$) against the alternative hypothesis that each time series is stationary ($H_1{:}\,\beta < 0$). LLC show that the pooled *t-star* statistic has a limiting normal distribution under the null hypothesis.

On the other hand, Im et al. (2003) extend the LLLC test by allowing heterogeneity on the AR coefficient. Im et al. (2003) propose a t-bar statistic, which is based on the average of the individual ADF t-statistics. The null hypothesis of a unit root in the panel data is defined as $\beta_i = 0$ for all i, against the alternatives that all series are stationary processes $\beta_i < 0$for some $i(i = 1,2,3 \ldots N_1; \beta_i = 0, i = N_1 + 1, N_2 + 2, \ldots N)$. To test the hypothesis, Im et al. (2003) modify a standardised t-*bar* statistic given by

$$\bar{t} = \frac{\sqrt{N}\left\{\hat{t}-(\frac{1}{N})\sum_{i=1}^{N} E[t_{iT}(\rho_i,0){:}\beta_i=0]\right\}}{\sqrt{(\frac{1}{N})\sum_{i=1}^{N} Var[t_{iT}(\rho_i,0){:}\beta_i=0]}} \tag{4}$$

where $\widehat{t} = N^{-1}\sum_{i=1}^{N} t_{iT}(\rho_i)$ with $t_{iT}(\rho_i)$ the ADF t-statistics for country i based on the country-specific ADF regression, as in Equation (3). The moments of $E[t_{iT}(\rho_i, 0){:}\,\beta_i = 0]$ and $Var[t_{iT}(\rho_i, 0){:}\,\beta_i = 0]$ are obtained by Monte Carlo simulation and are reported in Im et al. (2003). IPS show that when N and $T \to \infty$ then the standardised t-bar statistic converge to the standard normal distribution.

Another commonly used panel unit root test is the one proposed by Maddala and Wu (1999). Maddala and Wu (1999) suggest the use of non-parametric Fisher tests (Fisher, 1932). The test statistic, the Fisher test $P(\lambda)$is based on combining the probability limit values (p-values) of unit root tests (using Equation (3)) from each cross-section rather than average test statistics. The test statistic is given as follows,

$$P(\lambda) = -2\sum_{i=1}^{N} \log(\pi_i) \tag{5}$$

where π_i is the p-values of the ADF statistic for a unit root in cross-section country$i$. The Fisher test statistic,$P(\lambda)$ is distributed as a χ^2distribution with 2N degree of freedom under the assumption of independence across countries.

Panel Cointegration Tests

The aim of the panel unit root tests proposed above is to assess the order of integration of the variables included in Equation (2). If all variables are found to be integrated of order one, then we should use panel cointegration tests to address the non-stationarity of the series. If there is cointegration, then Equation (2) is non-spurious and it can represent a long-run relationship between tax evasion and its determinants. In this study, we apply three types of panel cointegration tests, namely; the Kao (1999), Pedroni (2004, 1999), as well as the combined Fisher (1932)-Johansen (1988) tests.

Both Kao (1999) and Pedroni (2004, 1999) provide cointegration test based on the residuals of the long-run model as per Equation (2) using the two-step cointegration approach of Engle and Granger (1987). Using Equation (2), the structure of the estimated residuals is as follows:

$$\widehat{\omega}_{it} = \rho_i \widehat{\omega}_{it-1} + \sum_{j=1}^{p} \tau_j \Delta\widehat{\omega}_{it-j} + \eta_{it} \tag{6}$$

where η_{it} is the disturbance term, and 1 to p lags of the first-difference of estimated residuals $\sum_{j=1}^{p} \tau_j \Delta\widehat{\omega}_{it-j}$ are included in the regression. On one hand, Kao (1999) test for unit root on Equation (6) with individual intercepts and no deterministic trend, but assuming homogenous in the AR coefficient. On the other hand, Pedroni (2004, 1999) constructs seven panel cointegration test statistics: four tests based on pooling (within-dimension or panel statistics test – panel υ-, panel ρ-, and panel t_{PP}-, panel t_{ADF}-statistics), which assumes homogeneity of the AR coefficient, while the remaining three tests are less restrictive (between-dimension or group statistics test - group ρ-, and group t_{PP}-, group t_{ADF}-statistics) that allow for heterogeneity of the AR coefficient. Both Kao (1999) and Pedroni (2004, 1999) tested against critical values for the null hypothesis of no cointegration. Nevertheless, Pedroni (2004) shows that the panel t- and group t-statistics perform better in smaller panels with shorter time periods.

Maddala and Wu (1999) propose a Fisher (combined Johansen) cointegration test based on the multivariate cointegration test of Johansen (1988); by combining the p-values of individual (system-based) cointegration tests in order to obtain a panel test statistic. To determine the presence of cointegration vectors in non-stationary time series, Johansen (1988) provide two test statistics – the maximum eigenvalue and the trace statistics. The trace statistics and maximum eigenvalue statistics are given below:

$$\lambda_{trace}(r) = -T \sum_{t=r+1}^{n} \ln(1 - \hat{\lambda}_i) \tag{7}$$

and

$$\lambda_{max}(r, r+1) = -T ln(1 - \hat{\lambda}_{r+1}) \tag{8}$$

where$T$ is the sample size, $n = 5$ variables and $\hat{\lambda}_i$ is the $i - th$ largest canonical correlation between residuals from the five dimensional processes and residual from the five dimensional differentiate processes. For the trace test tests the null hypothesis of at most r cointegration vector against the alternative hypothesis of full rank $r = n$ cointegrating vector. On the other hand, the null and alternative hypothesis of maximum eigenvalue statistics is to check the r cointegrating vectors against the alternative hypothesis of $r + 1$ cointegrating vectors.

To propose an alternative to the two previous tests, Maddala and Wu (1999) consider Fisher's (1932) suggestion by combining the p-values (say, π_i) of the individual cointegration test for cross-section i, then under the null hypothesis for the whole panel, $-2\sum_{i=1}^{N} log_e(\pi_i)$ is distributed as χ^2_{2N} degree of freedom.

The Pooled Mean Group (PMG) Estimator

Our main interest is to estimate the long-run parameters of the long-run model given by Equation (2) in a panel framework in the presence of cointegration. The two commonly used methods in the panel framework are the dynamic ordinary least square (DOLS) and fully modified ordinary least square (FMOLS) estimators; in which both estimators are robust to small sample, endogeneity and simultaneity biases. However, in this study we employ the pooled mean group estimator (PMG) proposed by Pesaran et al. (1999) for several reasons: First, the PMG approach do not make the testing for unit root necessary. The model can cater for I (1) or $I(0)$ variables or a mixed of them, while for both DOLS and FMOLS, all variables must be $I(1)$. Second, compared to both DOLS and FMOLS, PMG can provide estimates for both the long-run coefficients (as in Equation (2)) as well as short-run coefficients (including the speed of adjustment) simultaneously. Third, PMG allows the short-run coefficients to be heterogeneous across country, while the long-run slope coefficients are homogeneous across countries. In our case, there are reasons to expect that the long-run equilibrium relationships between variables to be similar across countries because as ASEAN founding member countries, they might have similar nature in terms of, for example, economic growth and financial development. However, in the short-run, they may differ in terms of adjusting to domestic and external shocks, monetary and fiscal adjustment mechanism, local laws and regulations and labour market imperfections. Thus, PMG is more likely to capture the nature of the data of the ASEAN countries. Fourth, PMG provides consistent coefficients despite the possible presence of endogeneity because it includes lags of dependent and independent variables. Lastly, PMG estimator offers the best available compromise in the search for consistency and efficiency especially in small sample compared to its counterpart, the mean group (MG) estimator (see Pesaran et al., 1999; Loayza and Ranciere, 2004).

Referring to Equation (2), assuming that all these variables are I (1) and are cointegrated, thus, making the error term $I(0)$ process for all i. Suppose the maximum lag equal to one, the ARDL (1,1,1,1,1) of Equation (2) is given as follows,

$$\begin{aligned} ltaxevasion_{it} = \psi_i + \delta_{10i} ltaxburden_{it} + \delta_{11i} ltaxburden_{it-1} \\ +\delta_{20i} lfindev_{it} + \delta_{21i} lfindev_{it-1} + \delta_{30i} lfindev_{it}^2 \\ +\delta_{31i} lfindev_{it-1}^2 + \delta_{40i} lincome_{it} + \delta_{41i} lincome_{it-1} \\ +\gamma_5 ltaxevasion_{it-1} + \varpi_{it} \end{aligned} \tag{9}$$

The error-correction equilibrium representation is derived as

$$\begin{aligned} \Delta ltaxevasion_{it} = \phi_i \begin{bmatrix} ltaxevasion_{it-1} - \theta_{0i} - \theta_{1i} ltaxburden_{it} \\ -\theta_{2i} lfindev_{it} - \theta_{3i} lfindev_{it}^2 - \theta_{2i} lincome_{it} \end{bmatrix} \\ +\Delta\delta_{11i} ltaxburden_{it} + \Delta\delta_{21i} lfindev_{it} \\ +\Delta\delta_{31i} lfindev_{it}^2 + \Delta\delta_{41i} lincome_{it} + \kappa_{it} \end{aligned} \tag{10}$$

where $\theta_{0i} = \frac{\psi_i}{1-\gamma_5}$, $\theta_{1i} = \frac{\delta_{10i}+\delta_{11i}}{1-\gamma_5}$, $\theta_{2i} = \frac{\delta_{20i}+\delta_{21i}}{1-\gamma_5}$, $\theta_{3i} = \frac{\delta_{30i}+\delta_{31i}}{1-\gamma_5}$, $\theta_{4i} = \frac{\delta_{40i}+\delta_{41i}}{1-\gamma_5}$, and $\phi_i = -(1-\gamma_5)$. The parameters $\delta's$ and $\theta's$ are the short-run and long-run coefficients, respectively. $\phi$is the coefficient of the error-correction term or the speed of adjustment to the long-run equilibrium, and κ is the disturbance term. The significant of the coefficient of the error-correction term, ϕ and negative and not lower than -2, implies cointegration or the existence of the long-run relationship among variables in Equation (2). Furthermore, the consistency of the PMG model requires that the error-terms are serially uncorrelated and the regressors are treated as exogeneous.

Sources of Data

The sample consists of five ASEAN founding member countries with annual data during the period 1980-2013. Apart from tax evasion, data on ratio of tax revenue to gross domestic product (GDP), ratio of money supply M2 to GDP ratio, and real GDP per capita were computed from data collected from World Development Indicators available from the World Bank database website at data.worldbank.org/indicator. All variables are in logarithm.

3. Results and Discussion

Results of the Panel Unit Root Tests

Table 1 Results of panel unit root tests

Series	LLC *t-star*		IPS *t-bar*		ADF-Fisher χ^2		PP-Fisher χ^2	
	Int.	Int.+Trend	Int.	Int.+Trend	Int.	Int.+Trend	Int.	Int.+Trend
Panel A: Level								
$ltaxevasion_t$	-0.96	-1.08	0.52	-0.28	10.77	9.48	9.08	25.90
	(1)	(3)	(1)	(3)	(1)	(3)	(1)	(3)
$ltaxburden_t$	-1.25	-0.27	-0.93	-0.24	11.58	9.77	11.74	9.72
	(0)	(0)						
$lfindev_t$	-3.23***	-0.73	-1.38	-0.28	15.76	11.73	16.42	12.05
	(1)	(0)	(1)	(0)	(1)	(0)	(1)	(0)
$lfindev_t^2$	-2.68**	-0.94	-0.94	-0.42	13.15	11.98	13.07	12.21
	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
$lincome_t$	-0.97	0.52	2.61	1.75	3.15	2.60	4.36	2.61
	(0)	(5)	(0)	(5)	(0)	(5)	(0)	(5)
Panel B: First-difference								
$\Delta ltaxevasion_t$	-13.29***	-13.40***	-12.28***	-12.84***	117.30***	118.2***	113.52***	372.4***
	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
$\Delta ltaxburden_t$	-10.72***	-9.61***	-10.89***	-9.86***	103.1***	88.42***	117.7***	162.2***
	(0)	(0)	(0)	(0)	(0)	(0)	(0)	(0)
$\Delta lfindev_t$	-9.03***	-8.41***	-8.77***	-8.15***	82.35***	69.63***	90.80***	79.57***
	(0)	(1)	(0)	(1)	(0)	(1)	(0)	(1)
$\Delta lfindev_t^2$	-8.84***	-7.91***	-8.86***	-8.00***	83.29***	68.17***	92.05***	78.95***
	(0)	(1)	(0)	(1)	(0)	(1)	(0)	(1)
$\Delta lincome_t$	-7.10***	-7.42***	-5.85***	-8.00***	55.85***	69.09***	60.07***	51.81***
	(6)	(4)	(6)	(4)	(6)	(4)	(6)	(4)

Notes: Asterisk *** denotes statistically significant at 1% level.LLC, and IPS represent the panel unit root test of Levin et al. (2002), and Im et al. (2003), respectively. ADF-Fisher and PP-Fisher represent the Maddala and Wu (1999) Fisher-ADF and Fisher-PP panel unit root tests, respectively. Figures in bracket (.) are automatic selection maximum lag length given by EViews. Automatic lag length selection was based on SIC. Deterministic components included: Intercept, and Intercept and trend. Variables $ltaxevasion_t$, $ltaxburden_t$, $lfindev_t$, $lfindev_t^2$, and $lincome_t$ denote natural logarithm of tax evasion to GDP ratio, tax burden to GDP ratio, M2 to GDP ratio, M2 to GDP ratio squared, and real GDP per capita, respectively. $l$denotes natural logarithm and Δ denotes difference operator.

Table 1 presents the results of the panel unit root tests with intercept (int.), and intercept and trend (int.+trend) for all-time series – *ltaxevasion*, *ltaxburden*, *lfindev*, *lfindev*^{2}, and *lincome*. The results of the three panel unit root tests – LLC t-star, IPS t-bar and Maddala-Wu Fisher tests, show that all variables are stationary at the 1% significance level after first differencing. In other words, all these variables are $I(1)$ in levels. Since all variables are $I(1)$, the next step is to test whether a long-run relationship exists between them using panel cointegration tests.

Results of the Cointegration Tests

Table 2 Results of panel cointegration tests

Test statistics			Model without time trend	Model with time trend
Panel A: Kao cointegration test:				
ADF-statistic			-0.32	-1.83**
Panel B: Pedroni cointegration tests:				
Within-dimension (panel):				
Panel υ- statistic			0.73	1.43
Panel ρ- statistic			0.33	0.55
Panel t_{PP}-statistic			-0.86	-2.20**
Panel t_{ADF}- statistic			-0.49	-2.66***
Between-dimension (group):				
Group ρ-statistic			1.26	1.21
Group t_{PP}- statistic			-0.81	-2.63***
Group t_{ADF}- statistic			-0.31	-2.80***
Panel C: Johansen-Fisher cointegration tests:				
Fisher statistics from trace test	Hypothesized no. of CE(s)	None	100.50***	153.8***
		At most 1	50.45***	77.57***
		At most 2	28.24***	41.90***
		At most 3	12.93	23.77*
		At most 4	4.07	15.24*
		At most 5	-	0.979
Fisher statistics from max-eigenvalue test	Hypothesized no. of CE(s)	None	62.75***	90.67***
		At most 1	31.72***	46.94***
		At most 2	24.30***	26.49***
		At most 3	14.62	16.63*
		At most 4	4.07	17.93*
		At most 5	-	0.979

Notes: Asterisks ***, **, * denote statistically significant at 1%, 5% and 10% levels, respectively.The Johansen-Fisher panel cointegration test – Fisher statistics p-values are computed using the asymptotic Chi-square distribution, and the trace and max-eigenvalue p-values are computed from MacKinnon-Haug-Michelis (1999).

The finding that all variables are *I* (1) permit us to perform the panel cointegration tests proposed by Kao (1999), Pedroni (2004, 1999) and Maddala-Wu (1999). The panel cointegration tests were performed on Equation (2) with and without time trend. The results are presented in Table 2. Generally, the results suggest there is cointegration between the variables. The Kao (1999) and Pedroni (2004, 1999) tests suggest cointegration or long-run relationship only in model with time trend. The *ADF*-statistic for the Kao (1999) test is significant at the 5% level, while the panel *t*-statistics and group *t*-statistics of the Pedroni (2004, 1999) tests suggest significant at least at the 5% level; both in tax evasion model with time trend included. On the other hand, the result of the Johansen-Fisher cointegration tests is presented in Panel C in Table 2. The Fisher's tests, either from the trace statistics or maximum eigenvalue statistics, support the presence of a cointegrated relation among the variables, with or without time trend in the model. For model without time trend, the Fisher test suggests three cointegrating vectors among the five variables; while model with time trend, the Fisher test suggests five cointegrating vectors among the six variables. Thus, we can conclude that there is panel long-run equilibrium relationship between tax evasion, tax burden, income and financial development.

Results of PMG Estimations

Table 3 Results of pooled mean group estimations

Variables	Model without time trend:		Model with time trend:	
	Coefficients	Std. Error	Coefficients	Std. Error
Error-correction coefficient:	-0.476**	0.231	-0.384**	0.175
Long-run coefficients:				
$ltaxburden_t$	2.752***	0.222	1.991***	0.202
$lfindev_t$	13.473***	1.953	3.678***	0.942
$lfindev_t^2$	-1.662***	0.240	-0.502***	0.137
$lincome_t$	0.666***	0.116	1.897***	0.319
Short-run coefficients:				
$\Delta ltaxburden_t$	0.143	0.736	0.251**	0.274
$\Delta ltaxburden_{t-1}$	-0.503	0.489	-0.180	0.105
$\Delta ltaxburden_{t-2}$	-0.478	0.344	-0.068*	0.064
$\Delta ltaxburden_{t-3}$	-0.156	0.262		
$\Delta ltaxburden_{t-4}$	-0.416***	0.102		
$\Delta lfindev_t$	6.788	5.711	1.197	1.758
$\Delta lfindev_{t-1}$	0.454	3.582	0.575	2.978
$\Delta lfindev_{t-2}$	2.151	8.746	2.743	4.112
$\Delta lfindev_{t-3}$	1.139	8.030		
$\Delta lfindev_{t-4}$	-6.782	5.837		
$\Delta lfindev_t^2$	-0.862	0.681	-0.136	0.208
$\Delta lfindev_{t-1}^2$	-0.101	0.406	-0.143	0.347
$\Delta lfindev_{t-2}^2$	-0.251	1.116	-0.320	0.499
$\Delta lfindev_{t-3}^2$	-0.137	1.001		
$\Delta lfindev_{t-4}^2$	0.797	0.673		
$\Delta lincome_t$	-1.322**	0.637	-0.812	0.868
$\Delta lincome_{t-1}$	-2.246**	0.928	-1.555*	0.794
$\Delta lincome_{t-2}$	-0.489	0.708	-0.029	0.603
$\Delta lincome_{t-3}$	-0.033	0.471		
$\Delta lincome_{t-4}$	0.397	0.342		
Constant	-18.511**	8.936	-9.353**	4.139
Time trend	-		-0.024**	0.009
Country	5		5	

Observation	145		155	
Log likelihood	267		239	
Individual country's error-correction coefficients:				
Indonesia	-1.218***	0.036	-1.025***	0.020
Malaysia	-0.062***	0.001	0.011**	0.002
Philippines	-0.006	0.004	-0.296***	0.002
Singapore	-0.299***	0.005	-0.192***	0.004
Thailand	-0.794***	0.014	-0.420***	0.010

Notes: Asterisks ***,**,* denote statistically significant at 1%, 5% and 10% level, respectively. Estimations are done using Pooled Mean Group/AR Distributed Lag Model routine in EViews. The lag structure is ARDL(1,5,5,5,5) for model without time trend, and ARDL(1,3,3,3,3) for model with time trend.

Table 3 shows the results of the estimations of the long-run and short-run parameters linking tax evasion, tax burden, income and financial development. In estimating Equation (9), the lag length chosen was based on Schwartz Bayesian criterion (SBC) and we have estimated the tax evasion model with and without time trend. More importantly, the results show that the error-correction coefficients in both models are significant at the 5% level, with correct negative signs. The speed of adjustment is -0.48 in model without time trend, and -0.38 for model with time trend. These figures indicate that 28% to 48% of the deviation from long-run equilibrium will be corrected within a year. The significant of the error-correction implies that there is long-run relationship between tax evasion, tax burden, income and financial development in the ASEAN-5 economies. On the other hand, the estimated error-correction coefficients for the individual countries suggest that for model without time trend, except for the Philippines, cointegration is achieved for Indonesia, Malaysia, Singapore and Thailand, where the error-correction coefficients are significant at the 1% level. For model with time trend, all five ASEAN countries exhibit long-run relationship among tax evasion, tax burden, income and financial development. Nevertheless, only Malaysia suggest unstable long-run relationship as it exhibit positive error-correction coefficient.

Interestingly, results for the long-run coefficients suggest that all variables are statistically significant at the 1% level in both models – with and without time trend. Nevertheless, the magnitude of the estimated long-run coefficients is higher for model without time trend compare to the estimated long-run coefficients in model with time trend, except for variable income. Tax burden has the correct positive sign indicating that higher tax rate impose by the government will push people not to pay taxes. On the other hand, the result suggests that income and tax evasion is positively related. More people will evade tax when their wealth increases. Tax evasion by the rich people is much more accommodative with the presence of many tax havens around the world.

For our main variable of interest, results in Table 3 clearly suggest that there is non-linear relationship between tax evasion and the level of financial development in the five ASEAN countries. The inverted U-shaped curve between tax evasion and financial development suggest a non-linear effect of the stages of financial sector on tax evasion activity in the five ASEAN countries. The result implies that at lower level of financial development, tax evasion is higher, however, at some turning point when financial development progress further, tax evasion is decreasing. This result is in line with the contention made by Bose et al. (21012) and Blackburn et al. (2012) that the banking sector can play an important role in mitigating tax evasion.

4. Conclusions

In this study we have estimated the tax evasion in five ASEAN founding member countries – Indonesia, Malaysia, the Philippines, Singapore and Thailand for the period 1980-2013. The main purpose is to relate tax evasion with the stages of financial development in these five economies. We would expect that as financial development progresses tax evasion will be reduce. The reason is that studies have shown that in a high developed financial system, individuals and firms are able to access to the credit market. Accessibility to funding and credit market will reduce shadow economy and also tax evasion. Apart from financial development as determinant of tax evasion, we also include tax burden and income as additional factors affecting tax evasion. We have employed the panel unit root tests, panel cointegration tests and pooled mean group analysis and able to conclude that there is long-run relationship between tax evasion and tax burden, income and financial development. Furthermore, the empirical evidence also points to a non-linear long-run relationship (an inverted *U*-shaped curve) between tax evasion and financial development in the ASEAN-5 economies. The important policy implication is that policies aiming at improving the financial inclusion by the financial sectors will have a positive effect on reducing the shadow economy and tax evasion in these ASEAN-5 economies.

Acknowledgement

Funding for this project comes from the MOHE-UM-INCEIF Research Grant (RPIF01-16INCEIF), a co-sponsored funding between the Ministry of Higher Education, University of Malaya and INCEIF, Malaysia.

References

Ahumada, H., Alvaredo, F., & Canavese, A. (2007). The monetary method and the size of the shadow economy: A critical assessment. *Review of Income and Wealth*, 53(2), 363-371.

Ahumada, H., Alvaredo, F., & Canavese, A. (2008). The monetary method to measure the shadow economy: The forgotten problem of the initial conditions. *Economics Letters*, 101, 97-99.

Berger, W., Pickhardt, M., Pitsoulis, A., Prinz, A., & Sarda, J. (2014). The hard shadow of the Greek economy: New estimates of the size of the underground economy and its fiscal impact. *Applied Economics*, 46(18), 2190-2204.

Blackburn, K., Bose, N., & Capasso, S. (2012). Tax evasion, the underground economy and financial development. *Journal of Economic Behavior & Organization*, 83, 243-253.

Bose, N., Capasso, S., & Wurm, M.A. (2012). The impact of banking development on the size of shadow economies. *Journal of Economic Studies*, 39(6), 620-638.

Breusch, T. (2005a). The Canadian underground economy: An examination of Giles and Tedds. *Canadian Tax Journal*, 53(2), 367-391.

Breusch, T. (2005b). Australia's cash economy: Are the estimates credible? *The Economic Record*, 81, 394-403.

Breusch, T. (2005c). *Estimating the Underground Economy Using MIMIC Models*. Canberra: The School of Economics, The Australian National University,

Caballe, J., & Panades, J. (2004). Inflation, tax evasion and the distribution of consumption. *Journal of Macroeconomics*, 26, 567-595.

Cebula, R.J. (1998). Determinants of aggregate income-tax-evasion behavior: The case of the US. *BNL Quarterly Review*, 206, 273-290.

Cebula, R., & Foley, M. (2010). Personal income tax evasion determinants revisited: An exploratory study using newly available data. *Academy of Economics and Finance Journal*, 2, 17-24.

Crane, S.E., & Nourzad, F. (1986). Inflation and tax evasion: An empirical analysis. *The Review of Economics and Statistics*, 68(2), 217-223.

Engle, R.F., & Granger, C.W.J. (1987). Co-integration and error correction: Representation, estimation and testing. *Econometrica*, 55, 251-276.

Feld, L.P., & Frey, B.S. (2006). *Tax evasion in Switzerland: The roles of deterrence and tax morale* (Working Paper Series No.284). Switzerland: Institute for Empirical Research in Economics, University of Zurich.
Fisher, I. (1911). *The Purchasing Power Parity of Money: Its Determination and Relation to Credit, Interest and Crisis*. New York: MacMillan.
Fisher, R.A. (1932). *Statistical Methods for Research Worker*. Edinburgh: Oliver and Boyd.
Gatti, R., & Honorati, M. (2008). *Informality among formal firms: Firm-level, cross-country evidence on tax compliance and access to credit* (Policy Research Working Paper 4476). New York: The World Bank.
Gordon, R. & Li, W. (2009). Tax structures in developing countries: Many puzzles and a possible explanation. *Journal of Public Economics*, 93, 855-866.
Gravelle, J.G. (2015). *Tax havens: International tax avoidance and evasion* (Congressional Research Service 7-5700). CRS Report Prepared for Members and Committees of Congress, Washington, D.C., USA.
Hanousek, J., & Palda, F. (2004). Quality of government services and the civic duty to pay taxes in the Czech and Slovak Republics, and other transition countries. *Kyklos*, 57, 237-252.
Hanousek, J., & Palda, F. (2015). The evasional Kuznets curve: A possible shadow economy dynamics during the transition. *Japanese Journal of Comparative Economics*, 52(1), 1-17.
Hendry, J.S. (2012). The price of offshore revisited. The Tax Justice Network.
Im, K., Pesaran, M.H., & Shin, Y. (2003). Testing for unit roots in heterogenous panels. *Journal of Econometrics*, 115, 53-74.
Johannesen, N. (2014). Tax evasion and Swiss bank deposits. *Journal of Public Economics*, 111, 46-62.
Johansen, S. (1988). Statistical analysis of cointegration vectors. *Journal of Economic Dynamic and Control*, 12(2-3), 231-254.
Kafkalas, S., Kalaitzidakis, P., & Tzouvelekas, V. (2014). Tax evasion and public expenditures on tax revenue services in an endogenous growth model. *European Economic Review*, 70, 438-453.
Kao, C. (1999). Spurious regression and residual-based tests for cointegration in panel data. *Journal of Econometrics*, 90, 1-44.
Kirchgassner, G. (2010). *Tax morale, tax evasion and the shadow economy* (Discussion Paper No.2010-17). Switzerland: Department of Economics, University of St. Gallen.
Loayza, N.V., & Ranciere, R. (2004). Financial development, financial fragility and growth. *Journal of Money, Credit and Banking*, 38(4), 1051-1076.
Levin, A., Lin, C.F., & Chu, C.S.J. (2002). Unit root tests in panel data: Asymptotic and finite-sample properties. *Journal of Econometrics*, 108, 1-25.
MacKinnon, J.G., Haug, A.A., & Michelis, L. (1999). Numerical distribution functions of likelihood ratio tests for cointegration. *Journal of Applied Econometrics*, 14, 563-577.
Maddala, G.S., & Wu, S. (1999). A comparative study of unit root tests with panel data and a new simple test. *Oxford Bulletin of Economics and Statistics*, 61, 631-652.
Martinez-Vazquez, J. (2011). *Taxation in Asia*. Philippines: Asian Development Bank.
Pedroni, P. (2004). Panel cointegration: Asymptotic and finite sample properties of pooled time series tests with an application to the PPP hypothesis. *Econometric Theory*, 20, 597-625.
Pedroni, P. (1999). Critical values for cointegration tests in heterogeneous panels with multiple regressors. *Oxford Bulletin of Economics and Statistics*, 61, 653-670.
Pesaran, M.H., Shin, Y., & Smith, R.J. (1999). Pooled mean group estimation of dynamic heterogeneous panels. *Journal of the American Statistical Association*, 94, 621-634.
Pickhardt, C., & Sarda, J. (2011). The size of the underground economy in Germany: A correction of the record and new evidence from the modified-cash-deposit-ratio approach. *European Journal of Law and Economics*, 32(1), 143-163.
Pickhardt, C., & Sarda, J. (2015). Size and causes of the shadow economy in Spain: A correction of the record and new evidence from the MCDR approach. *European Journal of Law and Economics*, 39(2), 403-429.
Richardson, G. (2006). Determinants of tax evasion: A cross-country investigation. *Journal of International Accounting, Auditing and Taxation*, 15, 150-169.
The Tax Justice Network. (2011). The cost of tax abuse: A briefing paper on the cost of tax evasion worldwide. The Tax Justice Network.
Zucman, G. (2013). The missing wealth of nations: Are Europe and the U.S. net debtors or net creditors? *Quarterly Journal of Economics*, 128(3), 1321-1364.