Tax Evasion, Growth and the Hidden Economy in Trinidad and Tobago

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Abstract

Studies indicate that countries with high tax evasion have reduced growth rates. The first objective of this paper is to determine the extent of tax evasion in Trinidad and Tobago during the period 1960-2000. This is done using estimates of the hidden economy based on a variant of Tanzi’s monetary model. The second objective is to determine if, and to what extent, any relationship exists between certain key macroeconomic variables and the level of income tax evasion in Trinidad and Tobago. The bounds testing procedure to cointegration within an autoregressive distributive lag (ARDL) framework is used to address this question.

Keywords:

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1. Introduction

The main objective of this paper is to determine the causes of tax evasion in Trinidad & Tobago. This is done within the framework of an Autoregressive Distributed Lag (ARDL) model, which is used to determine if, and to what extent, any relationship exists between income tax evasion in Trinidad and Tobago and per capita income, imports, debt, unemployment (U) and inflation (I)\(^1\). The bounds testing procedure (Pesaran et al., 2001), which is a relatively new cointegration technique, is used to test for the existence of a long-run relationship among the variables.

Studies confirming that an increase in the tax burden is one of the main causes of the augmentation in the size of the hidden economy also provide support to the often hypothesized relationship between the degree of tax evasion and the size of the hidden economy (see for example Schneider, 2002 and Giles and Johnson, 2000). Other studies show that more than half of the potential tax revenues in certain developing countries tend to remain uncollected (Richupan, 1984, Bird, 1989, 1992, Krugman et al., 1992).

Research on economic growth is abundant, but it is rare to find studies which take into account the impact of tax evasion on growth. In the few studies\(^2\) that do examine the impact of tax evasion on economic growth, it was found that as tax evasion increases growth declines. While this reason is in itself very persuasive, there are other equally convincing reasons to study tax evasion. For instance, tax evasion reduces government revenues, affects the taxes that

\(^1\) Justification for the inclusion of these variables is given later in the paper.

\(^2\) See studies by Roubini and Sala-i-Martin (1995), Chen (2003) and a few others.
compliant taxpayers face and the public services that citizens receive. Tax evasion may also encourage perceptions of inequitable treatment and disrespect for the law.

Cowell (1990, p. 6) observed that “evasion is a particular ‘economic crime’ – one that involves a breach of the laws designed to ensure that people act in the economic interests of the community and not just in their own economic interests”. The fact that people do not like paying taxes makes tax evasion one of the most widespread “economic crimes” (Cowell, 1981). Individuals tend to pursue any available method, both illegal and legal, that would allow them to reduce such payments. While tax evasion is not the only factor influencing participation in the hidden economy, it has a direct impact on the size of this economy. In all countries, and particularly in developing countries such as Trinidad and Tobago, the level tax evasion is therefore likely to be a significant indicator of the presence and size of a hidden economy.

Figure 1 (below) shows the extent of tax evasion in Trinidad and Tobago over the period 1973-1999. The figure shows that evasion varied between 1.60% and 7.26% of GDP throughout the period, achieving the highest level in 1985.

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3 Data on tax evasion are based on authors’ calculations.
This paper is organized as follows: In Section 2 an overview of tax evasion studies is undertaken focusing on developing countries and the major determinants of tax evasion in this type of country. Section 3 investigates the relationship between tax evasion and the variables identified as being related to it in Trinidad and Tobago. In this section the estimation method and empirical results are also presented. The section concludes with a discussion of the results. Section 4 ends the paper with a conclusion and policy recommendations.

2. The Determinants of Tax Evasion – Theoretical Considerations

Schneider et al. (2001, p. 3) define tax evasion as “an illegal reduction of tax payment (underreporting income or stating higher deduction rates)”. In his study on tax evasion in developed and developing countries, Herschel (1978) pointed out that in developing countries, such as Trinidad and Tobago, tax evasion tends to be more widespread, since these economies are based on a few
large enterprises, less wealthy people, low tax morale, reduced opportunities to resort to tax avoidance schemes and less use of tax practitioners.

Theoretical and empirical studies on tax evasion have shown that the factors that determine tax evasion are extremely diverse and include economic and sociological factors, psychological attitudes and administrative and legal issues. The most general form of the model of tax evasion to be estimated in this paper is:

\[ TE = f(PCY, IM, DEBT, U, I) \]

where,

TE = Tax Evasion
PCY = Per Capita Income
IM = Imports (as a Ratio of GDP)
DEBT = External Debt (as a Ratio of GDP)
U = Unemployment rate
I = Inflation rate

Studies on tax evasion have traditionally used *per capita income* as a proxy for the level of development and the sophistication of economic structure (see studies by Hinrichs, 1965, Tanzi 1987, Ghura, 1998). These studies conclude that an increase in the level of economic development is often accompanied by a decrease in the amount of tax evaded. Chelliah (1971) argues that a higher per capita income reflects a higher level of development because this means not only a higher capacity to pay taxes, but also a greater capacity to levy and collect taxes.
Frey and Weck-Hanneman (1984), offered another reason why per capita income may influence tax evasion. They claimed that at low real disposable per capita income individuals have strong incentives to hold various jobs and to pay taxes only on the first job. Because of the reasons outlined here, it is expected that per capita income and tax evasion would have a negative relationship in this study.

The *debt service ratio* is thought to influence tax revenues both instantly and also in a later time period. According to Tanzi (1989), a high debt burden can create macroeconomic imbalances that may tend to reduce tax revenues. Ghura (1998) lends support to the expected positive relationship between tax evasion and external debt by arguing that increases in external debt may be indicative of the substitution of external financing for domestic tax revenue mobilization.

The *import* variable is used in this study because imports represent an important tax base or a source of tax revenue in developing countries. Tanzi (1987) notes that the external sector has an impact (direct or indirect) on over half of the total tax revenue of developing countries. The significance of the import variable is confirmed in studies by Hinrichs (1966), Tanzi (1992) and Nagy Eltony (2002), among others. It is expected that a negative relationship exists between imports and tax evasion since there are certain features of international trade that make it more amenable to taxation than domestic activities. For instance there are specific entry and exit points for goods being imported (Lotz and Morss (1967)), which makes tax evasion difficult.
According to O’Higgins (1985), inflation can increase the real tax burden and so provide a possible motive for working in the hidden economy. Bajada (1999) notes that if earnings in the official economy are not indexed or if the tax system is not indexed completely, as the cost of living falls, earnings in the hidden economy appear relatively more appealing in comparison to real after-tax earnings in the official sector. As a result, it is hypothesized that tax evasion would be positively related to inflation.

Tanzi (1999) notes that the composition of the labour force of the hidden economy tends to be very heterogeneous and as a result the unemployment rate tends to be weakly correlated with the hidden economy. On the same note and according to Frey and Weck-Hanneman (1984), it is theoretically ambiguous whether an increase in unemployment leads to an increase or a decrease in tax evasion. It is often argued that the incentive to work in the hidden economy is particularly high for an unemployed person since he or she has more leisure than deserved and it is often easy to work in the hidden economy. However, while the demand for hidden work rises with the level of unemployment, it is also likely that the supply of such work opportunities falls with rising unemployment. The rate of unemployment is one of the indicators of the state of the economy and, when it rises, employers reduce the supply of all jobs, both official and hidden.

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4 It comprises of the officially unemployed persons, the ‘hidden’ workers (retired persons, illegal immigrants, minors and housewives) and the individuals who have both official and unofficial or hidden jobs.
3. **Model estimation and evaluation**

The new cointegration technique employed in this study does not require pre-testing for a unit root in the variables, since it can be applied whether or not the underlying regressors are purely I(0), purely I(1) or mutually cointegrated. The unit root tests were carried out here for descriptive purposes and to substantiate use of the bounds testing approach to cointegration rather than any of the conventional cointegration tests. Both the Augmented Dickey-Fuller (ADF) and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) tests were used to test for unit roots. The tests were carried out using the logarithms of tax evasion (TE), imports/GDP ratio (IM), external debt/GDP ratio (DEBT) and per capita income (PCY), and the rates of unemployment (U) and inflation (I).

The null hypothesis for the ADF test is that the time-series is non-stationary (i.e. the series has a unit root or is integrated of order one, I(1)). Hence, the rejection of the null indicates that the variable is stationary. Table 1 shows the results of the levels and first differences of the time series with an intercept. The ADF tests show that all the variables are non-stationary in levels and stationary in first differences. The per capita income series appears to be I(2) as the null hypothesis is rejected for the first differenced series.

The null hypothesis of the KPSS test is that the time-series is stationary (i.e. the series is stationary or is integrated of order zero, I(0)). The tests are performed with an intercept using the automatic lag selection procedure.

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5 The standard cointegration tests are inappropriate for other reasons, for instance the Johansen Maximum Likelihood test requires a large data sample, whereas the ARDL bounds test has good small sample properties.
developed by Newey and West (1994) in combination with the Bartlett kernel.

Table 1 shows that all but two of the series, external debt and inflation, are stationary in levels. This is completely at odds with the results of the ADF tests, which indicated that all of the variables were non-stationary in levels.

Table 1: Unit Root Tests

<table>
<thead>
<tr>
<th>Variables</th>
<th>ADF Tests</th>
<th>KPSS Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Level</td>
<td>Difference</td>
</tr>
<tr>
<td>Tax Evasion</td>
<td>-2.387</td>
<td>-3.948</td>
</tr>
<tr>
<td>Per Capita Income</td>
<td>-2.229</td>
<td>-2.609</td>
</tr>
<tr>
<td>Imports</td>
<td>-1.108</td>
<td>-4.009</td>
</tr>
<tr>
<td>External Debt</td>
<td>-1.042</td>
<td>-4.226</td>
</tr>
<tr>
<td>Unemployment</td>
<td>-1.614</td>
<td>-3.334</td>
</tr>
<tr>
<td>Inflation</td>
<td>-1.234</td>
<td>-6.774</td>
</tr>
</tbody>
</table>

Notes: For the ADF tests the McKinnon Critical value for rejection of the hypothesis of a unit root at the 5% level is –2.98. For the KPSS the critical value for the rejection of the hypothesis of stationarity at the 5% level is 0.463.

The ARDL form of the model used in this paper is:

\[
\ln TE = a_0 + \sum_{j=1}^{n_1} \beta_j \ln TE_{t-j} + \sum_{j=0}^{n_2} \gamma_j \ln PCY_{t-j} + \sum_{j=0}^{n_3} \delta_j \ln IM_{t-j} + \sum_{j=0}^{n_4} \epsilon_j \ln DEBT_{t-j} + \sum_{j=0}^{n_5} \phi_j \ln U_{t-j} + \sum_{j=0}^{n_6} \psi_j \ln I_{t-j} + u_t
\]

(1)

where \( \ln X \) indicates the natural logarithm of the variable \( X \). Equation (1) may be written in the form of an Error Correction Mechanism (ECM) model:

\[
\Delta \ln TE_i = a_0 + \sum_{i=1}^{n_1} b_i \Delta \ln TE_{i-1} + \sum_{i=0}^{n_2} c_i \Delta \ln PCY_{i-1} + \sum_{i=0}^{n_3} d_i \Delta \ln IM_{i-1} + \sum_{i=0}^{n_4} e_i \Delta \ln DEBT_{i-1} + \sum_{i=0}^{n_5} f_i \Delta U_{i-1} + \sum_{i=0}^{n_6} g_i \Delta I_{i-1} +
\]

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\( ^6 \) This is an ARDL\((n_1, n_2, n_3, n_4, n_5, n_6)\)
\[
\lambda (\ln TE_{t-1} + \varphi_2 \ln PCY_{t-1} + \varphi_3 \ln IM_{t-1} + \varphi_4 \ln DEBT_{t-1} + \varphi_5 U_{t-1} + \varphi_6 I_{t-1} ) + u_t
\]

(2)

Here, \(\Delta\) indicates the first difference in the variable and \(u_t\) is a white noise error term. This is the form of the equation that will be eventually estimated and evaluated.

The ARDL approach to modelling is carried out in two steps. The first step is a test for the presence of a long-run or cointegrating relationship. To do this, the following regression is estimated:

\[
\Delta \ln TE_i = a_0 + \sum_{i=1}^{p} b_i \Delta \ln TE_{i-1} + \sum_{i=0}^{p} c_i \Delta \ln PCY_{i-1} + \sum_{i=0}^{p} d_i \Delta \ln IM_{i-1} + \sum_{i=0}^{p} e_i \Delta \ln DEBT_{i-1} + \sum_{i=0}^{p} f_i \Delta U_{i-1} + \sum_{i=0}^{p} g_i \Delta I_{i-1} + u_i
\]

An error correction mechanism (ECM), hypothesizing the existence of a long-run relationship between the variables, is then added to the equation as shown:

\[
\Delta \ln TE_i = a_0 + \sum_{i=1}^{p} b_i \Delta \ln TE_{i-1} + \sum_{i=0}^{p} c_i \Delta \ln PCY_{i-1} + \sum_{i=0}^{p} d_i \Delta \ln IM_{i-1} + \sum_{i=0}^{p} e_i \Delta \ln DEBT_{i-1} + \sum_{i=0}^{p} f_i \Delta U_{i-1} + \sum_{i=0}^{p} g_i \Delta I_{i-1} + u_i
\]

\[
\varphi_1 \ln TE_{t-1} + \varphi_2 \ln PCY_{t-1} + \varphi_3 \ln IM_{t-1} + \varphi_4 \ln DEBT_{t-1} + \varphi_5 U_{t-1} + \varphi_6 I_{t-1} + \varepsilon_t
\]

The bounds test of Pesaran et al. (2001), really a variable addition test, is then performed to determine the presence of cointegrating relationships. This can be done whether or not the underlying regressors are I(0) or, at maximum, I(1). The relevant test statistic is the F-statistic for the joint significance of \(\varphi_1, \varphi_2, \varphi_3,\)
The test statistic is distributed according to a non-standard F-distribution irrespective of whether the explanatory variables are stationary or non-stationary. The critical bounds for these tests are tabulated in Pesaran et al. (2001). If the F-statistic exceeds the upper bound of the critical value band the null of no cointegrating relationship between the variables can be rejected. Conversely, if the calculated F-statistic falls below the lower bound the null cannot be rejected. In the event that the computed statistic falls between the two bounds then no conclusive inference can be drawn, and further information about the accurate order of integration of the variables has to be determined.

The second step is the estimation of the ECM form of the ARDL model (equation (2)), where the optimal lag length is chosen according to one of the standard criteria such as the Akaike Information Criterion (AIC) or the Schwartz Bayesian Criterion (SBC).

The test statistics for the bounds test are shown in Table 2 below. Given the small data set and the relatively large number of explanatory variables in the regression, the maximum number of lags was set equal to 2.

| Table 2: Statistics for Testing the Existence of Cointegration among the Variables |
|---------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| k     | 90% level | 95% level | 98% level | Calculated F-statistics |
|-------|-----------|-----------|-----------|-----------------|-----------------|
| 5     | 2.26      | 2.62      | 2.96      | I(0)            | 1 lag            |
|       | 3.35      | 3.79      | 4.18      | I(1)            | 2 lags           |

φ₄, φ₅ and φ₆. The test statistic is distributed according to a non-standard F-distribution irrespective of whether the explanatory variables are stationary or non-stationary. The critical bounds for these tests are tabulated in Pesaran et al. (2001). If the F-statistic exceeds the upper bound of the critical value band the null of no cointegrating relationship between the variables can be rejected. Conversely, if the calculated F-statistic falls below the lower bound the null cannot be rejected. In the event that the computed statistic falls between the two bounds then no conclusive inference can be drawn, and further information about the accurate order of integration of the variables has to be determined.
An examination of the results for the model with one lag indicates that $F_{TE}$ is higher than the upper bound critical value. The calculated F-statistic of 3.84 is greater than the upper critical value bound of 3.79 at the 5% level of significance. Thus, the null hypothesis of no cointegration is rejected and there is a long-run cointegration relationship among the variables in the model. The results for the other variables show that the calculated F-statistics fall below the lower bound. These test results confirm the existence of only one long-run relationship between the variables and that the variables PCY, IM, DEBT, U and I can be treated as ‘long run forcing’ \(^7\) variables in the explanation of TE.

Equation (2) is now estimated and Table 3 presents the estimates of the long-run coefficients based on the ARDL model selected by the Akaike Information Criteria (AIC). Both the AIC and SBC were used, but since the results obtained by both were very similar only the AIC results are presented.

Table 3: Estimates of the Long-Run Coefficients Based on ARDL Model Selected by AIC

<table>
<thead>
<tr>
<th>Variables</th>
<th>AIC: ARDL (2,2,1,0,0,0) (^4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>0.050227 (0.185)</td>
</tr>
<tr>
<td>lnPCY</td>
<td>0.014587 (0.024)</td>
</tr>
<tr>
<td>lnIM</td>
<td>-0.020645* (0.011)</td>
</tr>
</tbody>
</table>

\(^7\) A long-run forcing variable is one that is not caused by any of the other variables in the model and thus treated as exogenous.
Evaluation of the model chosen on the basis of the AIC criterion shows that the imports, external debt and inflation variables are statistically significant. The unemployment and per capita income variables were insignificant in the long run and the per capita income did not have the expected sign in the long run.. The existence of cointegration allows the short-run model to be estimated. The empirical results for the short-run model, together with diagnostic tests based on this model are presented in Table 4.

Table 4: Error Correction Representation for ARDL Model ARDL(2,1,0,2,0)
Selected on basis of AIC

<table>
<thead>
<tr>
<th>Regressors</th>
<th>Coefficient</th>
<th>t-statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Δln TE_{t-1}</td>
<td>0.37449</td>
<td>2.4239</td>
</tr>
<tr>
<td>Δln PCY_t</td>
<td>-0.056495**</td>
<td>-2.4728</td>
</tr>
<tr>
<td>Δln IM_t</td>
<td>-0.019702*</td>
<td>-1.9421</td>
</tr>
<tr>
<td>Δln DEBT_t</td>
<td>0.049955</td>
<td>1.6071</td>
</tr>
<tr>
<td>ΔU_t</td>
<td>-0.030744</td>
<td>-1.6466</td>
</tr>
<tr>
<td>ΔU_{t-1}</td>
<td>0.039056**</td>
<td>2.6097</td>
</tr>
<tr>
<td>ΔI_t</td>
<td>0.013074***</td>
<td>-3.2916</td>
</tr>
<tr>
<td>Intercept</td>
<td>0.047933</td>
<td>0.26944</td>
</tr>
<tr>
<td>ecm_{t-1}</td>
<td>0.95434***</td>
<td>-6.0139</td>
</tr>
</tbody>
</table>

R-Squared 0.858
R-Bar-Squared 0.747
DW-statistic 2.944
Ramsey RESET Test (1) 2.3468 (0.126)
LM Test (1) 7.377 (0.007)
ARCH Test (1) 0.0367 (0.848)
Jarque-Bera Test (2) 0.49127 (0.782)

*p-values in parentheses*

*Indicates the order of the variables chosen by the model selection criteria i.e. AIC
Standard Errors in Parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%
The error correction term is strongly statistically significant with a negative sign, also confirming that a long-run equilibrium relationship exists between the variables. The coefficient of -0.954, which is highly significant and correctly signed, suggests that once shocked, the speed of convergence to equilibrium in the model is extremely quick. The model passes all but one of the diagnostic tests: the Breusch-Godfrey LM test rejects the null of no serial correlation. However, the ARCH test rejects heteroscedasticity in the error term, there is no specification error as indicated by the Ramsey RESET test, and the Jarque-Bera statistic confirms normality of the residuals. Finally, the plots of CUSUM and CUSUM of Squares (Figure 2) reveal that the estimated parameters are stable over the sample period.

**Figure 2: Plot of CUSUM and CUSUM of Squares**

(The straight lines represent critical bounds at 5%.)
4. Discussion of Results

The results obtained are broadly consistent with the predictions of economic theory. The per capita income variable had a negative relationship with tax evasion in the short run. This result is consistent with the theory and findings of other taxation studies (for example, Tanzi (1992), Lotz and Morss (1967)) in that, as per capita income increases in the short run, tax evasion decreases. However, in the long run this variable was not statistically significant and even had a positive relationship with tax evasion. The external debt variable was positive both in the long run and short run, but was only statistically significant in the long run. Again, this result is consistent with that obtained by Tanzi (1989) and Ghura (1998). The imports variable was negative both in the short run and long run. This is a result which is consistent with the theory and empirical findings of previous studies. The fact that the import variable was statistically significant in both cases shows the importance of this variable in taxation studies such as this one. Studies by Hinrichs (1966), Tanzi (1992) and Nagy Eltony...
(2002), among others, have also confirmed the significance of the import variable in taxation studies, especially in developing countries.

In both the short run and long run, inflation had a negative relationship with tax evasion. This was an expected result and consistent with results obtained by Tanzi (1989) and Ghura (1999), among others.

The unemployment variable had a positive relationship with tax evasion in the short run and a negative one in the long run. However, it was significant only in the short run. Due to the ambiguity of the results found in various studies, there was no hypothesized sign for the result in this study. The positive relationship between the unemployment variable and tax evasion in the short run result was similar to that found by Giles and Tedds (2002) and Dell’Anno et al. (2004) in their studies of the hidden economy.

5. Conclusions and Policy Recommendations

This paper employed the estimates of tax evasion obtained from the currency demand model (authors’ own calculations) to analyse the determinants of tax evasion in Trinidad and Tobago during the period 1973 to 1999.

Additionally, by applying a relatively new cointegration technique, the study was able to identify a long-run relationship between tax evasion, per capita income, imports, external debt, unemployment and inflation. The results were generally consistent with the economic theory and suggested that the independent variables do matter in explaining tax evasion. The findings imply that fiscal and monetary polices should be aimed at reducing unemployment and inflation.
Further, external debt, which had a positive relationship with tax evasion, suggests that governments should act in a prudent way and ensure that expenditure using external financing should be moderated. Additionally, per capita income’s positive relationship with the tax evasion variable in the long run shows that government can decrease tax evasion by enhancing its tax collection capabilities. Imports showed a negative relationship with tax evasion, which is largely due to the difficulty in evading these taxes, and this result was consistent with the theory.

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