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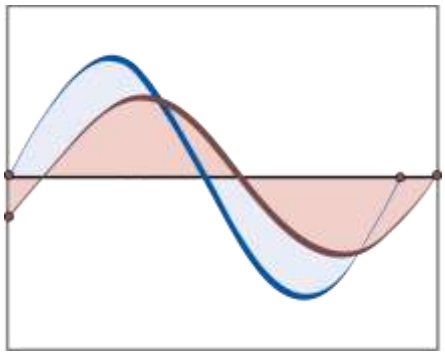

The Buoyancy and Elasticity of Non-Oil Tax Revenues in Trinidad and Tobago (1990-2009)

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This research paper updates an earlier study completed by the Central Bank and aims to accomplish three objectives: firstly, extend the analysis of tax buoyancy and elasticity for the period 1990-2009; secondly, evaluate the efficiency of the non-oil taxation system with respect to revenue generation; and finally, assess whether the tax reforms and policy measures improved tax buoyancy and elasticity. The main finding of the research paper is that the buoyancy of the non- oil tax system (0.99) in Trinidad and Tobago is unitary which indicates that it is relatively efficient but is dependent on substantial discretionary revenue measures annually to keep tax revenues increasing apace with Non-Oil GDP. This points towards natural built-in weaknesses in the tax structure and scope for improved revenue collections as these weaknesses are corrected. Preliminary evidence shows that some of these weaknesses may be prevalent in the category of indirect taxes; however, the tax buoyancy coefficient for direct taxes was also lower than one.

JEL Classification Numbers: H21

Keywords: tax buoyancy, tax elasticity, non-oil tax revenue, tax reform, Trinidad and Tobago.

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1.0 Introduction

The fiscal situation in Trinidad and Tobago took a turn for the worse in 2009 as the economy experienced the contagion effects of the world financial crisis and resulting decline in commodity prices. The fiscal accounts recorded a deficit of 5.3 per cent of Gross Domestic Product (GDP) after seven consecutive years of surpluses. Moreover, the domestic economy declined considerably as it grappled with depressed performances in both the energy and non-energy sectors. Since then, international commodity prices have rebounded somewhat. However, the prospects for the country's main revenue source still remain uncertain. The domestic energy industry is currently challenged with declining crude oil production, dwindling natural gas reserves, relatively low natural gas prices and reduced exploration activity. This has already begun to affect energy revenue collections which decline as a share of total revenue from 20 per cent in fiscal year 2008 to 16.6 per cent in fiscal year 2010 despite augmented collections from an energy audit spanning the period 2001-2008.

Amidst these conditions, the fiscal authorities will be hard pressed to find auxiliary sources of revenue if it intends to re-invigorate the domestic economy and return the fiscal accounts to a surplus position. Within this context, this paper revisits the concepts of tax buoyancy and elasticity. These concepts will be very useful to the central government as it formulates the national budget and introduces measures geared towards boosting revenue collections. In an earlier study, Roberts and De Silva (1990) provided buoyancy and elasticity estimates of non-oil tax revenues for the period 1966-1979. Since then, there have been significant reforms to the taxation system which could have changed the tax elasticity and buoyancy coefficients and this paper provides an update of these estimates.The current study updates the previous one in several ways: (i) the studyalign the definition of non-oil tax revenue with the classification in the Trinidad and Tobago System of National Accounts; (ii)utilizes an updated methodology for calculating elasticity coefficients and (iii) provides updated elasticity and buoyancy coefficients for the period 1990-2009.

The study is organized as follows: Section I (Background) outlines the concepts of tax elasticity and buoyancy, reviews the major tax reforms introduced over the two decades between 1990 and 2009 and highlights previous attempts to measure elasticity and buoyancy. Section II (Methodology & Results) discusses the

[1]The author is an economist in the Research Department of the Central Bank of Trinidad and Tobago and would like to acknowledge the comments and suggestions provided by Dr. Alvin Hilaire and Dr. Penelope Forde during the course of this research. The views expressed in this paper are those of the authors and not necessarily those of the Central Bank.

methodologies used to calculate the elasticity and buoyancy coefficients and. Section III (Conclusions) provides some closing remarks based on the findings of the paper.

2.0 Background

2.1 TaxBuoyancy and Elasticity

The concepts of tax buoyancy and elasticity which are used extensively throughout the paper are defined as follows: tax buoyancy is a measure of the responsiveness of a tax system to changes in the relative tax base inclusive of discretionary changes; while tax elasticity is a measure of the responsiveness of a tax system to changes in the relative tax base, exclusive of discretionary changes[2]. The tax baseis the measure upon which the assessment or determination of tax liability is based. For example, taxable income is the tax base for income tax and assessed value is the tax base for property taxes. This study utilized non-oil GDP as a proxy tax base for non-oil tax revenue.

The concepts of tax buoyancy and elasticity are used asestimates of the efficiency of a tax system, that is, the ability of the tax system to mobilize revenue with and without tax policy changes. Mitchell and Andrews (1991) noted that the knowledge of the elasticity's of different taxes allows one to project the additional revenues that can be mobilized by the existing tax system as national income rises.More specifically, these coefficients can be used for: (i) monitoring the progress of tax collections; (ii) formulating government budgets; (iii) tax revenue forecasting and (iv) for comparisons between countries. With respect to monitoring the progress of tax collections, historic data of tax elasticity's and buoyancies provide a picture of the performance of tax revenue over time and can assist governments in their decisions to increase and/or decrease the tax rates and/or bases for different categories of taxes in the national budget.Furthermore, knowledge of the elasticity's of different taxes allows for the projecting of additional revenues that can be mobilized by the existing tax system as national income rises. Finally, tax buoyancy and elasticity coefficients allows for comparison of the efficiency of taxes across countries.

It is desirable to have a tax system with buoyancy and elasticity coefficientsgreater than one (1).This indicates the tax system is elastic which means that duringtimes of economic growth tax revenues would be increasing at a faster rate than GDP. This can facilitate increases in savings or growth in expenditure (preferably that related to development) without the need for increases in the tax rate. Conversely a taxbuoyancy or elasticity coefficient that is lower than one (1) may point towards issues related to the structure of the tax, administration

[2]Discretionary changes include changes in the tax rate, brackets, coverage, exemptions and deductions in a given fiscal year.

or compliance. In general, if tax policy changes were revenue enhancing over time the buoyancycoefficient is expected to exceed the elasticity coefficient as actual revenue will exceedthe amount that would have been generated in the absence of changes in the taxsystem.

Algebraically tax elasticity is written as follows:

Where:

E_{tY} – Income elasticity of tax

Y – Non-Oil GDP

T_t- Total tax revenue

B_k– base of kth tax

T_k- revenue from kth tax

$$E_{tY} = \frac{\%\Delta T}{\%\Delta Y} = \frac{\Delta T}{T} \times \frac{Y}{\Delta Y} = \frac{\Delta T}{\Delta Y} \times \frac{Y}{T} \qquad Eq.1$$

Conventionally, tax elasticity is usually presented in aggregate form as a single value as indicated in equation (1).

$$ET_{tY} = \frac{\Delta T_t}{\Delta Y} \times \frac{Y}{T_t} = \frac{T_1}{T_t}\left(\frac{\Delta T_1}{\Delta Y} \times \frac{Y}{T_1}\right) + \left(\frac{\Delta T_2}{\Delta Y} \times \frac{Y}{T_2}\right) + \ldots + \frac{T_n}{T_t}\left(\frac{\Delta T_n}{\Delta Y} \times \frac{Y}{T_n}\right) \qquad Eq.2$$

However, the overall elasticity of a tax system is the weighted average of the sum of individual tax elasticity's that responds in various ways to changes in income as illustrated in equation (2). Where subscripts 1,2 and n refer to the different individual taxes which are expressed as a ratio of total tax revenue indicated by the subscript t to give the individual tax weight.

$$ET_{kY} = \left(\frac{\Delta T_k}{\Delta B_k} \times \frac{B_k}{T_k}\right)\left(\frac{\Delta B_k}{\Delta Y} \times \frac{Y}{B_k}\right) \qquad Eq.3$$

The elasticity of total tax revenue is then further disaggregated into its components in equation (3), which shows that the elasticity of any individual tax can be decomposed into the product of the elasticity of the tax to its base and the elasticity of the base to income.

$$ET_{tY} = \sum_{i=1}^{n} \frac{T_i}{T_t}\left[\left(\frac{\Delta T_i}{\Delta B_i} \times \frac{B_i}{T_i}\right)\left(\frac{\Delta B_i}{\Delta Y} \times \frac{Y}{B_i}\right)\right] \qquad Eq.4$$

Finally, equation (4) reveals that the elasticity of total tax revenue to income in a system of n taxes depends on the product of the elasticity of tax and base and base to income for each separate tax, weighted by the importance of that tax in the total system.

The previous algebraic notation can also be utilized for the tax buoyancy algebraic notation provided that E_{tY} is replaced with B_{tY}.

2.2 Tax Reforms and Policy Changes (1990-2009)

During the 1970s, the sharp rise in crude oil prices resulted in a significant increase in government revenues and expenditure, which boosted growth and stimulated aggregate demand. However, this prosperity was not sustained, as the international crude oil market crashed in 1982. This led to fiscal and external disequilibria and as a consequence the domestic economy slipped into a deep recession that lasted about ten years. During this time, the fiscal authorities sought the assistance of the International Financial Institutions (IFI's) which led to a series of reforms and the introduction of structural adjustment measures under the auspices of the International Monetary Fund (IMF). The following paragraphs provide a summary of some of the major reforms and policy changes to the taxation system during the period 1990-2009.

2.2.1 The Value Added Tax

The most notable change to the taxation system during the structural adjustment period was the introduction in 1990 of the Value Added Tax (VAT) which replaced the complicated system of indirect taxes that were in existence. The VAT is levied on all sales of commodities at every stage of production and distribution. The tax is levied at two rates: zero; and a standard rate of 15 per cent on domestic consumption and imports of goods and services[3]. Additionally several services are exempted from this tax under the VAT Act, 1989. Its primary advantage over other similar taxes e.g. retail sales tax is that VAT revenue is collected throughout the production process as opposed to the retail sales tax which is collected only at the point of sale to the final consumer.

[3]The VAT is normally applied as a destination based tax which means that it is imposed on imports and domestically-produced goods but not on exports.

Since the introduction of VAT, its collections have remained relatively stable (averaging 6.3 per cent of Non-Oil GDP) despite notable increases in consumption expenditure. Over time, there have been gradual extensions in the list of goods that are VAT exempt and zero-rated which has raised concerns that the efficiency of the tax may have been undermined. To determine the efficiency of the VAT in raising government revenue two ratios were calculated. These are: the VAT "Efficiency ratio" and "C-efficiency ratio".The first measure examines the ratio of VAT revenue to GDP divided by the standard VAT rate. For the purposes of this paper Non-Oil GDP was used as the tax base in the calculation of the "Efficiency ratio"as by and large activity in the petroleum/energy sector is not subject to VAT. The C-efficiency ratio is more robust than the former due to the use of consumption as the tax base rather than GDP as VAT is a consumption based tax.

An examination of Table 1 below reveals that there was a marginal improvement in the "C-Efficiency" ratio of VAT from 0.43 to 0.46 between the years 1995 and 2008; however, in comparison with emerging and advanced economies the VAT efficiency ratios in Trinidad and Tobago were considered to be relatively low. A recent study (IMF 2010) revealed that emerging economies have an average C-efficiency ratio of 0.50 while in advanced economies the ratio is 0.51. One of the possible reasons for the seemingly weak performance of the VAT system may be the extension of the list of zero-rated and exempt goods. This is referred to in the economic literature as "preference creep" and can lead to an erosion of VAT revenue. Estimates provided by ECLAC (2006) suggest that "preference creep" has led to an erosion of VAT revenue by as much as 25 per cent of VAT yields in Trinidad and Tobago.

The VAT Efficiency ratio in Trinidad and Tobago also seems smaller than that in other Caribbean jurisdictions. The average C-efficiency ratio in Barbados over the period 1996-2001 was 0.86 and an average of 0.65 was estimated for Jamaica (ECLAC 2006). The Asia Pacific Tax Bulletin (January/February 2005) also reported that the C-efficiency ratios for Barbados and Jamaica were higher than the 0.50 benchmark and were recorded at 1.02 and 0.83 respectively, with that for Trinidad at 0.47. More recently, the IMF Article IV Report for 2010 highlighted that the VAT efficiency ratio for Trinidad and Tobago is below the regional average of 0.68.

Although these results suggest that the VAT system in Trinidad and Tobago has been underperforming, caution needs to be exercised when comparing efficiency ratios between countries and across varying time periods.These ratios could be biased either upwards or downwards for several reasons including: (i) differences in administrative procedures, (ii) differing or multiple rates, (iii) the choice of goods and services that receive exemptions or zero ratings, (iv)the threshold level for the VAT and the extent of evasion.Additionally, further work needs to be conducted on the calculation of C-efficiency ratios for countries with multiple rates. Notwithstanding this, the above comparisons suggest that there is scope for improving the revenue performance of the VAT in the domestic economy.

Table 1: VAT Efficiency and C-Efficiency Ratios for Trinidad and Tobago (1990-2009)

Year	Actual Net VAT (TT$Mn)	Non-Oil GDP (TT$ Mn)	Net VAT/Non-Oil GDP (%)	Consumption Expenditure (TT$ Mn)	Efficiency Ratio	C-Efficiency Ratio
1990	926.6	14,807.5	6.3	n.a.	n.a.	n.a.
1991	1,054.4	16,269.2	6.5	n.a.	n.a.	n.a.
1992	968.6	17,734.3	5.5	n.a.	n.a.	n.a.
1993	1,163.1	18,868.5	6.2	n.a.	n.a.	n.a.
1994	1,259.0	20,219.9	6.2	n.a.	n.a.	n.a.
1995	1,344.8	22,460.7	6.0	20,679.6	0.40	0.43
1996	1,413.9	24,003.8	5.9	22,653.7	0.39	0.42
1997	1,623.9	26,489.6	6.1	23,914.8	0.41	0.45
1998	2,153.9	30,294.2	7.1	27,400.7	0.47	0.52
1999	1,637.5	32,984.8	5.0	31,414.9	0.33	0.35
2000	2,037.7	35,486.5	5.7	35,626.4	0.38	0.38
2001	2,178.7	39,385.7	5.5	34,412.7	0.37	0.42
2002	2,401.0	41,311.4	5.8	40,438.0	0.39	0.40
2003	2,272.2	45,687.0	5.0	43,177.9	0.33	0.35
2004	3,099.6	51,155.5	6.1	55,008.5	0.40	0.38
2005	3,079.1	54,372.7	5.7	44,381.5	0.38	0.46
2006	4,324.1	60,767.8	7.1	69,141.3	0.47	0.42
2007	5,335.4	74,789.5	7.1	80,019.0	0.48	0.44
2008	5,933.0	83,374.6	7.1	85,333.3	0.47	0.46
2009	5,549.3	83,537.5	6.6	n.a.	0.44	n.a.

Source: Ministry of Finance and Central Bank of Trinidad and Tobago.

Notes:

1. Actual net VAT was calculated as the residual of actual VAT revenue less refunds for purchases that enter into production of the final product (i.e. output VAT - input VAT).
2. Consumption expenditure data was not available for calendar years: 1990-1994 and 2009.

2.2.2 Personal Income Tax

During the 1980s the high marginal tax rates and complicated system of personal income taxes resulted in widespread tax avoidance and evasion. As a result, the tax reform efforts of the 1990s were geared towards simplifying the system of personal income taxes and fostering less dependence on direct taxes. This involved replacing numerous personal reliefs and allowances with a basic personal allowance, widening the tax brackets and reducing the high marginal tax rates. During the period 1990-2009, the number of tax brackets and rates applicable were gradually reduced from eleven (11) to two (2). In 2006 a flat rate of 25 per cent was introduced and the basic personal allowance was increased to $60,000 per annum. The tax system remained relatively unchanged between the years 2006-2009 except that deductions for: (i) pension fund/annuity and National

Insurance System (NIS) contributions were changed from $12,000 per annum (2006) to $30,000 per annum (2009) and (ii) tertiary education abroad increased from $18,000 to $60,000 per year (See table 2).

Table 2: Individual Income Tax Rates and bases for selected years

Chargeable Income TT$	1988 Tax Rate %
0-2,000	5
2,001-4,000	10
4,001-6,000	13
6,001-8,000	18
8,001-10,000	23
10,001-15,000	28
15,001-20,000	33
20,001-25,000	38
25,001-30,000	43
30,001-40,000	48
Over 40	50

Chargeable Income TT$	Tax Rate %						
	1989	1990	1991	1992	1994	1995	1996
0-12,000	5	5	5	5	5	5	5
12,000-20,000	20	15	15	15	15	15	15
20,001-40,000	40	30	30	35	38	33	30
40,001 and above	45	35	35	40	40	38	35

	Tax Rate %								
Chargeable Income TT$	1997	2002	2004	2005	Chargeable Income TT$	2006	2007	2008	2009
0-50,000	28	28	25	25	0-60,000	0	0	0	0
50,000 and above	35	35	30	30	60,000 and above	25	25	25	25

Source: Ministry of Finance budget speeches, various years.

Notes:

1. The definition of chargeable income in 1998 differs substantially from that of 1989 and 1990 due to the large number of special deductions and allowances permitted in the 1988 law.
2. The 1988 tax rate is exclusive of the 5 per cent income tax surcharge levied on net income.
3. The tax reform measures of the 1990s saw the reduction of the eleven tax rates to four and a widening of the chargeable income. Additionally, the nineteen items that could be considered either personal reliefs or allowances were eliminated and a system of personal tax credits was introduced.

2.2.3 Corporation Tax

The system of taxation for corporate entities was also similar to that of individuals as corporation tax rates were high and there were several other business levies. The first step in the reform process was the consolidation of several business levies into a single tax. This was introduced in the 1989 and resulted in a decline of the combined maximum tax rate for companies from 49.5 per cent to 45.0. This single rate contributed significantly to simplifying the corporation tax system. Throughout the period 1990-2009, the central government maintained its commitment towards reduced corporation taxes, such that the tax rate was lowered withminor fluctuations from 45 per cent to 25 per cent by2009 (See table 3).

Table 3: Corporation Tax rates for selected years

Year	Corporation Tax Rate (%) on Chargeable Profits
1989	45
1999	35
2000	35
2001	35
2002	35
2003	30
2004	30
2005	30
2006	25
2007	25
2008	25
2009	25

Source: Ministry of Finance.

2.2.4 Excise Duties

Excise duties may be broadly defined as an inland tax on the production for sale of specific goods or narrowly defined as a tax on goods produced for sale within the country. Excise duties are distinguished from customs duties which are taxes on importation or a border tax. In general, the taxes on excise duties on tobacco and alcoholic products throughout the review period (1990-2009) grew as emphasis was placed on improved health and wellness.

2.2.5 Taxes on International Trade

The reductions in the rate of international trade taxes during the 1990s were related to the agreement amongst CARICOM countries to impose a Common External Tariff (CET). This agreement envisaged a four stage reduction in the top tariff rate from 45 per cent to 20 per cent over the period 1993 to 1998. An examination of

the revenue from international trade taxes reveals that the trade liberalization program resulted in a marginal reduction in revenue from 8.6 per cent of non-oil imports in 1990 to 3.9 per cent in 2009.

2.2.6 Estimates of the revenue effects of budget tax measures

The fiscal measures outlined in the annual budget speech are usually accompanied by estimates of the revenue impact of these policy changes.These estimates are highlighted in table 4 below. Each value represents the net discretionary change in the respective revenue category with negative values indicating a net decrease in tax revenue and positive values a net increase. A net decrease in tax revenue could have resulted from any of the following factors: the removal/ or reduction in tax rates, extension of VAT zero-rated list, an increase in the VAT threshold level or the removal of fees. Conversely, a net increase in tax revenue could be attributed to: the introduction of a new tax, fee or levy, the increase in an existing tax, levy or fee, reduction in the VAT threshold level and the removal of items from the negative list. The analysis focused on budget tax measures that affected non-oil tax revenue.

The shaded cellsrepresent categories of revenue for which estimates of discretionary changes were not available. This was a frequent occurrence over the review period and especially in the case of VAT[4]. These omissions proved to be a major limitation in the estimation of elasticity coefficients and this study attempted to compute estimates for the proposed budget measures which are highlighted in bold in the shaded cells in table 4. The methodology used to make these computations is explained in greater detail in the section on elasticity methodology and coefficients.

Noticeably, the property taxation system remained relatively unchanged and revenue collections paltry over the past nineteen years despite significant increases in property values. This continues to be a potential source of revenue earnings that remains relatively unexplored.

[4] Amongst the budget measures affecting the VAT that were unaccompanied by revenue estimates were: the increase in the VAT threshold from $100,000 to $150,000 in FY1996 and the numerous zero-rated goods that were introduced during the period 2000 to 2007.

Table 4: Estimates of the Revenue Effects of Budget tax measures affecting Non-Oil Tax revenue,1990-2009
TT$ Mn

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
TAXES ON INCOME & PROFITS																				
Companies	(-)30		(+)30		(+)9.3	(-)101	**(-)43.2**	-				(-)48	**(-)14.4**	(-)200			**(-)200**			
Individuals	(-)200		(+)124	(+)36	(-) 1.0	(-)72	**(-)108**	(-)100		(-)50		(-)55	(-)58	(-)289	-	-	-		(-57)	(-25)
TAXES ON PROPERTY																				
Lands & Buildings				(+)120																
TAXES ON GOODS & SERVICES																				
Excise Duties		-	(+)324	(+)50					-			(+)24								
Value Added Tax	**(+)863.3**		(-)18	(+)129		**(+)5.0**	-			**(-)21.3**		**(-) 28.3**	**(-)31.2**	**(-)29.5**		**(-)40.2**	**(-)56.2**	**(-)69.3**		**(-)72.1**
TAXES ON TRADE																				
Import Duties	(+)109	(-)27	(+)55	(-)76	(-)128	-	-	-	-	-		(+)24		-		-	-	-	-	

Source: Central Bank of Trinidad & Tobago.

Notes:

1. The analysis focused on collections from the: VAT, personal income tax, corporation tax, international trade taxes and excise duties as they represent approximately 90 per cent of Non-Oil tax revenue.
2. The shaded cells represent budget tax measures (affecting Non-Oil tax revenue) without estimates of the discretionary change in revenue.
3. The shaded cells with figures in bold represent the author's computations of budget tax measures without estimates of discretionary changes in revenue. The estimates were based on historic information on changes in the tax rate and the expected revenue impact. See the section on elasticity methodology and coefficients for more details.
4. The reporting of the fiscal accounts was changed in 1997 from calendar year (January to December) to fiscal year (October to September).
5. The budget estimates for fiscal year 1999/2000 contained no new fiscal measures.
6. The estimates for the increase in excise duties in fiscal year 1991/1992 include a 65 per cent increase in the rate of excise duty on petroleum products.

2.3. Tax Buoyancy in Trinidad and Tobago

Over the past five decades there have been several independent studies with estimates of buoyancy coefficients for the tax system in Trinidad and Tobago (See Table 5).

1951-1967

One of the first studies which provided estimates for the period 1951-1967 suggested that Trinidad and Tobago's tax effort was low relative to its taxable capacity(Bobb 1967). The tax buoyancy coefficient for total tax revenue was less than unity (0.96); while the buoyancy for oil revenue was even lower (0.85). When the study was updated for the period 1958-1967 however, the total tax revenue coefficient was marginally higher at 0.96 but oil revenue coefficient declined further to 0.70. The primary reasons cited for the low tax effort were the existence of inelastic tax bases, the complicated nature of the tax system and high levels of tax evasion and avoidance.

1960-1974

Another study (Ramsaran 1967) in which estimates of total tax buoyancy (inclusive of the petroleum sector) were completed for the period 1960-1974 showed a marked improvement in the coefficient. The coefficient rose to 2.34 for the period 1960-1974 from 0.96 for the period 1958-1967. Most of this increase was attributed to a sharp rise in oil prices which surged from US$1.30 per barrel, WTI to US$9.80 per barrel, WTI, between 1970-1974. This was especially reflected in the coefficient for corporation taxes (including petroleum companies) which escalated to 6.11 from 0.48 in the earlier sub period (1960-1965). The results of this study clearly demonstrate the effect that changes in commodity prices can have on tax buoyancy coefficients. High tax buoyancy coefficients during times of buoyant oil prices can mask underlying vulnerabilities in energy based economies.

1966-1979

Roberts and De Silva (1990) compiled buoyancy estimates of the non-oil tax system for the period 1966-1979. The study revealed a buoyancy coefficient of 1.21, which was much lower than the coefficient of 2.34 for the comparable period 1960-1974. The result reinforced the view that the tax revenue buoyancy coefficient has a bias in the direction of movements in oil prices. When oil prices are rising the overall buoyancy coefficient for tax revenue is likely to be higher than that of non-oil tax revenue. Conversely, when oil prices are on the decline the overall buoyancy coefficient is likely to be lower than that of non-oil tax revenue. Over the review period the taxation system was heavily dependent on direct taxes which yielded a coefficient of 1.50 compared with a coefficient of 0.87 for indirect taxes.

1990-2000

The 1990s were significant in that there were major modifications to the taxation system, which were expected to change its structure and improve efficiency. At least two studies have examined the impact of these reform measures on tax buoyancy. The first study by Seerattan and Charles (2004) proposed that after the tax reforms the buoyancy coefficient for indirect taxes fell to 0.82 compared with 1.75 before the reform period. However, the tax buoyancy for direct taxes improved to 0.81 after the reform period from -0.21 in the decade prior to 1990. These results suggest that the reforms to the overall tax system were not revenue enhancing for indirect taxes but rather improved the buoyancy of the direct taxation system.

A similar conclusion could be made after examining the results of the Ramsaran and Tang (2004) study, although the estimated buoyancy coefficients were notably different. For example, the buoyancy coefficient for direct taxes (after reforms) was 1.33 in the Ramsaran and Tang study compared with 0.81 in the Seerattan and Charles study. The buoyancy coefficient for total tax revenue (after reforms) was 1.06 in the case of Seerattan and Charles compared with 0.82 in the other study. Both studies produced similar buoyancy coefficients for indirect taxes after the reform period. These results seem to support the notion that the escalation in zero-rating and in exempting items may have contributed to the increased inefficiency of the VAT system.

One reason for the sharp difference in buoyancy coefficients in both studies may be the choice of methodology used to compute the coefficients. Seerattan and Charles (2004) utilized a log-linear equation linking a time series on tax revenue to its corresponding GDP series. The approach by Ramsaran and Tang (2004) was more arithmetic in nature such that the coefficient was calculated as the percentage change in revenue divided by the percentage change in GDP. Haughton (1998) indicated that this approach if measured in nominal terms could lead to buoyancy estimates that are biased upwards. As a result, he recommends measuring the increases in tax revenue and its base in real terms. Another limitation stems from the fact that the coefficient is derived as the average of the calculated elasticity coefficients for each year. This causes the coefficient to be heavily influenced by unusually high or low (negative) measures of tax buoyancy in some years.

Table 5: Tax Buoyancy Coefficients for Trinidad and Tobago, 1951-2000

	Bobb (1951-1967)		Ramsaran (1960-1974)				Roberts & De Silva (1966-1979)	1980-2000				
	1951-1967	1958-1967	1960-1965	1965-1970	1970-1974	1960-1974	Non-Oil Tax Buoyancy	Seerattan& Charles (1980-1990)	Ramsaran& Tang (1980-1990)	Seerattan& Charles (1990-2000)	Ramsaran& Tang (1990-2001)	Seerattan& Charles Tax Buoyancy (1980-2000)
DIRECT TAXES			**0.89**	**1.65**	**4.25**	**3.93**	**1.50**	**-0.21**	**0.98**	**0.81**	**1.33**	**0.38**
Income tax			2.26	1.75	1.23	2.08	1.49					
Corporation tax			0.48	1.31	6.11	4.44	1.49					
INDIRECT TAXES							**0.87**	**1.75**	**11.71**	**0.82**	**0.85**	**1.39**
Purchase Tax/VAT			0.96	4.99	0.95	2.40	1.29		5.90		0.95	
Motor Vehicle Tax			1.49	1.35	0.45	0.81	1.01					
Excise duties							0.39					
Taxes on trade			1.45	0.49	0.26	0.43	1.00		0.23		0.56	
Property Tax			1.33	3.95	0.21	1.10			3.09		0.28	
TOTAL TAX REVENUE	**0.94**	**0.96**	**1.20**	**1.40**	**2.30**	**2.34**	**1.21**	**0.08**	**-0.23**	**0.82**	**1.06**	**0.63**

Source: Central Bank of Trinidad and Tobago.

Notes:

1. Buoyancy coefficients for the period 1951-1967 were sourced from Bobb (1969).
2. Buoyancy coefficients for the period 1960-1974 were sourced from Ramsaran (1975).
3. Buoyancy coefficients for the period 1966-1979 were sourced from Roberts and De Silva (1990).
4. Buoyancy coefficients for the period 1980-2000 were sourced from Seerattan and Charles (2004).
5. Buoyancy coefficients for the period 1980-2001 were sourced from Ramsaran and Tang (2004).

3.0 Tax Buoyancy Methodology and Coefficients

This research paper utilized six techniques[5] to calculate tax buoyancy as outlined by Haughton (1998). This range of methods was used to facilitate comparison of the buoyancy coefficients and assess the reliability of the results.

Tax revenue data for the period 1990-2009 was sourced from the Ministry of Finance and sub-divided into two main categories i.e. direct and indirect tax revenue. The following categories of revenue were classified as direct: corporation, individual income, unemployment levy (non-oil) and health surcharge. The corporation tax data was adjusted[6] to exclude receipts from petroleum, petrochemical, refining and gas processing and service contracting companies. This adjusted was made to align the definition of non-oil revenue with the Trinidad and Tobago System of National Accounts (TTSNA) classification[7].In the past, non-oil revenue as measured in the fiscal accounts included receipts from these companies which have traditionally been classified as part of the energy sector.

The revenue effects of the miss-classification may have been negligible prior to 2003 since several of the petroleum, petrochemical, refining and gas processing companies were on tax holidays. However, as many of these tax holidays came to an end in the year 2003, it has become important to ensure that non-oil revenue is correctly classified so as to prevent overestimating the calculations of non-oil revenue. Non-oil tax revenue was calculated as the difference between total tax revenue and tax revenues collected from firms in the petroleum industry (inclusive of refining, gas processing and service contracting companies) , that is, firms governed under the Petroleum Taxes Act of Trinidad and Tobago.

Indirect tax revenue was classified as receipts from purchase tax, VAT, excise duties, motor vehicle taxes and duties, taxes on international trade, taxes on financial services, alcohol and tobacco taxes and betting and entertainment taxes. Non-oil GDP data was sourced from the Central Statistical Office

The first and simplest method of calculating tax buoyancy is the Annual Average Method, which involves calculating the per cent change in tax revenue relative to its tax base for each year and category of tax

[5]Four of these methods involve arithmetic computations while the other two describe log-linear equations.
[6] The adjustment was effective for the period 2001-2009.
[7] In the TTSNA classification the Non-Oil sector excludes production from exploration and production, refining and gas processing, and service contracting companies operating in the petroleum sector.

revenue. The average of the calculated coefficients determines the buoyancy coefficient for the review period. This method is simple but is the least satisfactory since it is affected by the value of outliers that is buoyancy coefficients which are unusually high or low. The second method- The Annual Trimmed Mean Method improves on the former by calculating the trimmed mean of the coefficients, which improves on the average by removing a small percentage of the largest and smallest values before calculating the mean. After removing the specified observations, the trimmed mean is found using an arithmetic averaging formula. The third approach was – The Growth Rate between End points Method which calculates the tax buoyancy coefficient using data for the beginning and last years of the respective tax revenue and tax base data series. This method has the advantage that it requires data only for the two outer years of the review period, however, the results would be sensitive to the years chosen.

The fourth method- The Growth Rate between average end years involved calculating the change in tax revenue and the tax base between the average years (i.e. the average of the first three years of the series, compared with the last three years of the series). This procedure is less sensitive to the choice of end years than the previous but requires more data. The fifth method – The Logarithmic Method involves regressing the log of tax revenue on time. The coefficient produced represents the average growth rate of tax revenue. The same procedure is done for the tax base (Non-oil GDP) and then the buoyancy coefficient is calculated as the ratio of these two growth rates. This method is generally reliable but is least successful in cases where the coefficients in the regressions are not statistically significant or where the growth rate of the tax base is small. The final method- The Double Logarithmic Method involves regressing the log of tax revenue on the log of the base This method is frequently used in the literature on tax buoyancy and elasticity and is generally the most reliablealthough the results are sensitive to outlier years and the time interval used in the regression. The Double Logarithmic Method can be expressed in the following notational form:

$$\log T = \alpha \log + \beta \log X \qquad \text{Eq. 4}$$

Where:
T= adjusted tax revenue
X= tax base

The choice of the functional form of the equation has often been dictated by ease of computation than by apriori reasoning. It is found that in the least squares regression (identified above) the regression coefficient β gives the percentage change in tax receipts (T) that accompanies a per cent change in

income, i.e. it is the coefficient of income buoyancy. The main limitation with this form of equation is the assumption that the income buoyancy is constant over the range of income considered. This limitation becomes more restrictive when attempts are made to measure changes over long historical periods or great changes in per capita income. In these cases it may become necessary to introduce additional explanatory variables.An experiment was conducted whereby the buoyancy coefficient was estimated using a fixed tax base (i.e. non-oil GDP) and revenue appropriate tax bases (i.e. non-oil GDP, consumption expenditure and imports-Method G).

The results obtained from the estimates of tax buoyancy are shown in Table 6 below. In general, the coefficients obtained from the estimates of tax buoyancy were higher in Buoyancy Methods (1-4), but this may have been due to "outlier years"[8] which biased these arithmetic methods. A close examination of all the methodologies suggests Method 1- The Annual Average Method is clearly unreliable with large negative coefficients for several categories of tax revenue. The estimates in Method 6 – The Double Logarithmic method were utilized as the buoyancy results for this study given its frequent use in similar studies.

The non-oil tax buoyancy for the period 1990-2009 is unitary (0.99) which signals that the non-oil tax system is relatively efficient at raising tax revenues but is dependent on substantial discretionary revenues annually to keep tax revenues increasing apace with Non-oil GDP. This points towards natural built-in weaknesses in the tax structure and scope for improved revenue collection as these weaknesses are corrected. Preliminary evidence shows that some of these weaknesses may be prevalent in the category of indirect taxesas shown by the weakening in the buoyancy coefficient over the periods 1980-1990 (1.75); 1980-2000 (1.39) and 1990-2009 (0.96), with the most recent estimates showing a buoyancy coefficient lower than 1. This may be partly due to the increase in exemptions and zero-ratings of goods subject to the VAT. Moreover, the VAT efficiency ratios in Trinidad and Tobago seem lower than other Caribbean jurisdictions which support the call for a review of the VAT. However, the tax buoyancy coefficient for direct taxes was also lower than one. The simplification of the direct tax system seemed to improve its efficiency in the decade 1990-2000 (post tax reform), but there has been a decline in the tax buoyancy coefficient thereafter.

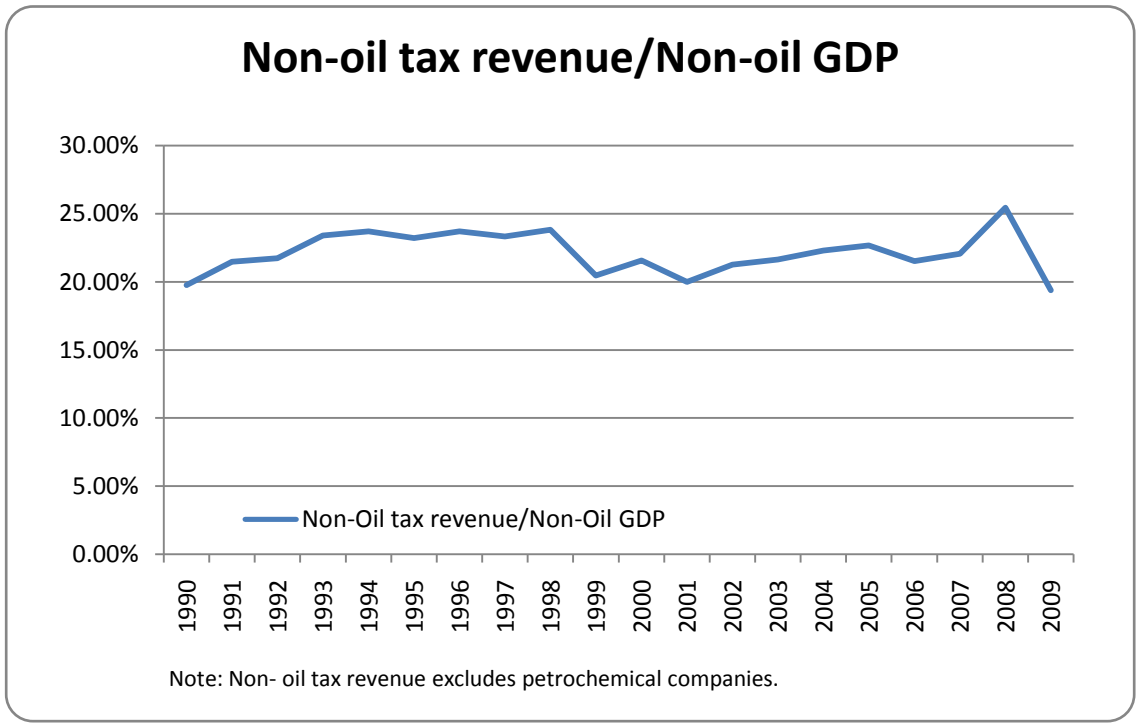
In utilizing the buoyancy coefficients calculated in this study however, several short coming must be borne into consideration: (i) there were wide variations in the buoyancy results depending on the approach utilized; (ii) the estimation approaches adopted in this paper were arithmetic and a partial equilibrium approach in that the estimates were not obtained within the context of a complete model; (iii) the tax

[8] Outlier years include: 1990- the introduction of VAT; 2008 – Commodity price boom; 2009 – Global financial crisis.

buoyancy coefficients were sensitive to the choice of tax base selected, i.e. the tax buoyancy coefficients for VAT, International trade tax and excise duties were lower when the tax base was changed to consumption expenditure and imports; (iv) an AR(1) term was introduced in the regression equation to solve for the presence of positive autocorrelation, however in some cases the coefficients had high p-values.The high p-values were attributed to the relatively small data set used in the study, i.e. 19 observations and (v) even though an AR(1) term was introduced the D.W. statistic for International Trade Taxes was still low.

While buoyancy can be estimated on the basis of econometrics, a visual inspection of the time series on the ratio of non-oil tax revenue/non-oil GDP would give a rough estimate of the buoyancy of the tax system. For buoyancy to improve the tax/GDP ratio would have to be increasing over time. The following chart (Chart 1) highlights that relationship which seems to be relatively stable over the period under review (1990-2009) and similar to the results obtained through the Double Logarithmic Method.

Chart 1: Non-oil tax revenue/Non-oil GDP



Source: Central Bank of Trinidad and Tobago.

Table 6: Estimated Tax Buoyancy Coefficients, (1990-2009)

		Non-Oil Direct Tax Coefficients				Non-Oil Indirect Tax Coefficients						
	Method Summary	Income Tax	Corp. Tax (excl. Petro.)	Corp. Tax (incl. Petro.)	**Total Non-Oil Direct Taxes**	VAT	Taxes on Property	Taxes on International Trade	Excise Duties	**Total Non-Oil Indirect Taxes**	**TOTAL NON-OIL TAX REVENUE**	TAX BASE
1.	Annual Average	1.31	-15.37	-8.70	-7.58	-0.64	-2.41	-4.94	1.09	-2.34	-3.93	Non-oil GDP
2.	Annual Trimmed Mean	1.29	1.54	1.77	1.37	1.03	0.40	0.87	0.80	0.92	1.15	Non-oil GDP
3.	Growth rates between end points	1.45	0.97	2.53	1.25	1.07	0.17	0.58	0.40	0.78	0.96	Non-oil GDP
4.	Growth rate between average end years	0.90	2.06	3.53	1.28	1.19	0.22	0.69	0.33	0.91	1.07	Non-oil GDP
5.	Logarithmic Method	0.95	1.15	1.64	1.04	1.05	0.27	0.89	0.53	0.94	0.99	Non-oil GDP
6.	**Double Logarithmic Method**	**0.79**	**1.16**	**1.67**	**0.97**	**1.05**	**0.18**	**0.94**	**0.50**	**0.96**	**0.99**	**Non-oil GDP**

Source: Central Bank of Trinidad and Tobago.

Note:

1. The table shows that including petrochemical companies and service contractors as part of corporation tax receipts (i.e. Corporation tax – incl. petro.) leads to a consistent upward bias in the buoyancy coefficient.
2. In Method 5 – Logarithmic Method the coefficient for each of the dependent variables were divided by the coefficient for non-oil GDP to calculate the buoyancy coefficient.
3. See Appendix Table 3 for the OLS results of methods 6 – Double Logarithmic Method.

Furthermore, comparing the buoyancy regression results with earlier studies seems to suggest that there was some improvement in non-oil tax buoyancy in the decade after the tax reforms (1990-2001), which was driven by improvements in direct tax revenue (See table 7). This however, was not sustained during the turn of the 21st century and caused an overall decline in non-oil tax buoyancy. However, this needs to be interpreted with caution given that the buoyancy coefficients were calculated using various methods which could have led to biases in the coefficients.

Table 7: Non-Oil / Tax Revenue Buoyancy Coefficients, 1966-2009

	Roberts & De Silva (1966-1979)	Ramsaran& Tang (1980-1990)	Ramsaran& Tang (1990-2001)	Current study (1990-2009)
Non-Oil Tax Buoyancy	**1.21**	**1.14**	**1.32**	**0.99**
Direct Taxes	1.50	-	-	0.97
Income Tax	1.49	-0.34	2.38	0.79
Company Tax	1.49	0.49	2.38	0.79
Indirect Taxes	**0.87**	**-**	**-**	**0.96**
Purchase tax/VAT	1.29	5.90	0.95	1.05
Trade Tax	1.00	0.23	0.56	0.94
Excise Duties	0.39	-	-	0.50
Property Tax	-	3.09	0.28	0.18
Notes:				
Buoyancy method used:	Double Logarithmic	Annual Average	Annual Average	Double Logarithmic

Source: Central Bank of Trinidad and Tobago and the Caribbean Centre of Monetary Studies.

Tax Elasticity Methodology and Coefficients

The available literature identifies at least four approaches[9] used to calculate tax elasticity. These are as follows: the constant rate structure, the divisa index method, the dummy variable procedure and the proportional adjustment method. The proportional adjustment method is used frequently in the economic

[9]The constant rate structure method involves the generation of a simulated tax revenue series based on the effective tax rate for a given reference year and estimates of the tax base for subsequent years.The divisa index method introduces a proxy for discretionary tax measures; this index measures the technical change which is taken as the effects of discretionary changes in tax yields. The dummy variable procedure involves the use of a dummy variable to represent important discretionary changes in the tax system for every year when such policy shifts occurred.

literature even though this approach has been subject to criticism. The main limitation of the proportional adjustment method surrounds the "data cleaning" process, where faulty budget estimates of discretionary tax changes can lead to biased elasticity coefficients as well as the inability of the research methodology to correct for this problem.

Given the above mentioned limitation, a modified proportional adjustment approach was developed by Sen (2009). The modified method makes more complete use of the available data in order to address the inherent problem of the standard proportional adjustment approach. This data cleaning methodology involves utilizing the budget estimates of tax revenue, actual tax collections and estimated discretionary effects of tax measures. The modified proportional adjustment method was used in this study and is described below.

The first step involves the selection of a "reference year" or the base year for the study. The base year chosen for this research was 1990. In the second step, an estimate of the non-discretionary component of tax receipts is calibrated by using the ratio of the actual to the budgeted tax receipts for each category of tax revenue. The third and fourth steps remain the same as the proportional adjustment method.In the third step, the adjusted tax revenue series is further adjusted to exclude the continuing impact of each discretionary change for all the other years. Two methods have been suggested to accomplish this, i.e. the forward and backward adjustment methods; these are conceptually the same except that the reference year for each is different. In the fourth step, the resulting series of "cleaned tax yields" is then regressed on a tax base to obtain the necessary elasticity values.

The modified proportional adjustment method becomes relevant when it is expected that there are significant estimation errors. However, in the case of Trinidad and Tobago the calculation of elasticity estimates faced another challenge, in addition to possible estimation errors of the revenue impact of discretionary policy measures, budget measures in several cases were unaccompanied by revenue estimates. In this case, the author attempted to compute estimates for the proposed budget measures (estimates are in bold and highlighted in Table 2). These estimates were only computed for years in which there was a change in the tax rate that was unaccompanied by the revenue impact of the budget measure. The estimates were based on historic information on changes in the tax rate and the expected revenue impact. For example: In 1996 the rate of corporation tax was reduced from 38 per cent to 35 per cent. Utilizing information from 1995, we can assume that every 1 per cent reduction in the rate of corporation tax will cost the government $14.4 million as a result the estimated cost of this measure is $43.2 million. In

2002 the rate of corporation tax was reduced from 35 per cent to 34 per cent. Based on 1995 data this measure was estimated to cost the government $14.4 million.

In the case of personal income tax, using information from 1995 it was assumed that every 1 per cent reduction in the tax rate will cost the government approximately $18 million. As a result, when the top marginal rate for personal income taxes was reduced from 38 to 35 per cent and the second tax bracket reduced from 33 to 30 per cent in 1996, this measure was estimated to cost the government approximately $108 million.The estimates for VAT were derived using information from an ECLAC study completed in 2006 which noted that the increasing number of exempt and zero-rated goods may have caused VAT revenue foregone to be approximately 25 per cent of VAT yields. This assumes a reduction in VAT revenue of about 1.3 per cent due to increases in exemptions and zero-ratings.

The modified proportional adjustment method can be represented mathematically as follows:

Where:
AT_i = the adjusted or cleaned tax yield in year i.

T_i = the actual tax yield in i.

D_i = budget estimate of the yield arising our of discretionary tax changes in year i.

T_1^e = budget estimate of the tax receipt inclusive of any discretionary change in year i.

$\forall$ = for all.

$$AT_0 = T_0 \qquad \text{Eq.5}$$

In the reference year[10] "0", i.e. the year whose tax structure is to be used as the basis for building up the adjusted series, the adjusted tax yield is set at the actual. In the following year, however the formulation is different:

$$AT_1 = \frac{(T_i^e - D_1).T_1}{T_1^e} \qquad \text{Eq.6}$$

In every subsequent year:

$$AT_i = (T_i^e - D_i).\frac{T_i}{T_i^e}.\frac{AT_{i-1}}{T_{i-1}} \forall i = 2, \ldots . n \qquad \text{Eq.7}$$

e.g.

$$AT_2 = (T_2^e - D_2).\frac{T_2}{T_2^e}.\frac{AT_1}{T_1} \forall i = 2, \ldots . n$$

[10] The reference year for this study was 1990.

Through sequential substitution it can be shown that equation (7) can be rewritten as:

$$AT_j = T_j . \prod_{i=1}^{j} \frac{(T_i^e - D_i)}{T_i^e} \forall j = 1, \ldots . n \qquad \text{Eq.8}$$

The results obtained from the estimates of tax elasticity are shown in Table 8 below.

Overall, the non-oil tax elasticity coefficient (0.81) was lower than that of tax buoyancy (0.99) which confirms the earlier assertion that the non-oil tax system would be inelastic if the government did not introduce major policy measures on a yearly basis to boost collections. This may point to issues related to the structure of taxes, administration and/or compliance. Furthermore, there have been reports of a large accumulation in tax arrears estimated at approximately $13 billion (as at December 2010) by the Minister of Finance. This prompted the central government to announce a tax amnesty in fiscal year 2011 for penalty and interest payments for income years up to and including 2009. A significant part of these arrears relate to penalty and interest charges on unpaid corporation taxes, individual income tax and the VAT. There have also been reports of tax evasion by self-employed persons as well as owners of medium to largebusinesses and other professionals in private practice who are either paid far below what their incomes suggest or not at all.

Notwithstanding this, the elasticity coefficients for direct and indirect taxes (1.21; 0.99) were higher than that of tax buoyancy (0.97; 0.96) which was not in line with apriori expectations. In the Roberts and De Silva Study (1990), it was also noted that the elasticity coefficient for direct taxes (1.65) was higher than that of tax buoyancy (1.50), while the elasticity and buoyancy coefficients for total non-oil tax revenue were the same (1.21).

Table 8: Ordinary Least Squares Results for Tax Elasticity, 1990-2009

	Elasticity	t-ratio	R^2	D.W.	p-value	Tax Base
Non-Oil Direct Taxes (excl. petro.)	1.21	21.20	0.95	1.97	0.00	Non-Oil GDP
Individual Income Tax	1.02	11.22	0.96	1.85	0.00	Non-Oil GDP
Company Tax (excl. petro.)	1.39	9.79	0.90	1.74	0.00	Non-Oil GDP
Company Tax (incl. petro.)	1.90	19.13	0.98	1.66	0.00	Non-Oil GDP
Non-Oil Indirect Taxes	0.99	10.34	0.97	2.31	0.00	Non-Oil GDP
VAT	1.13	12.40	0.97	2.39	0.00	Non-Oil GDP
International Trade Tax	0.95	6.91	0.96	1.54	0.00	Non-Oil GDP
Excise Duties	0.62	4.41	0.96	1.60	0.00	Non-Oil GDP
Property Tax	0.23	0.83	0.48	1.86	0.42	Non-Oil GDP
TOTAL NON-OIL TAX REVENUE (excl. petro.)	**0.81**	**12.46**	**0.97**	**2.18**	**0.00**	Non-Oil GDP

Source: Central Bank of Trinidad and Tobago.

Given the mixed results from the elasticity coefficients and the scarcity of estimates of the revenue impact of discretionary changes the above mentioned elasticity coefficients should be used with caution. Moreover, the measurement of tax elasticity posed several challenges to the researcher including: (i) the inherent limitations of the various methodologies; (ii) the proxy-measures used for the calculation of coefficients; and (iii) computing estimates of discretionary tax changes when none were provided in the budget speech which could have possibly influenced the estimated coefficient and weaken the potential inference of the results.

4.0 Conclusions

The results of the paper suggest that the buoyancy of the non-oil tax system in Trinidad and Tobago is unitary which indicates that it is relatively efficient but is dependent on substantial discretionary revenue measures annually to keep tax revenues increasing apace with non-oil GDP.This points towards natural built-in weaknesses in the tax structure and scope for improved revenue collections as these weaknesses are corrected. Preliminary evidence shows that some of these weaknesses may be prevalent in the category of indirect taxes; however, the tax buoyancy coefficient for direct taxes was also lower than one.

In terms of indirect taxes, there has been a gradual weakening in the buoyancy coefficient over the periods 1980-1990 (1.75); 1980-2000 (1.39) and 1990-2009 (0.96) and the available evidence shows inefficiencies in the VAT and property taxes may be the main contributors to this decline.The "C-Efficiency" ratio for VAT

averaged 0.42 for the period (1995-2008) which were low in comparison with emerging (0.50) and advanced economies (0.51). The VAT Efficiency ratio in Trinidad and Tobago also appears small when compared with other Caribbean jurisdictions. The average C- efficiency ratio in Barbados over the period 1996-2001 was 0.86 and an average of 0.65 was estimated for Jamaica (ECLAC 2006). Caution however, needs to be exercised when comparing efficiency ratios between countries and across different time periods. The property tax coefficients were also low and although in most cases they were not significant there is sufficient evidence to conclude that there has been a noticeable neglect of the property taxation system over the past nineteen years and it remains relatively unexplored as a potential source of revenue.

On the other hand, the simplification of the direct taxation system seemed to initially improve its efficiency in the decade 1990-2000 (post tax reform) but there appears to have been some slippages in the direct tax buoyancy coefficient thereafter. This assumption seems justifiable in light of the recently announced tax amnesty and reports of a large accumulation in tax arrears estimated at approximately $13 billion (as at December 2010).

Data gaps on the revenue effects of budget tax measures presents a challenge for the calculation of elasticity coefficients in Trinidad and Tobago. However, the non-oil tax elasticity coefficient (0.81) was lower than that of tax buoyancy (0.99) which confirms the earlier assertion that the non-oil tax system would be inelastic if the government did not introduce major policy measures on a yearly basis to boost collections.

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The National Budget of Trinidad and Tobago, various years.

APPENDIX TABLES

Appendix Table 1: Central Government Non-Oil Tax Revenue, 1990-2009
TT$Mn

Year	Direct Taxes of which:				Total Non-Oil Direct Taxes (excl.Petro.)	Indirect Taxes of which:				Total Non-Oil Indirect Taxes	TOTAL NON-OIL TAX REVENUE (excl. Petro.)
	Companies (incl.Petro.)	Companies (excl.Petro.)	Individuals	Unemp. Levy		VAT	Taxes on Intern. Trade	Taxes on Property	Excise Duties		
1990	383.4	383.4	570.8	0.6	1,113.4	926.6	462.9	40.6	193.9	1,866.2	2,979.6
1991	414.1	414.1	900.9	1.2	1,475.1	1,054.4	547.6	43.9	203.7	2,022.8	3,497.9
1992	426.1	426.1	1,228.7	8.8	1,813.2	968.6	569.1	39.7	305.1	2,045.8	3,859.0
1993	504.6	504.6	1,344.9	5.8	2,087.6	1,163.1	628.5	72.3	282.8	2,329.9	4,417.5
1994	599.8	599.8	1,430.9	3.4	2,286.6	1,259.0	578.8	109.6	276.7	2,507.9	4,794.5
1995	748.3	748.3	1,533.4	2.1	2,686.0	1,344.8	493.9	60.9	268.6	2,529.6	5,215.6
1996	903.8	903.8	1,786.4	7.2	3,035.5	1,413.9	496.2	58.9	273.9	2,656.7	5,692.2
1997	1,067.1	1,067.1	1,765.1	1.8	3,134.3	1,623.9	570.0	56.8	297.5	3,049.3	6,183.6
1998	1,081.2	1,081.2	1,893.6	2.5	3,388.5	2,153.8	695.3	60.1	309.6	3,827.4	7,215.9
1999	1,093.5	1,093.5	2,008.7	1.9	3,448.8	1,637.5	698.5	61.5	317.7	3,303.7	6,752.5
2000	1,281.4	1,281.4	2,207.4	2.7	3,918.9	2,037.7	765.3	62.3	318.6	3,733.8	7,652.7
2001	1,635.9	960.8	2,526.8	0.7	3,859.7	2,178.7	834.8	69.5	348.7	4,014.0	7,873.7
2002	1,645.4	1,281.0	2,701.9	21.6	4,424.0	2,400.9	885.3	84.9	399.4	4,357.5	8,781.5
2003	2,138.2	2,137.4	2,803.2	0.3	4,698.8	2,272.2	1,040.5	77.0	406.9	4,462.3	9,161.1
2004	2,696.5	1,609.7	3,428.9	115.9	5,791.3	3,099.6	1,319.2	85.9	411.8	5,612.8	11,404.1
2005	3,060.2	1,229.0	4,399.6	84.9	6,388.0	3,079.1	1,550.6	64.6	433.9	5,944.6	12,332.6
2006	3,996.9	1,629.0	2,853.8	0.0	5,259.3	4,324.1	1,970.1	72.8	465.2	7,819.4	13,078.7
2007	5,436.9	3,268.8	3,381.1	53.4	7,599.5	5,335.4	2,021.0	75.9	532.2	8,891.3	16,490.8
2008	7,994.9	5,798.9	4,449.8	6.1	11,409.4	5,933.0	2,172.9	82.9	545.2	9,812.0	21,221.4
2009	4,879.6	2,117.8	4,424.7	0.0	7,579.6	5,549.3	1,699.1	72.3	553.9	8,609.1	16,188.7

Source: Ministry of Finance and Central Bank of Trinidad and Tobago.

Appendix Table 2: Adjusted Tax Revenue (Modified Proportional Adjustment Approach), 1990-2009
TT$Mn

Year	Corporation (excl. petro.)	Individuals	Total Non-Oil Direct taxes	VAT	Taxes on Trade	Excise Duties	Taxes on property	Total Non-Oil Indirect Taxes	TOTAL NOIL TAX REVENUE (excl. petro.)
1990	383.4	570.8	1,113.4	926.6	462.9	193.9	40.6	1,866.2	2,979.6
1991	414.1	900.9	2,063.8	1,054.4	580.4	203.7	43.9	2,063.8	3,535.0
1992	397.0	1,092.5	1,702.8	983.8	550.7	191.5	39.7	1,702.8	3,351.0
1993	470.2	1,116.0	1,722.3	1,049.1	683.4	166.1	126.2	1,722.3	3,583.5
1994	551.2	1,236.1	1,955.8	1,135.6	754.0	162.5	191.3	1,955.8	3,988.2
1995	767.5	1,391.3	1,968.9	1,209.3	643.4	157.8	106.3	1,968.9	4,480.4
1996	976.6	1,718.4	2,067.8	1,271.5	646.4	160.9	102.8	2,067.8	5,028.6
1997	1,153.1	1,792.3	2,373.4	1,460.3	742.5	174.8	99.1	2,373.4	5,565.5
1998	1,168.3	1,922.8	2,979.1	1,936.8	905.7	181.9	104.9	2,979.1	6,494.6
1999	1,181.6	2,093.1	2,590.2	1,487.9	909.9	186.6	107.3	2,590.2	6,143.9
2000	1,384.7	2,300.1	2,927.4	1,851.6	996.9	187.2	108.7	2,927.4	6,963.0
2001	1,071.5	2,698.9	3,126.0	2,004.9	1,052.7	210.7	121.3	3,126.0	7,872.2
2002	1,439.6	2,960.2	3,426.6	2,236.5	1,116.4	241.3	148.2	3,426.6	8,535.6
2003	1,781.2	3,400.6	3,537.2	2,140.8	1,312.1	245.9	134.4	3,537.2	9,788.9
2004	2,022.9	4,159.6	4,449.2	2,920.4	1,663.6	248.8	149.9	4,449.2	12,373.4
2005	1,544.5	5,337.2	4,757.0	2,939.4	1,955.4	262.2	112.7	4,757.0	14,085.6
2006	2,193.9	3,462.0	6,344.8	4,198.0	2,484.4	281.1	127.1	6,344.8	15,755.8
2007	4,402.4	4,101.6	7,299.4	5,269.5	2,548.6	321.6	132.5	7,299.4	19,122.5
2008	7,809.9	5,487.6	8,055.2	5,859.7	2,740.2	329.4	144.7	8,055.2	24,079.9
2009	2,852.2	5,490.6	7,120.0	5,532.0	2,142.7	334.7	126.2	7,120.0	19,573.2

Source: Central Bank of Trinidad and Tobago.

Appendix Table 3: Ordinary Least Squares Results for Tax Buoyancy, 1990-2009

	Buoyancy	t-ratio	R^2	D.W.	p-value	Tax Base
Non-Oil Direct Taxes (excl. petro.)	**0.97**	**14.03**	**0.95**	**2.17**	**0.000**	Non-Oil GDP
Individual Income Tax	0.79	9.32	0.94	2.17	0.000	Non-Oil GDP
Company Income Tax (incl. petro.)	1.66	21.07	0.98	1.69	0.000	Non-Oil GDP
Company Income Tax (excl. petro.)	1.16	11.05	0.87	1.63	0.000	Non-Oil GDP
Non-Oil Indirect Taxes	**0.96**	**17.84**	**0.98**	**2.04**	**0.000**	Non-Oil GDP
VAT	1.05	23.31	0.97	1.65	0.000	Non-Oil GDP
International Trade Tax	0.94	4.33	0.95	1.22	0.000	Non-Oil GDP
Excise Duties	0.50	10.37	0.93	1.99	0.000	Non-Oil GDP
Property Taxes	0.18	1.42	0.32	1.89	0.22	Non-Oil GDP
TOTAL NON-OIL TAX REVENUE (excl. petro.)	**0.99**	**31.92**	**0.98**	**1.62**	**0.000**	Non-Oil GDP

Source: Central Bank of Trinidad and Tobago.

Appendix Table 4: Major Foreign Direct Investment in the Energy Sector, 1959-2009

Company[1]	Start-up Year	Estimated Cost (US$ Mn)[2]	Product
Yara Trinidad Ltd (formerly, HydroAgri Trinidad Ltd.)	1959	n.a.	Ammonia
Trinidad Nitrogen (Tringen) I	1977	125.0	Ammonia
Caribbean Ispat Ltd.	1980	468.3	Direct reduced iron, steel billets and wire rods
PCS Nitrogen I (formerly Arcadian)	1981	333.3	Ammonia
PCS Nitrogen II	1984	172.5	Granular urea
Trinidad and Tobago Methanol Company (TTMC)	1984	182.8	Methanol
Tringen II	1988	350.0	Ammonia
Phoenix Park Gas Processors Ltd.	1991	98.8	Propane, butane, and natural gasoline
Caribbean Methanol Company (CMC)	1993	200.0	Methanol
Trinidad and Tobago Methanol Company II	1996	235.0	Methanol
PCS Nitrogen III	1996	75.0	Ammonia
PCS Nitrogen IV	1998	252.0	Ammonia
Farmland / Miss Chem Ltd (formerly, Point Lisas Nitrogen Limited	1998	300.0	Ammonia
Methanol IV	1998	265.0	Methanol
Cleveland Cliffs DRI	1999	115.0	Direct reduced iron, steel billets & wire rods
Ispat DRI	1999	200.0	Direct reduced iron
Atlantic LNG Train I	1999	930.0	LNG
Methanex Trinidad Ltd (formerly,Titan Methanol	1999	261.0	Methanol
Atlantic LNG Train II	2002	550.0	LNG
Caribbean Nitrogen Company	2002	300.0	Ammonia
Atlantic LNG Train III	2003	550.0	LNG
Atlas	2003	300.0	Methanol
N2000	2004	315.0	Ammonia
International Steel Group	2004	-----	Hot Briquetted Iron (HBI)
M5000	2005	450	Methanol
ALNG IV	2005	1,200	LNG
Nu-Iron (Nucor)	2006	180	Directly Reduced Iron
Methanol Holdings Trinidad Limited	2009	1700	Urea-ammonium nitrate, melamine, ammonia

Source: Central Bank of Trinidad and Tobago.

Notes:

1. Some of these enterprises have changed ownership and names several times during the life of the company.
2. The estimated cost represents the total value of the respective plants and not necessarily the value of the foreign investment as some of these also have local participation.
3. The Income tax in Aid of Industry Act, Chapter 85:04 enacted in 1950 provides among other things, allowances to energy companies through accelerated mechanisms to encourage investment. The capital allowances are granted in accordance with the category set out under the Income Tax in Aid of Industry Act.