



Structural Fiscal Policy in an Oil-Based Economy: A Proposal for Trinidad and Tobago

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Abstract

This paper presents an estimation of the structural fiscal balance for Trinidad and Tobago, and discusses the current situation of the country in meeting the preconditions for the establishment of a structural fiscal balance target. The authors makes some recommendations, which include a budgeting process that is centralized in the ministry of finance and in which the political discussions is focused on the composition of spending and associated priorities, rather than on the level of spending. The level of total spending should be defined using a macroeconomic framework that provides a foundation for the projected structural fiscal revenue and the targeted structural fiscal balance. Other recommendations to improve the methods of fiscal policy involve deepening the transparency of fiscal data, including revenues, expenditure, debt, and contingent liabilities.

JEL Codes: E62, H60

Keywords: Fiscal Policy, Fiscal Rules, Structural Fiscal Balance Rule

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I. Introduction

This paper on structural fiscal policy in an Oil dependent economy, Trinidad and Tobago, has been prepared at the request of the IDB, and is part of a larger effort on fiscal policy analysis, which includes similar works for other countries in the region. The preparation of this report included a five day visit to Port of Spain in late January 2010, and entailed a significant amount of work for compiling and processing the required data¹.

The report for structural fiscal policy in an Oil dependent economy is divided in six sections including this introduction and the concluding remarks. The second section consists of a presentation and interpretation of descriptive statistics for the Trinitarian fiscal accounts and macroeconomic data. The compilation of such data represents an effort that goes beyond from a simple recollection, the time series were put into place using data from different sources and ensuring its compatibility². The third section is devoted to the estimation of the structural fiscal revenue in the non-oil sector of the economy, the GDP cycle is wide and generates very significant volatility in non-oil fiscal revenue. The fourth section estimates the structural balance and the structural revenue obtained from oil and gas and develops a proposal of structural fiscal policy in T&T. The fifth section is devoted to the analysis of preconditions required for the application of a structural fiscal policy in T&T.

The non-oil structural fiscal revenue was estimated as a function of trend GDP, on the basis of a Cobb Douglas production function and time series on capital stock, labor force, unemployment, and total factor productivity that go back to the 1970s. The analytical framework presented for defining and estimating the relevant structural fiscal variables was used to derive structural fiscal targets based upon a limited time horizon for future oil revenue, after which the resource will be exhausted and alternative sources of fiscal revenue will be needed.

¹ I gratefully acknowledge the useful comments of Gustavo García, Teresa Ter-Minassian, Rolando Ossowski and other participants in the IADB seminar held in Washington DC in June 2010, to an earlier version of this paper. I am also very grateful to Ewart Williams, the Governor of the Central Bank of Trinidad and Tobago, and to Shelton Nicholls the Deputy Governor, for their very valuable insights. In useful discussions during my visit to T&T in early 2010, they indicated possible avenues to pursue in this project, and their help and guidance were invaluable for obtaining the information used in this work. However, the views presented in this paper represent my own and any errors or shortcomings are my sole responsibility.

² Salvador Andino performed an able and efficient work as research assistant throughout this project, including in the preparation of the data base using information provided by the Central Bank and the Ministry of Finance of T&T, the estimation of the different models presented in the paper, and the preparation of the report. Pamela Searle helped with the preparation of the final version. To both of them my deepest thanks.

The price of oil is the main source of volatility and deviations from trend of T&T's fiscal revenues. Oil structural revenue was estimated from a model that considers the price of oil, the oil output and the real exchange rate as sources of deviations of actual from trend oil revenues. The mere existence of a trend price for a commodity like oil is a controversial subject, however we approach the issue with a practical view: irrespective of the existence of the trend, some reference price should be used to help define how much of the oil revenue should be spent on an annual basis, and how much should be saved.

The selection of the structural fiscal target for the primary fiscal balance was associated to a goal for the net worth of the public sector that ensures sustainability of its financial position before and after oil exhaustion. The goal for the net worth to be accumulated is to generate a sustained stream of fiscal revenue after oil exhaustion, so that the non-oil fiscal deficit can be sustained beyond the point of oil exhaustion. In the case of T&T oil exhaustion appears to be the most significant vulnerability for the fiscal account considering that almost half of total revenue comes from that source, and that the question regarding oil exhaustion is not if it will happen, but when.

This paper presents an estimation of the structural fiscal balance for Trinidad and Tobago, and discusses the current situation of the country in meeting the preconditions for the establishment of a structural fiscal balance target. The authors makes some recommendations, which include a budgeting process that is centralized in the ministry of finance and in which the political discussions is focused on the composition of spending and associated priorities, rather than on the level of spending. The level of total spending should be defined using a macroeconomic framework that provides a foundation for the projected structural fiscal revenue and the targeted structural fiscal balance. Other recommendations to improve the methods of fiscal policy involve deepening the transparency of fiscal data, including revenues, expenditure, debt, and contingent liabilities.

The final objective of introducing a structural fiscal policy in T&T is to improve on macroeconomic resiliency eliminating a major source of vulnerability to financial crisis associated to the sustainability of oil revenue. It is possible to attain this goal by creating institutions that would channel the definitions of fiscal policy in consistency with macroeconomic stability, recognizing the inter-temporal choices that otherwise will be imposed through forced adjustments and eventually crashes. In essence, with the massive fiscal revenue and high contribution to GDP of the oil and gas sector, the T&T economy is quite vulnerable to the cycle of the international price of oil and gas. Moreover, the oil-induced widening of the non-oil fiscal deficit exacerbates the domestic demand-activity

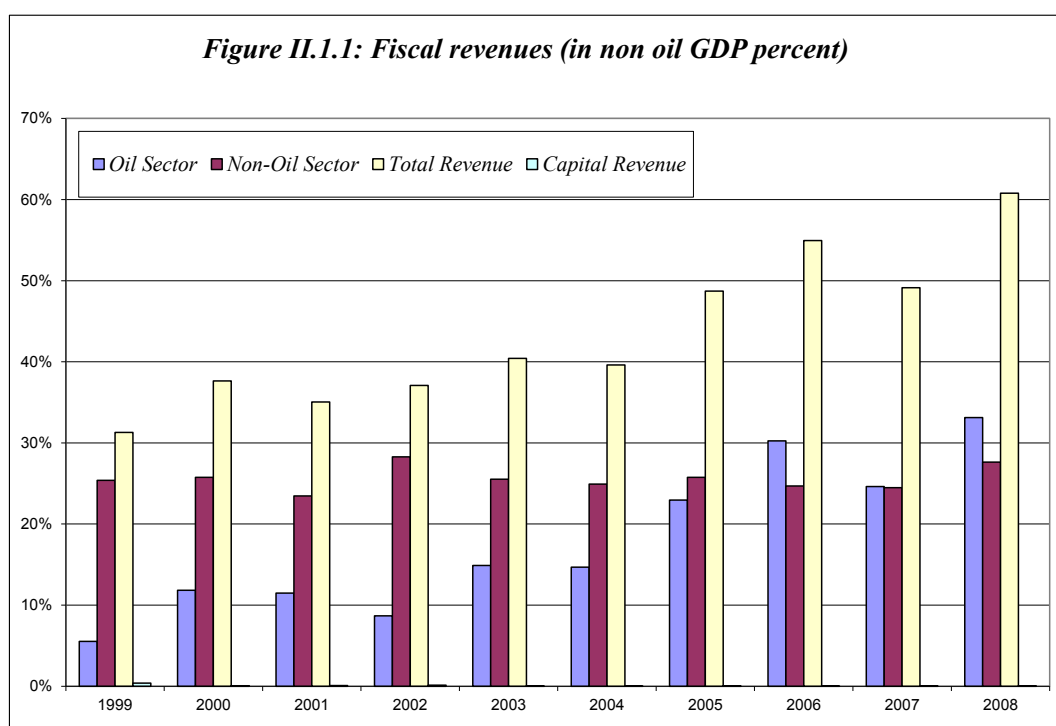
cycle, putting pressures on the domestic price level and appreciating the real exchange rate. These cycles aggravate the Dutch disease syndrome that concentrates the production of tradable goods in oil, gas and oil and gas derivatives, including manufactured goods intensive in energy use, or in energy products, that get those inputs at a subsidized (below international market) price. The exhaustion of oil would not only result in a fiscal crisis because of a short fall in fiscal revenue, but also a productive crisis because of the complete annihilation of the tradable industry.

With a structural fiscal target that gives incentives towards the accumulation of savings using part of the oil and gas revenue, the non-oil deficit gets to be limited and, as a consequence, the aggregate demand pressure on the price level and the real exchange rate would subside. That would help to preserve some incentives for the production of non-energy tradable goods well before fiscal oil revenue disappears due to exhaustion of the resource base, or technological obsolescence. Close to oil revenue exhaustion the real exchange rate will depreciate in response to widening fiscal and current account deficits, but that may be too late for the development of a non-oil tradable sector, particularly if the real exchange rate becomes excessively appreciated during the years of oil abundance.

II. Macroeconomics of Trinidad and Tobago's Public Sector

1. Fiscal Revenues and Expenditures

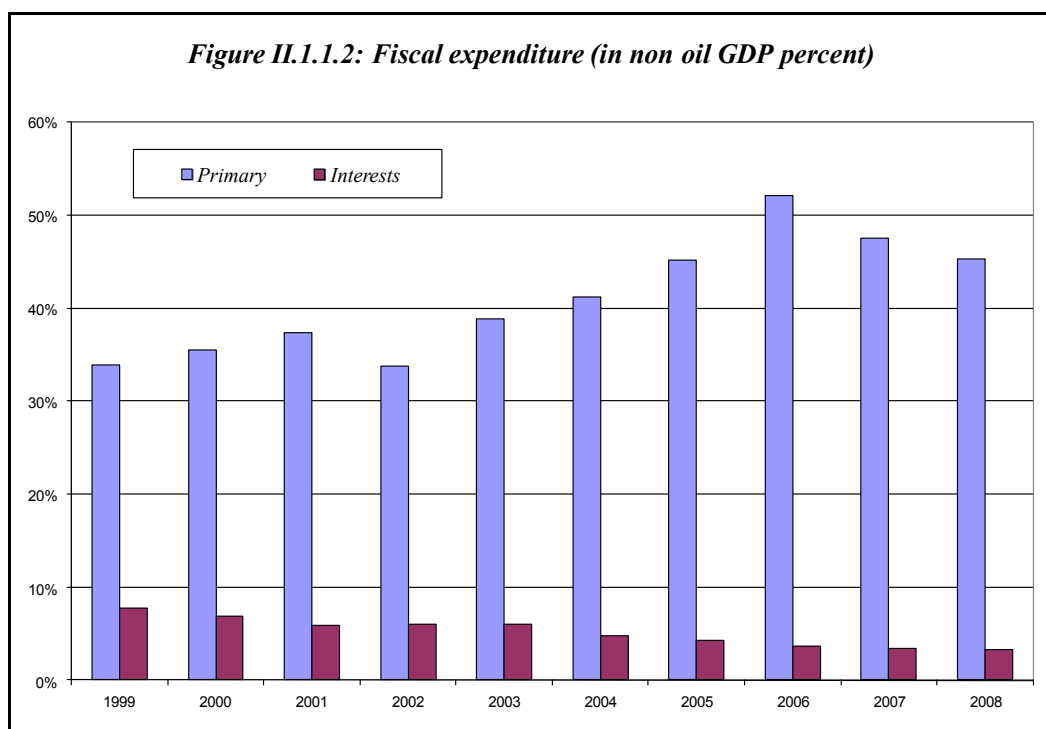
Almost all of the fiscal revenues in Trinidad and Tobago (T&T) come from tax revenues, and about half of the tax revenues originate in the energy sector (oil and gas). Moreover, the relative importance of the oil and gas sector for the fiscal accounts has progressively increased over the last 15 years: From just over 20 percent of tax revenue in 1997 to over 50 percent in 2008. Within the oil sector, the importance of the corporation tax is also on the rise, from just over 40 percent in 1997 to over 80 percent of oil revenues in 2008. Regarding non-oil sector, it is possible to observe some regularities in the prevalence of each type of tax, with the main contributions being made by income tax collections, with approximately 45 percent of non-oil revenue, taxes on goods and services with a little over 30 percent, and taxes on international trade with 10 percent. Tax revenue has increased from 22 percent of GDP in 1999 to 37 percent in 2008, being the 15 percent of GDP increment explained by additional revenue from the oil sector: Oil revenue increased from 4 percent of GDP in 1999 to 20 percent of GDP in 2008 while non-oil sector revenue remained almost constant at around 16 percent of GDP. Considering that total GDP is subject to the volatility of oil price, we present the fiscal variables in percent of non-oil GDP (NO_GDP). Fiscal revenue almost doubled in a decade, from just over 30 percent of NO_GDP in 1999, to more than 60 percent in 2008, mostly as result of the increase in oil and gas prices. We can also note that non-oil revenue is stable at about 25 percent of NO_GDP, while oil revenues rose from about 5 percent to almost 34 percent of NO_GDP during that period.



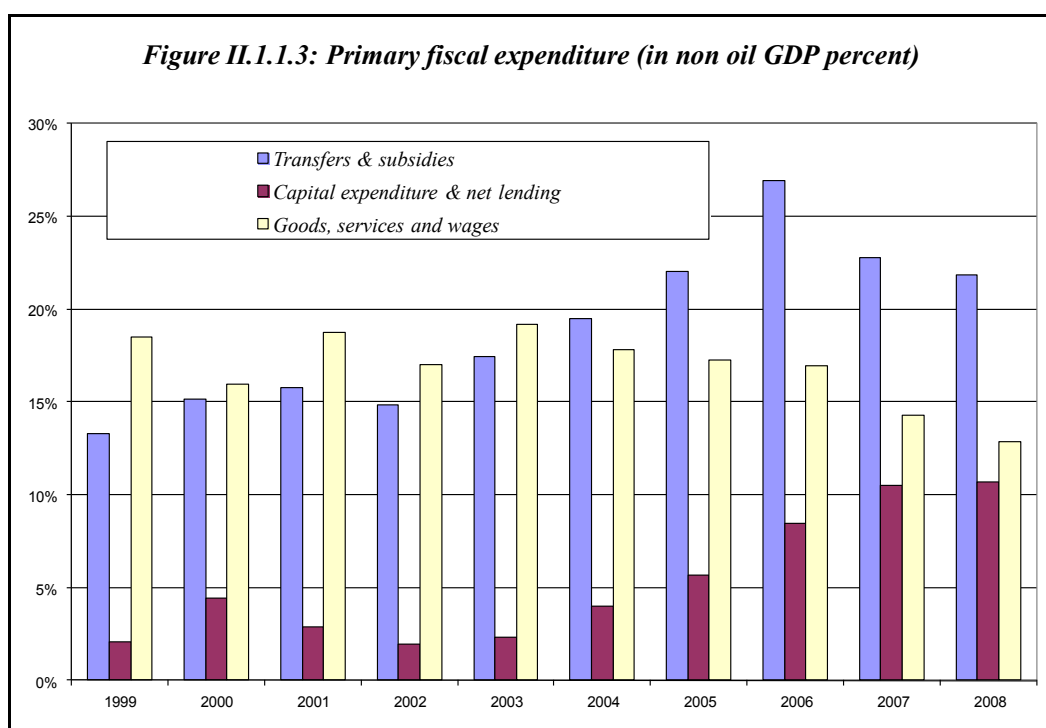
Source: LE&F, based on information from Ministry of Finance of Trinidad and Tobago

Capital expenditure has increased sharply from 1 percent to 6 percent of GDP over the last 10 years. At the same time, primary fiscal expenditure has increased gradually from 20 percent of GDP in 1999 to 28 percent of GDP in 2009, while interest expenditure has fallen from 5 percent to 2 percent of GDP over the same period. Within the primary expenditure, transfers and subsidies almost doubled in 10 years, from 8 percent to 14 percent of GDP, while expenditure on goods and services fell from 11 percent to 9 percent of GDP.

When analyzed in terms of NO_GDP, primary expenditure have increased from 33 percent of NO_GDP in 1999 to 45 percent of NO_GDP in 2008, with a peak of 51 percent in 2006, while interest expenditure decreased from 7 percent to around 3 percent of NO_GDP in the same period. As a result the relative importance of transfers and subsidies has doubled, passing from about 20 percent to over 40 percent of total fiscal expenditure. In turn, we see a decline in salaries from about 35 percent of total spending in 1999 to around 20 percent of total in 2008. The remaining items are relatively invariant. In terms of NO_GDP, transfers and subsidies have increased from 13 percent of NO_GDP in 1999, to 22 percent in 2008. Goods, services and wages went down from 18 percent of NO_GDP in 1999 to 13 percent in 2008. Finally, capital expenditure and net lending rose from 2 percent to more than 10 percent of NO_GDP over the same period.



Source: LE&F based on information of the Central Bank of Trinidad and Tobago



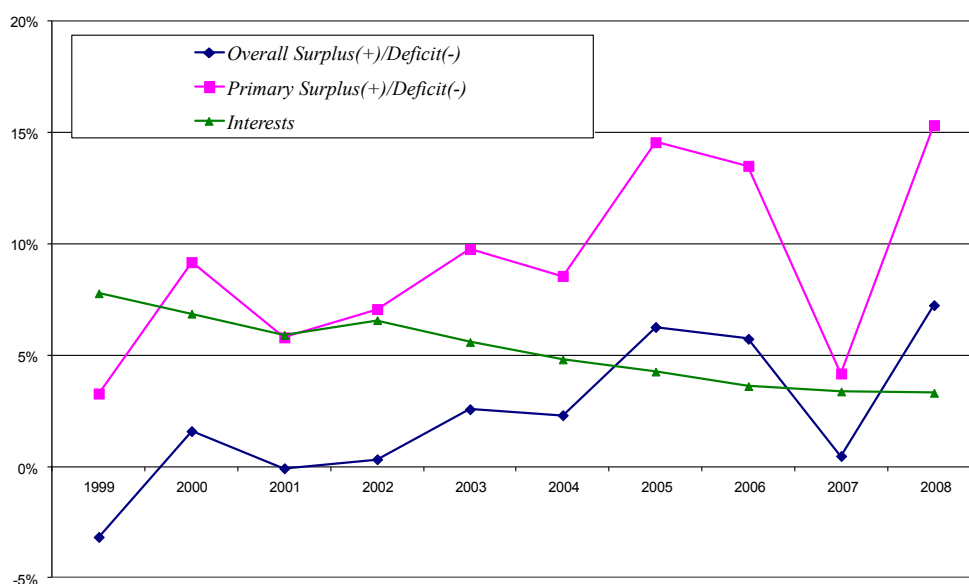
Source: LE&F, based on information from Central Bank of Trinidad and Tobago

2. Primary and Overall Fiscal Balances

Over the last 10 years the primary fiscal balance has remained in surplus, ranging from 2 percent of GDP to 8 percent of GDP. With interest payments falling from almost 6 percent of GPP to 2 percent of GDP, the overall balance has moved from a deficit of 3 percent of GDP in 1999 to roughly balance from 2000 to 2002, to moderate surplus of around 2 percent of GDP in 2003 and 2004, and finally to large surpluses between 2 percent and 6 percent of GDP over the last 5 years.

In terms of NO_GDP, the overall balance changed from a deficit of 3 percent in 1999 to a surplus of 6 percent in 2005, then fall back to almost balance (0 percent) in 2007 and up to a surplus of 7 percent of NO_GDP in 2008. The primary balance rose from 3 percent of NO_GDP in 1999 to nearly 15 percent in 2005, to subsequently fell to 4 percent in 2007, bouncing back to more than 15 percent in 2008. Public sector interest payments have fallen from approximately 7 percent of NO_GDP, to just over 3 percent in the same period.

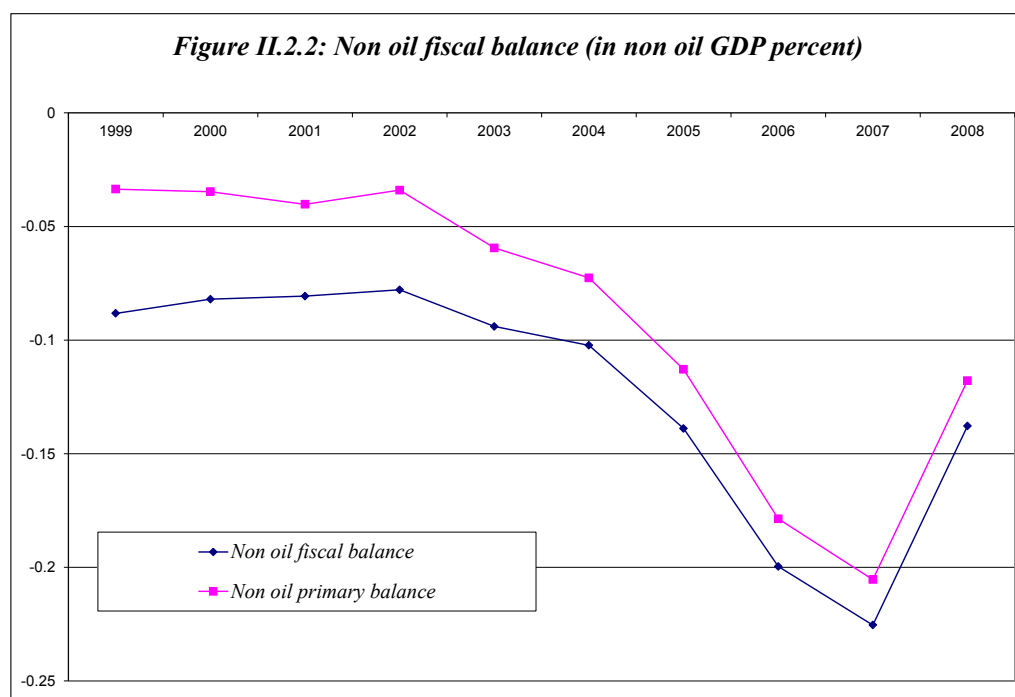
Figure II.2.1: Public sector balance (in non oil GDP percent)



Source: LE&F, based on information from Central Bank of Trinidad and Tobago

The non-oil balance presents large deficits that have been increasing continuously from 2005 to 2009. In the first half of this decade, the non-oil balance presented a deficit of around 7 percent of total GDP, in 2006 the non-oil deficit reached 11 percent of GDP and in 2008 the deficit is

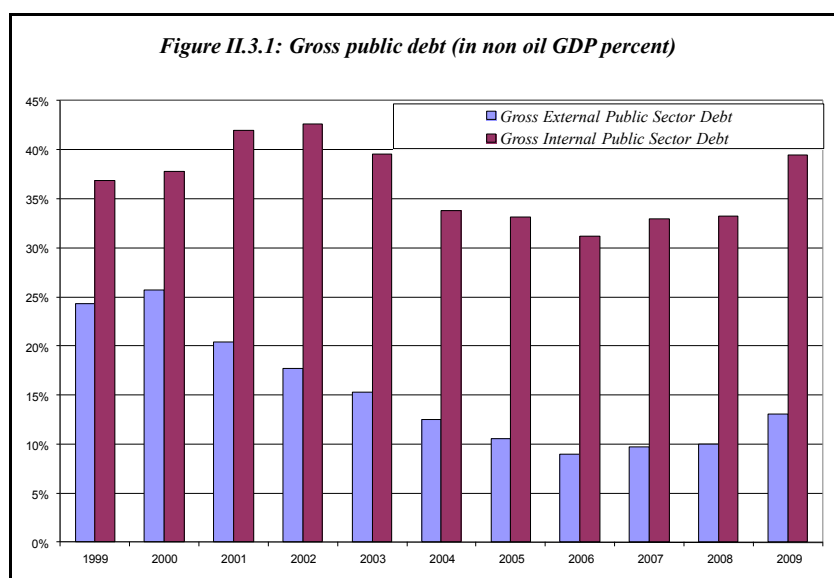
almost 14 percent of GDP. Measured in terms of NO_GDP, the non-oil fiscal balance went from -9 percent in 1999, to -22 percent in 2007, bouncing back to -14 percent of NO_GDP in 2008.



Source: LE&F, based on information from Central Bank of Trinidad and Tobago

3. Public Debt

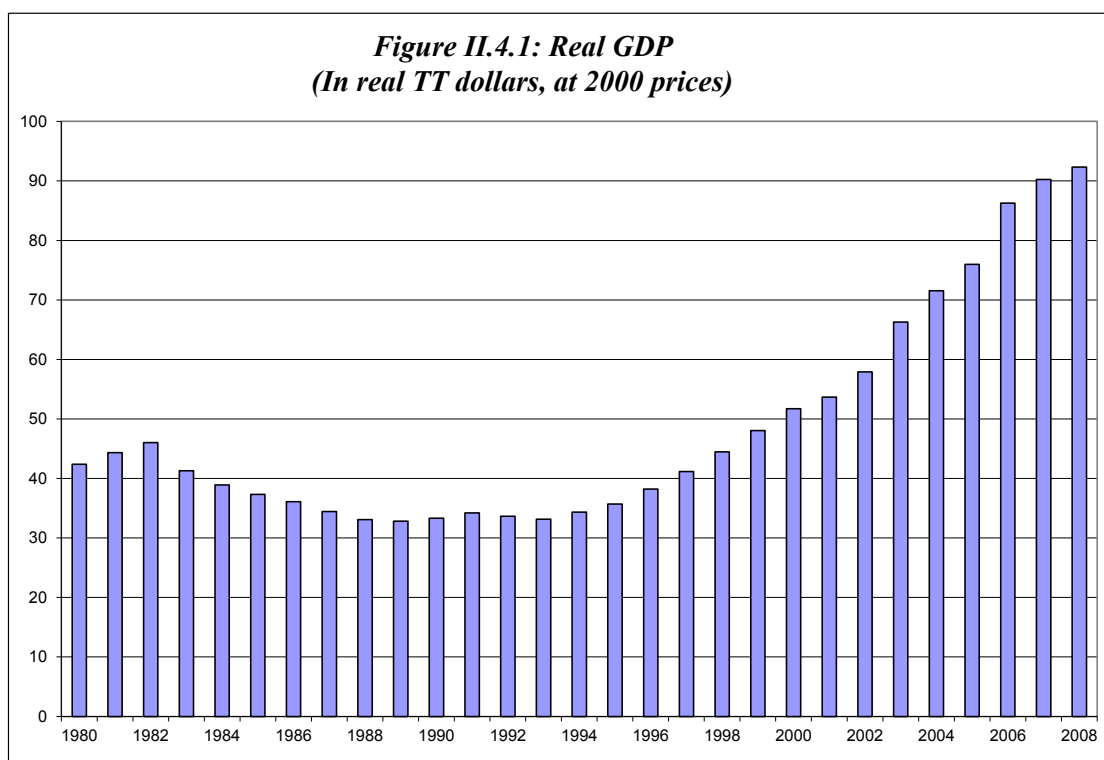
T&T presents a declining public debt. Debt as a percent of GDP has fallen gradually from 43 percent of GDP in 1999 to 30 percent of GDP in 2009. Public debt is increasingly domestic, growing from 60 percent of total debt at the beginning of the decade, to over 70 percent the last 5 years. External debt has fallen from 17 percent of GDP in 1999 to only 7 percent of GDP in 2009. While domestic debt, after increasing from 26 percent of GDP in 1999 to 28 percent in 2002, has decreased back reaching 23 percent of GDP in 2009. In terms of NO_GDP, external debt declined from 24 percent of NO_GDP in 1999 to nearly 14 percent in 2009, while internal debt rose from 37 percent of NO_GDP in 1999 to 39 percent in 2009.



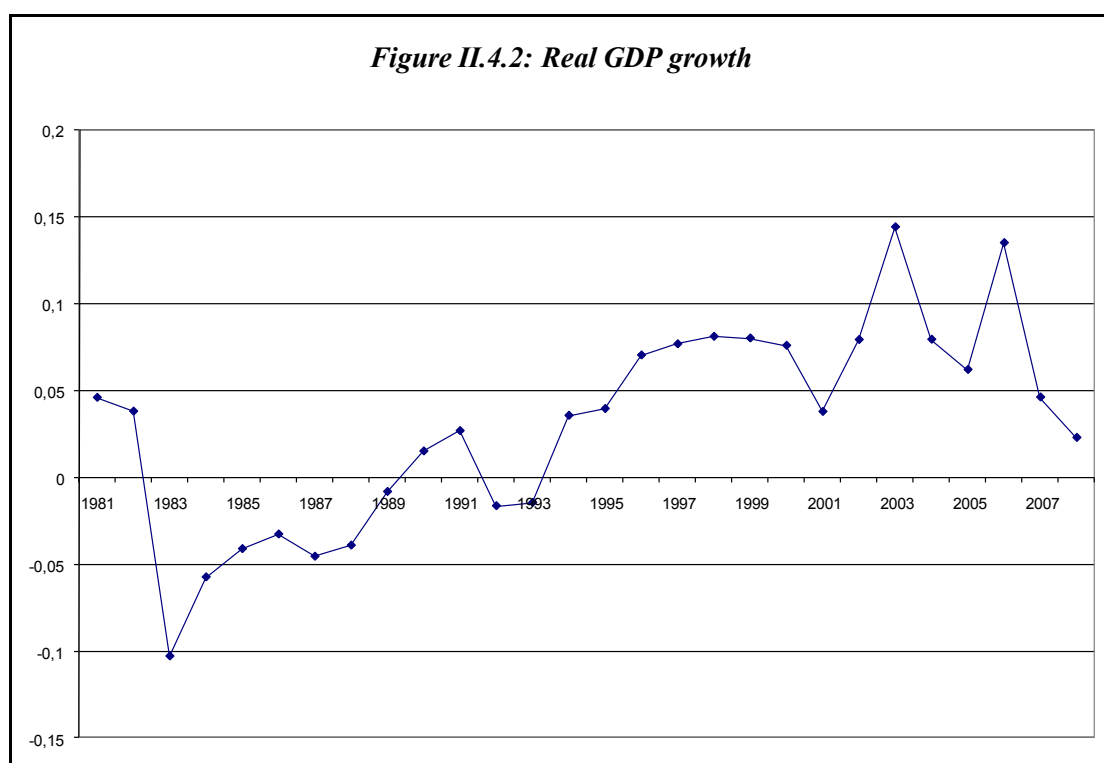
Source: LE&F, based on information from Ministry of Finance of Trinidad and Tobago

4. Real GDP and Capital Stock in the Main Sectors

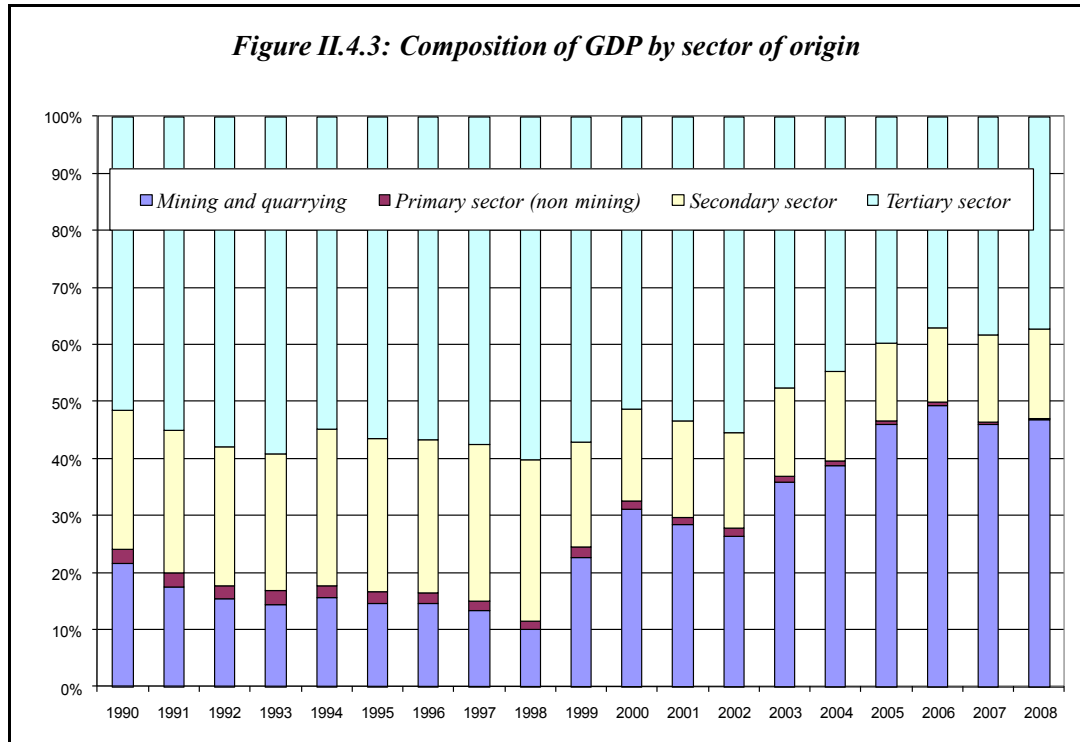
A rapid and sustained real GDP growth characterize the last fifteen years in T&T, with annual growth rates ranging from 4 percent to 15 percent and averaging about 8 percent throughout the decade. The composition of GDP by sector of activity has increasingly shifted towards the primary sector and within the primary sector to oil, which went from 30 percent of total GDP in 2000 to over 45 percent of GDP in 2008 on the basis of the increasing oil volume. Other main components of GDP present more or less stable participation rates, around 40 percent the tertiary sector or services and 15 percent the secondary sector. The secondary sector shows similar participations among construction and manufacturing. Finally, the tertiary sector has three major sub-sectors, with similar shares, which are financial services, personal and social services and trade.



Source: LE&F, based on information from bank of Trinidad and Tobago



Source: LE&F, based on information from bank of Trinidad and Tobago



Source: LE&F, based on information from UN ECLA

We will distinguish between two sectors, oil and gas and the rest of GDP, called non-oil GDP, which includes manufactures associated to oil derivatives. The information available for T&T does not allow separating investment and employment by sectors of allocation. Considering the relative intensity in natural resources and capital of the oil and gas sector, and given the lack of data we proceeded as if all employment was allocated to the non-oil sector. Consequently we assume that oil and gas are obtained without the use of significant amounts of labor.

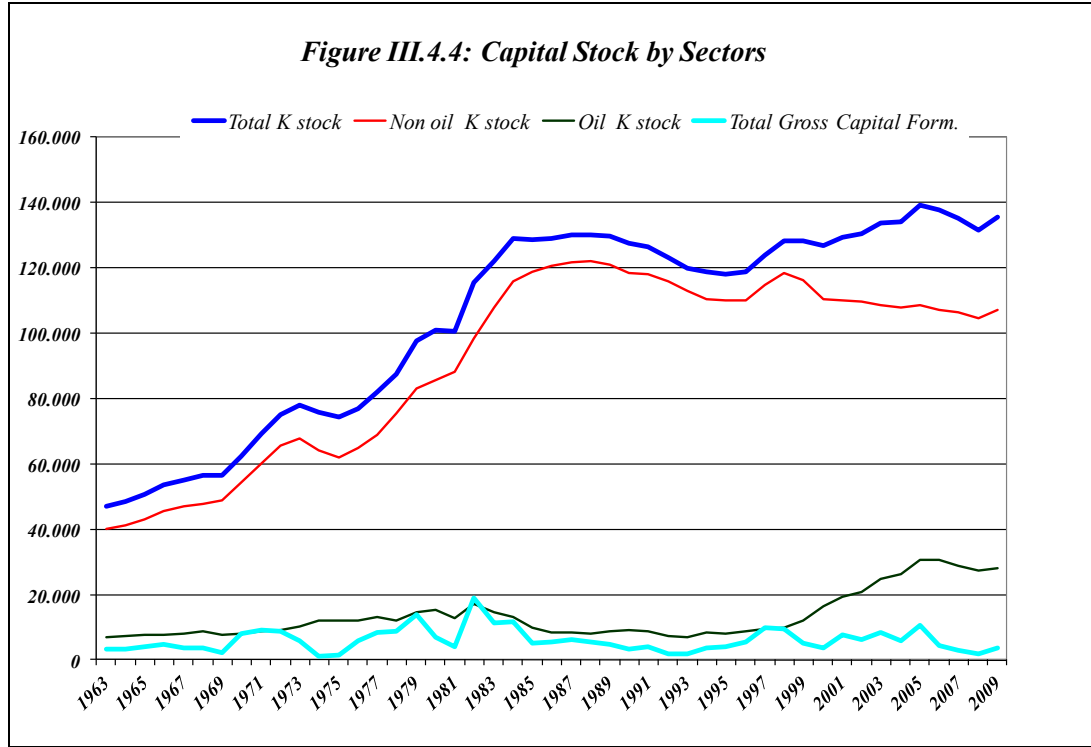
Capital Stock: Total and by Sectors

The estimation of the total capital stock is based on the regular inventory equation, where K is the capital stock; I represents investment, defined as the fixed gross capital formation; and d is the depreciation rate. The series on gross capital formation were obtained from the Central Bank of T&T, and the depreciation rate was obtained from the World Penn extended table³. The initial value for the capital stock implies a capital to GDP ratio equal to 2.45 in 1963.⁴

$$K_t^P = K_{t-1}^P(1 - \delta) + I_t$$

³ Rather than the annual series for depreciation rates we used the average rate for the whole sample.

⁴ The initial estimate of the capital stock (1963) was obtained using the inventory approach, assuming constant investment to output ratio (16%), depreciation rate (3%) and growth rate of GDP (3.7%)..



Source: LE&F, based on information from bank of Trinidad and Tobago

In order to separate the capital stock by sectors, we first estimated the oil sector K using the assumed production function for the oil sector, and then obtained the non-oil capital as a residual. Accordingly, we have that the trend rate of growth of the oil sector capital stock will be equal to the trend rate of growth of oil GDP ($d\log y_{oil}$) minus the rate of productivity growth in the oil sector ($d\log A_{oil}$)

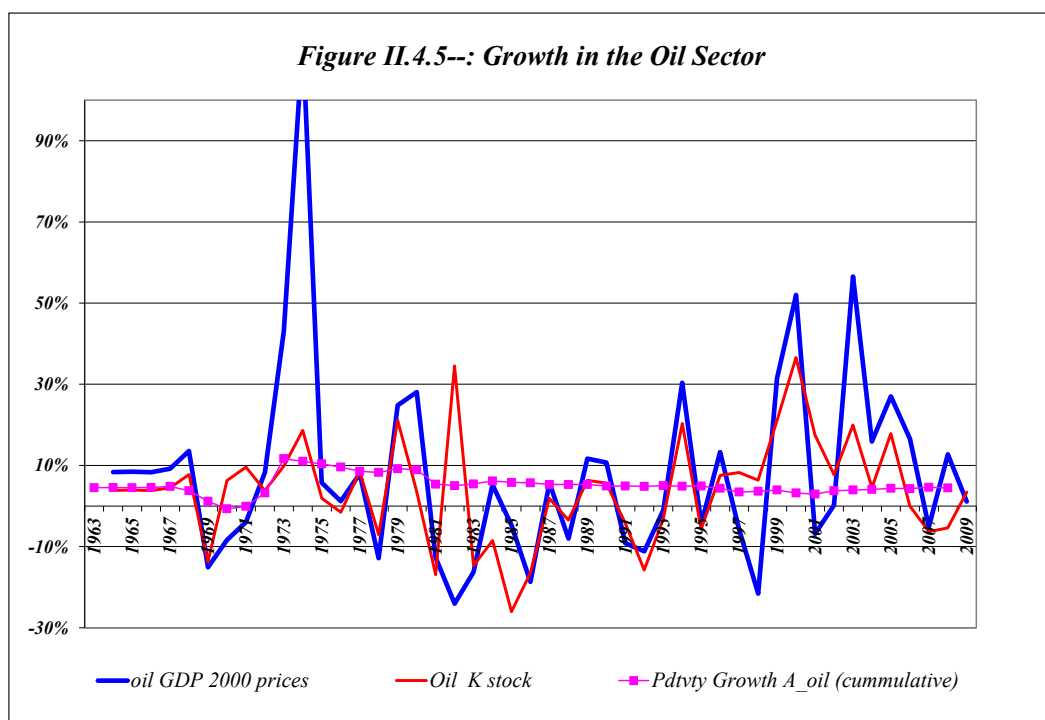
$$d \log y_{oil}^P - d \log A_{oil}^P = d \log K_{oil}^P$$

To estimate the average productivity growth in the oil sector we use information from other studies on the growth rates of the oil capital stock (14.1 percent annual average between 1991 and 2003)⁵, which is 4.5 percent lower than the annual average increase in oil GDP during the same period. As the starting point, we assume an equal capital to output ratio in both oil and non-oil sectors in 1963 (2.45). As a result, approximately 11 percent of the capital stock was allocated to the oil sector in 1970⁶. We complete the annual evolution of the oil capital stock with a trend rate of growth equal to the trend rate of growth of oil GDP minus the trend

⁵ See Artana (2007).

⁶ This value is similar to that of copper in Chile at a time in which both countries had a similar share of “commodities GDP”.

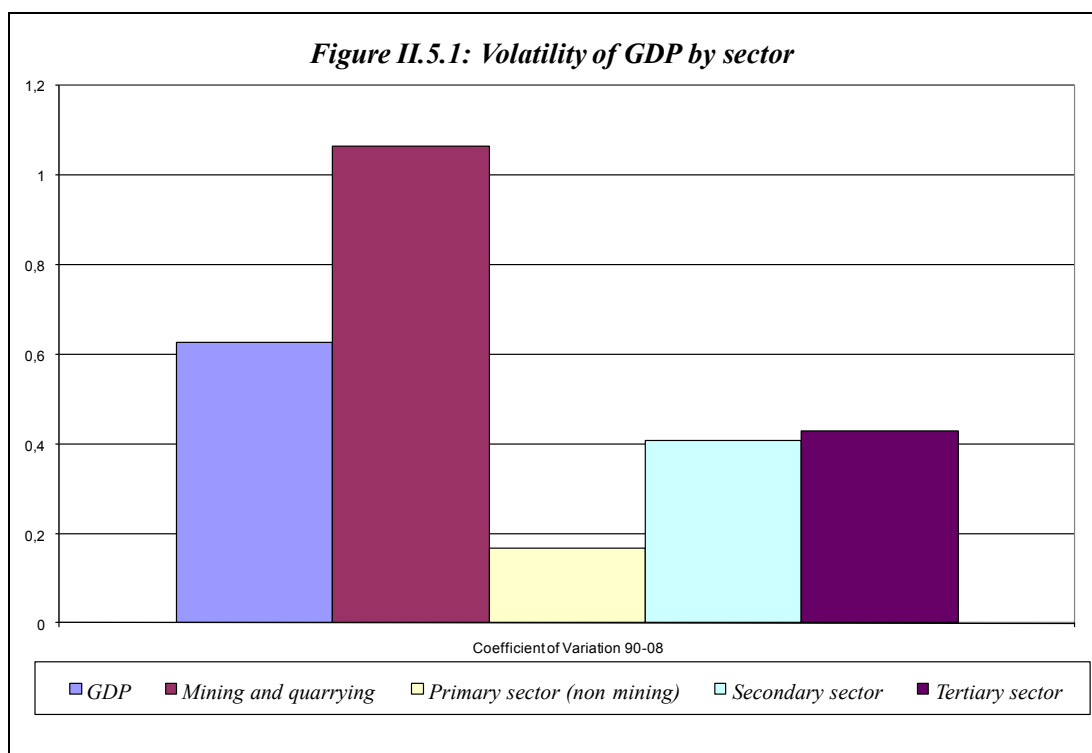
productivity growth. In addition we attempt some smoothing to reduce the jumps in the rate of growth of the non-oil capital stock, which is calculated as a residual.



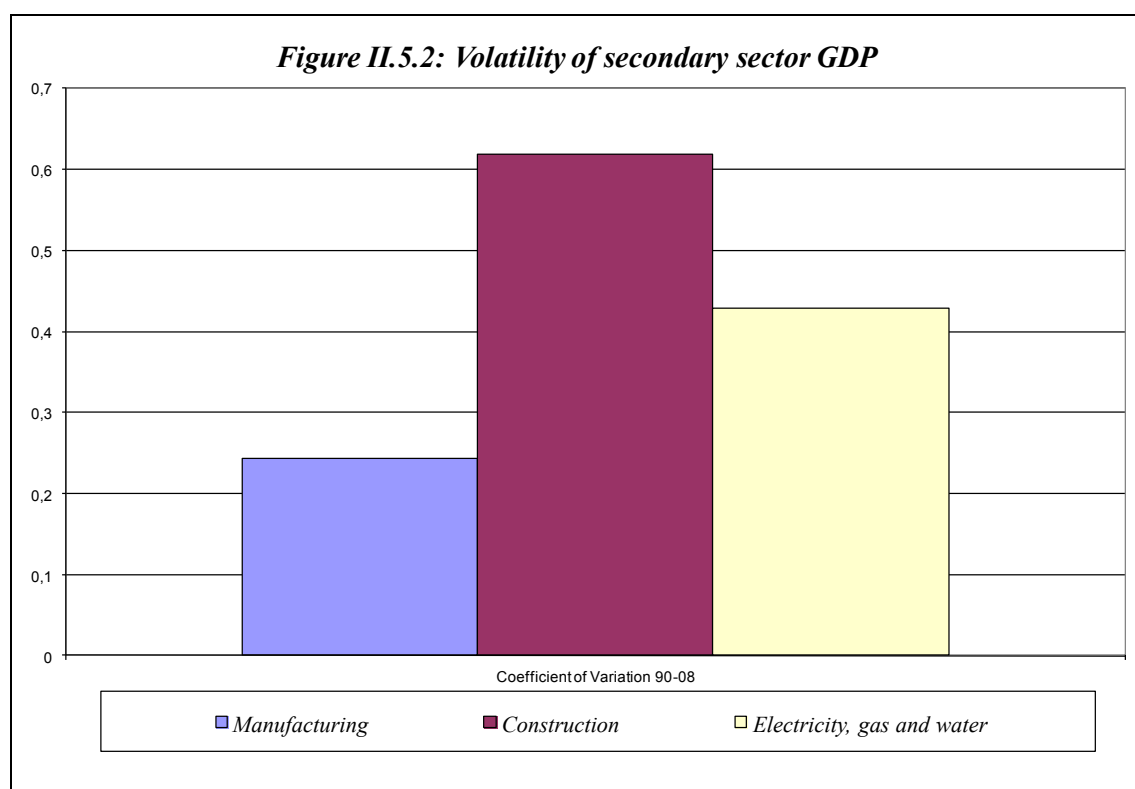
Source: LE&F, based on information from bank of Trinidad and Tobago

5. Volatility of Real GDP and of Fiscal Revenues

To conduct an analysis of the variability of GDP and its sectors of origin we used the coefficient of variation over the last 10 years of available data. This is the standard deviation of real GDP over the mean level for the period. The primary sector is the most volatile of the main three sectors, and considering its participation in total GDP, is the main source of GDP volatility. Within the secondary sector, the construction sector has a volatility coefficient, which doubles the manufacturing sector. The tertiary sector maintains similar volatility ratios except the financial sector, which present a volatility ratio a bit higher than other services.

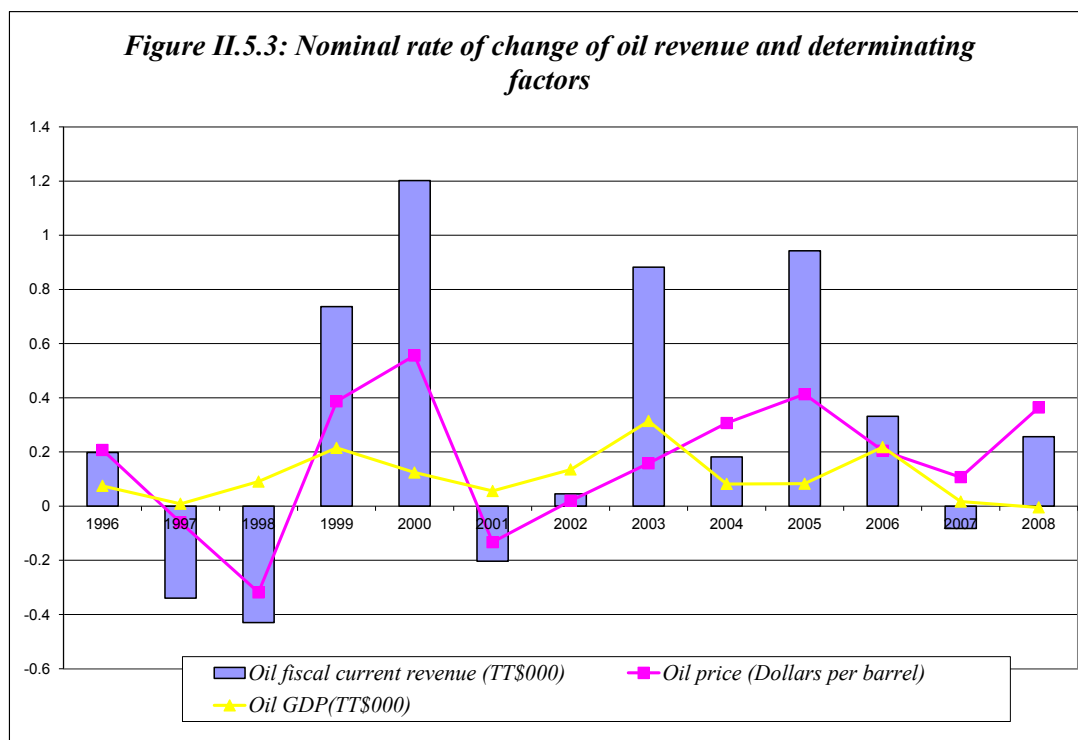


Source: LE&F, based on information from UN ECLA

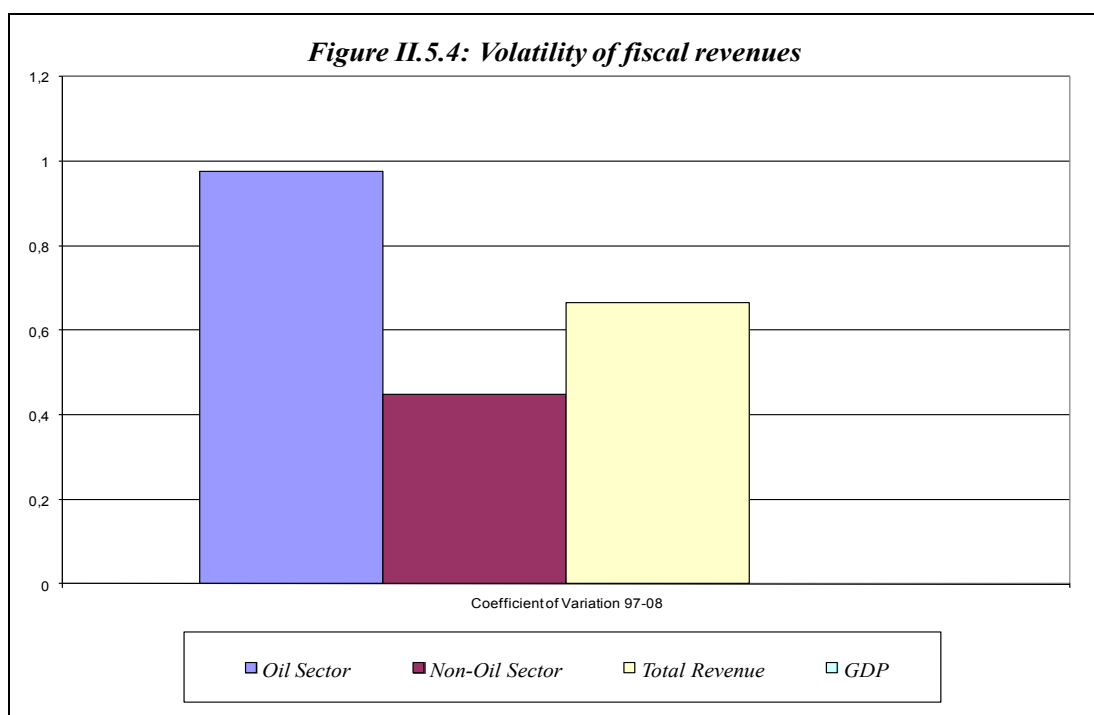


Source: LE&F, based on information from UN ECLA

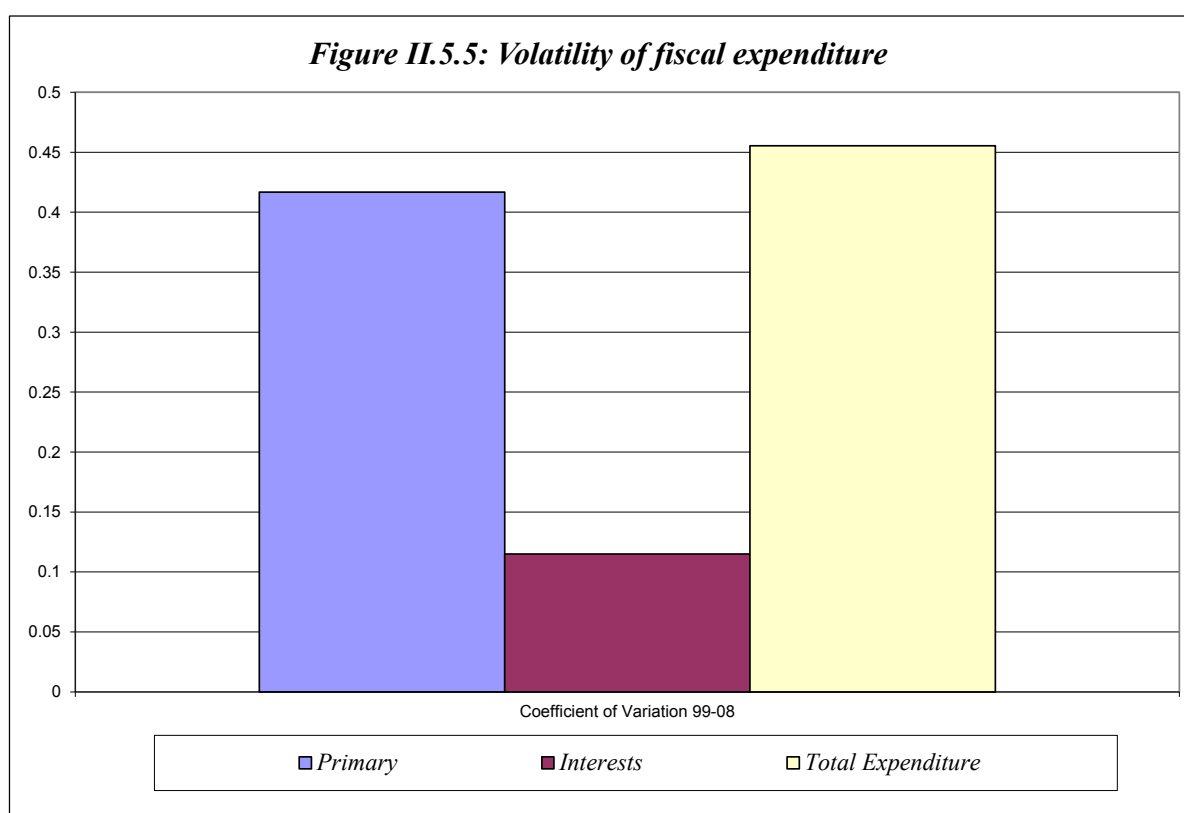
Changes in the activity of the oil sector and changes in the international oil prices are fundamental determinants of changes in taxes and fiscal revenues. Analysis by coefficient of variation shows that the oil revenue is the most volatile, in turn; within this sector corporation and withholding tax are the most volatile. Within non-oil sector all have similar volatility coefficients, except the property tax, which is smaller. Finally, with respect to fiscal expenditures, primary expenditure, and within it, capital expenditures, is the most volatile.



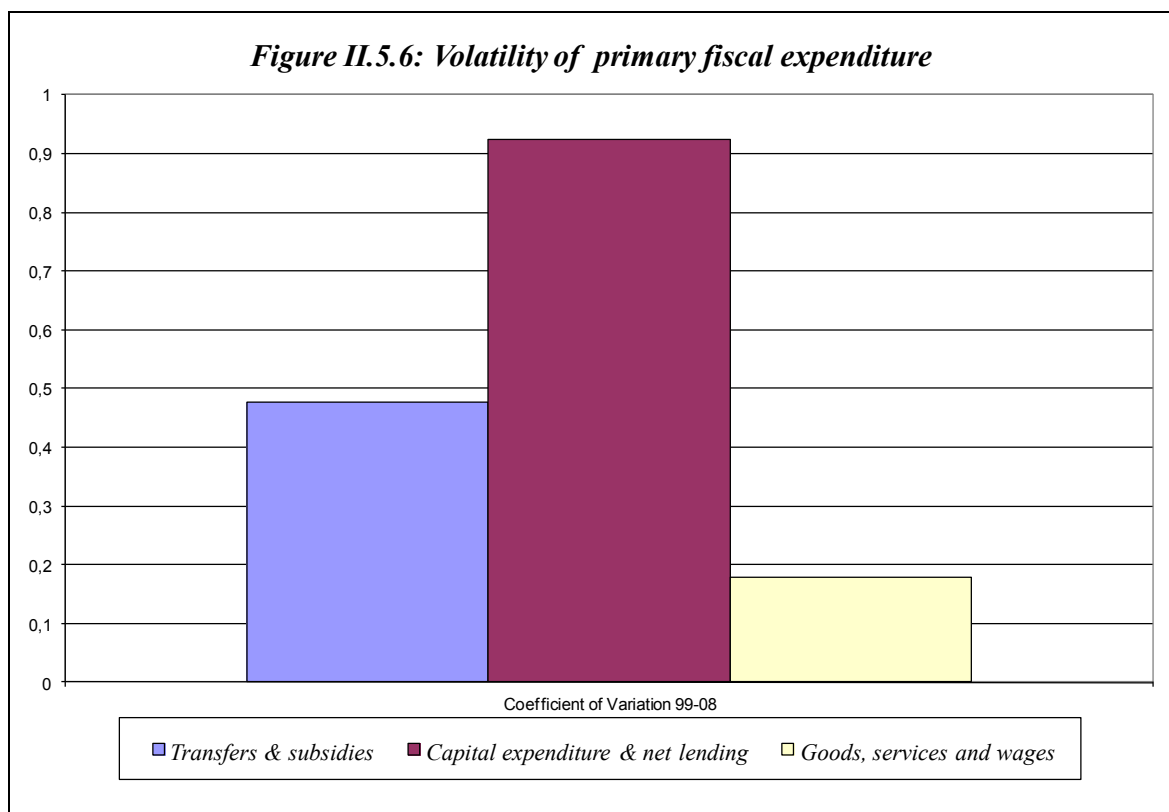
Source: LE&F, based on information from UN ECLA



Source: LE&F, based on information from Central Bank of Trinidad and Tobago



Source: LE&F, based on information from Central Bank of Trinidad and Tobago



Source: LE&F, based on information from Central Bank of Trinidad and Tobago

III. Fiscal Stance: The Structural Fiscal Balance in the Non-Oil Sector

This section attempts an estimation of the non-oil structural fiscal balance in Trinidad, an oil dependent economy. The purpose of such exercise is two fold, first to obtain an indication for the fiscal policy stance and its evolution over time, and second to develop the basis for a fiscal policy target that would contribute to macroeconomic stability. Had Trinidad been a non resource economy, the non-oil balance would be representative of the total fiscal position. However, two distinct sources for fiscal revenue can be distinguished in T&T, one from the oil sector associated to exports and the other domestic associated to other economic activity. The non-oil fiscal balance is a good indication of the fiscal policy stance and is the one used in economies that are not resource based, or that do not obtain significant fiscal revenues from the export of a single or group of commodities. But in a resource based economy like T&T, the sustainability of the non-oil balance, in general a large deficit also depends on the size of the structural oil revenue. We will tackle the first issue in this section and the structural oil revenue in the next.

1. Trend Non-Oil GDP

The estimation of structural revenue from the non-oil sector follows the methodology regularly used by international organizations, including the OECD and the IMF⁷. Trend GDP, representing productive capacity under a normal use of resources, is estimated using an aggregated production function (Cobb Douglas). Afterwards, the elasticity of non-oil revenues with respect to trend GDP is estimated with a simple regression. This allows us to obtain non-oil fiscal structural revenue and thus to determine the non-oil structural balance. The estimation of trend non-oil GDP was obtained using historical data on total gross fixed capital formation, total employment and non-oil GDP released by the Central Bank of Trinidad and Tobago⁸. Real non-oil GDP (y_{NO}) can be analytically decomposed in a trend or structural component (y^P_{NO}) and a transitory or cyclical component (y^{tran}_{NO}). The log of transitory non-oil GDP is positive in

⁷ See Bezdek (2003). We followed the application of such methodology in the Chilean case as presented in Marcel (2001).

⁸ Several information limitations had to be overcome, including extending the series and breaking down investment and employment by sectors. The information in the websites of Trinidad and Tobago only covers data from 1990 and does not consider fiscal revenue. Most of the additional data required was obtained in a visit to Trinidad and Tobago and with the help from officials from the Central Bank and the Ministry of finance.

expansionary periods, negative during slow downs and recessions, has zero mean and is also defined as the non-oil GDP gap. To simplify the notation from now on GDP will be equivalent to GDP_NO.

$$\log y_t = \log y_t^P + \log y_t^{tran}; \log y_t - \log y_t^P = \log y_t^{tran} = gap_t^Y$$

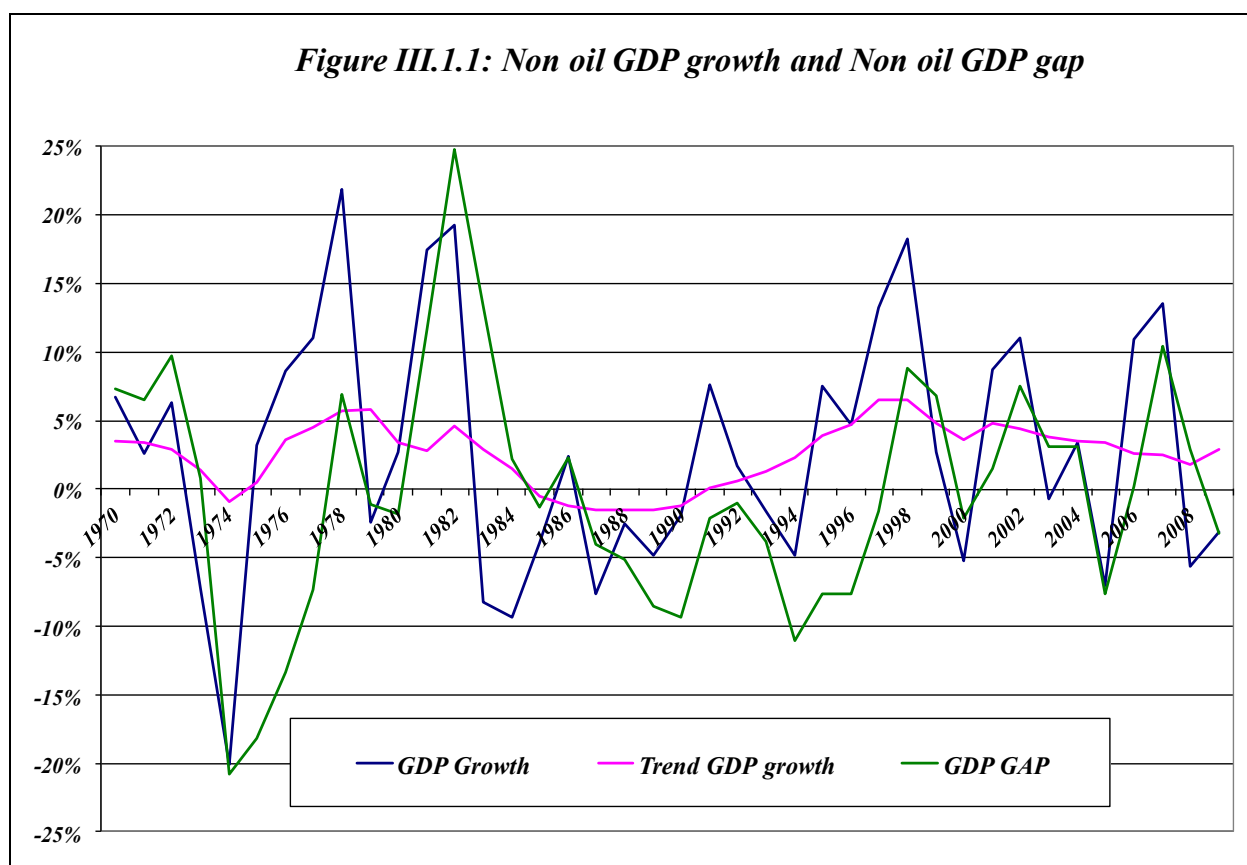
Trend or structural non-oil GDP is estimated from a Cobb Douglas production function with constant returns to scale, where A is total factor productivity, K capital, N effective labor and α the share of capital in total income. The superscript “P” is used to represent the trend component of the corresponding variable, total factor productivity, capital stock, and effective labor. In selecting the capital and labor shares we use the results of previous works, where α is a constant estimated equal to 0.3⁹.

$$y_t^P = A^P (K_t^P)^\alpha (N_t^P)^{(1-\alpha)};$$

$$\log y_t^P = \log A_t^P + \alpha \log K_t^P + (1 - \alpha) \log N_t^P.$$

The overall results for the estimation of trend non-oil GDP in Trinidad Tobago indicate a period of stagnation in the second half of the 1980s, which was followed by an acceleration of trend growth during the 1990s. The acceleration of trend growth culminated in the first half of the first decade of the XXI century with a period of 5 years at a 5 percent annual rate of growth. However, in the last few years, trend non-oil GDP growth has slowed down again, converging to an annual rate of growth of around 3 percent. The ups and downs of trend non-oil GDP growth rate of some significance, however they seem almost nil compared with the variability of actual non-oil GDP growth and of the GDP gap.

⁹ Bernanke and Gürkaynak (2001),



Source: LE&F on the basis of information provided by the Central Bank of T&T and WEO projections.

2. Trend Employment and Capital in the Non-Oil Sector

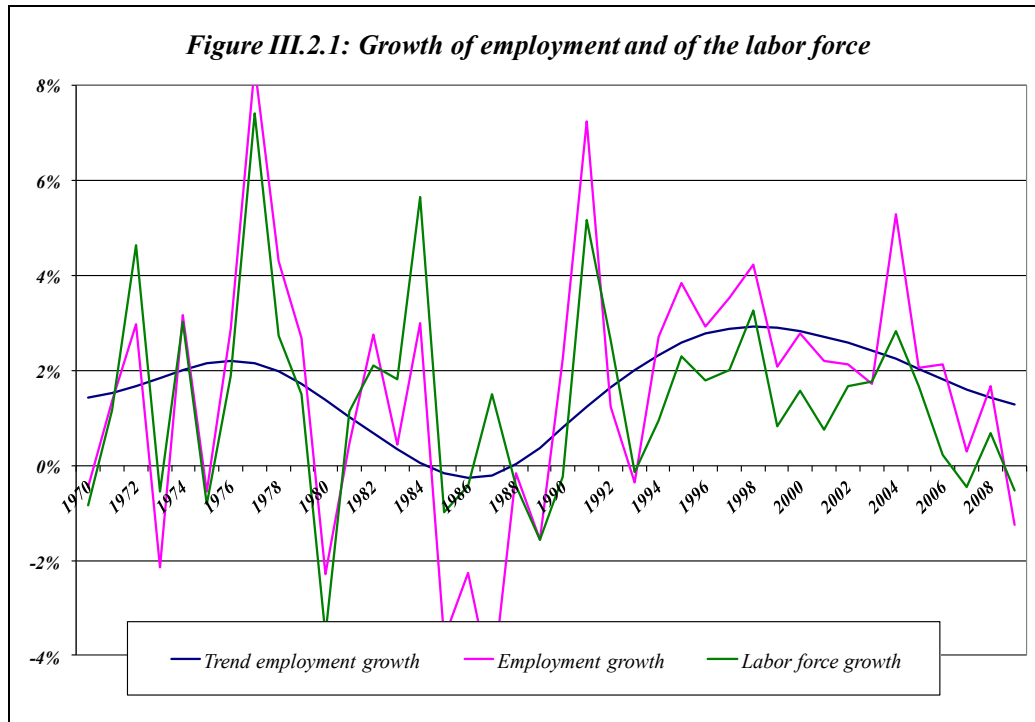
Effective employment (N) is the result of multiplying the number of employed workers ($N\#$) by the average number of hours worked (h) and by the average years of schooling (s). The series on the number of workers $N\#$ was obtained from the Central Bank of Trinidad and Tobago for the period 1970-2009. Unfortunately the series on average number of hours worked and average years of schooling of the labor force are not available, thus we have assumed value 1 for all observations of both variables. Employment can also be presented as the Labor Force multiplied by one minus the unemployment rate.

$$N_t = N_t\# \times h_t \times s;$$

$$N_t = L_t \times (1 - U_t)$$

The degree of utilization of Labor and capital is derived from the unemployment rate (U), which is defined as the difference between the labor force (L) and the number of people employed $N\#$,

as a percent of the labor force¹⁰. Trend or natural unemployment is obtained applying a HP filter to the unemployment series¹¹.



Source: Central Bank of T&T and LE&F estimations.

$$U_t = \frac{L_t - N_t}{L_t}$$

$$U_t^P = HPfilter(U_t)$$

$$L_t^P = HPfilter(L_t)$$

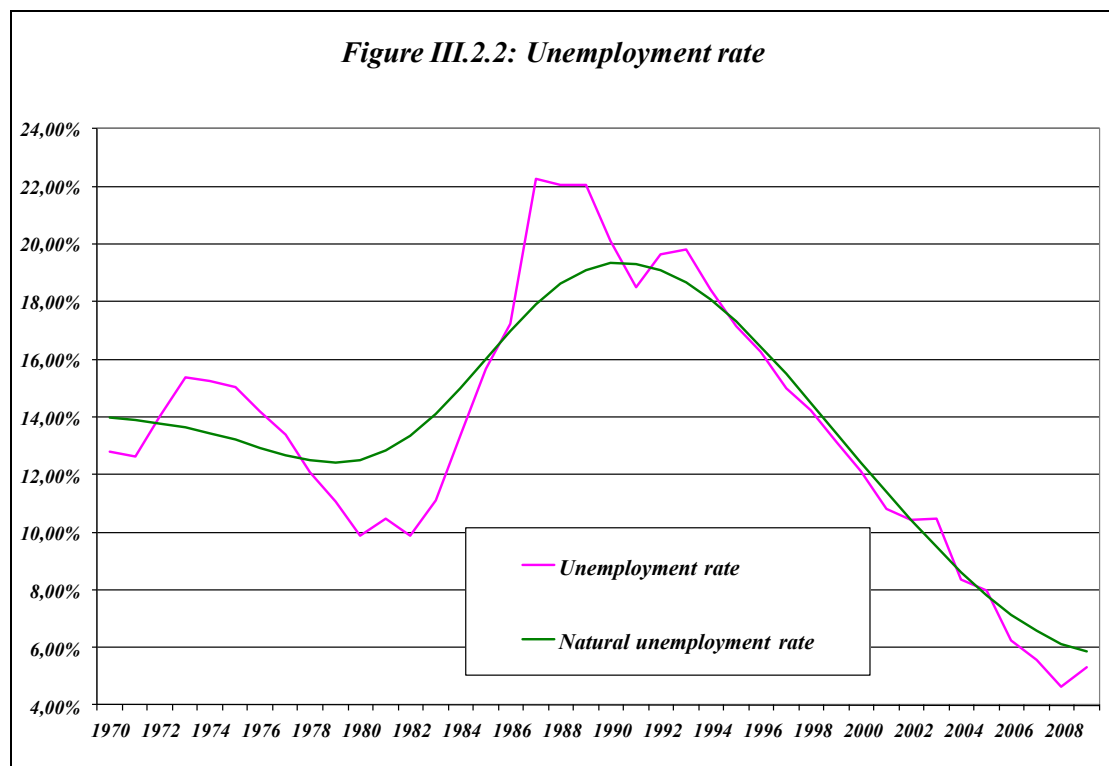
The trend value of effective employment is obtained applying a Hodrick and Prescott filter (HP filter) to the series of labor force L , and multiplying it for one minus the natural unemployment rate.

$$N_t^P = L_t^P \times (1 - U_t^P)$$

¹⁰ The source of the series on the labor force and employment is Central Bank of Trinidad and Tobago.

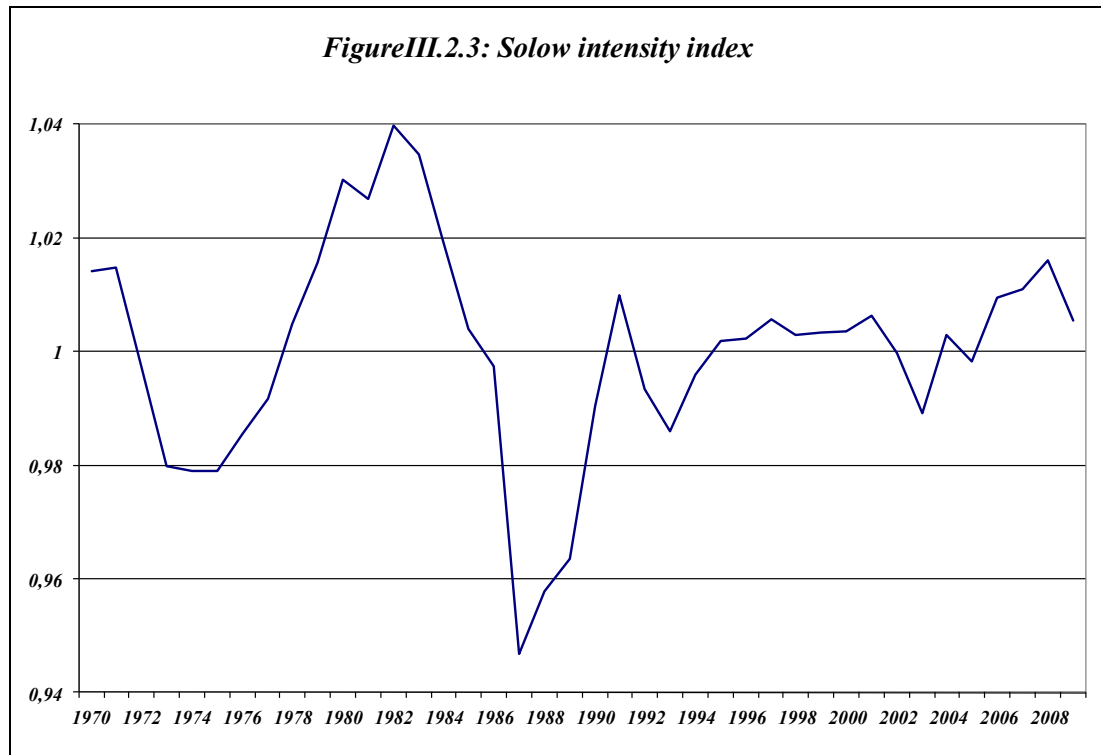
¹¹ Standard practice also applied by the OECD method, recommends the use a lambda value of 100, where lambda is the HP filter parameter.

Very much like trend non-oil GDP, trend employment growth fell to stagnation during the nineteen eighties and reaccelerated in the 1990s. The maximum trend growth of employment was around 3 percent and was reached at the turn of the century. Since then, employment growth has fallen converging towards an annual rate of 1.5 percent. The unemployment rate is high and volatile, with a maximum exceeding 20 percent during the recession of the 1980s.



Source:

Central Bank of T&T and LE&F estimations.



Source: LE&F estimations

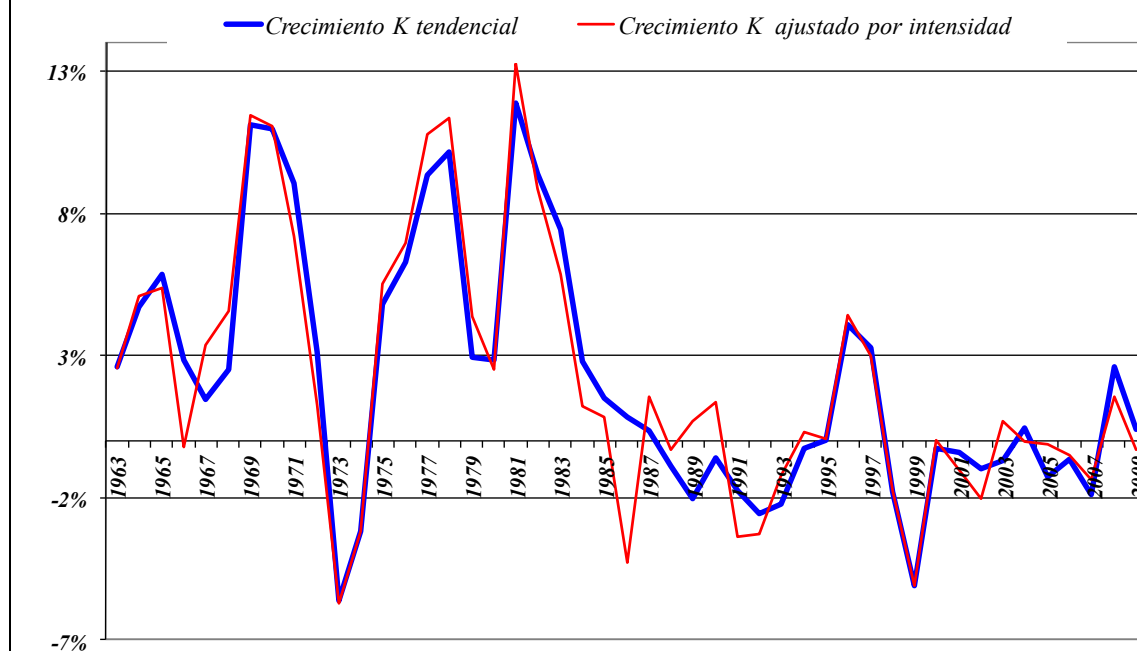
The trend value of capital assumes full utilization of the capital stock. The estimation of the non-oil capital stock effectively used is carried out using the Solow ratio. The Solow ratio of the intensity of use is defined on the basis of the regular and natural unemployment ratios, so that the index value is 1 when the unemployment rate is equal to the natural rate and less than one when effective unemployment is above the natural rate. Thus trend capital will be equal to the effectively used capital when the Solow ratio is equal to one, that is, when unemployment is at its natural rate.

$$S_t = \frac{(1 - U_t)}{(1 - U_t^P)}$$

The estimation of the effective non-oil capital stock K is obtained by correcting the trend capital stock K^P by the Solow intensity of use (S):

$$K_t = K_t^P \times S_t$$

Figure III.2.4: Growth of the Non oil Capital stock



Source: LE&F, based on information from Central Bank of Trinidad and Tobago.

Effective and trend capital follow very similar trajectories which are rather parsimonious and fluctuate gradually over time between expansions of up to 12 percent and contractions of -5 percent. The recession of the 1990s resulted in a sustained contraction of the capital stock during almost the whole decade. The reacceleration that follows took the rate of expansion of the capital stock to a maximum of about 3 percent in 2008, and since then the rate of growth of the capital stock is converging towards -2 percent per year.

3. Trend Non-Oil Total Factor Productivity (TFP)

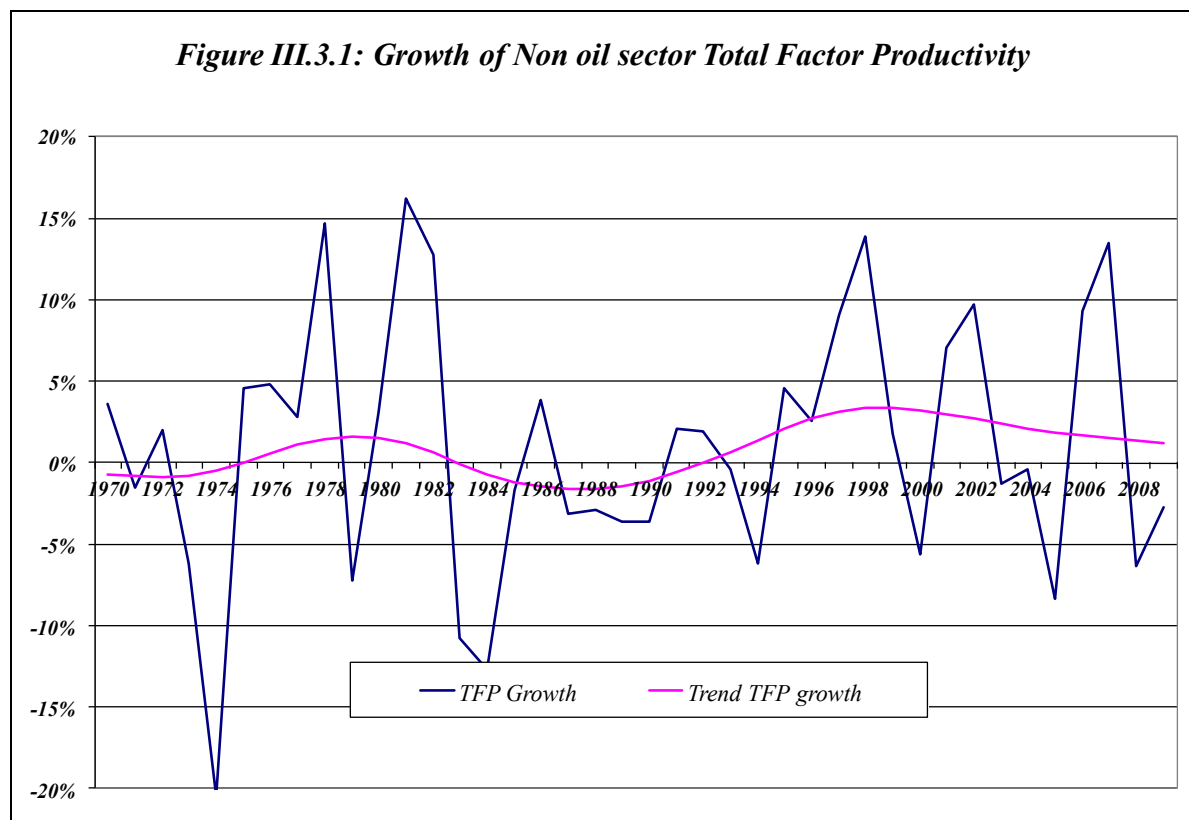
Finally, total factor productivity TFP in the non-oil sector is derived as a residual using the production function and effective data on non-oil GDP, capital and employment. This version of the TFP contains both permanent and transitory elements.

$$A_t = \frac{y_t}{K_t^\alpha N_t^{(1-\alpha)}};$$

$$\log A_t = \log y_t - \alpha \log K_t - (1 - \alpha) \log N_t$$

To obtain the permanent or trend total factor productivity, the OECD methodology indicates applying the Hodrick and Prescott filter to the TFP series.

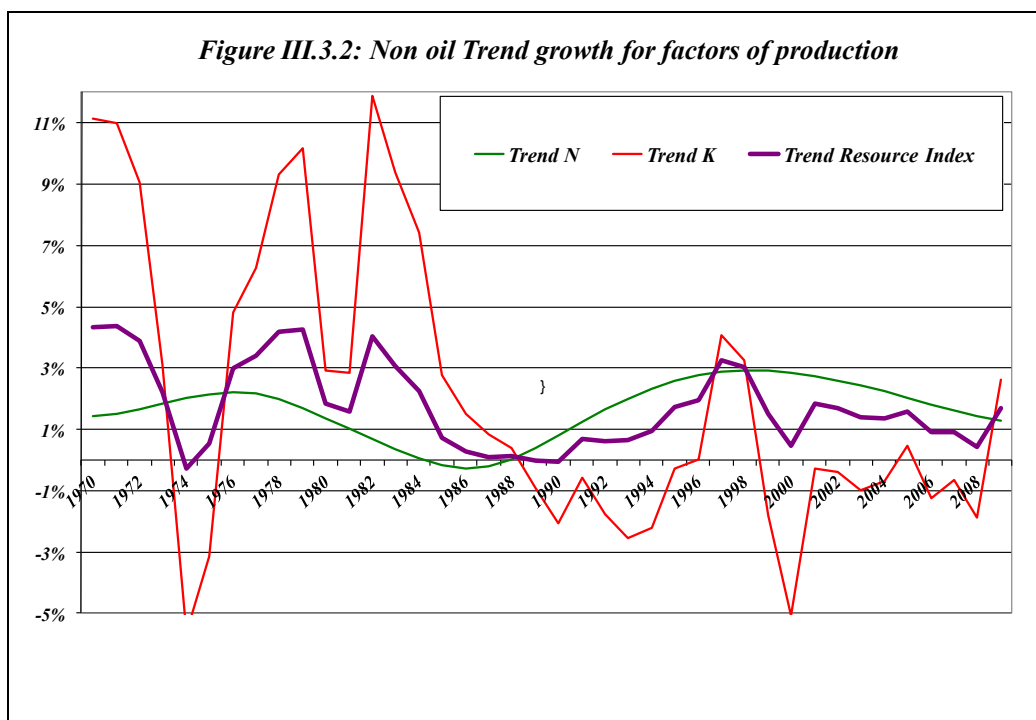
$$A_t^P = HPfilter(A_t)$$



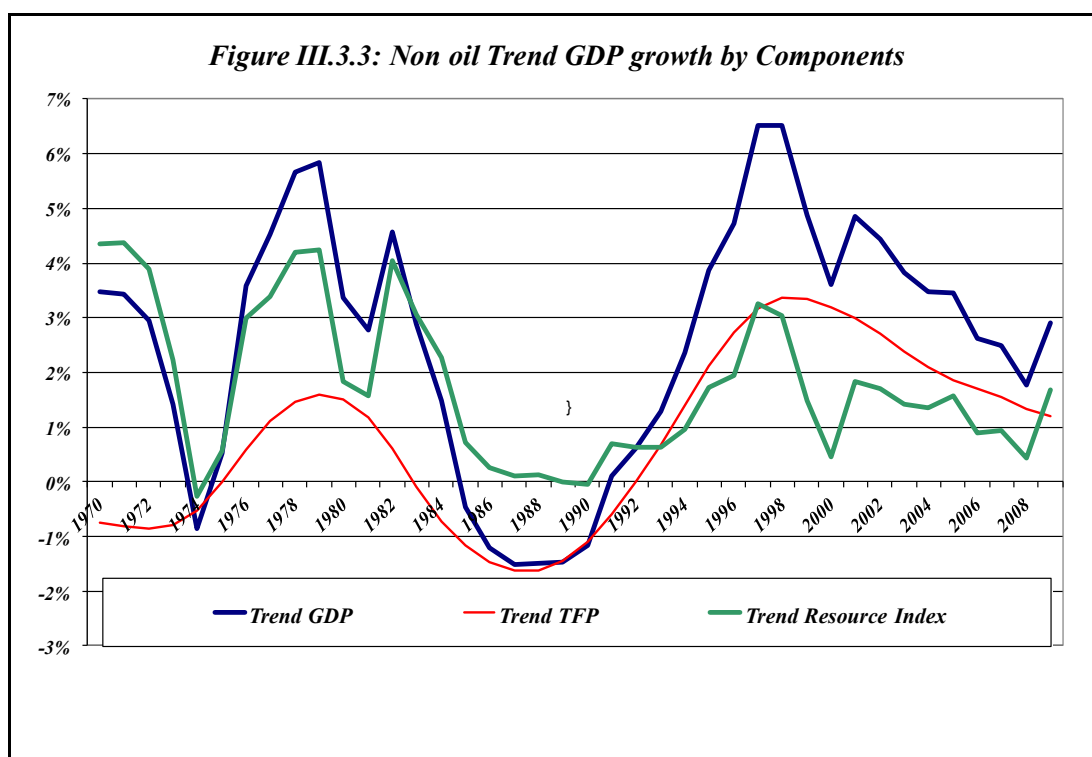
Source: LE&F, based on information from Central Bank of Trinidad and Tobago.

Two periods of very rapid trend TFP growth appear in the data with an annual growth rate of around 3 percent, the first is in the late seventies and early eighties after the first oil shock, and the second in the late nineties and first years of the XXI century. After the first period of rapid growth of trend TFP, productivity decelerated deeply first to stagnation and then to a small contraction in the late eighties and early nineteen nineties. The expansion that followed took the rate of growth of trend TFP to a maximum above 4 percent per year by the turn of the century. In the following years, trend TFP growth has converged towards 2 percent and has been projected at a slightly higher rate for the next decade¹².

¹² As a result of our own projections based upon the IMF-WEO. Projections represent opinions and are subject to change.



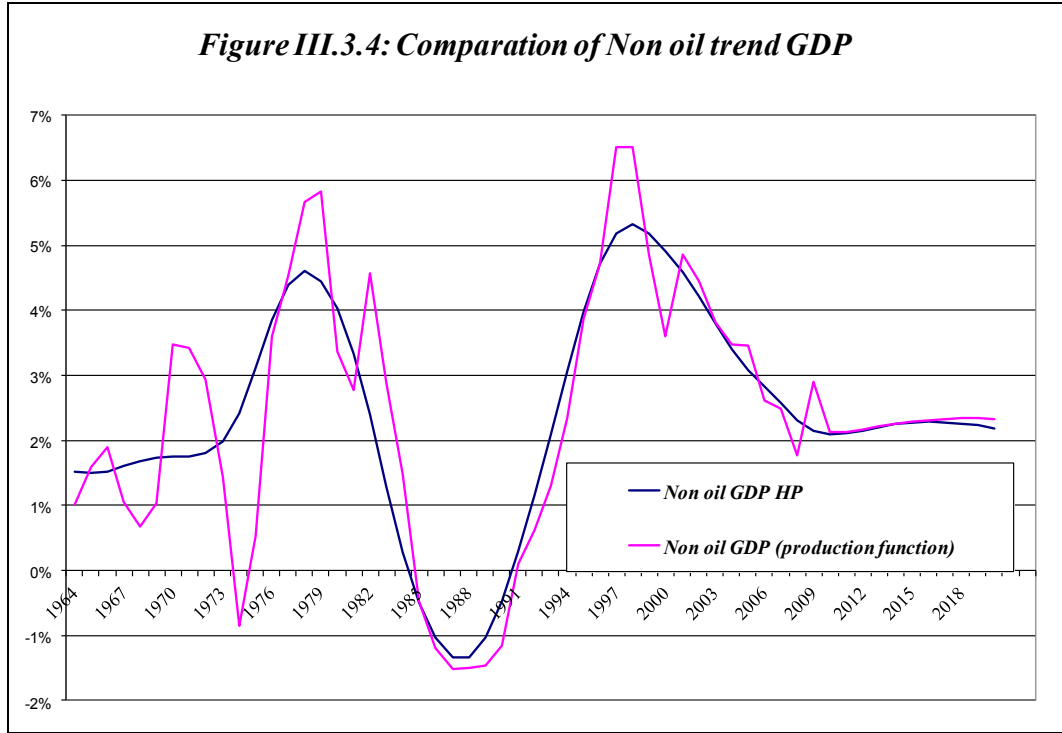
Source: LE&F, based on information from Central Bank of Trinidad and Tobago.



Source: LE&F, based on information from Central Bank of Trinidad and Tobago.

In sum, the estimation of trend non-oil GDP growth in T&T indicates a minimum expansion of -2 percent in the late-1980s, and a maximum expansion close to 6 percent per year in the late seventies. The peaks and troughs of non-oil GDP growth coincide with those of employment and

productivity; meanwhile the peaks of the non-oil capital stock follow them with a lag of about 5 years. The rates of growth of trend GDP and trend capital are converging towards 3 percent per year, the trend growth of employment to 1.2 percent and that of TFP to 1.2 percent too.



Source: LE&F, based on information from Central Bank of Trinidad and Tobago.

4. Estimation of the Structural Non-Oil Revenue

Considering that the main source of deviations of the non-oil fiscal revenue from its trend is the GDP cycle, we can use the estimated trend non-oil GDP to derive trend non-oil revenue and thus cyclical non-oil revenue as a residual. The estimation of the structural non-oil fiscal revenue requires the estimation of a stable relationship between non-oil fiscal revenue with trend non-oil GDP and the GDP gap. The elasticity of fiscal revenue with respect to trend GDP is going to play a pivotal role in determining the value of the structural revenue and the structural balance. The estimated regression is of the following form,

$$\log T_t^{NO} = \beta_0 + \beta_1 \log y_t^P + \beta_2 gap_t^y + \beta_3 D_t^{1976} + \varepsilon_t$$

Where T^{NO} represents the real non-oil fiscal revenue (deflated by CPI); y^P is the trend non-oil GDP, gap^y is the NO_GDP gap and D^{1976} a qualitative variable to represent a structural break, the policy reaction that shifted the level of Public sector revenue in Trinidad. Different specifications were attempted, with different dates for the structural break, and by considering that the effect of trend non-oil GDP and the GDP gap on non-oil revenue is the same. Actually, it was not possible to reject the hypothesis that the gap and trend GDP have the same effect on non-oil revenue ($\beta_1=\beta_2$). Despite the inclusion of the dummy, which has a value of 0.284 and is significant, the estimated long term elasticity of non-oil revenue with respect to non-oil GDP is larger than one, actually it is 1.39. Then, doing an analysis of co integration, we find that the residuals are stationary at 5 percent, so the variables of the main regression co integrate (non-oil real revenues, non-oil GDP gap and trend GDP)

Table III.4.1.i: Regressions for Non-Oil Revenues and Non-Oil GDP

Dependent variable	log non oil revenues	
	coefficient	p value
Constant	-5.720612	0
log non oil trend GDP	1.392816	0
GDP Gap	0.885294	0.0001
Dummie (1976)	0.283941	0.0004
R2	0.9515	
Durbin Watson	0.7569	

Dependent variable	log non oil revenues	
	coefficient	p value
Constant	-4.733745	0.0001
log Total GDP	1.293448	0
Dummie (1976)	0.321337	0.0003
R2	0.9444	
Durbin Watson	0.8584	

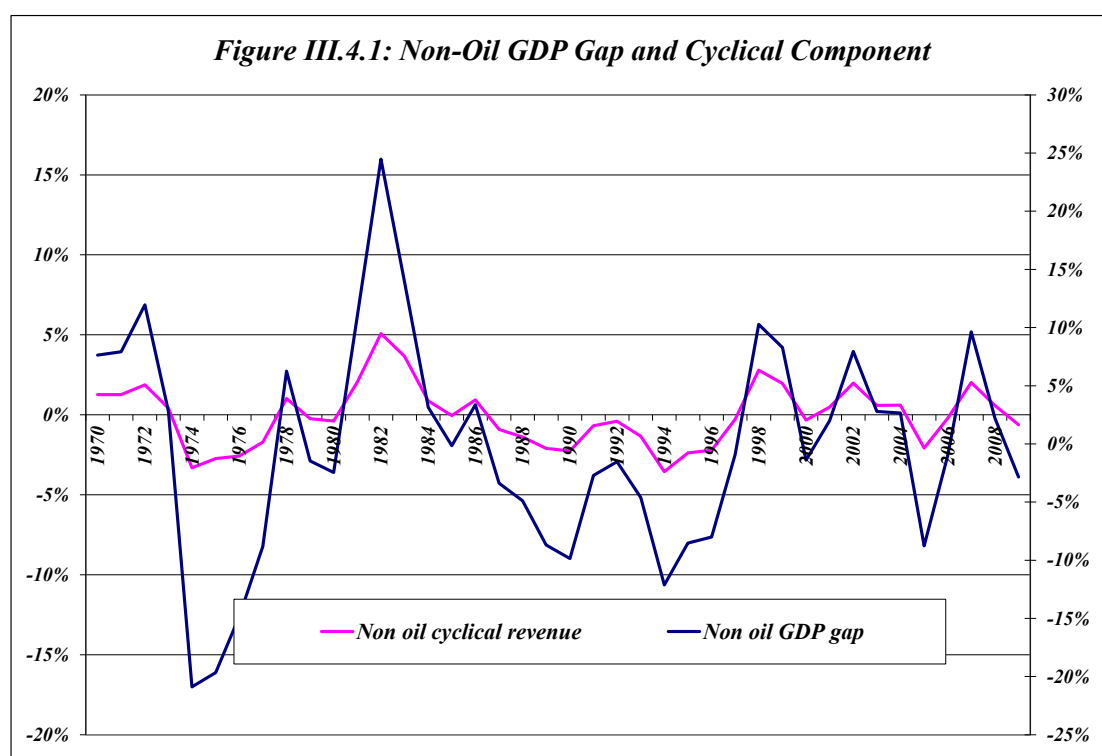
Source: LE&F estimations.

Table III.4.1.ii: Cointegration Analysis (residual test)

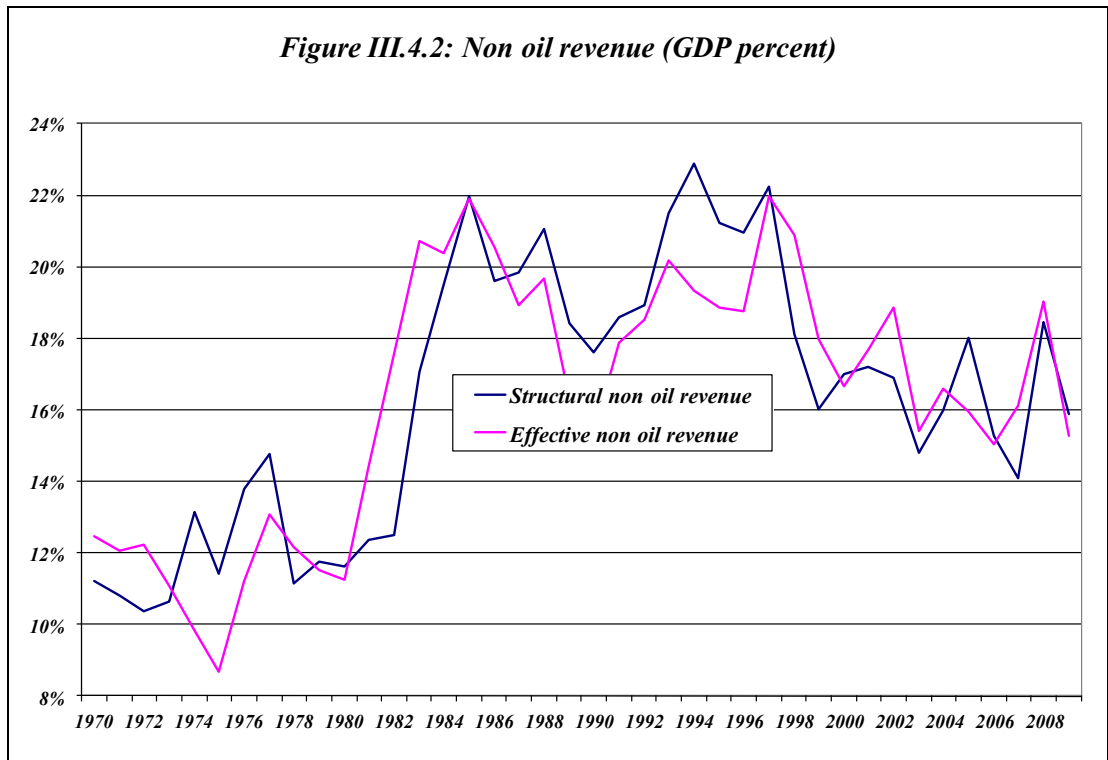
		t-Statistic	Prob
Augmented Dickey-Fuller test statistic		-2,61	0,098
Test critical values	1% level	-3,61	
	5% level	-2,94	
	10% level	-2,6	

Source: LE&F estimations.

As it can be seen in the figure III.4.1 the non-oil GDP gap is highly volatile. The ups and downs of the non-oil cyclical revenue presented as a percent of non-oil GDP, follows a similar pattern but its fluctuations are much smaller in value, although still significant ranging from +5 percent to -3 percent of NO_GDP.



Source: LE&F, based on information from Central Bank of Trinidad and Tobago



Source: LE&F, based on information from Central Bank of Trinidad and Tobago

IV. Estimating the Structural Fiscal Balance in an Oil Dependent Economy

1. The Estimation of the Sustainable or “Structural” Oil Revenue

Trinidad and Tobago fiscal revenues have the particularity to rely heavily and increasingly on the proceeds from the exploitation of oil and natural gas. The oil and gas sector is not only the main source of fiscal revenue, it is also the most volatile sector of the economy, mostly reflecting the ups and downs of the international price of energy products, but also of significant jumps in the sectorial output. Future oil revenue is quite uncertain because of these factors, moreover, this source of revenue depends on an economic resource that will eventually become extinct in the not so distant future, and that may become obsolete due to technological change.¹³

Therefore, the structural fiscal rule should consider a special treatment for the oil and gas sector, a source of revenue that will eventually require to be replaced. A key element in the estimation of the structural oil revenue is the trend price for oil; a tricky subject for which several views compete, including one according to which the trend price of oil simply does not exist. On this subject we take a practical view using two alternative approaches. One that considers that the oil price will eventually return to the long term marginal cost of extraction, that is represented by a long term “trend price” obtained through a simple autoregressive model with a drift. The second alternative considers that the trend price is a moving average between oil future contracts and past prices from the last three years. Besides we assume that the oil and gas international prices are attached to a common trend.

Other sources of cyclicity of the real oil revenue are the deviations of the oil output and the deviations of the real exchange rate from their respective trends. They were also considered in the estimation of the structural oil revenue. Oil fiscal revenue presents a proportional response to the level of oil GDP as can be seen from the regression analysis presented in Table IV.1.1 Oil production has important ups and downs, but eventually returns to a trend growth that will determine the number of years of oil fiscal revenue left. The more rapid are the existing oil reserves exploited, the higher will be the annual oil revenue, however the number of years of future oil revenue left would be conversely reduced.

¹³ There are different views on the number of years of oil revenue left at current rates of production for T&T. According to calculations of some experts a total of 20 years of mining potential are available. (Central Bank of Trinidad and Tobago) They established at 800 million barrels the reserves for potential extraction and assumed a production of 4 million barrels a year. Others are more optimistic and consider that the new discoveries and technological change will continue increasing the amount of potential reserves.

Table IV.1.1: Regressions for Oil Revenues and GDP (oil and total)

Dependent variable	log oil fiscal revenues	
	coefficient	p value
Constant	-1,067817	0,2944
log Oil GDP	1,009482	0
R2	0,7088	
Durbin Watson	0,2973	

Source: LE&F estimations.

The sustainable or structural oil revenue will be available to recurrently finance fiscal expenditure in the future, during the period that is estimated that the oil reserves will last. To avoid the harmful volatility of fiscal spending, it is reasonable to size it in accordance to sustainable fiscal revenue, both oil and non-oil revenue. There are different sources of risk for the sustainable fiscal oil revenue, including international oil price risk, oil volume risk, and real exchange rate risk. The main risk is the one associated to the international price of oil, which can fluctuate widely depending on the international economic conditions that determine the demand and supply for oil and gas and their substitutes. The international price of oil can “explode” in scenarios of rapid global growth and restricted supply of energy, but could also “collapse” if oil becomes obsolete due to technological change and the emergence of alternative, cheaper and less contaminating energy sources.

A secondary risk is the one associated to the volume of oil production. It fluctuates depending on the quantity of investment and its volatile returns, responding in general to incentives for oil exploration and extraction. What is most important, however, is that the time of oil extraction left will depend on the remaining oil reserves and on the “trend level” of oil output implicitly selected. Finally, the third source of risk for real oil revenue is the real exchange rate in T&T. Considering that the sustainable real oil revenue should finance a certain level of real government spending it must be defined in real T&T dollars. Thus if the currency becomes more appreciated in real terms, the same sustainable oil revenue measured in dollars will finance a lower level of real fiscal spending.

To estimate the sustainable or structural oil revenues, both historical and to be projected into the future, the historical oil revenues were regressed against the variables that represent the different sources of oil revenue risk: oil price, oil output and the real exchange rate. With the parameters obtained we were able to project the actual and the sustainable oil revenue on the basis of the projected oil prices oil volumes and the real exchange rate. The deviation of actual

oil revenue from the sustainable oil revenue will depend upon the deviations of each of these variables with respect to its sustainable path. The international price of oil is obtained from a reference representing its “trend”; the oil output or volume from its trend; and, the actual real exchange rate from its long term equilibrium value. To obtain the elasticities that would allow decomposing actual oil revenue in cyclical and structural, an error correction model was implemented. It considered as the dependent variable the purchasing power of fiscal oil revenues (that is oil revenues deflated by CPI) and as independent variables the lagged real oil revenue, the oil price, the amount of oil production and the real exchange rate¹⁴. Then, we estimate the ADL model with lags of all variables and eliminating those that were not significant. The final model estimated is as follows:

$$\log T_t^O = \delta_0 + \delta_1 \log T_{t-1}^O + \delta_2 \log p_t^O + \delta_3 \log q_t^O + \delta_4 \log \varepsilon_t + \eta_t$$

Where $\log T^O$ is the logarithm of real oil income, $\log P^O$ the logarithm of the real price of oil, $\log q^O$ the logarithm of the amount of oil produced, and $\log \varepsilon$ the logarithm of real exchange rate. From the above, we have that the long-term relationship of oil revenues is:

$$\log T^O = \frac{\delta_0}{1 - \delta_1} + \frac{\delta_2}{1 - \delta_1} \log p + \frac{\delta_3}{1 - \delta_1} \log q + \frac{\delta_4}{1 - \delta_1} \log \varepsilon$$

$$\log T^O = a + b \log p + c \log q + d \log \varepsilon$$

Where variables without time subscript correspond to those of long-term and a, b, c, and d are combinations of estimated parameter.

$$a = \frac{\delta_0}{1 - \delta_1}, b = \frac{\delta_2}{1 - \delta_1}, c = \frac{\delta_3}{1 - \delta_1} \text{ and } d = \frac{\delta_4}{1 - \delta_1}$$

By rearranging the above, we obtain the following balance equation

$$\Delta \log T_t^O = \delta_2 \Delta \log p_t + \delta_3 \Delta \log q_t + \delta_4 \Delta \log \varepsilon_t - (1 - \delta_1)(\log T_{t-1}^O - a - b \log p_{t-1} - c \log q_{t-1} - d \log \varepsilon_{t-1}) + \eta_t$$

¹⁴ The Dickey-Fuller unit root test indicates that each of these variables have unit root (Schwarz criterion).

The estimation of the equation above delivers the following results:

Table IV.1.2: Regressions for Oil Revenue

Dependent variable	log oil revenues	
	coefficient	p value
Constant	-10.4763	0.0028
log Oil price	0.587067	0
log Oil quantity	0.977527	0.0148
log Real exchange rate	1.45157	0.012
log non oil revenue (-1)	0.44273	0.0006
R2	0.877914	
Durbin Watson	0.907763	

Source: LE&F estimations.

In order to project the sustainable future oil revenue we can use the estimated equation along with some estimates for the independent variables. The purpose of this exercise is not to forecast the annual oil revenue, but to determine how much of it can be available to finance fiscal expenditure on a sustained basis, avoiding the harmful volatility of fiscal outlays. Thus to project the sustainable or “structural” oil revenues, the estimated oil revenue equation can be used together with the trend or long-term values for the explanatory variables: oil price, real exchange rate and oil output. The trend for the real exchange rate represents the equilibrium long term real exchange rate, which can be estimated historically using an HP (Hodrick and Prescott) filter, and projected on the basis of its long term average¹⁵. Similarly, the historical trend for the oil output can also be obtained applying a HP filter to oil output series, and the projection can be derived extrapolating the rates of expansion in output.

The oil price is the most important source of cyclical variability of oil revenue, yet it is the variable for which a trend estimate is the most difficult to generate. Many would state that the price of oil follows a random walk, and as such there is no trend value for it different from the actual price. It is not our intention to solve a controversy that with available data is not possible to solve, and thus prior belief have a fundamental bearing in the answer on whether or not there is mean reversion in commodity prices. Our intention is to determine a reference price of oil that would minimize the volatility in the sustainable oil revenue, as it is to be used as a reference to determine fiscal spending. Using the current market price is undesirable, as it is well documented

¹⁵ The real exchange rate returns to its long term equilibrium, which we assume for simplicity constant, although it may have some drift due to technological reasons or due to a trend in the terms of trade.

volatility would imply very large swings in the annually available oil revenue and therefore in fiscal spending.

2. Oil Price and the “Sustainable” Structural Oil Revenue

We will attempt to obtain an oil price that can be considered as a reference to determine how much of the current oil revenue can be spent and how much should be saved. If the oil reference price is equal to the actual oil price, then all the oil revenue is structural and should be spent, but if the reference oil price is half the actual oil price, half the oil revenue should be spent and half saved. Why should the reference price be different than the actual? Several reasons come to mind. First, because a bubble of may affect the oil price sorts that is generating very high returns to investments in energy generation. Those investments may mean that eventually the supply of oil or oil substitutes will increase as a response of those investments, and consequently the price of oil will fall towards the long term marginal cost of extraction. In an extreme case, the emergence of new energy sources, or oil substitutes, may make oil technologically obsolete, in that case its price would go to zero.

There are no easy fixes to estimate the reference price of oil; we propose two alternatives, both with their shortcomings. One possibility is to consider a price that represents a level for the price of oil with “normal” returns to investment. That is a price in line with the long-run marginal cost of extracting and producing oil. This price would represent the technology and costs of exploration, extraction and refining, as well as the long term or structural demand factors, like the global industrial production, and the cost and availability of other energy sources or oil substitutes. If such a price exists, there would be a mean reverting process for the oil price, at least in the very long run, so that the revenue calculated on the basis of this price may be considered a sustainable or long run revenue. The second possibility is to use a mixed average of past and future oil prices just to reduce the fluctuations in the oil price used as a reference for the spending decision.

The short coming of the first alternative is that the oil price may not return to the estimated trend in the foreseeable future. If that is the case and fiscal policy is based in the associated “structural oil revenue”, the country would be spending less than the “optimal” and accumulating more reserves for the future. Thus it would be ready earlier for the coming collapse of oil revenue when the inevitable exhaustion of the resource or the eventual technological obsolescence drastically reduces future oil revenue. The short coming of the second alternative is that oil price may eventually return to its trend and fall significantly from its later years average.

If that is the case, the country would be forced into a significant fiscal adjustment to reduce the oil revenue being effectively spent.

Under the first methodology, we estimated an autoregressive equation with a drift that would represent the long term oil price as a mean reverting process, as established by others works attempting to find a mean reversion process in commodity prices ¹⁶. The oil price equation estimated that rendered the best fit was an AR 1 process with a drift, implying that the trend price will have an upward trend.

$$p_t = \alpha_0 t + \alpha_1 p_{t-1} + \eta_t$$

Table IV.2.1: Regressions for Oil Price

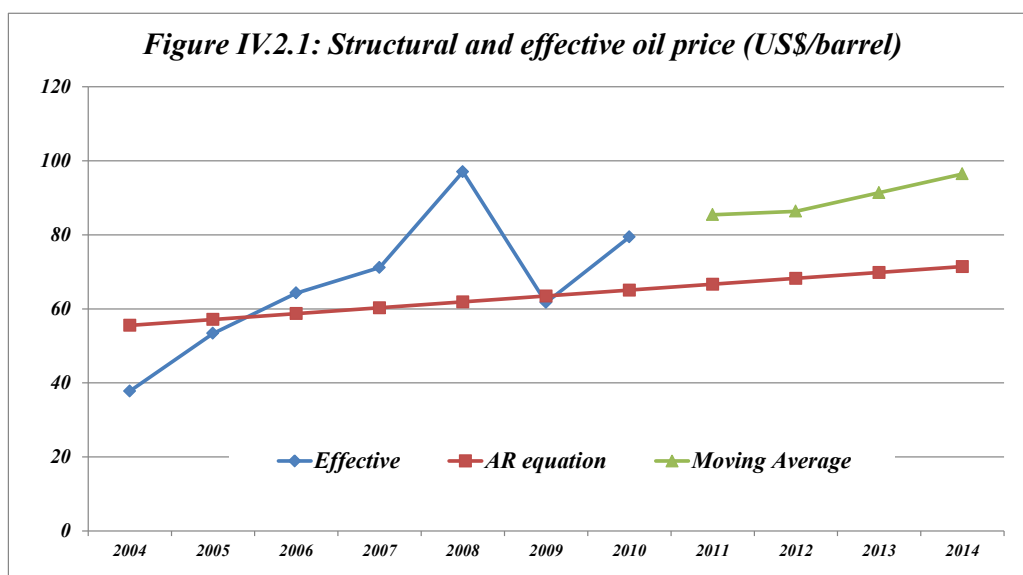
Dependent variable	Oil price	
	coefficient	p value
Drift	0,282824	0,0386
Oil price (-1)	0,821778	0
R2	0,802823	
Durbin Watson	1,760734	

Source: LE&F estimations.

The estimated regression delivers parameter values of 0.28 for the drift and 0.82 for the autoregressive (AR1) or lagged oil price value. Besides the one chosen, alternative specifications were used, incorporating a constant and more lags, but none of those rendered satisfactory results as the additional coefficients were not significant¹⁷. The forecasted structural oil price is presented in figure IV.2.1 and as indicated has an increasing trend, moving from less than 60 dollar a barrel in 2004 to almost 80 dollars a barrel in 2014.

¹⁶ See Engel and Valdés (2000)

¹⁷ Obviously the calculation of the structural oil revenue and structural oil price are simplifications, but something more elaborated would exceed the purpose of this paper and is left for the work of the experts in T&T oil sector.



Source: Central Bank of T&T ,NYMEX and LE&F estimations.

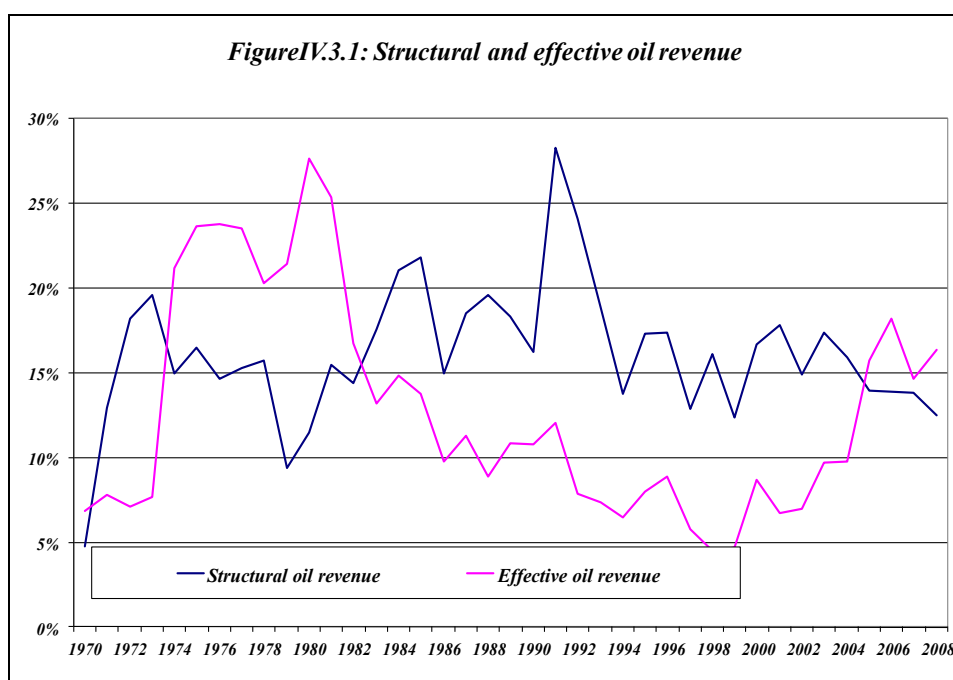
Moving Average of Past Prices and Future Contracts

The second methodology considered is based upon the idea that the reference or sustainable oil price does not follow a stable process, and may confront unexpected changes, so that the current actual market price plays a significant role in determining the sustainable price. In order to ignore short term changes in the market price of oil, and to provide for some time to adjust to price changes, we estimated the second reference oil price on the basis of an historical moving average of past prices (3 years) and the average price in future contracts for the next five years.

As an alternative, a reference for the long term oil price was estimated using the average between the effective oil price between 2008 and 2010 (US\$ 79 a barrel) and the NYMEX future contracts for 2011 and 2016 (US\$ 91 a barrel). The reference long term price under this alternative approach would be US\$85 a barrel for 2011. Subsequent years are estimated on the basis of future contracts and presented in Figure IV.2.1. It is possible to follow other ways to estimate the structural oil price, and most likely the best approach is to consider a good number of them represented by the opinions of different experts. However, for the calculations developed in this paper we use the first approach whereby the oil price returns to a long term trend defined by an autoregressive process. The implications of the second approach will be shown in the calculation of the structural fiscal target. The alternative approach implies a long term price of oil 30 percent higher for 2011 than the one based on the AR1 equation.

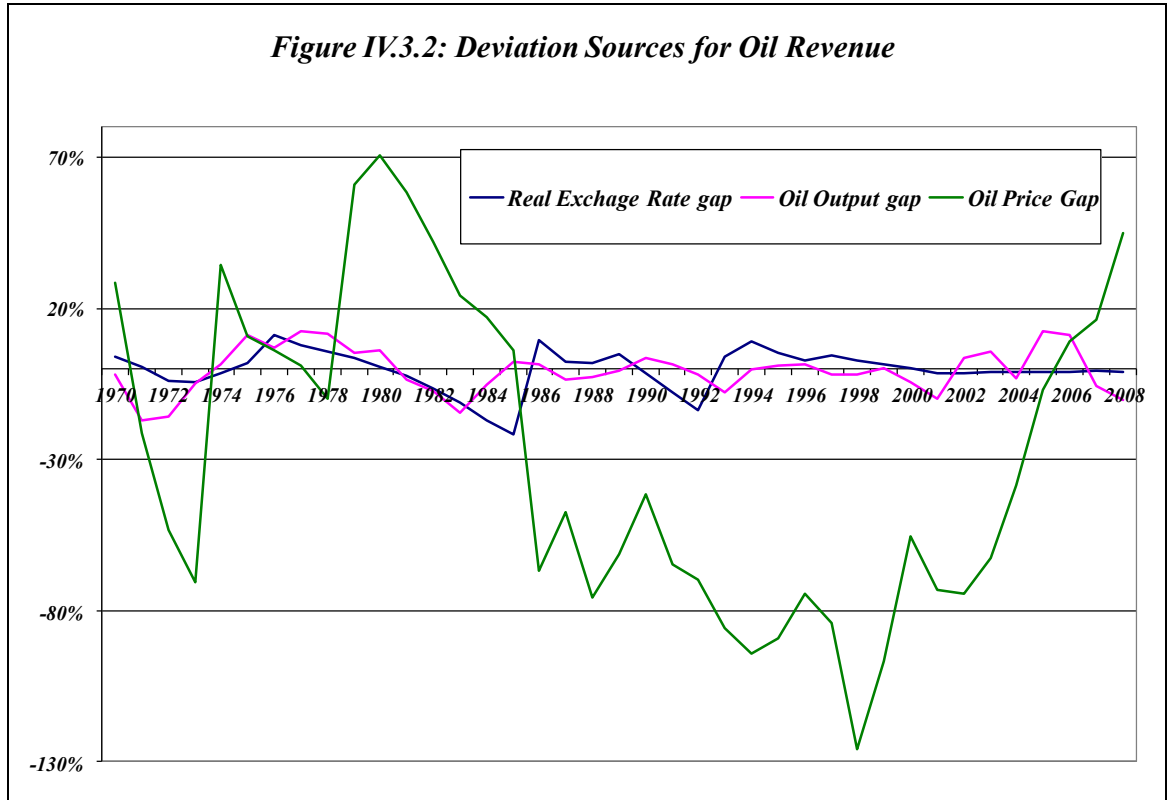
3. The Structural Fiscal Balance

The structural fiscal balance results from the correction of the actual balance replacing actual for sustainable revenues, both oil and non-oil revenue. In the case of oil revenue, the effective oil revenue exceeded the structural oil revenue during the 1970s and the early 1980s, to fall below the structural during most of the 1980s, all of the 1990s and the first years of the XXI century. Over the last few years, once again the effective oil revenue exceeds the structural revenue.



Source: Central Bank of T&T and LE&F estimations.

It is easy to see that the deviations between actual and sustainable oil revenue are mostly explained by the gap between actual and reference oil price. The deviation from trend of the oil output and of the real exchange rate are relatively minor, been kept in general in the interval +15 percent-15 percent. However, in the case of the price of oil, its gap can be as high as +70 percent, the actual price exceeding the trend price in 70 percent, or as low as 130 percent, with the actual price falling largely below the reference price.

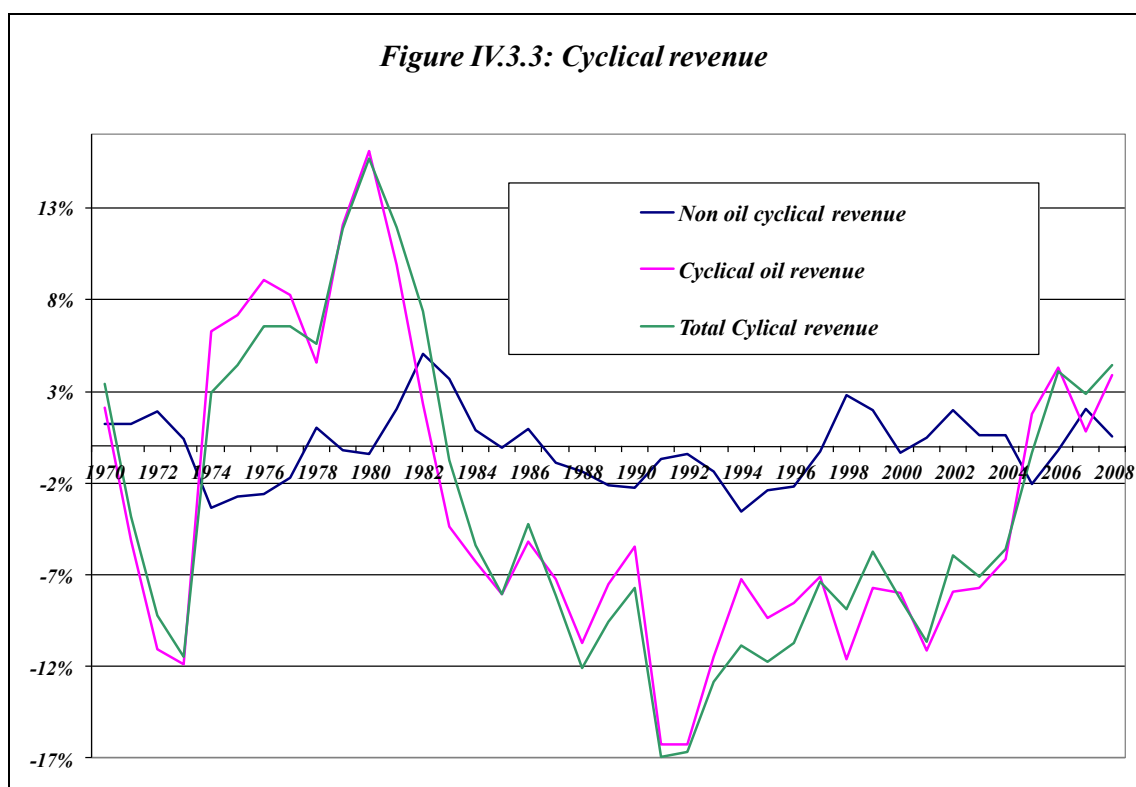


Source: Central Bank of T&T and LE&F estimations.

Then the structural fiscal balance is defined as the difference between the total structural fiscal revenue and the total fiscal expenditure. The estimation of the total structural revenue can be obtained using the estimations for non-oil and oil fiscal revenues presented in the previous sections of this paper. Conceptually, the structural fiscal balance is the one that would have existed under normal macroeconomic conditions. That is, if GDP, the oil price, oil output and the real exchange rate were all at their trend or reference level. Correspondingly, the structural fiscal revenue is the revenue that would have been obtained under a zero gap for GDP, oil price, oil output and the real exchange rate. Thus the structural fiscal balance is

$$SFB_t = T_t^P - G_t$$

Government revenue (T) is the sum of oil and non-oil revenue, and each of them have a permanent (T^P) and a transitory (T^{tran}) component.



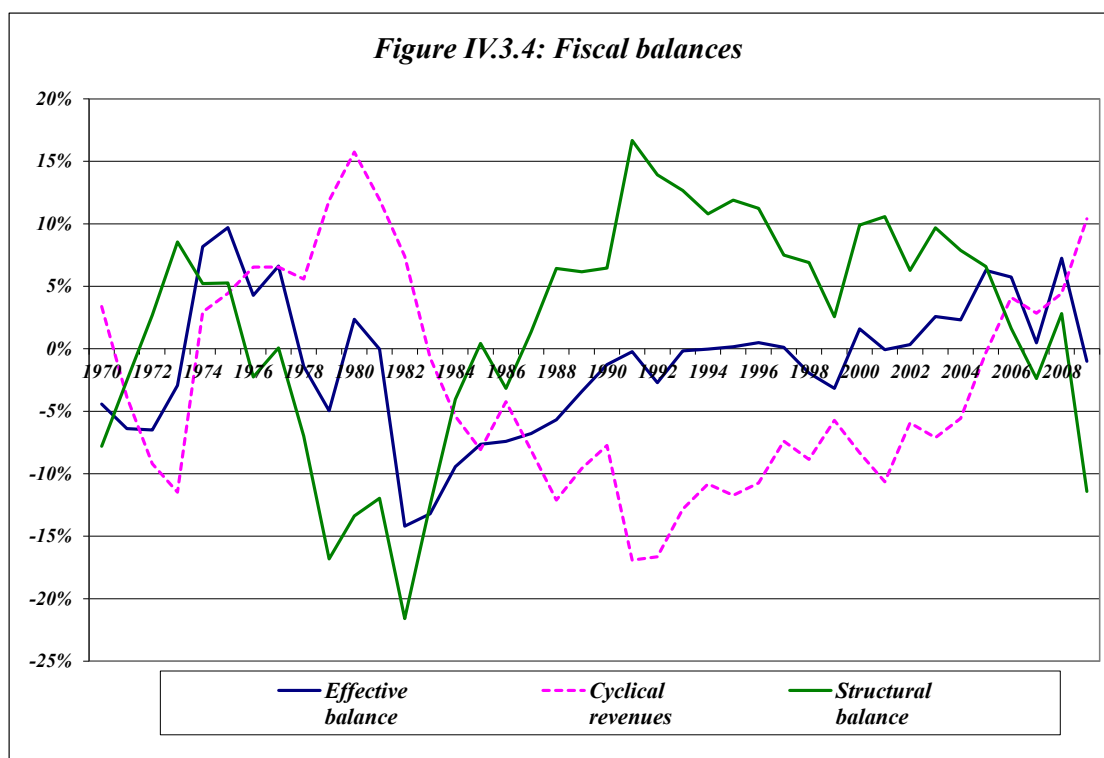
Source: Central Bank of T&T and LE&F estimations.

The cyclical volatility of fiscal revenue in T&T is highly significant and is mostly explained by the cyclicity of oil revenue. Non-oil fiscal revenue also presents a cyclical pattern, however its cyclical deviations are bounded between a maximum of 5 percent of GDP and a minimum of -3 percent of GDP. The cyclical deviations of oil revenue are much wider reaching a maximum of 15 percent of GDP and a minimum -17 percent of GDP. In recent years, the cyclical gap of total fiscal revenue exceeds 4 percent of GDP as the oil (3 percent) and non-oil revenue (+1 percent) presents positive cyclical gaps

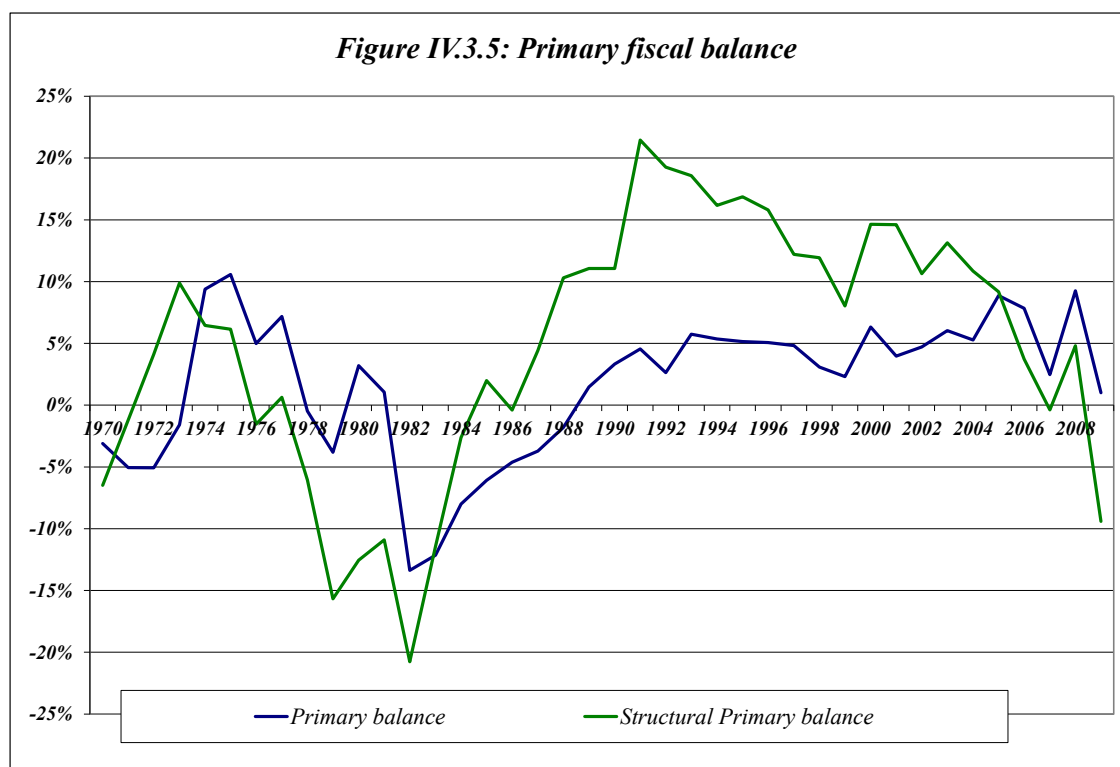
As shown in the figure, the total and structural fiscal balances were in surplus in the 1970s, to move then to a deep deficit in the 1980s. A sustained fiscal effort, despite very negative cyclical revenue eliminated the deficit and built the conditions for another succession of structural fiscal surpluses and effective balances during the 1990s and the first years of the last decade. At last, in the years after 2005 the effective fiscal balance has been helped by favorable cyclical revenues while the structural surpluses have gradually faded away. The fall in the oil price in 2009 took the effective fiscal balance into a small deficit, while the structural balance presents again a significant deficit in 2009.

The primary structural and effective fiscal balances have in general been in surplus, exception made of a period of deep deficits in the 1980s, when the structural primary balance deteriorated to a minimum of about -20 percent of GDP. In the years from 1990 on, the structural

primary fiscal balance has been relatively stable in a surplus of around 5 percent of GDP, becoming somewhat more volatile in the last few years and presenting a deficit in 2009.



Source: LE&F, based on information from Central Bank of Trinidad and Tobago



Source: LE&F, based on information from Central Bank of Trinidad and Tobago

4. Fiscal Projections and Fiscal Target

In the fiscal projections exercise we assume an active policy scenario in which a structural fiscal policy is implemented. Primary government expenditure as a percent of GDP (pg) is budgeted on the basis of permanent total fiscal revenue (t^P) and the fiscal target for the primary balance (ps^*). Net interest spending (ig) is predetermined by debt contracts and by the return on fiscal assets. Adding net interest expenditure to primary spending we obtain total government expenditure (g).

$$pg_t = t_t^P - ps^* \quad g_t = pg_t + ig_t = t_t^P - ps^* + ig_t$$

To define the budget for primary expenditure (pg) it is necessary first to estimate the structural fiscal revenue (t^P) and then to set the fiscal target for the primary structural balance ps^* . The future structural fiscal revenue is to be obtained from the estimation of the future trend for GDP, in the case of non-oil revenue, and for oil price, oil output and the real exchange rate in the case of oil fiscal revenue.

The future value of the structural non-oil fiscal revenue has to be estimated on the basis of the production function, using projected future values for trend productivity (A^P), trend non-oil Capital stock (K^P) and trend employment (N^P). In this work GDP is projected for the period 2010-2020 using the forecast in the World Economic Outlook (WEO) of the International Monetary Fund (IMF)¹⁸.

In what follows in this section of the paper we are going to review the basis for the estimation of GDP growth, examining the estimation of trend capital, labor and productivity.

$$\log y_{t+1}^P = \log A_{t+1}^P + \alpha \log K_{t+1}^P + (1 - \alpha) \log N_{t+1}^P$$

$$A_{t+1}^P = HPfilter(A_{t+1})$$

Trend productivity can be obtained applying an HP filter to the series of actual and projected productivity. For that purpose projections of TFP through 2020 were used.

$$\log A_{t+i} = \log y_{t+i} - \alpha \log K_{t+i} - (1 - \alpha) \log N_{t+i}$$

¹⁸ Data base of October 2009. For the period not covered in the WEO projections we extrapolated the last rates of change (2016).

For consistency the projected values for TFP should be obtained as a residual from the projections of GDP, Capital and Labor.

$$K_{t+1}^P = K_t^P (1 - \delta) + I_{t+1}$$

Trend capital is equal to total capital and the projections for K can be obtained on the basis of the inventory equation and projections for gross capital formation. Again we projected the capital stock adjusted for the intensity of use that is needed in the projection of A through 2020.

$$N_{t+1}^P = HPfilter(L_{t+1}) \times (1 - U_t^P)$$

Finally, the projection of trend employment requires the projection of the labor force, and of the unemployment rate. Summing up, projections through 2020 were used for GDP, gross capital formation, labor force and the unemployment rate. From there the budgeting process can derive the trend fiscal revenue and given the target, the budgeted primary fiscal expenditure is to be obtained. In this exercise we used the WEO projections for GDP growth through 2016 and assumed a stable growth rate afterwards at the level of the last observation. Investment was projected assuming that the last five year average for the investment GDP ratio will prevail in the future. Finally, the projected expansion of the working age population was used to project labor force, and the stabilization of the unemployment rate at the natural rate value was used to derive effective employment. Different views about these macroeconomic projections are possible, and for that reason is convenient to organize a board of experts to provide them.

The structural oil fiscal revenue was projected using the estimated equation for oil fiscal revenue and the trend oil price and assumed trend values for the real exchange rate and oil output.

$$\log T^O = \frac{\delta_0}{1 - \delta_1} + \frac{\delta_2}{1 - \delta_1} \log p + \frac{\delta_3}{1 - \delta_1} \log q + \frac{\delta_4}{1 - \delta_1} \log \varepsilon$$

Considering that the oil is an exhaustible resource, fiscal oil revenue will only be available for a certain number of periods. After oil exhaustion, and to avoid a sudden contraction in fiscal spending, an alternative source of fiscal revenue should be available. We have considered as an alternative source of fiscal revenue the income that in the future can be provided by the accumulated level of public sector financial wealth. The interest income coming from financial

wealth should be high enough to be able to replace the oil revenue that is used to finance government spending after the exhaustion of oil reserves.

$R(t-1)$ represents the pre-existing reserves of the commodity and Q_c its rate of annual oil exploitation that reduce the reserves until exhausting them. The rate of exploitation is assumed to grow with total GDP, so that the structural commodity revenue is stable as a percent of GDP to the extent that the oil price is stable. The number of periods N before oil exhaustion is given by the following law of motion:

$$R_t^O = R_{t-1}^O - Q_{t-1}^{OP}(1 + \lambda)$$

$$R_{t+1}^O = R_t^O - Q_{t-1}^{OP}(1 + \lambda)^2 = R_{t-1}^O - Q_{t-1}^{OP}[(1 + \lambda) + (1 + \lambda)^2]$$

$$R_{t+k}^O = R_{t-1}^O - Q_{t-1}^{OP} \sum_{j=1}^k (1 + \lambda)^j$$

Consequently $k=N$ if and only if:

$$R_{t+N}^C = 0 \Rightarrow \frac{R_{t-1}^C / Q_{t-1}^{CP}}{\sum_{j=1}^N (1 + \lambda)^j} = 1$$

The number of periods left before oil exhaustion (N) is a function of the initial ratio of reserves to annual oil out put $(R/Q)(t-1)$, and of the accumulated growth of oil output $(\Sigma(1+\lambda))$. After exhaustion, the oil fiscal revenue that is effectively used to finance fiscal expenditure has to be replaced by some other sources of revenue, for example the financial revenue of an asset saved in an oil fund. If that is the case, any sudden changes in oil revenues would not have significant impacts on fiscal expenditure or in the non-oil fiscal revenue.

The oil revenue effectively used to finance expenditure is obtained by subtracting from the structural oil revenue the structural primary balance, if the balance is zero, all oil revenue is being effectively used, as the primary balance represent the amounts of fiscal resources being saved. Up to the point of oil exhaustion, the structural primary surplus financed the accumulation of wealth, not government spending or the non-oil deficit. After oil exhaustion there is no need for further accumulation of public sector wealth, hence the primary surplus should go to zero, unless there are other sources of fiscal vulnerability that would require further accumulation of assets. These fiscal vulnerabilities may stem from risks on the return of the financial assets, like interest rate, counterpart or other financial risks, or from the volatility of non-oil GDP. It is

important to note that debt would not be a source of vulnerability at this point to the extent that public sector financial wealth is positive and large.

$$t^{OP} - psb^* = rb_{t+N} \Rightarrow b_{t+N}^* = (t^{OP} - psb^*) / r$$

The revenue that would need to be replaced in the event of oil exhaustion is the amount of oil revenue effectively used to finance the non-oil primary deficit. Thus, the public wealth targeted to be attained in N periods should be the source of a permanent revenue alternative to the oil revenue being effectively used. The public sector wealth target expressed as a percent of GDP is contingent upon the oil revenue as a percent of GDP used to finance spending and the long term real rate of return that can be generated by financial wealth, represented by the long term real interest rate r .

To estimate the target for the primary fiscal surplus that will allow the accumulation of the desired level of public sector wealth in N periods we used an equation for the law of motion of public sector wealth as a percent of GDP (b) as a function of the primary fiscal balance as a percent of GDP (ps), the long term growth rate of GDP (λ), and the long run real interest rate (r). Starting from the very basic we can establish a relationship between the fiscal wealth level (B), the primary fiscal surplus (PS) and the nominal interest rate i .¹⁹

$$B_t = PS_t + (1 + i)B_{t-1}$$

Defining the variables as a percent of GDP, where b is public sector wealth in percent of GDP, psb the primary balance in percent of GDP, Y is nominal GDP, π is inflation, λ real GDP growth, and r the real interest rate.

$$b_t = psb_t + (1 + i_t)b_{t-1} \times \frac{Y_{t-1}}{Y_t} = psb_t + \frac{(1 + i_t)}{(1 + \lambda_t)(1 + \pi_t)} b_{t-1}$$

Following Croce and de Ramón we define $1+\psi$ as the discount factor that comprises the effects of the real interest rate and the growth rate in the law of motion of public sector wealth expressed as a percent of GDP.

¹⁹ Here we follow the work by Croce and de Ramón (2004).

$$b_t = psb_t + \frac{(1+r_t)}{(1+\lambda_t)} b_{t-1} = psb_t + (1+\psi_t) b_{t-1}$$

Where the discount factor is: $(1+\psi) = \frac{(1+r)}{(1+\lambda)}$

The idea is to find a permanent target for the primary structural fiscal balance psb^* , represented as a percent of GDP, which we will assume to be constant. In addition we will assume constant real interest rate and constant growth rate, so constant discount factor. To that effect we develop the equation for the law of motion of fiscal wealth for future periods as a function of existing wealth in t-1 and the discount factor.

$$b_{t+1} = psb + (1+\psi)b_t = psb[1 + (1+\psi)] + (1+\psi)^2 b_{t-1}$$

$$b_{t+2} = psb [1 + (1+\psi) + (1+\psi)^2] + (1+\psi)^3 b_{t-1}$$

$$\dots b_{t+N} = psb \sum_{j=0}^N [1+\psi]^j + b_{t-1} [1+\psi]^{N+1}$$

The value for the targeted psb depends on the initial wealth level b_{t-1} , the discount factor $(1+\psi)$, the final level of the public sector wealth, which can be considered the wealth goal b_{t+N} , and the number of periods to reach that goal (N). If the objective were to accumulate fiscal wealth b_{t+N}^* , then the fiscal target psb^* would have to satisfy the following general result

$$\frac{b_{t+N}^* - b_{t-1} [1+\psi]^{N+1}}{\sum_{j=0}^N [1+\psi]^j} = psb^*$$

In the case of the oil dependent economy the goal is to achieve a level of financial wealth high enough so as to generate an income stream that can replace oil after exhaustion. Replacing the definition for the public wealth goal, and solving for the fiscal target psb^*

$$\frac{(t^{OP} - psb^*) / r - b_{t-1}[1 + \psi]^{N+1}}{\sum_{j=0}^N [1 + \psi]^j} = psb^*$$

$$\frac{t^{OP} / r - b_{t-1}[1 + \psi]^{N+1}}{1} = psb^* \sum_{j=0}^N [1 + \psi]^j + psb^* / r$$

$$\frac{t^{OP} / r - b_{t-1}[1 + \psi]^{N+1}}{\sum_{j=0}^N [1 + \psi]^j + 1 / r} = psb^*$$

In general the structural fiscal target for the primary balance is going to be more demanding, the larger is the structural oil revenue that will be exhausted after N periods; the lower is the real interest rate (r), the lower (more negative) is the initial level of wealth (b_{t-1}), and the shorter is the number of periods to attain the wealth target, N. The effect of the discount factor on the *psb* target will in general be negative; however its effect can be amplified depending on the sign of the initial wealth. If the initial level of financial wealth b_{t-1} is positive, a higher discount factor implies a much less demanding *psb* target. In this case however T&T has net public debt and hence a negative initial level of public wealth. To estimate a fiscal target for the structural primary balance we need information for structural oil revenues, public debt, public assets and the real interest rate and real GDP growth rate, as shown in the above equation²⁰.

The structural oil revenue is the one obtained through the error correction procedure presented in a previous section. The key piece of data to derive the structural oil revenue is the future structural oil price, and it is possible to relate the projected average structural oil revenue with a projected oil price. For a price close to 90 dollars per barrel, the structural oil revenue would amount to 16 percent of GDP, in the other extreme a projected oil price of 45 dollars per barrel, the structural oil revenue would be only 8 percent of GDP. In that sense the projection of oil price appears as the key variable to project future oil revenue²¹.

Considering different possibilities for the structural oil revenue and for the number of years before the depletion of oil resources, the results for the fiscal target are presented in Table IV.4.2. The target for the structural primary balance is presented as a function of the number of

²⁰ The information on public sector debt and assets was obtained from the Central Bank of Trinidad and Tobago

²¹ The international oil prices are deflated by the US CPI is used for the calculations.

years of oil production left, ranging from 20 to 60, and the oil price that determines the structural oil revenues considered, ranging from 8 percent of NO_GDP to 16 percent of NO_GDP. The result indicates that the fiscal target for the primary balance would range from a maximum of almost 7.7 percent of GDP under very high oil revenues (16 percent of GDP-oil price of 90) and a relative short period of years of oil production remaining (20). On the other extreme a primary fiscal balance of only 1.6 percent of GDP would be required under a very long period of remaining oil production (60 years) and a reduced value of the structural oil revenue (8 percent of GDP-oil price of 45).

Table IV.4.1: Implicit “Long Term” Oil Price for Structural Oil Revenues

Structural oil revenues	Implicit Oil price
GDP percent	Dollars the barrel
16%	89
15%	84
14%	79
13%	73
12%	68
11%	63
10%	57
9%	52
8%	46
7%	41
6%	35

Source: LE&F simulations

Table IV.4.2: Fiscal Targets for the Primary Fiscal Balance (in percent of GDP) as a Function of Structural Oil Revenues and Years of Oil Production Remaining

Horizon/Structural oil revenues	8.00%	9.00%	10.00%	11.00%	12.00%	13.00%	14.00%	15.00%	16.00%
20	4.16%	4.61%	5.06%	5.51%	5.95%	6.40%	6.85%	7.30%	7.75%
30	3.14%	3.47%	3.80%	4.12%	4.45%	4.78%	5.10%	5.43%	5.76%
40	2.45%	2.69%	2.94%	3.18%	3.42%	3.67%	3.91%	4.16%	4.40%
50	1.95%	2.14%	2.32%	2.51%	2.70%	2.88%	3.07%	3.25%	3.44%
60	1.59%	1.73%	1.88%	2.02%	2.16%	2.30%	2.45%	2.59%	2.73%

Source: LE&F, based on information from the Central Bank of Trinidad and Tobago

A better idea of the fiscal effort required would be the non-oil primary structural balance implicit in the fiscal target for the structural primary balance. It can easily be obtained subtracting the structural oil revenues to the primary balance target psb*. In general the target for the non-oil primary balance is a deficit as large as -13 percent of GDP associated with 60 years of oil production left and 16 percent of GDP in structural oil revenue, that is with an implicit reference oil price of 90 dollars per barrel. However, if the conditions are less favorable, the required or

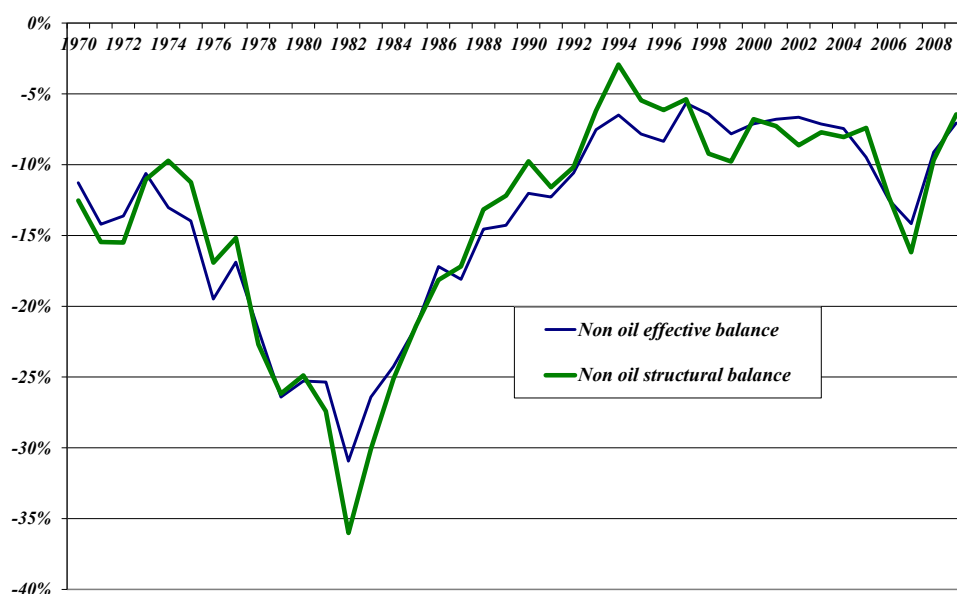
target non-oil structural deficit would be severely reduced, to only -3.8 percent of GDP if there were only 20 years of oil production left and if the structural oil revenue would represent only 8 percent of GDP, with an implicit oil price of 45 dollars per barrel.

Table IV.4.3: Fiscal Targets for the Primary Non-Oil (in percent of GDP) as a Function of Structural Oil Revenues and Years of Oil Production Remaining

Horizon/Structural oil revenues	8%	9%	10%	11%	12%	13%	14%	15%	16%
20	-3.84%	-4.39%	-4.94%	-5.49%	-6.05%	-6.60%	-7.15%	-7.70%	-8.25%
30	-4.86%	-5.53%	-6.20%	-6.88%	-7.55%	-8.22%	-8.90%	-9.57%	-10.24%
40	-5.55%	-6.31%	-7.06%	-7.82%	-8.58%	-9.33%	-10.09%	-10.84%	-11.60%
50	-6.05%	-6.86%	-7.68%	-8.49%	-9.30%	-10.12%	-10.93%	-11.75%	-12.56%
60	-6.41%	-7.27%	-8.12%	-8.98%	-9.84%	-10.70%	-11.55%	-12.41%	-13.27%

Source: LE&F, based on information from Central Bank of Trinidad and Tobago

Figure IV.4.1: Non oil Effective and Structural Balance (In percent of GDP)



Source: Central Bank of T&T and LE&F estimations

The determination of a reasonable fiscal target for T&T is a debatable issue, subject to an informed judgment on the future “sustainable” price of oil and the structural oil revenue that the T&T public sector would be receiving in the future. This source of revenue would have to be eventually replaced after oil exhaustion; therefore the number of years remaining before exhaustion (or obsolescence) is the other key element in selecting the fiscal target. Although this is a matter for experts in T&T oil and gas sector, the impression formed on the basis of the data

gathered and the interviews sustained during the visit to Port of Spain, indicate that a reasonable horizon of oil production remaining is no greater than 30 years. On the same basis, we have taken the view that T&T can sustain for that number of years structural oil revenue averaging about 10 percent of GDP, which is consistent with an oil price of about 70 dollars per barrel, the trend price obtained by the previously estimated autoregressive equation. If that were the case, the fiscal target ought to be a primary balance (surplus) of 3.8 percent of GDP. Consequently the non-oil balance consistent with that target would be a deficit of -6 percent of GDP. This target for the non-oil balance has not been attained in the last five years when the structural non-oil deficit has fluctuated from -7 percent of GDP to -16 percent of GDP. The suggested fiscal target is consistent with the fiscal policy stance effective during the period 1993–1997 and not very different from that of 2000–2002.

However attaining the target starting from current fiscal conditions, i.e. a non-oil structural deficit of -10 percent of GDP, would require an adjustment of about 4 percent of GDP in public spending cuts or non-oil taxes hikes. Under a more optimistic view about the reference price for oil, like the price of 85 obtained under the average of past and future prices, the structural oil revenues expected for the future would be the equivalent of 15 percent of GDP. Given that the structural oil revenue is higher, the target is more demanding because a larger fund would be needed to replace larger oil revenue being used in the T&T economy. Now, the primary balance target is the equivalent of 5.43 percent of GDP. Still this more optimistic view and more demanding fiscal target implies a looser fiscal stance, because the implicit target for the non-oil balance would be a deficit of -9.5 percent of GDP. This is the result of subtracting from the 5.4 percent primary target the 16 percent of GDP in structural oil revenue under this alternative. This non-oil fiscal balance target is not very different from that obtained in the last few years.

Table IV.4.4: Fiscal Targets and “Long-Term Oil Price”

	Structural oil Price	Structural oil revenue in percent GDP	Target Primary Non-oil balance In percent GDP	Target Primary balance in percent GDP
Autoregressive equation	US\$60	10.00 percent	-6.00 percent	3.80 percent
Moving average	US\$85	15.00 percent	-9.50 percent	5.40 percent

Source: Central Bank of T&T and LE&F estimations.

A more optimistic view about the structural annual oil revenues implies a more demanding total fiscal target, but still a looser fiscal policy.

5. The Role of the Sovereign Fund

In the year 2000 Trinidad and Tobago established a Sovereign Fund whose purpose was to stabilize fiscal revenue. Until 2007 the fund had an interim basis, and from that year on it was more formally organized and called since then the Heritage and Stabilization Fund (HSF). In December of 2009 the fund totaled more than US\$ 3 billions in deposits. The objectives of the fund, as Ministry of Finance of Trinidad and Tobago said, are to cushion the impact on or sustain public expenditure capacity during periods of revenue downturn whether caused by a fall in prices of crude oil or natural gas; generate an alternative stream of income so as to support public expenditure capacity as a result of revenue downturn caused by the depletion of non-renewable petroleum resources; and provide a heritage for future generations, of Trinidad and Tobago.

The rules of operation of the HSF consider that when the effective petroleum revenue exceeds by more than 10 percent its estimated value, the excess should be deposited in the HSF. Excesses of less than 10 percent may at the decision of the government be also deposited in the HSF. When the petroleum revenues fall below the estimated by at least 10 percent (10 percent), withdrawals may be made from the Fund as follows, whichever is the lesser amount: Either sixty percent (60 percent) of the amount of the shortfall of petroleum revenues for that year; or Twenty-Five percent (25 percent) of the balance standing to the credit of the Fund at the beginning of the year.

Under the structural fiscal policy proposed in this paper, the HSF would play an important role in continuously accumulating the resources generated by the fiscal surplus targeted. The accumulation should not only result from the difference between actual oil revenue and the oil revenue that would have been received at the reference price. Under the proposed policy the target is more demanding as it considers the accumulation of a heritage fund so that future generations can confront oil exhaustion or obsolescence. The target for the primary fiscal balance implies a deposit to the fund that has to be made even though the effective price of oil was exactly equal to the reference or long term price.

The resources accumulated in the HSF should also generate returns that would be reinvested and help the accumulation of resources in the HSF. We estimate that the relevant real rate of return should be associated to an indicator for the real return on global assets, including both fix income and equity investments. Current rates of return are relatively low due to current global macroeconomic conditions, so that the real global rate of return in the long run ought to be estimated rather than on current rates, on the basis of historical rates. We propose to use the average annual growth rate of the JPM Global Bond Index, used to represent the fix income rate

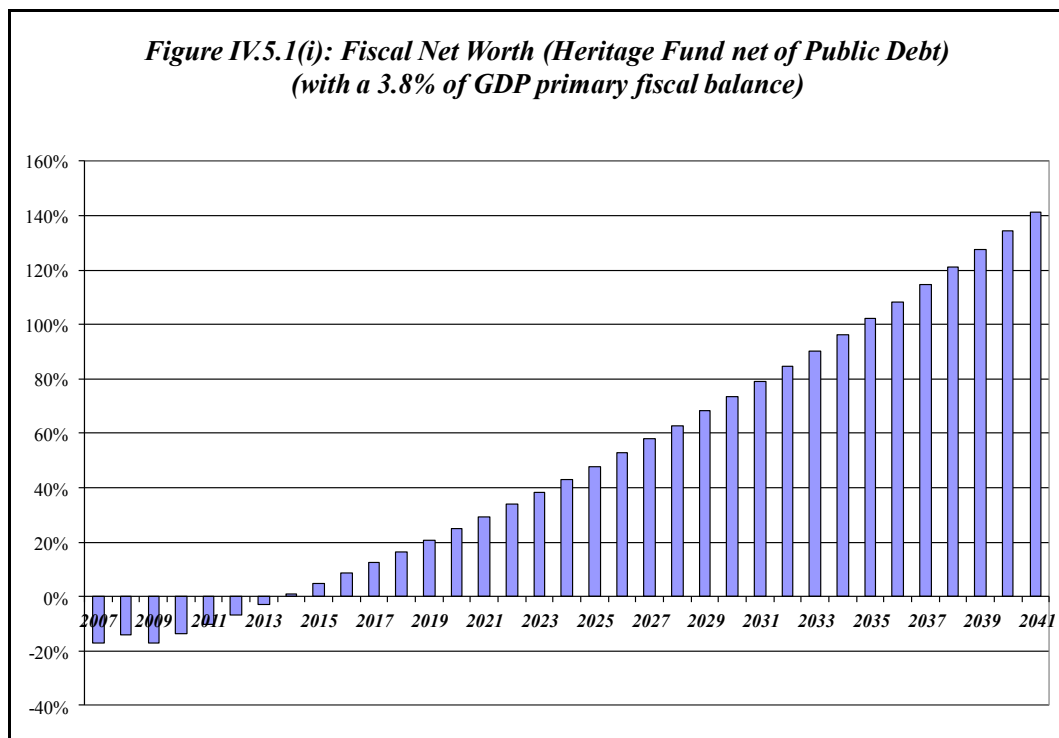
of return, and the MSCI all countries index, used to represent the rate of return on equity. The average annual return in dollars for the period of about 30 years that both indices are available is used to represent the nominal rate of return in U.S. dollars, while the real rate of return is obtained deflating by the US CPI. We assume that the sovereign fund would give an equal weight to fixed income and equity investments considering its long term nature and that would diversify so as to approach a global portfolio, but other possibilities of portfolio composition are also possible. The historical average real return of this global portfolio can be considered to represent the global real interest rate that will prevail in the long run, and was estimated at 4.65 percent per year²². The average structural GDP growth rate estimated for Trinidad Tobago is of 2.3 percent as presented in the projection exercise previously in this section. The initial wealth value in 2009 is equal to -17.3 percent of GDP, considering the amount saved in sovereign wealth fund and the level of public debt.

The estimates of oil and gas reserves indicate that known energy resources may sustain around 15 years of production at current levels. However, it has been shown now and again that oil reserves are not monotonically descending with exploitation; they can be maintained and even increase as the result of new discoveries and technological improvements. Thus, the approach taken in this work is that there are alternative views on the number of years left of oil and gas production, considering a range from 20 to 60 years of future production. The more years of oil and gas production remaining, the lower would be the fiscal target required to generate the fiscal revenue alternative to oil. The risk of course is to overestimate the number of years of energy production left in T&T, at the cost of having to severely reduce the non-oil fiscal deficit, cutting the level of public spending or increasing non-oil taxes, if depletion occurs before it is anticipated.

Following the target of a 3.8 percent of GDP primary surplus, the accumulation of net fiscal wealth would be sustained as presented in Figure III.5.1.i. After few years, the resources accumulated in the heritage fund would balance out the existing debt so that in 2015 the net worth becomes positive. After 30 years of accumulation following the fiscal target, the net fiscal wealth would reach the equivalent of 140 percent of GDP. Such level of wealth would generate a sustained income equivalent to 6.2 percent of GDP that would substitute the oil revenue (10 percent of GDP), and continue to finance a stable non-oil deficit.

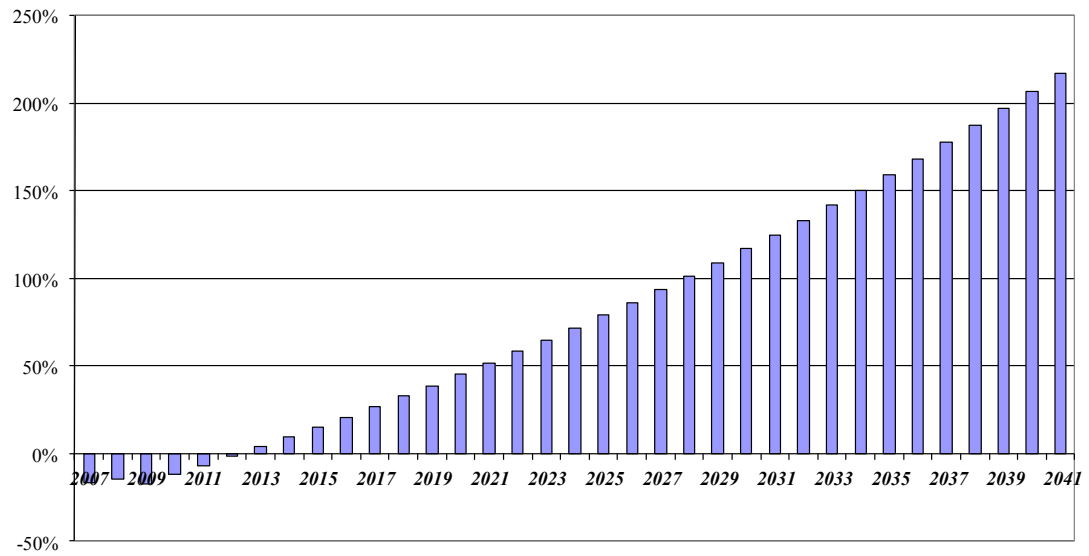
²² In the estimations effectively used, the real interest rate should reflect the expected long term rate of return of the sovereign fund defined by its policies and international financial conditions.

Following the target of 5.4 percent of GDP in primary fiscal balance, the accumulation of resources into the Fund would be more intense. By 2015 the net worth of T&T becomes positive as the deposits in the fund exceed public debt. By 2035 the fund would be reaching 140 percent of GDP, six years before than in the other case, and by 2040 the fund would accumulate more than 200 percent of GDP in resources.



Source: Central Bank of T&T and LE&F estimations.

**Figure IV.5.1(ii): Fiscal Net Worth (Heritage Fund net of Public Debt)
(with a 5.4% of GDP primary fiscal balance)**



Source: Central Bank of T&T and LE&F estimations.

V. Design and Preconditions for the Fiscal Rule in T&T

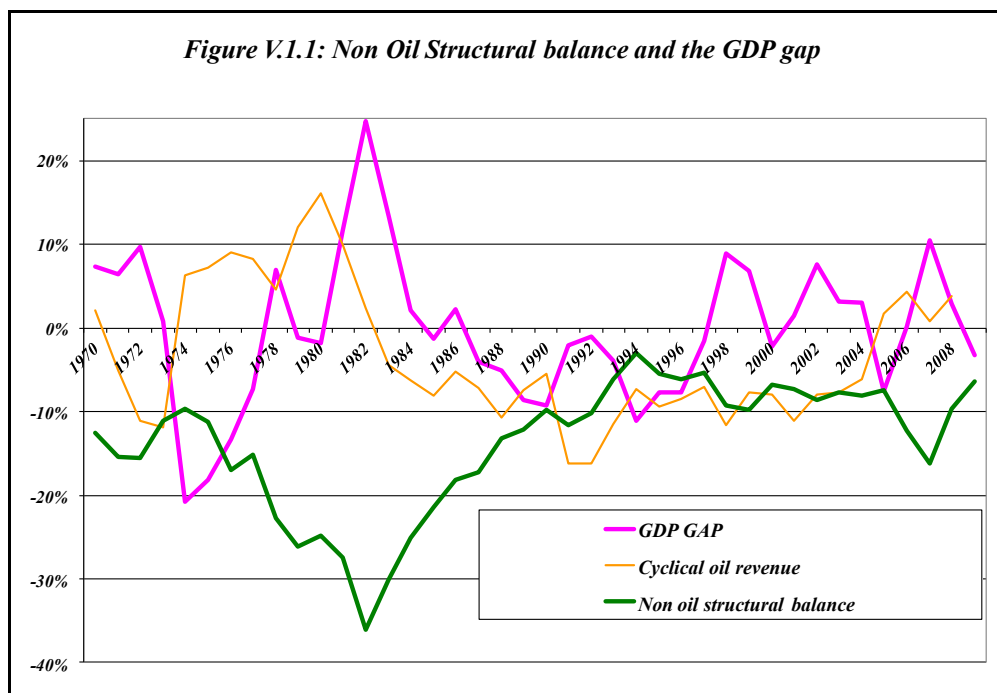
1. The Design of the Fiscal Rule in an Oil based Economy

There are at least three important contributions that a fiscal rule can make to an oil dependent country like Trinidad and Tobago. First, reduce the macroeconomic instability, GDP- gap and real exchange rate volatility, induced by the oil price cycles and associated fiscal spending; second, anticipate and confront with adequate measures the main long term risk faced by a resource based economy: the sharp reduction of the revenue source, due to resource exhaustion or obsolescence; third, generate confidence in the future of the Trinitarian economy by making explicit policy commitments that reduce medium and long term risks.

There is an historical track record of macroeconomic instability in Tat's economy that is evident in the ups and downs of the GDP gap. According to the estimates developed in this work, the GDP gap has presented a maximum of +25 percent of GDP and minimum of -25 percent of GDP in the 1970s. Since that could be considered ancient history, we can establish that in recent years the fluctuations are still very large: the maximum in the last decade is of +10 percent of GDP and the minimum -10 percent of GDP, perhaps less impressive but still representing very large fluctuations in economic activity and the degree of utilization of resources. The gap impacts on the real exchange rate, so that appreciations take place during the booms (positive gap).

It happens that the wide swings in the GDP gap can be associated with swings in fiscal policy: Very large and increasing non-oil fiscal structural deficits are associated with large and increasingly positive GDP gaps. Conversely, low and shrinking fiscal deficit are associated with increasingly negative GDP gaps. Those very large swings in the fiscal policy stance are to some extent associated to cyclical oil prices, that historically have had large expansionary effects on fiscal spending, thus generating large non-oil fiscal deficits. Those non-oil fiscal deficits stimulate domestic demand and impulse a widening positive GDP gap together with real exchange rate appreciation. When the oil price falls down, the non-oil deficit shrinks, thus the demand stimulus is retracted, resulting in a gap that initially falls towards zero and then, as the financing possibilities are exhausted and the fiscal adjustment gets tougher, becomes deeply negative with the implied social consequences on unemployment and poverty.

A structural target for fiscal policy, where public spending is associated to structural revenue and hence independent from short-term fluctuations in the oil price, would soften the volatility affecting the Trinitarian economy. This would show up in a stable structural primary balance and a stable structural non-oil deficit, and thus in a less volatile GDP gap.



Source: Central Bank of T&T and LE&F estimations.

The main long term risk of a resource based economy is the exhaustion or obsolescence of the resource base. Trinidad and Tobago obtains 10 percent to 15 percent of GDP in fiscal revenue from oil, and maintains a non-oil fiscal deficit not much lower than the level of oil income. The exhaustion of oil and of the associated source of fiscal revenue would require an adjustment of the fiscal stance of 10 percent to 15 percent of GDP, similar to the one that Greece is confronting these days, but without a possible support from the European Community or other club of rich countries since T&T is not a member of any. Such event would be a catastrophe of biblical proportions for the Trinitarian economy, including a sharp contraction in activity and a collapse of the currency, a run on T&T assets in general and a crisis in the financial system.

The probability of a sudden reduction and exhaustion of oil revenue appears to be low for the next decade, but as time goes by the probability will increase monotonically. It is known as a fact that after 5 or 6 decades from today oil will disappear and the T&T economy will face a catastrophe if it has not prepared to confront oil exhaustion. To confront oil exhaustion an alternative source of fiscal revenue should be built, the one considered in this work is a sustained

savings effort to generate a sovereign fund that would provide alternative income in a similar way as the Norwegian Oil Fund. The sooner the savings effort is implemented through a structural primary surplus in the fiscal account, the lower would be the impact of a sudden fall in oil revenue, as a larger cushion would have been built. The size of the cushion would very much depend on the number of years with fiscal primary surpluses at the time of oil exhaustion, and in that sense time is the essence.

A structural fiscal policy that addresses the oil exhaustion risks and that clarifies future policy intentions would go a long way in reducing uncertainty regarding the T&T economy. Despite the large oil wealth, the spreads at which the T&T economy has been able to lift foreign financing is relatively high, averaging around 300 basis points over the years. A structural policy that addresses the main risk would reduce the cost of financing for the T&T public sector, allowing reducing the cost of the expensive public debt, but more importantly to reduce the cost of financing for the local private sector. That may spark a more rapid expansion of investment and capital accumulation and hence a more rapid growth rate and diversification of the economy away from oil, particularly considering the impact of the structural fiscal policy on the real exchange rate.

The definition of the primary structural surplus selected as the fiscal target would require the value of several long term parameters for the oil sector and the macroeconomic conditions. Among them, the average structural oil revenue as a percent of GDP projected for the long term, which depends primarily on the long term oil price and the rate of oil exploitation. That needs to be defined along with the number of years that such revenue would be available before oil exhaustion, which depends on existing oil and gas reserves, the future discoveries that can be anticipated and the rate of exploitation of the resource. Among the long term macroeconomic parameters to be defined are the long term growth rate of the T&T economy and the long term real interest rate that will be earned by the sovereign funds.

Given that the determination of the value of those variables is a technical issue, a board of 3 to 5 experts could be selected and given the responsibility of defining the fiscal target for the next 5 years and the value of the variables in which that target is based. After 5 years the target should be revised on the basis of what has effectively happened with the level of oil reserves, the level of the financial wealth and the changes of views that may have affected the value of the long term oil and macroeconomic parameters.

The annual estimation of the structural oil and non-oil revenue requires the definition of several oil sector and macroeconomic medium term parameters. Those for the structural oil revenue include the structural oil price, the structural oil output and the trend of the real

exchange rate. Those for the structural non-oil revenue requires the estimation of trend GDP, based on the estimations for the trend TFP, trend capital stock, trend labor force and natural unemployment.

The determination of all these variables is also a technical issue, accordingly a board of experts could be given the responsibility of defining the value of the medium term parameters, on the basis of which the budget office should prepare the estimates for oil and non-oil revenue to be included in the budget. The 3 to 5 members of the technical board could be given the responsibility of selecting the fiscal target every five years on the basis of the long term parameters. Also the same board could define annual values of the medium term parameters upon which are based the calculations of the structural fiscal revenue to be used in the annual budget.

The board members could be selected by the government with the approval of parliament, privileging the academic credentials and technical capacities of the individuals and giving them independence through periods of 10 years, without re election, so as to avoid a competition for political favor among existing Board members. The idea is that the Board members could not be removed before the end of their period unless wrong doing or failure to comply with their duties as determined by the relevant Court of Law. The first Board members should be nominated for escalating periods, i.e. a board with five members would be nominated for 10, 8, 6, 4 and 2 periods, with the members elected for less than 6 years having the right to be re nominated.

The Board would define the framework under which the fiscal policy is to be conducted by the government and parliament. Fiscal policy would continue to be managed by the Government with the approval of Parliament, and in its definitions would include selecting the composition of spending and also increasing or reducing the level of spending, to the extent that true resources (additional or less taxes) are approved by law.

To achieve the proper functioning of the structural fiscal policy it is necessary to create consensus on the importance of this national policy. It is essential that compliance of the fiscal target is priority and not subject to discretion or political maneuvering. For the foregoing is necessary to consider a series of measures:

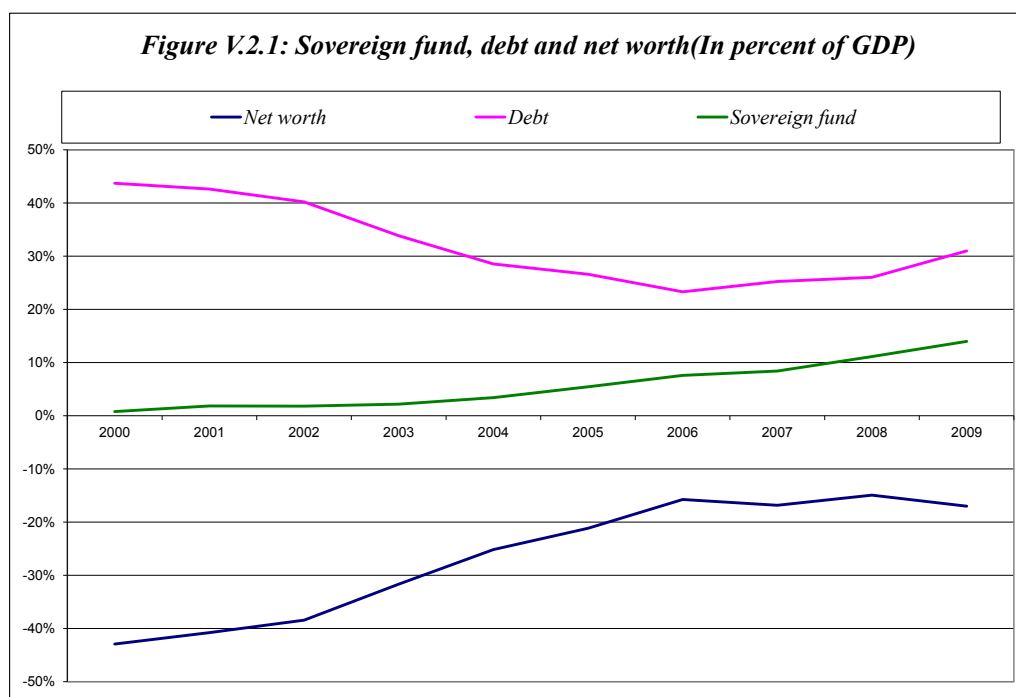
- The definition of the fiscal target and the calculations of the structural revenues made by a group of experts can not be changed arbitrarily by the executive and should be based on structural estimates of the kind presented in this work.
- In case the government wants to run a counter cyclical policy and hence deviate from the fiscal target during years of international recession, that

should be made explicit and the fiscal board should concur and agree with the government counterbalancing measures to be taken later during the years of more rapid economic expansion. This is nothing more than an escape clause for the fiscal rule. The escape clauses are best when the trigger conditions are made explicit and objective and when they have an explicit reversion once the triggering factors have receded.

- Fiscal accounts must be fully transparent and public, so that the compliance or noncompliance with the fiscal target is information known by all.

2. Sustainability of the Existing Fiscal Policy in T&T

The information available indicates that the net worth of the Trinitarian Public Sector has been continuously improving during the last decade. The level of public debt declined continuously from 56 percent of GDP in 1999 to 32 percent of GDP in 2006, but since then has stabilized at around 30 percent of GDP. The Public sector net worth has continued to improve from -32 percent of GDP in 2006 to -14 percent of GDP in 2008 because of the accumulation of resources in the sovereign fund. In 2009 the public sector net worth deteriorated slightly to -17 percent of GDP as a result of the expansive policies implemented to confront the global recession. The financial position of the public sector has been improving and in this regard appears perfectly sustainable, however there are two issues to flag regarding sustainability, the first is the portfolio composition between debt and sovereign fund, and the second the vulnerabilities stemming from oil revenue.



Source: LE&F, based on information from Central Bank of Trinidad and Tobago

The portfolio composition between debt and assets in the sovereign fund seems not to be optimal. The rate of return of the assets in the sovereign fund falls short of the financing cost of public debt, hence more than to continue accumulating assets in the fund, it may make sense to pre pay the most expensive types of debt. That is, the savings to be obtained in the future should first be used to pre pay expensive debt rather than continue accumulating assets, at least to a point that remaining debt is reasonably priced.

Debt and the net worth of the public sector seem to be in a sustainable path. However the vulnerability of T&T public sector does not arise from excessive indebtedness, but from oil revenue. The problem is for how long oil revenue will continue at its current level allowing large non-oil deficit that have fluctuated between 10 percent and 15 percent of GDP over the last few years. The selection of a fiscal target on the basis of 30 more years of oil revenue at the tune of 10 percent of GDP per year would imply an implicit non-oil primary deficit of only 6 percent of GDP. In that regard, to take a fiscal path that ensures long-term sustainability the T&T public sector requires to carry on an adjustment of 4 percent of GDP, which is not minor. The adjustment needed reflects pending requirements to ensure sustainability, however the adjustment would be softer to the extent we consider a longer horizon of remaining oil revenue, and a higher level of sustained oil revenue. With a 60 year horizon of oil revenues and an average of 16 percent of GDP of oil revenue, then the required non-oil balance would be -13 percent of GDP, which is similar to the one existing today. In that sense fiscal sustainability in

T&T today is a debatable issue that depends on the views regarding the level and duration of oil revenues. The problem with being too optimistic regarding the future oil revenue is that the probability of falling short of expectations and having to confront a crisis becomes very high, in that regard prudence seems to be advisable.

It is important to note that the need for some fiscal adjustment to ensure long-term sustainability of public sector finances in T&T is not a precondition for establishing a structural rule. Quite the opposite, a structural fiscal rule would be a way to address the long term vulnerabilities stemming from massive oil revenues that will eventually be discontinued in the coming decades. In this regard the precondition for a fiscal rule is to establish fiscal institutions that can carry a national policy with a medium to long term view, like the proposed Fiscal Board and a Budget Law that would require the annual budget to be subject to a structural framework, with parameters defined by a technical board. Under current institutions the government in charge has all the power to define fiscal policy without more boundaries than currently available fiscal revenues. Then the incentives are to use as much as possible of the effective oil revenue, without much regard for what would happen in the future after the government has left office. The people of T&T ought to have a longer planning horizon for fiscal policy like the one provided by the institutions of a structural fiscal policy.

3. Fiscal Data and Transparency

The availability of fiscal and macroeconomic data in Trinidad and Tobago is quite limited and we have to confront various problems to compile the data base for this work. Most of the data come from economic reports of the Central Bank of Trinidad and Tobago or the Ministry of Finance, obtained in a trip to Port of Spain. However, public data availability through their websites is limited since it covers only since 1990, most in the central bank's annual reports in PDF format and is not directly downloadable from the web. In addition there are certain pieces of information that were not possible to obtain despite the many efforts made, for example it was impossible to find information on the maturity composition, currency composition and interest rate composition of public debt. The vast majority of the data used were obtained directly from the sources, after the author visited Trinidad and Tobago, where we were given in physical format a statistical compendium of the Central Bank with most of the information required. Other sources of data were obtained from ECLAC and IMF. All this indicate that there is much to be done in terms of transparency of the fiscal accounts and macroeconomic data.

Regarding the data used, there are potential shortcomings, because of the estimates used for certain variables and parameters that can be inaccurate. That is the case of the depreciation rate upon which the capital stock was estimated, calculated using information from the Penn World Tables, rather than the system of national accounts. In the same token, the weight of capital and labor in the production function was obtained from estimates in a work by Bernanke et al (2001), and not on the national Accounts. We lacked estimates of hours worked or of average years of schooling. More over, the estimates of the elasticities of fiscal revenue and expenditure to trend GDP were derived on the basis of aggregated data and not by individual taxes or spending lines, which was not possible due to the lack long time series for such data.

VI. Concluding Remarks

Fiscal policy in Trinidad and Tobago has shown an erratic trend throughout its history and different periods can be differentiated. First, during the 1970s a very volatile fiscal outcome was registered, going from large surpluses of up 10 percent of GDP to wide deficits reaching down to -5 percent of GDP. Afterwards in the 1980s, a period of very wide fiscal deficits was observed with a maximum of -14 percent of GDP in 1982. Later, in the nineties, the fiscal deficit was reduced keeping a fiscal balance close to 0 percent until the Asian crisis, when it became negative again. Finally, in the last decade we observed an improvement in the fiscal balance, with a surplus averaging around 3 percent of GDP. Most of these ups and downs obey to the ample fluctuations of the oil and gas price that obscures the evolution of the fiscal stance. The fiscal stance deteriorated sharply during the late 1970s and early 1980s, reaching a maximum non-oil deficit of more than 30 percent of GDP in 1982. Over the next decade or so the non-oil fiscal balance improved on a sustained basis until reaching the maximum historical non-oil fiscal balance: a deficit of 6 percent of GDP during the early years of this decade. Since 2006 the non-oil fiscal deficit has deteriorated again, fluctuating between -10 percent and -15 percent of GDP.

In this work we attempt to construct estimates of the structural fiscal balance, distinguishing between the oil and non-oil fiscal balance. For the non-oil structural fiscal balance we used a production function methodology, similar to that employed by the OECD countries, particularly Chile. For the oil sector, the structural revenue was estimated using an error correction equation in which the most relevant variable is the estimated reference or “trend” oil prices. To estimate the reference oil price we used two alternative approaches. The first consisted in the estimation of an autoregressive equation for the price of oil, which gave a long-term price of U.S. \$ 60. The second approach considers a moving average between the price of future oil contracts until 2016 and the price of the last three years. This last estimate indicated a price of U.S. \$ 87. Using each of them we get different estimates for structural oil revenues.

The issue of the reference oil price and the structural oil revenue clouds the debate. This is not the main problem faced by an oil dependent economy in defining its fiscal policy. Selecting any value for the reference oil price and the structural oil revenue the main problem remains: How would this “structural oil revenue” be replaced after oil exhaustion, a sure event, or obsolescence, a possible event? To confront that main problem, the paper proposes the derivation of a structural fiscal target to use as a guide in the definition of fiscal policy in an oil dependent economy. The fiscal target is obtained for both the total and the non-oil structural balance, considering the need for substituting for the oil revenue after the exhaustion or

obsolescence of this resource. During the remaining period with oil and gas resources, the total fiscal surplus should be used to accumulate a stock of public wealth that would generate a sustained source of alternative fiscal revenue in the future, which should be enough to replace oil revenue after its exhaustion or obsolescence.

The fiscal target is dependent on the trend oil revenue that will be replaced by the accumulated wealth, which in turn depend on the trend oil price. Under the first approach with a structural price of US \$ 60, which translates into a structural oil revenue of 10 percent of GDP, the target for the total primary fiscal balance is of 3.8 percent of GDP, and the target for the non-oil structural balance is a deficit of -5 percent of GDP. Under the second more lax approach, we get a structural oil price of US \$ 87, with consequent structural oil revenue of 15 percent of GDP. Consequently, the non-oil balance target would be a larger deficit of -9 percent of GDP. Is interesting to note that under the first approach a fiscal adjustment of 7 percent of GDP is required in the non-oil structural fiscal balance, estimated at -12 percent of GDP in 2008. Under the second approach the required adjustment would be reduced to 3 percent of GDP, but would be adjustment still. A far more optimistic view on oil price and structural oil revenue may reduce further the need for adjusting the non-oil balance, but would demand a higher target for the primary fiscal surplus, given that more structural oil revenue will need to be replaced in the future.

A less optimistic view on the structural oil price and the structural oil revenue is favorable in different counts. First it would reduce the dependence on oil and the risk of a policy reversal in the event of exhaustion, given that fiscal policy would be based on lower structural oil revenue. Second it would reduce the non-oil fiscal deficit, which would not only contribute to the accumulation of resources to reduce the impact of the exhaustion of fiscal oil revenue, but also would better prepare the economy for such event. A lower demand pressure coming from fiscal policy and the non-oil fiscal deficit, would allow for a more depreciated real exchange rate and thus to stimulate the production of tradable goods alternative to oil.

A structural target for fiscal policy, where public spending is independent from short-term fluctuations in the oil price, would soften the volatility affecting the Trinitarian economy. However, even if the oil reference price is let to fluctuate with the actual price, the proposed fiscal target would contribute to confront the main long term risk of a resource based economy: the exhaustion or obsolescence of the resource base. The exhaustion of oil fiscal revenue would require an adjustment of the fiscal stance of 10 percent to 15 percent of GDP, a catastrophe, including a sharp contraction in activity, a collapse of the currency, a run on T&T assets in general and a crisis in the financial system. The probability of a sudden reduction and exhaustion

of oil revenue appears to be low for the next decade, but as time goes by the probability will increase monotonically. To confront oil exhaustion an alternative source of fiscal revenue should be built, the one considered in this work is a sustained savings effort to generate a sovereign fund that would provide alternative income in a similar way as the Norwegian Oil Fund.

A structural fiscal policy that addresses the oil exhaustion risks and that clarifies future policy intentions would go a long way in reducing uncertainty regarding the T&T economy. A structural policy that addresses the main risk would reduce the cost of financing for the T&T public sector, but more importantly to reduce the cost of financing for the local private sector. That may spark a more rapid expansion of investment and capital accumulation and hence a more rapid growth rate and diversification of the economy away from oil.

There are two issues to flag regarding fiscal sustainability in T&T, the first is the portfolio composition between debt and sovereign fund, and the second the vulnerabilities stemming from oil revenue. The rate of return of the assets in the sovereign fund falls short of the financing cost of public debt, hence more than to continue accumulating assets in the fund, it may make sense to pre pay the most expensive types of debt. Debt and the net worth of the public sector seem to be in a sustainable path. The problem is for how long oil revenue will continue at its current level allowing large non-oil deficit that have fluctuated between 10 percent and 15 percent of GDP over the last few years. To take a fiscal path that ensures long-term sustainability the T&T public sector requires carrying on an adjustment of 4 percent of GDP, which is not minor. With a 60 year horizon of oil revenues and an average of 16 percent of GDP of oil revenue, then the required non-oil balance would be similar to the one existing today. The problem with being too optimistic regarding the future oil revenue is that the probability of falling short of expectations and having to confront a crisis becomes very high, in that regard prudence seems to be advisable.

Finally, the paper reviews a series of conditions for the implementation of a structural fiscal policy and makes several recommendations to facilitate the implementation and choice of the rule, including measures to increase fiscal transparency and developing fiscal institutions. The precondition for a fiscal rule is to establish fiscal institutions that can carry a national policy with a medium to long term view. Under current institutions the government in charge has all the power to define fiscal policy without more boundaries that currently available fiscal revenues. Then the incentives are to use as much as possible of the effective oil revenue, without much regard for what would happen in the future after the government has left office. The people of T&T ought to have a longer planning horizon for fiscal policy like the one provided by the institutions of a structural fiscal policy.

VII. Appendix

Appendix 1: Estimates of Trend Non-Oil GDP and GDP Gap

	Estimated non oil GDP gap	Estimated non oil trend GDP growth	Effective non oil GDP growth
1965	2.47%	1.59%	1.74%
1966	-5.18%	1.89%	-5.61%
1967	-3.39%	1.05%	2.88%
1968	-1.10%	0.68%	3.01%
1969	4.26%	1.03%	6.59%
1970	7.31%	3.48%	6.69%
1971	6.48%	3.43%	2.58%
1972	9.72%	2.95%	6.33%
1973	0.82%	1.42%	-7.21%
1974	-20.76%	-0.85%	-20.10%
1975	-18.14%	0.53%	3.19%
1976	-13.37%	3.60%	8.66%
1977	-7.32%	4.53%	11.05%
1978	6.94%	5.68%	21.87%
1979	-1.13%	5.83%	-2.37%
1980	-1.77%	3.37%	2.72%
1981	11.61%	2.78%	17.50%
1982	24.79%	4.57%	19.30%
1983	13.39%	2.89%	-8.19%
1984	2.17%	1.48%	-9.29%
1985	-1.32%	-0.47%	-3.88%
1986	2.30%	-1.20%	2.43%
1987	-4.06%	-1.52%	-7.58%
1988	-5.12%	-1.49%	-2.53%
1989	-8.56%	-1.46%	-4.79%
1990	-9.32%	-1.16%	-1.91%
1991	-2.06%	0.10%	7.64%
1992	-0.97%	0.62%	1.73%
1993	-3.86%	1.30%	-1.60%
1994	-11.08%	2.35%	-4.78%
1995	-7.63%	3.87%	7.52%
1996	-7.68%	4.73%	4.68%
1997	-1.60%	6.52%	13.20%
1998	8.87%	6.51%	18.26%
1999	6.80%	4.87%	2.72%
2000	-2.15%	3.60%	-5.26%
2001	1.46%	4.86%	8.72%
2002	7.57%	4.45%	11.03%
2003	3.12%	3.82%	-0.70%
2004	3.08%	3.48%	3.44%
2005	-7.59%	3.46%	-7.01%
2006	0.18%	2.61%	10.91%
2007	10.45%	2.48%	13.57%
2008	2.88%	1.77%	-5.65%
2009	-3.20%	2.91%	-3.15%
2010	-3.36%	2.13%	1.96%
2011	-2.47%	2.13%	3.04%
2012	-1.58%	2.16%	3.08%
2013	-0.45%	2.22%	3.38%
2014	-0.31%	2.26%	2.41%
2015	-0.19%	2.29%	2.41%
2016	-0.10%	2.32%	2.41%
2017	-0.03%	2.33%	2.41%
2018	0.04%	2.34%	2.41%
2019	0.11%	2.34%	2.41%
2020	0.19%	2.33%	2.41%
Average	-0.35%	2.39%	2.62%

Appendix 2: The Cyclicalities of Fiscal Spending

The response of fiscal expenditure to GDP also indicates that the long run elasticity is greater than one, reflecting the increasing participation of the government sector in economic activity in Trinidad. The responses of public expenditure to the GDP cycle and to the trend non-oil GDP are 1.26 and 1.03 respectively. The elasticity of expenditure with respect to the GDP gap and GDP trend are high and cannot be distinguished. Expenditure presents a pro cyclical bias given that the GDP gap coefficient is significantly greater than 0. Moreover, given that the elasticity of fiscal expenditure with respect to effective GDP is around 1, the cyclical fluctuations of government expenditure are wider than those of GDP.

Table A2.1: Regressions for Total Fiscal Expenditures and GDP

Dependent variable	log Total fiscal expenditure	
	coefficient	p value
Constant	-1,579226	0,2353
log Effective GDP	1,072618	0
R2	0,6558	
Durbin Watson	0,1821	

Dependent variable	log Total fiscal expenditure	
	coefficient	p value
Constant	-1,23773	0,4141
log Non oil trend GDP	1,03931	0
GDP gap	1,268581	0,005
R2	0,658	
Durbin Watson	0,2085	

Source: LE&F.

Appendix 3: Trinidad and Tobago Database

[First section.xls](#)

[Second Section.xls](#)

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