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THE IMPACT OF OIL ON TRINIDAD AND TOBAGO 1966-1990

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Benjamin, Devarajan and Weiner (1989) which looks at the impact of oil windfalls in the Cameroon. Secondly the management of the commodity boom relative to the consumption pattern, public and private will be analysed to test whether the windfall gains were consumed away or saved. The feature here will be to check for consistency with the life cycle permanent income hypothesis (LCPIH) similar to that done on Botswana by Hill (1990 and 1991). The main implication of this hypothesis as applied to temporary commodity booms is that in the absence of liquidity constraints the appropriate policy should be the avoidance of excessive increases in government and private consumption.

The approach to the paper will be in Section 1 a review of theories on commodity windfall gains. The main issue of interest will be the booming sectors and the "Dutch disease" theory.

A review of the economic performance of the economy over the period of the study will form the basis of Section 2 as it relates to the theory of Section 1. Particular attention will be paid to the sectoral structure of the economy both in terms of traded, non-traded and petroleum. The modelling of the impact of oil will be in Section 3 including a general discussion of the functioning of the model, and the results of simulations.

Section 4 addresses the macro-economic management by the government of commodity booms, touching on issues such as export instability and economic growth and economic diversification. The focus will be however on what is considered an appropriate response to commodity booms using the LCPIH. The policy responses of Botswana and T&T will be highlighted.

Section 5 will contain the main findings of the paper in the context of what can be learnt from the country's experience of the impact of oil and what questions remain unanswered.

INTRODUCTION

The Republic of Trinidad and Tobago (T&T) along with other oil exporting countries experienced dramatic increases in its revenues from oil in the 1970's. The experiences of countries undergoing a commodity boom are favourable to the extent that they lead to improvement in the revenues of the governments, in the balance of payments, relaxing of the foreign exchange constraint on growth and in general increasing of the total income of the countries concerned.

Analyses of countries with such an experience indicate that the boom changes the economic structure of the economy through contraction of other non-booming tradeable sectors which has been termed the "Dutch disease", one of the manifestations being through the appreciation of the real exchange rate. The impact on the non-booming traded sectors after the boom is deleterious and often irreversible. The adjustment of the economy to the sudden curtailment of the revenue source is problematic with resulting internal and external imbalances. The realization of the adverse aspects of the boom depends on its very nature i.e. whether it is of a permanent or temporary duration. In the case of a permanent boom, notwithstanding the changing economic structure, the boom is clearly advantageous to the economy. The difficulty lies in temporary booms; the failure to recognize the boom as such and improper management of the windfall gains received, result in the exacerbating of the effects of "Dutch disease".

This paper analyses the impact of oil on the economy of Trinidad and Tobago. In the post 1981 period the economy experienced crises in its major macro-economic balances, notwithstanding the fact that along with other oil exporting countries it was one of the beneficiaries of the oil booms of 1973/74 and 1979/80.

The analysis will look at two aspects. Firstly to assess whether there was "Dutch disease" in T&T using a three sector version of a macro-economic model developed by

SECTION 1 THE "DUTCH DISEASE" FRAMEWORK

1.1 THE STANDARD MODEL

In this section I discuss the impact of windfall gains from a resource boom on the economy of the exporting country through the approach of the "Dutch disease", described by Corden and Neary (1982) as:

"...the coexistence within the traded goods sector of progressing and declining, or booming and lagging, sub-sectors...the booming sector is of an extractive kind, and it is the traditional manufacturing sector which is placed under pressure..."

The problem of the "Dutch disease" is it causes change in the economic structure of the booming commodity exporting country which is often irreversible after the boom. One manifestation of such change is an appreciation of the real exchange rate which causes a contraction of the traded sector. The sources of the problem which affect the non-booming traded goods sectors are lower technological progress, a loss of net exports and market share which is difficult to regain, disappearance of certain sectors which it is difficult to re-establish, and an unsustainable cost of production after the boom due to downward rigidity of wages. The result is an economy which is not diversified and is therefore dependent on the once booming export with greater susceptibility to fluctuations in export prices. This contributes to decreasing revenues and balance of payments difficulties.

This is an occurrence which is common to both developed and developing countries such as natural gas in the case of the Netherlands, oil in the case of Norway, the United Kingdom and for many OPEC and non-OPEC developing countries. As expressed by Corden and Neary (1982) the boom can be seen as happening in three ways which are (i) a "once and for all technical improvement" which is transmitted through increased levels of

production and affects only the specific country, (ii) a discovery of a new resource and finally, (iii) an increase in the exogenous price of a product which is produced for the export market.

The focus of the literature on commodity booms is on the sectoral impact on the traded and the non-traded sectors. In the standard "Dutch disease" models, the effects of a commodity boom are analysed by looking at three sectors: a booming sector, a lagging sector usually manufacturing (non-boom tradeables) and the non-tradeables (services). This framework is used by Corden & Neary (1982) who look at a small open economy producing two goods corresponding to the booming and traded sectors above, that are traded by world prices which are exogenously set and a third (non-traded) the price of which is domestically determined through demand and supply conditions. Capital is normally taken to be sector specific whilst labour is assumed to be mobile between sectors. Amongst the other assumptions of this model are:

- all goods are assumed to be used for final consumption;
- monetary considerations are ignored;
- only relative prices are determined;
- there are no distortions in commodity or factor markets with real wages being perfectly flexible.

The analysis distinguishes between two effects of the boom which are the spending effect and the resource movement effect. Higher domestic income as a result of the boom leads to increased demand for traded and non-traded goods which is the spending effect. With the price of traded goods exogenously determined (international price) the price of the non-traded good increases relative to the traded price i.e. an appreciation of the real exchange rate (RER) which is defined as, $RER = P_t/P_{nt}$ where P_t is the price of the traded goods and P_{nt} is the price of the non-traded goods. This therefore implies a loss in competitiveness

of the traded goods sector relative to the non-traded and a contraction in output of the former. The importance of the spending effect is positively related to increased marginal propensity to consume non-tradeables (Corden & Neary, 1982).

In an efficient functioning market clearing system the wage is equal to the cost of the marginal productivity of labour across all sectors. The resource movement effect is triggered off by an increase in the marginal product of labour in the booming sector which draws labour from the other two sectors. This implies a fall in output in the non-booming sectors. There are two aspects of this resource movement effect:

- the movement of resources out of the lagging tradeable sector into the booming sector lowers output in the tradeable sector i.e there is a contraction of supply in this sector with the non-tradeable sector being unaffected;
- the movement of resources out of the non-tradeable sector into the booming sector creates excess demand for non-tradeables additional to that created by the spending effect. The result is additional movement of labour from the tradeable sector into the non-tradeable reinforcing the appreciation of the real exchange rate through raising the relative price of non-traded goods. The net effect on the non-tradeable sector is ambiguous (Corden, 1984 and Neary & van Wijnbergen, 1986).

CRITICISMS OF THE STANDARD MODEL

In reality the assumptions of the standard model may limit its applicability to both developed and developing countries. In this section the discussion centres around some of these criticisms and resulting variants of the mechanisms assumed in the standard model. Firstly the standard model assumes short to medium term effects. In the long term all factors of production

are mobile except land (Roemer,1983). Output of tradeables can increase even more than that of non-tradeables if it is more capital intensive. Similarly if the output of non-tradeables can expand rapidly then its relative price can decline which is a real exchange rate depreciation.

Secondly the assumption of perfectly functioning factor and commodity markets may not be a feature of most developing countries since wages may be downward inflexible and there may be resource allocation rigidity.i.e. the instantaneous adjustment assumption of prices such that markets of domestic goods clear continuously may not hold in reality. The rigidity of wages may give rise to transitional unemployment following a resource boom which may affect the spending and resource movement effects.(Neary et al,1986).

Thirdly where there are trade restrictions such as prohibitive tariffs, divergences occur between the international price and the domestic price of tradeables and these should be treated as non-tradeables.i.e. there may not be a sharp distinction between the categories, tradeables and non-tradeables (Roemer,1983).

For the fourth case domestically produced manufactures are not necessarily perfect substitutes for imports such that some manufactures can be considered non-tradeables therefore benefiting from the spending effect of the boom.

Amongst other weaknesses identified include the use of the oil windfall gains in the context of the policy choices of the producer government (Gelb,1988). The identification of the economic agent that receives the oil windfall gains and how it is used may have implications for the spending effects of the boom (Vos,1989). For example governmental policies instituted during the oil boom may not be easily reversible such as the downward stickiness of government expenditure in investment and

civil servant's wages and salaries which it may be politically difficult to curtail. (Gelb, 1988).

The above criticisms therefore give rise to a number of variants of the standard "Dutch disease" model which is contained in the discussion that follows.

VARIANTS OF THE STANDARD MODEL

Variants from the standard model may arise through immobility of certain categories of labour, negating the resource movement effect. For example skilled labour requirements in the booming sector may not be available from the other two sectors in the short run. Similarly skilled labour in the traded and non-traded sectors may also not be immediately mobile negating the resource movement effect.

Secondly the possibility of a capital intensive booming sector implies negligible resource movement effects into that sector with the major adjustment therefore being through the spending effect. i.e. the booming sector is treated as an enclave relative to the rest of the economy. The demonstration effect of higher wages in an enclave booming sector on the traded and non-traded sectors occurs if the wage is institutionally set in these two sectors in which case trade union pressure for higher wages may be triggered off by the increased wages of the booming sector. The increase in wages is therefore not accounted for by increased marginal productivity of labour as assumed in the standard model. This results in contraction of the non-booming sectors due to increased costs of production.

The enclave argument can also be used to consider oil as an aid-like transfer to the government with the mechanism of transmission being through government expenditure. In this case there are resource movement and spending effects dependent on the manner of spending of the revenues e.g. increased expenditure in

the government sector on the provision of services of construction and maintenance not only results in increased income and increased demand for goods and services but may cause labour to be shifted from the traded sector to the non-traded sector. The spending effect reinforces the appreciation of the real exchange rate through increased government expenditure in non-tradeables (i.e. increased profitability of this sector). If one distinguishes between the marginal propensity to consume (MPC) of government and that of private economic agents in the context of the initial recipients of the oil windfall gains, then this affects the spending effect. Similarly the eventual recipients of different income groups also have different MPCs which specifically affects the expenditure of services in contrast to other goods.

The violation of the assumption of the law of one price for tradeables (which is the small country assumption) can also be considered as a source of erosion of the traded sector. If these domestically produced traded goods are perfect substitutes for imports, increased incomes from oil may in fact fuel increased imports that are lower priced than the domestic equivalents further benefiting the non-tradeable sector through a demand for services. If the tradeables are imperfect substitutes for imports then it is possible for the traded sector to expand.

The above variants of the standard model show that the impact of oil on a developing country may differ from that of a developed when the assumptions are relaxed or altered to suit the conditions of the former. The following section briefly explores some comparative applications of the "Dutch disease" theory to countries experiencing resource booms.

1.2 COMPARATIVE APPLICATIONS OF THE "DUTCH DISEASE" FRAMEWORK

The review of the standard "Dutch disease" theory above and its deviations now lead us to compare selected country experiences. Firstly the focus will be on a developed country the Netherlands (Kremers, 1986) which will be followed by the experiences of Indonesia and Nigeria. The checks to determine whether the country has experienced symptoms of the "Dutch disease" will be: (i) an increase in the relative price of non-traded goods; i.e. an appreciation of the real exchange rate; (ii) a decline in output in non-booming tradeables and an increase in that of non-tradeables¹; (iii) resource movement effect into the booming sector or into non-tradeables.

THE NETHERLANDS

At the onset it can be said that despite the terminology "Dutch disease" the impact of the natural gas discoveries did benefit the Dutch economy. Application of the theoretical issues discussed above shows that the resource movement effects are not applicable in the Dutch case (Ibid, 1986). Natural gas exploitation required limited inputs and very low employment such that there was never any pressure on the resources of the other sectors with respect to labour supply. Capital inputs were mainly financed from the gas revenues themselves.

There are a variety of controversial issues (Ibid, 1986) with respect to the application of the spending effects of the standard "Dutch disease" theory including that of the optimal depletion problem of the natural gas, the pricing policy, the absence from the theory of the role of the booming commodity as an intermediate input, inflexibility of real wages and prices,

¹ This is subject to existing situations within the economy which may offset this impact. For example the traded sector may continue to increase but at a slower rate due to the boom (Kamas, 1986).

and the issue of who receives the gas revenues and how it is spent. Government's share in actual gas revenue increased from 65% in 1960 to more than 75% in 1985. The low pricing of gas implied that the government in effect spent part of its potential revenues as transfers to households and as a subsidy to industry with an increasing amount being spent on income transfers and consumption after the first energy crisis.

The core of the "Dutch disease" focuses on the contraction of the tradeables relative to the non-tradeables. In the case of the Netherlands there was more rapid growth in manufactures than in services before the oil price hike than after in volume terms (Ibid,1986). The figures were reversed for the oil boom period and after. The growth of services relative to manufacturing was more pronounced in the period 1973-78. There was a decline in growth rates of both tradeable and non-tradeable sectors in the 1973-78 period with a larger decline occurring in tradeables relative to non-tradeables.

In the application of the standard model the distinction is made between tradeables and non-tradeables but there is some difficulty in making a clear cut distinction between traded and non-traded services. It is arguable how much of the appreciation of the real exchange rate has been a consequence of the gas boom, or of other causes such as the collapse of stable exchange rates in the early 1970's or due to the link between the guilder and the Deutschmark (Ibid,1986). It is stated that there has been little empirical research into the relationship between natural gas and the exchange rate hence the difficulty in drawing conclusions.

The experience of the Netherlands shows that relative price movements did not bring about optimal resource allocation between tradeables and non-tradeables as in the standard model at full employment with the resultant resource movement effects between

the two sectors. Wages were indexed to the Consumer Price Index (CPI), with an aggregate index of labour productivity being used as part of the wage bargaining process. This indicator did not necessarily reflect the marginal productivity of labour in specific sectors. There was upward pressure on wages implying a rise in production costs which in the case of the Dutch led to an erosion of the profit margin as well as to unemployment (Ibid,1986).

Amongst the conclusions drawn from the Dutch experience are that alternative ways of spending the gas revenues would have smoothed the benefits derived from gas over time. Gas has helped the Netherlands to develop one of Europe's most advanced welfare systems, but at the expense of exacerbating the difficulties by increasing the number of economically inactive persons in the public sector.

INDONESIA

In the case of Indonesia the revenues accrue largely to the government which affects both the resource movement and spending effects (Warr, 1986). One of the problems in analysing the impact of the petroleum boom on the economic structure of Indonesia is the unsatisfactory separation between tradeables and non-tradeables with the possibility of some sectors belonging to both categories.

Structural effects of the oil boom seem to indicate that there was a high rate of decline in agriculture's contribution to GDP, from 44% to 31% from 1971 to 1981 (Ibid, 1986). The proportional contribution of services increased gradually with a more rapid increase in government, construction and manufacturing (which include oil-refining) from the mid-1970's onwards. Except for the growth of manufacturing the increase in the contribution of these services sectors to GDP is in

accordance with the theoretical expectations of the "Dutch disease" literature as earlier described.

Relative to the spending effect of the boom for the period immediately after the first oil boom 1975-76, out of 21.6% (relative to GDP) of budgeted expenditures, 2.5% was in agriculture, 1.7% manufacturing and mining with the remainder in areas such as education, health, defence and government (Warr,1986). The inclusion of oil refining in manufacturing poses a definitional problem of tradeables versus non-tradeables, or booming sector versus lagging sector.

With respect to the impact of the boom on prices of tradeables compared to that of non-tradeables there was a rapid decline of this ratio from mid-1973 to mid-1974. This decline is attributed to the very large rise in prices following a poor rice harvest in late 1972 and a major monetary expansion in 1972 and 1973. Subsequently, there is evidence of "Dutch disease" effect in further decline of this ratio from 1974 to 1978. In 1978 Indonesia devalued the rupiah which resulted in a partial amelioration of the decline of the profitability of non-oil tradeables and in the relative price of tradeables to non-tradeables. However Indonesia's non-oil traded sector is highly protected (Ibid,1986) which limits the applicability of the Standard model relative to the law of one price.

NIGERIA

Oil constituted 50% of Nigerian commodity exports in 1970 (Bienen,1988). Initially in 1973/74 large surpluses of oil revenue were accumulated abroad. Public capital spending increased from 3.6% of non-mining GDP in 1970 to 29.5% in 1976 absorbing almost the entire oil revenues from 1970-1976. Current spending also rose sharply for this period resulting in huge deficits, which were financed through previously accumulated

reserves and the expansion of the money supply.

The second oil price increase in 1979/80 did not restore budgetary surplus. The Nigerian government was unable to respond by sharply reducing its expenditure. Debt increased in the 1981-83 period to \$19.7 bn. (U.S.), the current account deficits to \$17.2 bn. (cumulative) whilst reserves fell to \$1.3 bn (Bienen, 1988). Most of the projects that were planned such as a steel plant, petrochemicals and a paper projects moved slowly from the feasibility stage to implementation. The resource-based industrialization strategy did not start until the second oil boom and was therefore affected by declining revenues after the oil boom. (Auty, 1990).

By sector, the share of non-oil tradeables in total exports became insignificant with oil accounting for over 90% of total exports from 1974 to 1984. The production pattern in Nigeria shifted from traded to non-traded goods during the 1970's. Data on the performance of agriculture indicates that Nigeria became a net importer of agricultural products in 1975 (Bienen, 1988).

Other results of the growth of exports were a shift in relative prices towards non-traded goods. The result is an over-valued exchange rate and a loss in competitiveness of the price of non-oil traded goods (Taylor et al).

The impact of the spending effect was felt through intense pressure from government employees, with the doubling of the salaries of these workers in 1974 (Bienen, 1988). This effect led to further inflationary impact in the economy. The spending effect was also transmitted through heavy investment in education, transport and construction; .i.e. Nigeria increased spending on non-tradeables which coupled with import restrictions led to further appreciation of the real exchange rate with the naira moving from 100 in 1970-72 to 129 in 1974/78. The appreciation was aggravated by trade restrictions and money

creation.

In conclusion it can be said that a specific feature of the experiences of the countries are the mechanism through which the increased revenues from the boom was received and transmitted to the rest of the economy which has implications for the spending effects of the boom. Variants of the standard "Dutch disease" model appear to fit each of the country discussed with some of the effects being related to other external and internal factors affecting the country. Of importance is the use that is made of the oil revenues in the cases above. In all three cases the experiences suggest that there were "Dutch disease" effects, sometimes attributable to the boom but in some cases such as the appreciation of the guilder, the effects are not clearly as a result of the boom.

The case of Trinidad and Tobago will be dealt with in more detail in the next section relative to characteristic features of the "Dutch disease" in terms of the sectoral impact and other manifestations in the form of key macro-economic trends.

SECTION 2 A REVIEW OF THE ECONOMY OF TRINIDAD AND TOBAGO RELATIVE TO THE "DUTCH DISEASE" FRAMEWORK

This section discusses the performance of the economy of Trinidad and Tobago relative to the theoretical discussion of the "Dutch disease" in Section 1. The problem of the "Dutch disease" as earlier highlighted is its impact on the economic structure of the booming commodity exporting country. At the root of the problem is the irreversibility of this change on the structure of the economy in the post boom period. The appreciation of the real exchange rate which causes a contraction of the traded sector is one of these effects.

The "Dutch disease" effect at the macro-level is through the curtailment of the revenue source of the commodity, and the inability of the economy to be self-sustaining due to the failure of the other sectors as a revenue base. This is exacerbated by downward rigidity in government expenditure after the boom and other governmental policy during the boom; for example, investment and foreign borrowing.

I will therefore look at the economic structure of the economy for the period 1966-1990² as it throws light on the trends in the total income of the economy, output, employment and relative prices of the traded and non-traded sectors and their sub-sectors, and the performance of the booming sector. In this paper the traded³ sector is defined as the agriculture and manufacturing sectors, the latter excluding manufacturing of petroleum and natural gas products which is included in the booming sector. The non-traded sector includes all the services such as financial, construction, personal, distribution etc.

Concentration will be on the analysis of four periods⁴, the

² This is subject to the availability of data. For all data in constant prices the base year is 1970 .

³ As discussed in Chapter I, to the extent that there are prohibitive tariffs on tradeables these should be treated as non-tradeables. The definition of the traded sector in this research is limited to the extent that a sharp distinction relative to this aspect could not be made due to unavailability of information.

⁴ For period averages of growth rates geometric means are used whilst for percentage contributions the arithmetic means are used.

pre-boom period 1966-73, the period of the oil boom, 1974-81 and two periods after the oil boom, the immediate period being 1982-87 and the other period 1988-90, where there was some improvement in oil prices and the intervention of the International Monetary Fund (IMF) and the World Bank in T&T.

It was stated in the introduction that the economy of Trinidad and Tobago is that of an oil exporter with oil being the major source of export earnings (as high as 90% for some years of the boom) as well as contributing significantly to government revenue (over 60% during the period of the boom) and to value added. This characteristic therefore justifies the use of these periods as a basis of the analysis of the trends in the sections to follow.

2.1 TRENDS IN REAL GDP

An overview of the performance of the economy shows that in the period 1966/73 the growth rate of real⁵ GDP (Gross Domestic Product) was on average 3.1%. For the period of the oil boom the average rate of growth of GDP was 6.1% with figures of -4.8% and -1.9% for the periods 1982/87 and 1988/90 respectively. Despite the oil boom the economy as shown by this indicator was in a worse position after the boom, with the smaller negative growth rate in the last period being possibly due to improved prices of oil or other factors. This pattern in the real growth of the economy as shown in Table 2.1 is linked to the earlier issues raised in the theoretical discussion in Section 1 on the manifestation of the "Dutch disease".i.e higher total income during the boom and the ensuing problem of the erosion of the income base after the boom. This phenomenon however does not constitute proof of "Dutch disease". This will be dealt with more conclusively in the modelling of the impact of oil in Section 3.

⁵ The estimate of real GDP (at fixed prices) is to obtain the effect of changes in quantity. The base year is 1970=100. Problems however arose in obtaining a consistent series due to a change of base as well as data revisions for the period 1983-87. An approximate series was derived on the 1970 base using a crude method. A more refined method of dealing with this problem is discussed in an article by Patterson & Heravi (1991).

TABLE 2.1 SELECTED MACROECONOMIC AND SECTORAL TRENDS

VARIABLE	67-73	74-81	82-87	88-90
REAL GDP GROWTH RATE%	3.1	6.1	-4.8	-1.9
SECTORAL OUTPUT (REAL GROWTH RATE)%				
PETROLEUM	0.2	-2.3	-0.1	-
TRADED SECTOR	6.3	3.5	-3.8	4.2
AGRICULTURE	1.6	0.4	-1.1	8.0
MANUFACTURING	10.1	5.0	-5.0	1.8
TEXTILES	4.7	-0.6	-11.9	-
ASSEMBLY	17.6	9.3	-12.1	2.6
NON-TRADED SECTOR	3.5	8.7	-5.7	-3.6
CONSTRUCTION	12.3	16.1	-15.1	-4.9
GOVERNMENT	3.7	6.0	-1.4	-0.1
SECTORAL EMPLOYMENT(000's)				
TRADED	110.3	94.6	86.5	85.0
NON-TRADED	186.7	245.8	292.1	266.4
RER ⁶	100	83	80	85

Source: Republic of Trinidad and Tobago Central Statistical Office (C.S.O) National Accounts Reports 1966-83 & 1983-87; Unpublished National Accounts Report 1985-90.

2.2 SECTORAL TRENDS

THE BOOMING SECTOR-PETROLEUM OUTPUT

The share of the petroleum sector in total output at current market prices moved on average from 25 % of GDP (1966-73) to 40.5 % (1974-81) and then declined to 24.2% and

⁶ Comparison with the bilateral RER with US shows the same trend as in the table where the RER is defined as the relative price of traded to non-traded goods.

24.5% respectively in the periods 1982-87 and 1988-90. These average shares for these periods reflect mainly the movement in the price of oil as well as increased revenue from petroleum based industries in the 1988-90 period, such as natural gas production which is classified in this sector.

At constant prices however the share of petroleum declined from 23.4% in the pre-boom period to 16% in the 1974-81 period with a further decline to 12.9% in the 1982-87 period before increasing to 15% in 1988-90 due to the downstream industries.

Real growth rates were 0.2% (1966-73), -2.3% (1974-81), -0.1% (1982-87) and nil (1988-90) as shown in Table 2.1. The declining output is another dimension to the problem of the effects of the "Dutch disease" as it relates to the issue of management of commodity booms. The feature of declining oil production reflects the temporary nature of the boom in the context of the eventual depletion of the resource. This adds to the problem caused by the reduced price of petroleum. The next section looks at trends in the traded and non-traded sectors.

TRADED AND NON-TRADED OUTPUT-AN OVERVIEW

The performance of the traded and non-traded sectors in real terms show a pre-oil boom average real growth rate of 6.3% and 3.5% for these sectors respectively. Figures for the oil boom period were 3.5% (traded) and 8.7% (non-traded). The pattern after the boom shows negative growth rates in the 1982-87 period for both sectors with the average for the traded being -3.8% and the non-traded, -5.7%. There was some improvement in the period 1988-90 with a positive rate of growth of 4.2% for traded goods and a lower negative growth rate for non-traded at -3.6% as compared with the previous period. Real output in the traded sector therefore expanded for the oil boom period 1974-81 but at a lower rate of growth as compared with the previous period. This possibly reflects the erosion of some sectors and the expansion of others during the boom. The overall expansion of the traded goods sector is a reversal of the results of the "Dutch disease". It is left to be seen in the modelling of the impact of oil in Section 3 whether the model will in fact be able to isolate this

effect on the traded sector.

For the share of GDP at current prices there was a decline in the traded sector from the pre boom figure of 15.7% to 10.2% in the boom period with the figures for the periods following the boom being 10.7% (1982-87) and 12.8% (1988-90). The shares for non-traded output are 59.2% (1966-73), 49.3% (1974-81) with 65.1% and 62.1 % being the shares for 1982-87 and 1988-90 respectively. The lower total contribution of both the traded and non-traded sectors combined for the period 1974-81 is due to the increased profitability of the oil sector as earlier described.

At constant prices there was no marked change in the share of the traded sector in GDP with figures for the four periods being: 16.1%(1966-73), 16.8%(174-81), 14.9%(1982-87) and 16.1%(1988-90).

DETAILS OF OUTPUT IN MANUFACTURING AND AGRICULTURE

In the traded sector the percentage change in agriculture for the period 1966-73 was 1.6%, with that for 1974-81 being 0.4% on average. For the other two periods the changes were -1.1% for 1982-87 and 8% for 1988-90. Both export (excluding sugar) and domestic agriculture declined during the period of the oil booms with figures of -0.4% and -0.9% respectively.

For the pre-oil boom period the overall rate of growth of the manufacturing sector was 10.1% with all of the sectors showing positive growth rates for this period, the highest being in assembly with 17.6% followed by miscellaneous manufacturing with 13.6% and printing and paper converters with 10.1 %.

Manufacturing's real output grew by 5% on average for the oil boom period. The rate of growth of real output of textiles/clothing, printing and paper converters, and miscellaneous manufacturing sectors declined for the period of the oil boom with figures of -0.6%, -1.1% and -1.6% respectively. This emphasises the issue raised earlier on the lower growth rate of manufacturing for this period reflecting the erosion of some of the sectors.

Assembly type manufacturing (9.3%) showed the highest average growth rate for the boom period followed by food (5.2%).

For the post boom period, the sectors contracting the most were assembly type manufacturing (-12.1%), textiles (-11.9%), and printing and paper converters (6.4 %).

Again this relates to the problems of the "Dutch disease" as earlier stated. These problems are: loss of competitiveness of the products of these sectors internationally; the erosion of the market share for the output; unsustainable cost of production through high wages which are downward rigid, and inefficient production relative to output per employee. In the case of textiles the substitutability between imports and locally produced output was such that erosion of this sector was accelerated during the period of the boom. The figures for total imports show both positive and negative real changes, for example -25.1% for 1975 and 28.6% change for 1976. This is possibly due to the offsetting effect of increased import prices. Figures by commodity were similarly affected in real terms.

The share of manufacturing in GDP at current market prices fell from 9.1% in 1966-73 to 6.4% in 1974-81 followed by a marginal increase to 7.4% in the immediate post boom period and 9.2% in the period 1988-90. Agriculture's contribution to GDP moved from 6.6% in 1966-73 to 3.8% in the boom period and 3.3% in the post boom period 1982-87 and 3.7% in 1988/90.

The contribution of these sectors to GDP at current market price shows that agriculture and manufacturing which were already negligible were sectors adversely affected by contraction in their value added which could have been due to a movement of resources out of these sectors symptomatic of the "Dutch disease".

DETAILS OF OUTPUT IN THE NON-TRADED SECTORS

In the non-traded sector, finance with 16.4%, construction with 16.1%, and transport with 8.6% were the sectors whose average growth rates of real output showed the most improvement for the period of the oil boom. These sectors were also amongst those that were adversely affected in the period 1982-87 with construction showing a negative rate of growth in this period of -15.1%, hotels and restaurant with -9.1% and transport with -8.3%

were the sectors most affected.

RELATIVE PRICES OF TRADED/NON-TRADED OUTPUT (REAL EXCHANGE RATE)

The ratio of the relative price of traded to non-traded output defines the real exchange rate which will be the variable to be discussed in this section. An appreciation of the real exchange rate affects the competitiveness of the non-booming traded sector. There was a fall in this index from 101 in 1972 to 95 and 85 in 1973 and 1974 respectively. For the next three years there was some mild improvement particularly in 1977 (90) which followed the pegging of the currency to the US \$ and its revaluation.

From the year 1978 onwards to 1983 there was continued appreciation of this index with some slight improvement in 1984 and in 1985 which coincided with a devaluation of the currency and the introduction of a dual exchange rate for selected items for example to facilitate industrial development, medicinal needs etc.

Looking at the analysis by period there was a deterioration of the real exchange rate from 100 in the pre-oil boom period to 83 for the period 1974-81 and further deterioration to 80 in the period 1982-87 with some slight improvement to 85 in the period of "adjustment" 1988/90 with the intervention of the International Monetary Fund and the World Bank for balance of payment support and sectoral adjustment loans. As observed earlier the bilateral RER with the US followed the same trend by period. Following the revaluation of the nominal exchange rate in 1976 there was no further devaluation for the period 1977-85. The inflation rates for T&T for these years were always greater than the US inflation rate so the RER as described by this alternative formula⁷ appreciated. The appreciation of the real exchange rate did therefore occur in the case of Trinidad and Tobago showing clearly that this country did not escape this aspect of the "Dutch disease".

⁷

RER=NOMINAL EXCHANGE RATE*US WHOLESALE PRICE INDEX/T&T CPI.

EMPLOYMENT IN THE BOOMING SECTOR

A brief look at the booming sector petroleum shows negligible changes in employment in all the periods, with 0.5% for 1966-73, 1% for 1974-81, -1.7% for 1982-87 and -0.4% for 1988-90 which implies negligible resource movement effect into the booming sector.

Briefly trends in employment for the traded sector show that on average there were 110,300 persons employed in this sector for the period 1966-73, whilst for the period 1974-81 there were on average 94,600 persons employed, a decrease of 10%. Comparison with the non-traded sector shows that employment increased from 186,700 in the first period (1966-73) to 245,800 in 1974-81 an increase of 31.7%. It therefore shows that there has been resource movement⁸ out of the traded sector due possibly to the contraction of output in some of those sectors such as agriculture. There was resource movement into the non-traded which again parallels the expansion of output in this sector.

One of the defects of the theory is that no allowance is made for unemployment in the standard model. The fall in the traded sector employment (10%) was less than the increase in employment in the non-traded sector (31.7%). Assuming that there is resource movement from traded to non-traded, allowance should be made for unemployment as well as other increases in the labour force.

For the period 1982-87 the average number of persons employed in the traded sector was 86,500 a further decline of 2.3% and 85,000 for the period 1988/90.

In the non-traded sector the average number of persons employed in the period 1982-87 was 292,100 an increase of 18.8% from the boom period whilst the period 1988-90 saw employment in this sector decline to 266,400 (-8.7%).

⁸ It is arguable whether one may expect efficient functioning labour markets and therefore resource movement effect in T&T. However government spending on public works programme resulted in movement of labour from agriculture.

DETAILS OF EMPLOYMENT IN TRADED SECTORS

The rate of growth of employment in agriculture was -3% for the period 1966-73 immediately preceding the boom. For the boom period the growth rate in this same sector was -2.4% whilst the change was nil for the period 1982-87 and 2.5% for the period 1988-90.

Manufacturing experienced a rate of growth of 1.9% for the period 1966-73, 0.4% for the boom period, with the figures for 1982-87 and 1988-90 being -4.8% and 2.6% respectively.

Available figures of sectoral breakdown for the manufacturing sector for the period 1975-81 show that textiles with -3.1% growth rate in employment, printing and packaging with -2.4% and miscellaneous manufacturing with -5% growth rate were sectors that experienced decline in employment.

Food manufacturing and assembly type manufacturing were the sectors with the highest increases in employment with 3.3% and 2.3% respectively for the same period.

Most of the manufacturing sectors had negative growth rates of employment in the period 1982-87 after the oil boom. Textiles had a rate of growth of -19.5%, chemicals -8.6% and assembly -5.2%. The sectors experiencing positive growth rates in this period were food, printing and packaging with 1%, and miscellaneous manufacturing with 2%.

DETAILS EMPLOYMENT IN NON-TRADED SECTORS

For the period of the boom construction showed the highest rate of growth of employment with 6.3% followed by finance with 4.9% and government with 2.9%. During this period hotels and restaurants had a negative rate of growth of employment with -7.2% and distribution with -0.6%.

For the period 1982-87, negative growth rates were experienced in construction with -7.1%, transport with -1.7% and hotels and restaurants with -0.9%. Finance with 5.7% and personal services with 4.6% were amongst the sectors having positive rates of growth of employment.

For the period 1988-90, employment in construction continued to decline with -7.2% as well as central and local government

-1.9% and education -3.9%.

In general the rates of growth of non-traded labour increased during all the years of the oil boom period. Except for 1974 there were decreasing rates of growths for traded labour which is typical of the "Dutch disease" resource movement effect. The increased demand for services attracted resources into the non-traded sector.

CONCLUSION

To conclude one can say that there are some features of the "Dutch disease" reflected in the trends described above. The macro-economic effect of the curtailment of the revenue source after the boom is reflected in the negative growth rates of real GDP during this period. There is evidence of appreciation of the real exchange rate during and immediately after the boom. The net effect of non-traded output appears to be the expansion of this sector during the boom but there is a dramatic decline in construction reflecting the inability to sustain expenditure after the boom. There is clear evidence however of resource movement into non-tradeables, negligible resource movement into petroleum and resource movement out of the traded sector. Even though the traded sector expanded there is evidence that some sectors declined during the boom as illustrated for export and domestic agriculture and manufacturing of textiles/clothing, paper converters and miscellaneous manufacturing.

In the Section to follow the modelling of the impact of oil will be presented to obtain conclusive evidence of whether the "Dutch disease" syndrome characterised the economy's experience of the oil windfalls.

SECTION 3 THE MODELLING OF THE IMPACT OF OIL

3.1 OBJECTIVES OF MODELLING

In this section the theoretical framework of the "Dutch disease" presented in Section I will form the basis of the modelling of the impact of oil on the economy of Trinidad and Tobago. Most of the literature on the "Dutch disease" has as its foundation a model developed to look at the impact of a resource boom on a developed country; the 'Australian' model, in which the inflow of revenues results in both positive and negative effects on the economy. One of the main manifestations is the appreciation of the real exchange rate which leads to a fall in competitiveness of the traded goods sectors. The resulting contraction of this sector is a likely occurrence as well as dramatic inflationary tendency in the non-traded sectors.

This is the spending effect of the boom (Corden & Neary, 1982) with another effect the resource movement effect being reflected through increasing movement of mobile factors to the booming sector where there are increasing factor rewards, resulting in contraction of the traded and non-traded sectors. Other aspects by which the two sectors are affected have been outlined previously in Section I.

The mechanics of the functioning of the standard model therefore links increased oil revenue to increased income and increased demand for traded and non-traded goods with the price of the latter rising higher relative to the former. The increased demand for traded goods is also satisfied through imports. The traded sector is expected to contract and the non-traded expand.

Because of the problems that arise in applying a model suited for developed countries to that of a developing country, the major objective of the model constructed by Benjamin, Devarajan and Weiner (1989) is to look at the impact of a resource boom on a developing country, Cameroon, capturing features that are peculiar to these countries such that the structural changes that result may differ from the case of developed countries. The Cameroon model will be tested on data of Trinidad and Tobago for the period 1966-1990.

The effects⁹ of oil inflow are being analysed in this model of the Cameroon by distinguishing between three sectors; the booming sector which is oil and two sectors producing traded and non-traded goods respectively. The traded sector comprises agriculture and manufacturing since according to the model these are the sectors most likely to be affected by the occurrence of a resource boom in developing countries. The non-traded sector consists of the services sectors.

The feature of imperfect substitution between domestically produced traded goods and imports is one of the major underlying assumptions used in this model. It was shown that the results of the standard model can be reversed dependent on the elasticity of substitution between the two goods. Utilising this assumption the expected outcome is the expansion of the traded sector and the contraction of the non-traded sector for a specific value of the elasticity say, σ . The rationale is that the goods being imperfect substitutes, there is not a marked shift in demand into imports from domestically produced traded goods sufficient to cause a contraction of the traded goods sector.

The mechanisms of the Cameroon model links increased revenue from oil to increased income and increased demand for traded and non-traded goods. The imperfect substitutability between imports and domestically produced traded goods lessens any satisfaction due to increased demand of traded goods from imports facilitating the expansion of the domestic traded sector.

In this version (3-sector version) of the model production functions are introduced and capital is assumed to be fixed and sector specific in order to show the mobility of labour between sectors. The oil sector is modelled as an enclave with respect to the rest of the economy therefore there is no movement of labour from the oil sector to the other sectors or the converse. The implications are that either a fixed amount of labour is required or expatriate labour is utilised. Notwithstanding the

⁹ The model as utilised deals with the real effects of the boom abstracting from monetary considerations. It is stated by Neary and van Wijnbergen (1985) that the large scale exploitation of natural resource discoveries is a real rather than a monetary shock to an economy with its primary impact being on the level of real income and the intersectoral allocation of factors of production.

assumption of capital being sector specific the oil sector is assumed to rely only on imported intermediate inputs with the industry being highly capital intensive. There is no competition for labour from the non-booming sectors but there is competition for foreign exchange.

In the context of Trinidad and Tobago it was stated that the economy of this country was dependent on oil, this sector being the largest single contributor to export earnings, value added and government revenues even in periods of declining prices or production. This feature provides sufficient justification to model the impact of oil using the "Dutch disease" theory as in the case of Cameroon to assess the impact of oil on the economy. Absent from this version of the model is a clearly defined government sector which is the main source through which the impact of oil revenues is transmitted to the rest of the economy.

The application of the model is to look at the structural impact of oil on the economy in which case the model will be used to analyse the impact of oil on the agriculture and manufacturing sectors combined (traded) relative to the non-traded sectors (services) to see if there is any erosion of the former which is symptomatic of the "Dutch disease". The erosion of the traded sectors if any should take the form of the contraction of real output and employment. The behaviour of the real exchange rate will be scrutinised to see if there was an appreciation which is again a feature of the "Dutch disease" referred to earlier in this paper causing the contraction of the traded sectors.

Secondly, at the macro-economic level, the model will look at the impact on total income which should be a reflection of other macro-economic problems. The analysis will however look at partial effects and not indirect multiplier effects since it is a full employment model.

The underlying assumptions and the corresponding structure of the model will now be formally presented.

3.2 GENERAL CHARACTERISTICS OF THE MODEL

Underlying assumptions

The assumptions of the model are as follows:

(1) The non-tradeable sector (N) comprises all services and construction with the possibility of the latter being skilled and labour intensive. The products of the import competing tradeable sector (D) are assumed to be imperfect substitutes for imports, oil being the only exports. P_m , the price of imports is exogenous whilst P_D , the price of domestically produced traded goods is endogenously determined.

(2) Capital is fixed and sector specific in the short run. Therefore labour, L , is the only mobile factor and is in fixed supply with L_D and L_N being the labour utilised in the production of the traded and non-traded goods respectively. (3) Cobb-Douglas production functions are used in the N and D sectors.

(4) A uniform nominal wage, w , is assumed which implies an efficiently functioning market clearing system.

Equations

The equations of the model are as follows:

$$D = AL_D^\alpha \quad (3.1)$$

$$N = BL_N^\beta \quad (3.2)$$

where α and β are elasticities representing the constant factor shares of labour in total output in the D and N sectors respectively with capital being suppressed as a constant. The first order conditions for these production functions imply that the value of the marginal productivity of labour must equal the cost of the factor of production (wage).

$$\frac{\alpha P_D D}{L_D} = \frac{\beta P_N N}{L_N} \quad (3.3)$$

$$w = \frac{\alpha P_D D}{L_D} \quad (3.4)$$

It follows from the Cobb-Douglas utility functions that a constant proportion of total national income Y , is spent on traded goods represented by γ_N i.e. Consumption of non-traded goods is a fixed proportion of national income:

$$P_N N = \gamma_N Y \quad (3.5)$$

where P_N is the price of non-traded goods.

Income spent on tradeable goods is divided into import competing goods and imports according to a constant elasticity of substitution utility function (CES) with the ratio of consumption of domestically produced traded goods to that of imports given by:

$$\frac{D}{M} = k \left(\frac{P_m}{P_D} \right)^\sigma \quad (3.6)$$

where k is a constant and $\sigma > 0$ is the elasticity of substitution between D , and M , imports.

As $\sigma \rightarrow \infty$ then the goods are perfect substitutes so that any increase in P_D relative to the price of imports will imply that $D \rightarrow 0$. i.e. the market clearing mechanism is the relative prices of the two goods. As $\sigma \rightarrow 0$ the goods are imperfect substitutes and a larger increase in P_D relative to P_m is required to cause D to contract.

If $\sigma = 0$ then the goods are complements and the goods are consumed in fixed proportions.

The national income identity is given by:

$$Y = P_N N + P_D D + F \quad (3.7)$$

where F is the revenue from oil exports, the trade balance being assumed to be zero which requires that,

$$P_m M = F \quad (3.8)$$

i.e oil revenues are not used to pay the foreign debt nor accumulated in reserves or used for any other investments abroad. The assumption of fixed labour supply requires the following:

$$L = L_D + L_N \quad (3.9)$$

The share of labour in the traded sector is defined as

$$\lambda = \frac{L_D}{L}$$

from equation (3.3) or

$$\lambda = \frac{\alpha P_D D}{\alpha P_D D + \beta P_N N}$$

The model therefore consists of nine (9) equations with L , F and P_m being the exogenous variables and D , N , L_D , L_N , P_D , P_N , M , w , and Y being the endogenous variables.

The impact of the increase in oil revenues is obtained through finding logarithms and taking total differentials of the demand and supply equations i.e. the relative change is measured. In Appendix A the equations with percentage changes and their interpretations are given.

The main points arising out of the equations in percentage changes are that as $\sigma \rightarrow \infty$ the traded sector contracts since the goods are perfect substitutes with imports and the smaller will be the increase in the price of the domestically produced equivalents relative to the price of imports required for the traded output to contract (which follows from equation (3.6) above). For $\sigma > 1$, the traded sector contracts and the non-traded expands which follows the "Dutch disease" model. For $\sigma < 1$ the traded expands and the non-traded contracts which is a reversal of the standard results. For $\sigma = 1$ there is no change in output of

both sectors.

Adjustment of Cameroon Model

In order to enable the model to better represent reality the assumptions that the labour supply is fixed and that the price of imports is constant were adjusted. Using the Cameroon model holding these variables constant one is able to isolate the full impact of oil. However in reality one cannot hold the import price and the labour supply constant. In the context of this adjustment the impact of oil on the endogenous variables does not change but is clouded by the changes exerted by these two other exogenous variables. It was therefore necessary to derive algebraically new relationships for the endogenous variables. Some of the new equations are given in Appendix A (A.18 & A.19).

Highlights of these variations are that the impact of import prices is symmetrically opposite to that of oil revenues i.e. for $\sigma < 1$, the traded sector will expand only if the increase in the price of oil is greater than the increase in import prices ($\Delta F > \Delta P_m$) subject to the influence exerted by the labour employed which exerts an offsetting positive impact. The full effect of the oil revenue is not transmitted to increase the output of the traded sector because of its use to pay for the increasing cost of imports. The impact on the non-traded sector is in the opposite direction to that of the traded, but may be in the same direction if the offsetting impact of the labour employed is significant.

In Figures 3.1 and 3.2 simulations are done on the adjusted Cameroon model allowing for variation in import prices and the labour supply using assumed parameters and exogenous values. There are some differences from the results of the unadjusted Cameroon model for $\sigma < 1$. It is possible for both traded and non-traded output to increase for an increase in oil revenue as the first data point indicates, $t=1$, (t - time period) or for the standard results to hold as in $t=11$ (traded contracts, non-traded expands). For an exceptionally large increase in oil, $t=13$, the results of the Cameroon model holds in that the traded sector expands and the non-traded contracts.

These results can be analysed by considering the new relationships of the adjusted model discussed above which indicates that it is possible for the impact on the traded and non-traded sectors to conform to the standard results dependent on the rate of increase of P_m with respect to F and the impact of any change in L and not necessarily be reversed as in the unadjusted model.

For $t=1$, (See Figures 3.1 & 3.2) where both traded and non-traded output expanded, the exogenous variable with the most dramatic increase was the labour supply, L with 50 % with 5% increases in the other two exogenous variables. This does not conform to either the expectations of the standard or Cameroon model but shows a likely occurrence for large increases in the labour force and small increases in oil revenue and import prices.

For the second case ($t=11$) in which the results of the standard "Dutch disease" model held, the exogenous factor showing the most increase was import prices with 33 % with oil and labour increasing respectively by 12% and 3%. The implication here is that the influence of the large increase in import prices affected adversely output of the traded sector due to the fact that the increased oil revenue had to pay for the increased cost of imports. This caused a decrease in output in the traded sector by 5% and an increase in the non-traded by 3%. For the third case above the exogenous variable exerting the most influence was oil with an increase of 33 % with import prices and labour increasing by 4% and 6% respectively and as stated earlier the pattern of the "Dutch disease" as in the Cameroon model held.

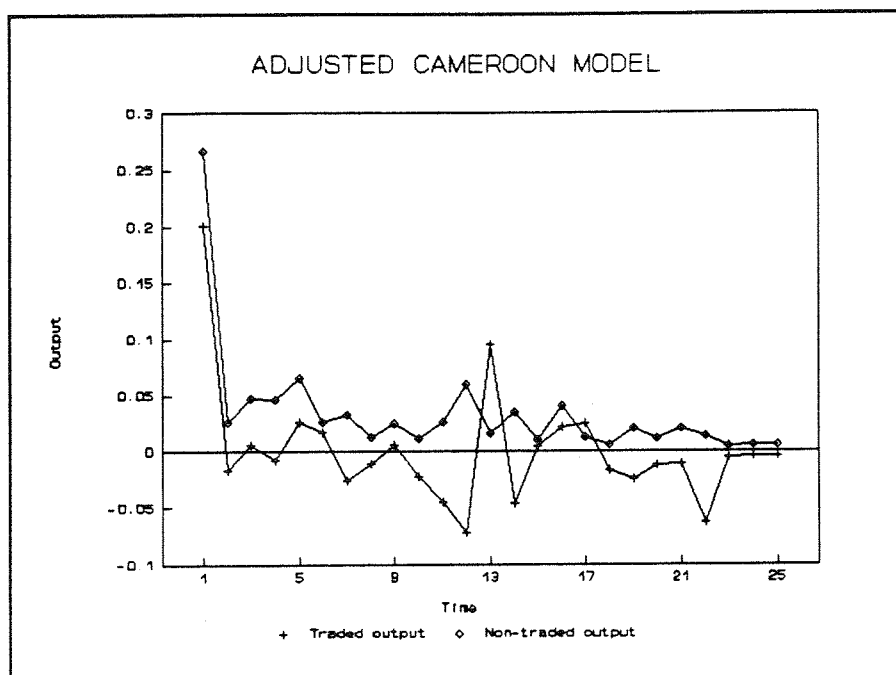


Figure 3.1 Simulation of the adjusted Cameroon model using assumed parameters and exogenous values for $\sigma < 1$

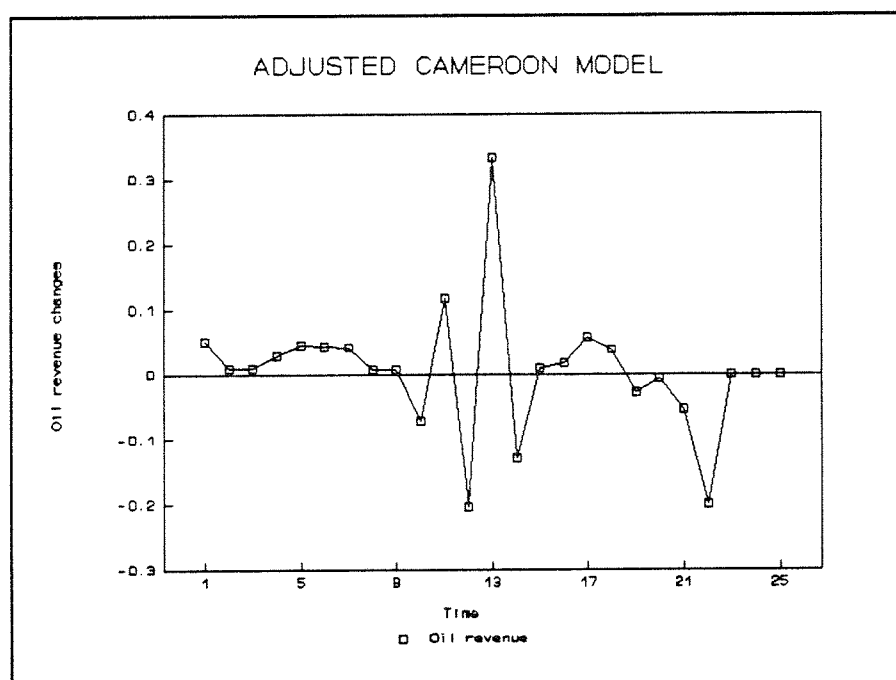


Figure 3.2 Simulation of increased oil revenue corresponding to Figure 1 above

3.3 MODEL RESULTS WITH SIMULATIONS

The focus in this section is to analyse whether there are any "Dutch disease" effects due to the impact of oil, and to see whether these effects follow the Cameroon model or the standard

model or both. Furthermore the analysis will also focus on any offsetting or reinforcing impact of the variation in the other two exogenous variables which may cloud the impact of oil.

Expectations from the simulations above suggest that the results may be consistent with the Cameroon model in which case the aspect of the "Dutch disease" will be a reversal of the standard results dependent on the increase of oil relative to the other exogenous factors. It is expected, again based on the results above, that the form of "Dutch disease" as exhibited in the standard model will hold if the increase in the price of imports is sufficiently high relative to the increases of the other exogenous factors. Furthermore the results may deviate from both models if the increase in the labour supply is sufficiently large relative to the other two variables with F increasing.

A proxy variable was used for actual revenues which was the value of total exports. This was thought to firstly be a good reflection of the quantum of government oil revenue or to be closely correlated with it. Estimates of the parameters of the behavioural equations will be obtained using the method of ordinary least squares (OLS) and would be used to generate estimates of the endogenous variables which on comparison with the actual values of these variables will give an indication of the relevance of the model structure and assumptions.

The current price estimates of GDP similarly represented the value of these two sectors i.e P_D and P_N . The price variables were then derived by finding the respective current price deflators for the two sectors. The import unit value index was used as the price of imports and was utilised in deriving the import volume from trade data which again it was expected to be more closely correlated with the data on exports.

The initial values of the endogenous variables were the actual values for this period. This however resulted in some of the assumptions of the model not being strictly adhered to in the simulations with the differences being marginal in some cases. The variables on the levels (and not the percentage changes) were affected, with the assumption of a uniform wage being violated.

The parameter estimates¹⁰ used in the analysis of the model were:

$$\alpha = 0.9, \beta = 0.7, \gamma_M = 0.5, \sigma = 0.2$$

These were found to be plausible and to give the best fit for most of the variables.

Comparison of actual and estimates

In general the estimated trend for the prices variables did not provide good fits for these variables with much higher levels of both variables arising from the estimates. In reality prices are subject to the influences of other variables such as the money supply which is not a feature of this model. The increases in traded prices, though marginally higher than those of non-traded show that the inflationary tendency is in the traded goods sector which is expected from the Cameroon model.

The estimates and the actual values were not close for both traded and non-traded output (Figure 3.3). However features of the "Dutch disease" did show up in the estimated trend. For significant increases in oil, the estimates of output of the traded sector increased whilst that of the non-traded either decreased or increased. For the year 1971 when oil revenue increased by 7% according to the model results traded output fell by 2% and non-traded output increased by 1.9%. This is in line with the "Dutch disease" effects of the standard model. The other exogenous variables import prices increased by 10.6% and labour by 1.7% indicating that the increase in the price of imports was sufficient to cause a fall in traded output.

For 1990 the increase in oil revenue was 59.8%, whilst import prices increased by 50% and labour employed in both sectors fell by 1.1%. The result is a positive increase of 6.5% in traded output and decrease of 2.2% in non-traded output is not surprising which conforms in this case to the "Dutch disease" feature of the Cameroon model.

The estimate of the non-traded output was more inaccurate

¹⁰ The estimates of α and β found using OLS were rejected since they were either of the wrong sign or the magnitude was not realistic. γ_M was found to have that average value over time and from the regression σ was less than 1.

relative to the actual values and was more accurate for values of the elasticity of output with respect to labour, when β is greater than 1 which was seemingly unrealistic.

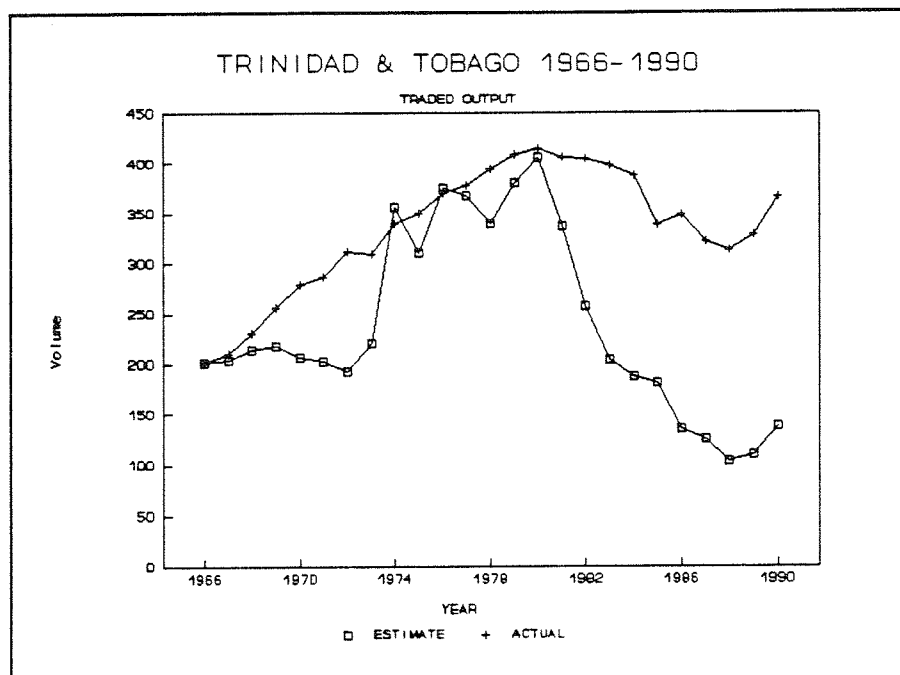


Figure 3.3 Estimate and actual output of the traded sector.

The estimate of traded labour generally showed levels which were much higher than the actual values for example for the oil boom period 1974-1981 which implies that the model predicted a higher resource movement effect into the traded sector for large increases in oil than actually occurred with a larger negative resource movement effect for the post oil boom period. The estimate of non-traded labour however showed a persistent increasing trend capturing better the actual data. The post oil boom period shows that labour in this sector levelled off rather than increased which the Cameroon model predicted.

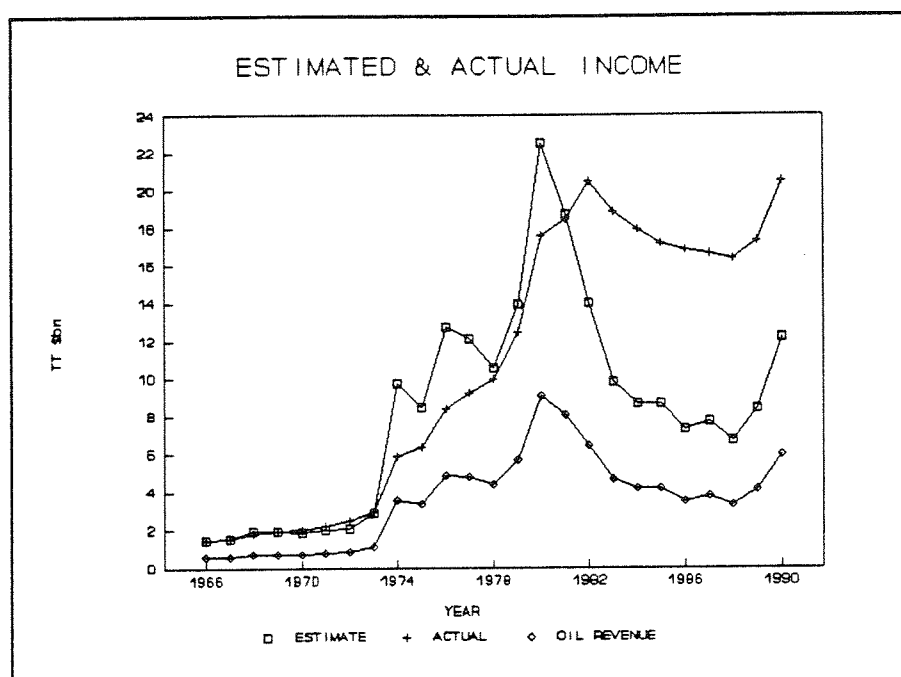


Figure 3.4 The impact of oil on total income

For total income the estimated and actual values were very close as can be seen in Figure 3.4. For the post 1981 period which marked the end of the oil boom period for the economy in which case early warning signals were reflected in 1982 with the current account and fiscal deficits re-appearing, the model indicated a sharp decrease in total income with increases in the 1989 period. The actual data shows that there was a lagged effect of the fall in oil prices and hence oil revenue with income increasing one year beyond that indicated by the model (1982) before decreasing.

Furthermore the trend in the post 1982 period differs only in level. This reflects the divergence of the assumption of the model as contained in equation (3.8). The government accumulated significant foreign exchange reserves during the period of the first oil boom and spent equally significantly during the second oil boom (Auty, 1985), the continued increase reflected in the actual data was as a result of the availability of previously accumulated reserves which enabled continued expenditure. This also points to the inability of the government to curb expenditure after the fall in oil prices and therefore to the need to model the government expenditure in assessing the impact

of oil on the economy.

A similar pattern to total income emerged from the model for the value of non-traded output as well as being a close fit with the actual data which seems to coincide with the assumption that the share of this sector in total income is a constant proportion. The value of output of the traded sector was not as accurate and appeared to be a bit erratic for the oil boom period possibly due to the influence of the price component which was not well predicted.

The assumption of equation (3.8) of the value of imports being equal to the oil revenues which was violated in the actual data implies that the increase in M is always greater than the increase in the difference of oil revenue and import prices with the change in D being a proportion of that difference. i.e. the increase in M was larger than the increase in D subject to the increase in labour employed.

Simulation of reduced oil revenues

This section concentrates on further assessment of the impact of oil on the endogenous variables through simulating its impact if it were reduced by 50% with the other exogenous factors varying as compared with its base simulation with oil revenue at its actual value, and also isolating the influence of oil by holding these other exogenous variables constant.

If oil revenues were half their actual values then traded prices would have been reduced on average by 25% for the entire period (Figure 3.5). Import prices increased on average by 17% and the labour employed by 3%. i.e. the converse is that increasing oil revenue by 50% will result in a 25% increase in traded prices. Since $\sigma < 1$ (imperfect substitution) then the increase in import prices had an offsetting effect on the increase in oil. Figure 3.6 shows the scenario if oil revenues were reduced and import price and labour were held constant. In this case this is a replication of the Cameroon model with the result of the simulation showing that isolating the impact of oil results in a much higher increase in prices for the period of the oil boom 1974-1981, than if those other factors were not

held constant. For this same period the increase in import prices was 31% supporting the above point in that allowing the effect of import prices lessens the increase in traded prices exerted by the impact of oil.

For non-traded prices reducing oil revenue by 50% results in a reduction of these prices by approximately 22% and for the oil boom period a reduction 16% which is marginally less than that of traded prices reinforcing the point that the inflationary tendency of increasing oil revenue is marginally higher in the traded sector.

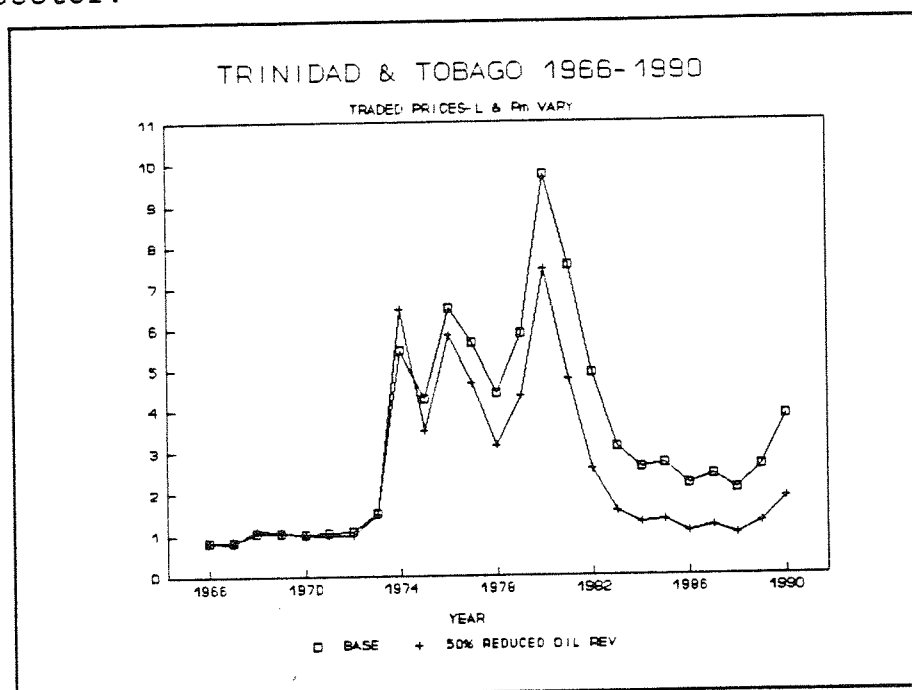


Figure 3.5 Simulation of a 50% reduction in oil revenues $\sigma < 1$, L & Pm varying

The real exchange rate showed a general downward trend reflecting an appreciation for a 50% reduction in oil revenue with P_m and L varying. A close look at Figure 3.7 however shows that there are at least three points where there were indicators of depreciation of the real exchange rate coinciding with the oil boom i.e the influence of oil was sufficient to cause a "Dutch disease" feature to be reversed due to the impact of import prices.

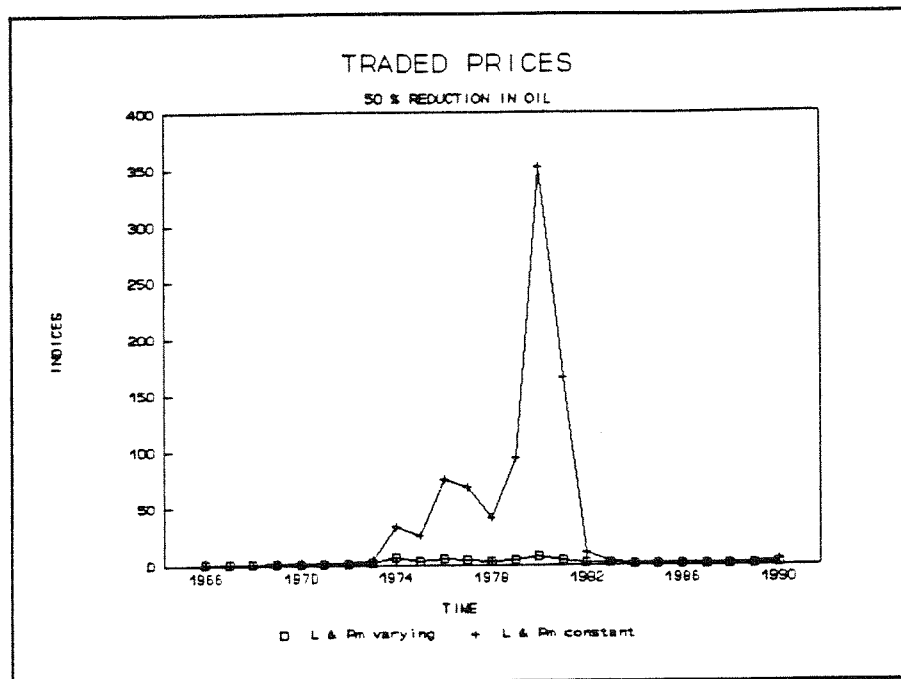


Figure 3.6 Comparison of a 50% reduction in oil revenues holding import prices and labour constant and varying $\sigma < 1$

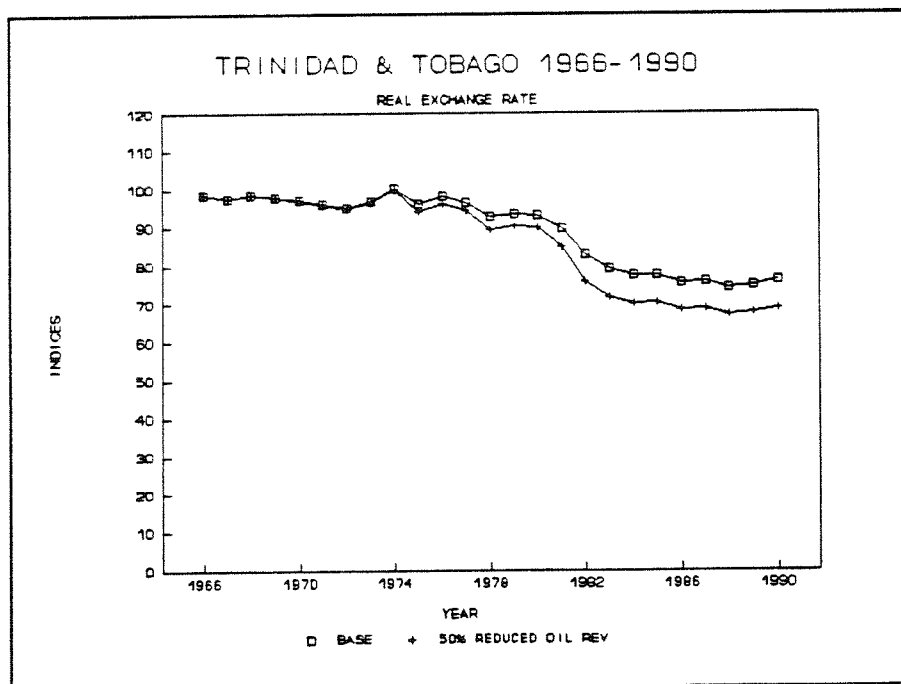


Figure 3.7 Simulation of the real exchange rate for a 50% reduction in oil-L&Pm varying

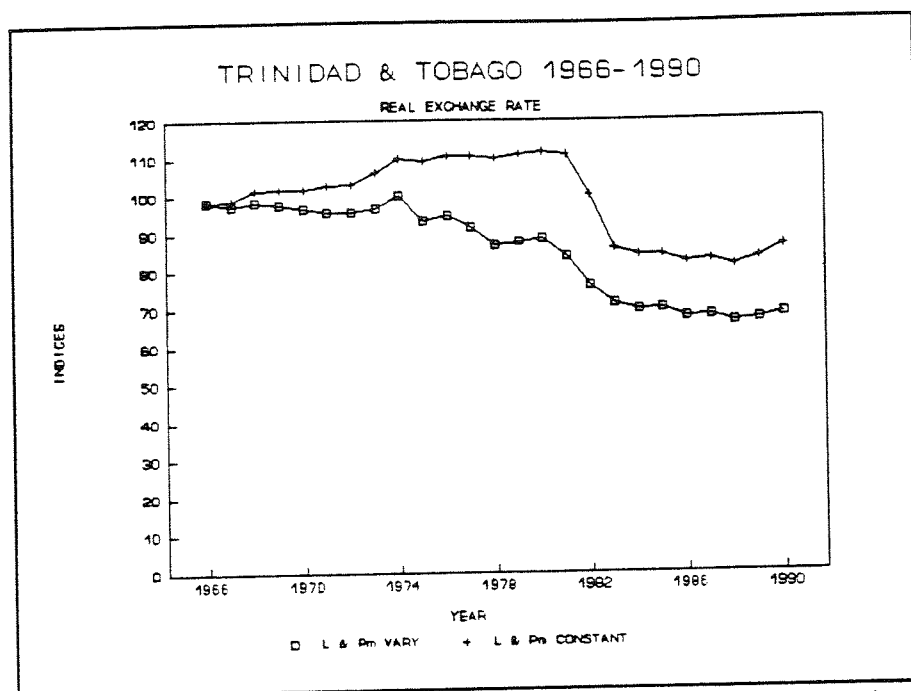


Figure 3.8 Comparison of simulation L&P_m varying and constant for a 50% reduction in oil revenues

A look at Figure 3.8 which gives the impact of oil holding L and P_m constant shows a more pronounced depreciation feature for the oil boom period.

The impact of a 50 % reduction of oil revenues on output shows that there is negligible change in traded or non-traded output as compared with the base simulation with oil revenues at its actual value. Traded output decreased by approximately 1% whilst non-traded output decreased by 6%. For the oil boom period the impact was slightly more with decreases of 5% and 11% for traded and non-traded output respectively but nothing close to the reduction in traded and non-traded prices as earlier described (See Figures 3.9 and 3.10). Holding import prices and labour constant shows that there is more significant variation for both traded and non-traded output with a manifestation of a feature of the "Dutch disease" from the Cameroon model which is the expansion of the traded sector and the contraction of the non-traded sector (Figures 3.11 and 3.12). The changes in the other exogenous factors have therefore dampen the "Dutch disease" effects.

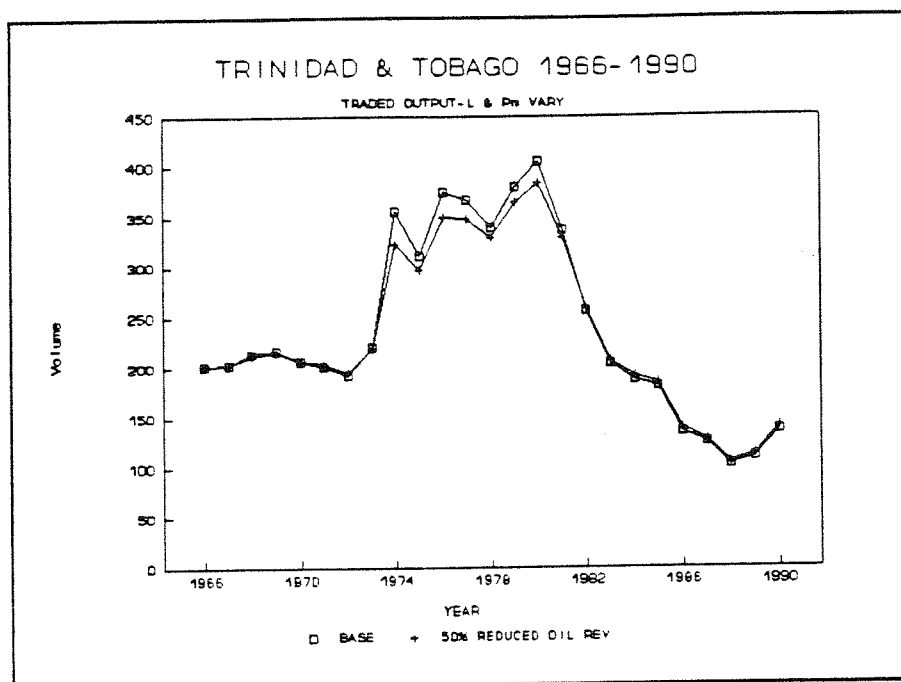


Figure 3.9 Simulation of the impact of a 50% reduction in oil revenue traded output, L & Pm varying

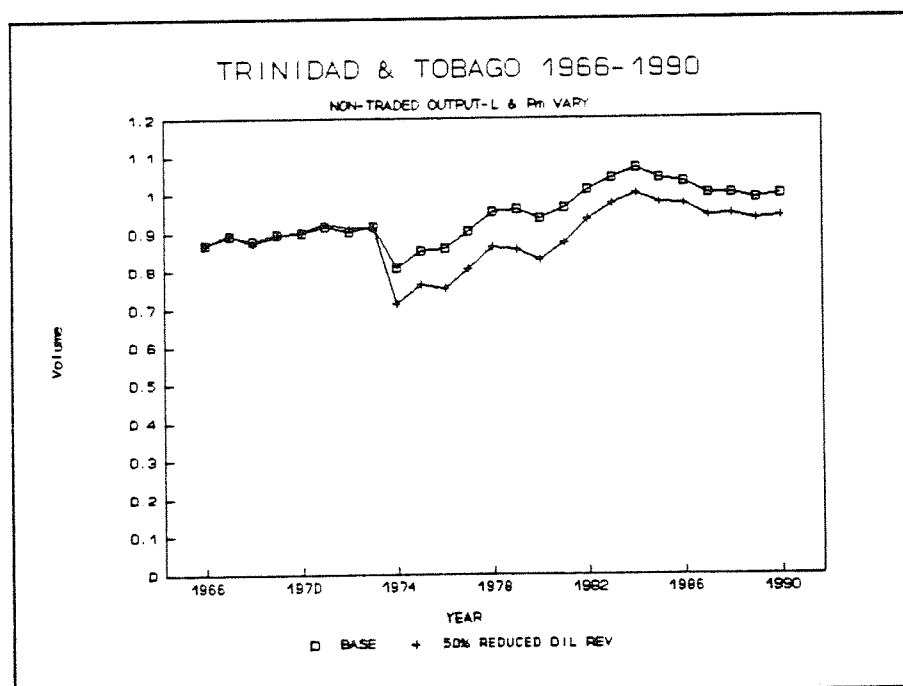


Figure 3.10 Simulation of the impact of a 50% reduction in oil revenue on non-traded output, L & Pm varying

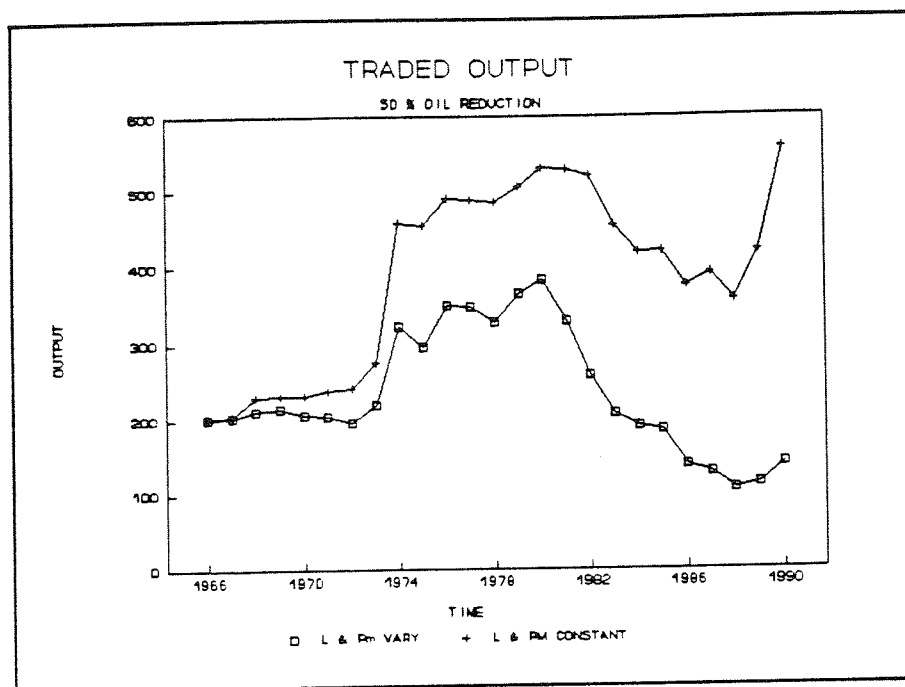


Figure 3.11 Comparison of a 50% reduction in oil revenue on traded output holding import prices and labour constant and varying

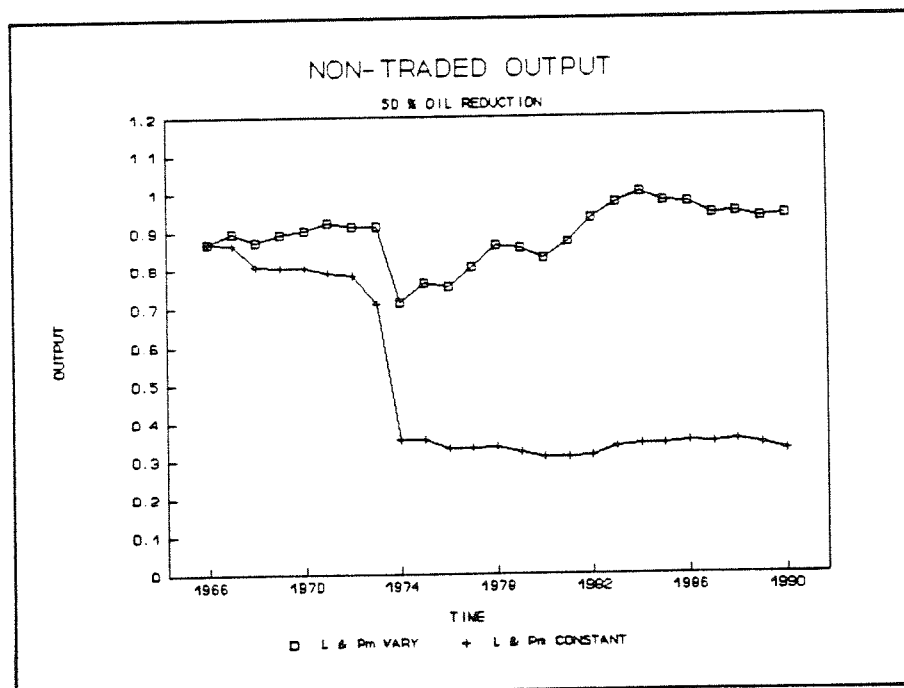


Figure 3.12 Comparison of the impact of a 50% reduction in oil revenue on non-traded output holding import prices and labour constant and varying

The impact of a reduction of oil by 50 % showed similar

impact on traded and non-traded labour as for output and holding import prices and labour constant resulted in more significant changes in labour in both sectors with a resource movement effect resulting in increased labour in the traded sector from the non-traded. Figure 3.13 highlights the effects with the two variables varying and constant.

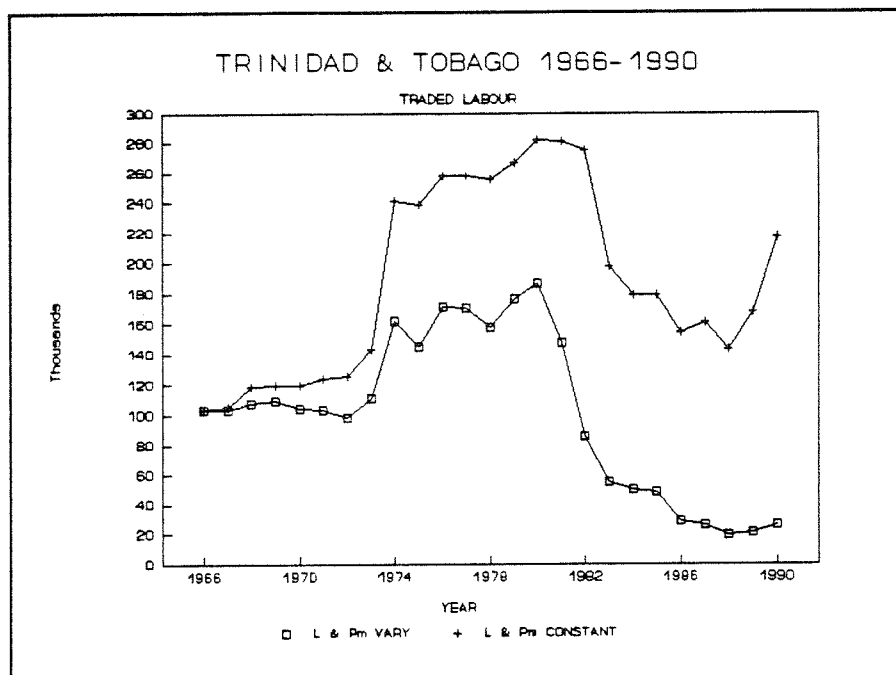


Figure 3.13 Comparison of the impact of a reduction in oil revenue by 50% on traded labour holding import prices and labour constant and varying

Total income was reduced by 33% for the 50% reduction in oil with the largest reduction occurring in the post oil boom period of approximately 49%. Higher oil revenue therefore results in increased income but by less than the increase in oil. Holding L & P_m constant results in dramatic increases in income particularly for the period of the oil boom (See figures 3.14 and 3.15)

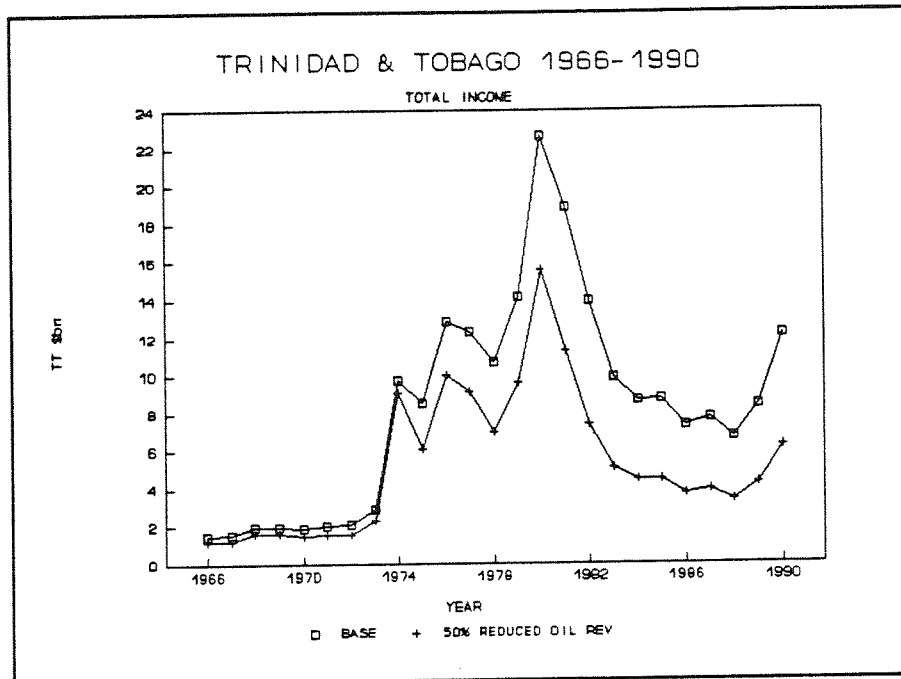


Figure 3.14 The impact of a reduction in oil revenue on total income

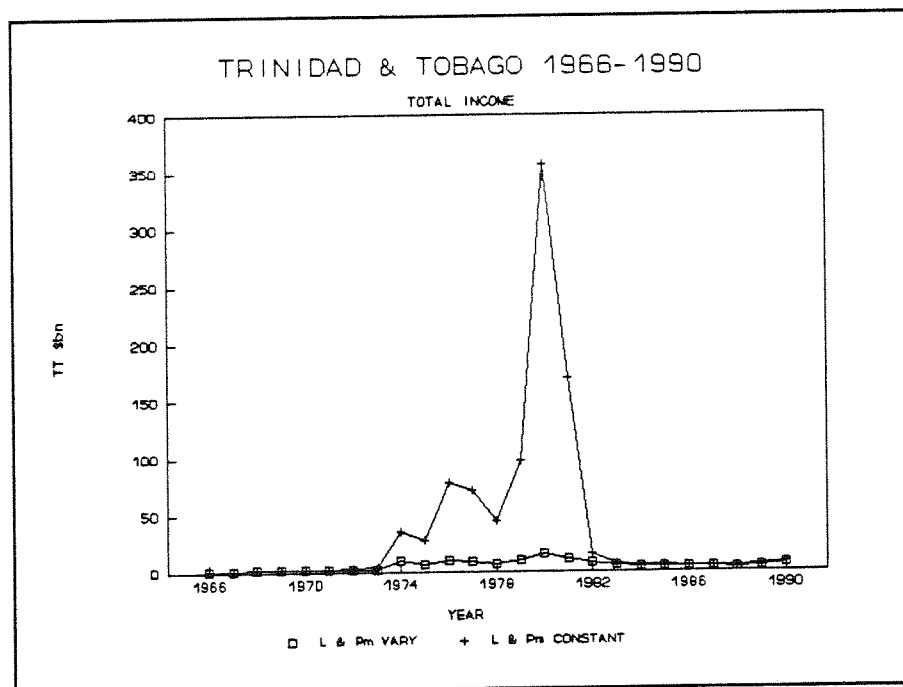


Figure 3.15 Comparison of the impact of a 50% reduction in oil on total income holding import prices and labour constant and varying

3.4 CONCLUSION

One of the critical assumptions to be violated was that of equation (3.8) which implied that the oil revenue was not invested abroad or used to pay the foreign debt or in the accumulation of reserves. This is obviously unrealistic in most developing countries and specifically in the case of Trinidad & Tobago. There was in fact accumulation of reserves amounting to approximately \$TT 1 billion for the period 1974-1981 which includes two phases of oil price hikes in late 1973 and 1979. Additionally the country does have to service the foreign debt out of oil revenues.

Another factor which affected the relevance of this version of the model is the absence of a clearly defined government sector. The focal point of the collection of oil revenues in the country being analysed is the Treasury and therefore the government sector plays a vital role in that it is through the mechanism of government expenditure that the impact of the boom is felt. The lack of a clearly defined government sector therefore detracts from the inter-relationships brought about by the use that is made of the oil revenues.

This points to mis-specification of the functional form of the model in that the inclusion of the interrelationships involving government expenditure will enhance the explanatory power of the model. Another important factor relative to the inadequacies with respect to the price variables is the omitted variable bias in that there are other determinants of prices that are not included in the model for example the rate of change of the money supply will impact on prices.

As observed earlier the initial values used in the simulation did in fact influence the results resulting in possible assumptions not holding but in more realistic results. The simulated percentage changes were generally not affected but on the levels there were differences. Inaccuracies could have also resulted in the choice of parameter values.

The adjusted model however did conform to the Cameroon model for sufficiently large increases in oil enough to negate the impact of high import prices. The imperfect substitutability

between imports and domestically produced traded goods ensured that increase in prices of traded goods relative to that of imports did not result in the contraction of this sector once the increase in oil outstripped that of import prices. i.e there was less satisfaction of demand through expenditure switching from domestic goods into imports.

In general therefore there is need to further analyse the data taking into consideration the role of government in influencing the impact of oil which will be the purpose of the following section.

SECTION 4 THE "DUTCH DISEASE" AND THE MACROECONOMIC MANAGEMENT OF COMMODITY BOOMS

"...For a country to be endowed with a resource that is valued highly in world markets can be a benefit. However, it is not sufficient for strong growth performance. If badly managed, both unstable growth and external debt crises can result. Recent experiences of oil-exporting, middle-income, developing countries demonstrate this. Botswana has avoided many of the problems that other developing countries have been unable to avoid..."

(Hill & Mokgethi, 1989)

The above quotation is based on the case of Botswana and the macroeconomic management of commodity booms. The main issues raised in the preceding sections are the theory of the "Dutch disease", the trends in the economy relative to this phenomenon and the analysis of the impact of the oil boom using a "Dutch disease" model of a developing country. Criticisms have been focused on the absence from the theory of the economic agent receiving the oil windfalls and the use of these revenues. In this context one angle of the problem of the "Dutch disease" is seen to be that of the improper management of a commodity boom where the receiving agent is the government. The main aim of this section is therefore to complement the modelling of the previous section, by assessing the role of the government in the impact of oil. This role has implications for the issue of management of the windfalls and the effects of the "Dutch disease". This will be done through the analysis of government's fiscal expenditure and a review of the policy response to the boom.

I will start with a brief discussion on the management of commodity boom as it influences the "Dutch disease" which will be followed by the issue of export price instability and temporary booms. Next, I will discuss the life cycle-permanent income hypothesis (LCPIH), the savings path suggested by this hypothesis being proposed as an appropriate one to follow in response to commodity booms. Empirical analysis of the same hypothesis will be done using data on consumption and investment both public and private. The management of the commodity boom by Botswana as a case of good management will be used as a means of comparison with that of T&T to assess whether the latter's

response exacerbated or dampened the "Dutch disease" effects. This will include a brief discussion on economic diversification specifically resource based industrialization (RBI). Conclusions will follow.

4.1 MANAGEMENT OF COMMODITY BOOMS

Commodity booms can result in both benefits as well as difficulties to the countries experiencing such booms. The benefits as previously stated include increased domestic production and incomes, improved balance of payments and government budgetary positions, and increased capital inflows providing much needed foreign exchange earnings for investment and economic growth.

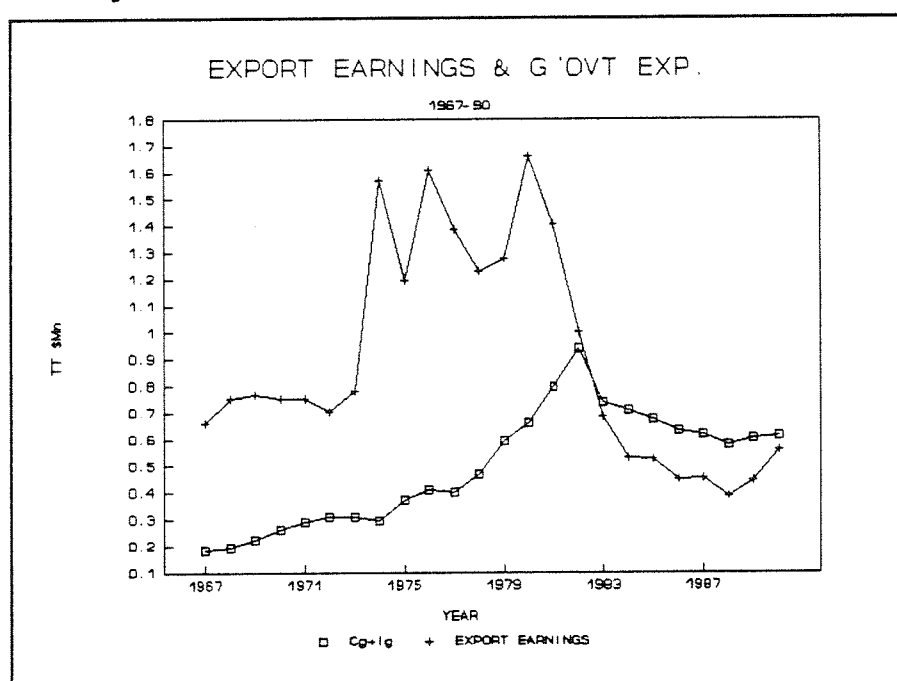


Figure 4.1 TOTAL GOVERNMENT EXPENDITURE AND TOTAL EXPORT EARNINGS-T&T Source: Central Statistical Office

Amongst the difficulties experienced by countries that have undergone a temporary commodity boom was that of unsustainable government expenditures which is downward rigid after the boom. Figure 4.1 above compares total government final consumption and investment expenditure ($C_g + I_g$) with total export earnings, all in constant prices. The period 1981-83 highlights the issue of

government's expenditure being unsustainable, the trend in expenditure being superimposed on that of income. The real growth rate of government final consumption expenditure for the period 1967/73 was 2.4% with the figure for 1974/81 being 10.4%. For government investment expenditure the real rate of growth was 2.4% for the period 1967/73 and 23.4% for 1974/81. High points in government investment expenditure were real growth rates in 1978 (44.4%), 1980 (42.4%) and 1981 (40.8%). Total government expenditure only fell by 4.1% in the post boom period 1982/87. In nominal terms total government revenue including grants was approximately 41 \$TT Bn for the period 1974-83 whilst government final consumption and investment expenditure was approximately 23 \$TT Bn for the same period also in nominal terms (T&T National Accounts Reports, 1966-83).

Before a government can elicit a response to sharp increases in its revenues, of utmost importance is the recognition of the nature of the boom - Is it permanent or temporary? And how can one detect this? The boom in coffee prices in 1975-76 caused by the frost in Brazil was obviously of a temporary nature. In other instances the duration is not easily detectable. Studies on commodity markets indicate that fluctuations in export prices that are common features to such markets follow a pattern of sporadic peaks and long shallow troughs (Bevan et al, 1987). The link between temporary commodity booms and export price instability is related to the uncertainty surrounding the duration of the fluctuations i.e. the periods of boom and slump and whether one can ascertain the effect of this instability on economic growth. The next section looks at some arguments on this issue as it can shed some light on policy response in temporary booms.

4.2 EXPORT PRICE INSTABILITY

It is widely accepted that fluctuations in export prices have significant impact on the economies of the producing economies. There is little consensus however on the direction and significance of the impact on economic growth (Adam et al, 1979). Several channels have been identified through which fluctuations

in primary commodities can affect the macro-economy. These include balance of payments effects resulting from changes in value of exports, and fiscal policy effects through the changes in the quantum of tax revenues.

The empirical results on the impact of export instability and economic growth in LDC's in some cases showed that the relationship was negative, others positive and also no significant relationship.¹¹ A discussion of these results by Newberry and Stiglitz (1981) in their book entitled "Theory of Commodity Price Stabilization" cited an empirical study by Knusden and Parnes (1975) in which the permanent income theory of consumption and investment for LDCs was tested. According to this theory consumption is based on long run trend or permanent income and is unaffected by transient fluctuations in income like those caused by export instability. They argue that income instability reduces the average propensity of income consumed and therefore increase savings. If investment is savings constrained then income instability will encourage investment and growth.

This brings us to the issue of the policy response of the government in which case an appropriate response can largely avoid such adverse consequences as those resulting from "Dutch disease". It is possible that timely and corrective action by governments may result in positive rather than negative feedback due to export instability. There are three aspects to government policy response relative to the issue of export instability and temporary booms.

Firstly it has been argued that an appropriate policy response to a temporary boom in the absence of liquidity constraints is to follow a savings path which is consistent with the life cycle permanent income hypothesis (Cuddington, 1986 cited in Hill, 1991). This implies the avoidance of excessive increase in government and private consumption and investment expenditure, and the building up of international reserves to be used after the boom. Secondly the accrual of oil windfalls to

¹¹ A discussion of studies on export instability and economic growth can be found in Macbean et al (1988). Studies have also been done by Glezakos (1983); Gyimah-Brempong (1991).

governments whose expenditure would then be the mechanism of transmission of the oil revenues to the economy implies that the models of fiscal behaviour are of some relevance in analysing the effectiveness of policy response. In this paper the fiscal behaviour approach¹² will not be emphasised. The central issue would be to assess whether the governments' fiscal expenditure was in fact in line with the life cycle-permanent income hypothesis. The third area, that of economic diversification including RBI, is another means of assessing the appropriateness of governments' policy as it leads to the avoidance of the full adverse impact of the "Dutch disease". Below I will deal with the life cycle-permanent income hypothesis.

4.3 LIFE CYCLE-PERMANENT INCOME HYPOTHESIS

The life cycle theory of consumption associated primarily with Modigliani (1963) has as its basis micro-economic theory of the pattern of consumption and savings over the lifetime of an individual, and gives rise to the macroeconomic theory of consumption and saving (Dornbusch et al, 1990). The consumption function assumes that current consumption is proportional to current income with current savings being a residual. The life cycle hypothesis sees the process of consumption and savings as intertemporal with individuals planning their consumption and savings behaviour over time in order to optimally allocate consumption over their life time. An individual smooths his or her consumption over his or her life time rather than periods of high consumption and other periods of low.

Factors such as an individual's age, wealth and bequests are seen as influencing savings and consumption behaviour. The main idea of the life cycle theory is that individuals save during periods of high income and dissave during periods of low income in order to achieve a smooth level of consumption over their lifetime.

The permanent income hypothesis which is the work of

¹² For further information see Heller (1975); Mosely (1987); White (1992) and (1993).

Friedman (1957)¹³ views consumption behaviour of individuals as being based on their permanent or long term income and not on their current income. The basic argument is the preference of a smooth flow of consumption over time so that the permanent income is defined as the present value of his future income stream times a rate of return. Permanent income is distinguishable from transitory income which is assumed not to affect consumption significantly. An important aspect of this theory is the ability to detect whether the change in income is permanent or transitory and to consume accordingly. There are two further implications - the short run marginal propensity to consume is in general lower than the long run marginal propensity to consume, and the short run marginal propensity to consume of an individual with very unstable income is lower than that of one with more stable income.

An interesting extension of the above concerns whether consumption is excessively sensitive to current income (Flavin, 1981). The assumption is that fluctuations in current income is correlated with fluctuations in permanent income such that for an increase in current income, consumption should react only to the change in permanent income. If the change in consumption exceeds the current change in permanent income, consumption is said to be excessively sensitive to current income and is reacting too much to the transitory change in income.

In the following section analysis of the data for Trinidad & Tobago will be done to try to ascertain whether the government's fiscal policy was consistent with the above theory as a means of drawing some conclusion with respect to the management of the boom.

4.4 EMPIRICAL ANALYSIS

The analysis will isolate the trend in permanent income from transitory income. This is to obtain an estimate of the boom or bust in oil revenues which is the transitory or cyclical component. Three methods are used, with the first assuming that

¹³ Cited in Dornbusch et al (1990); Beveridge & Nelson (1981); Nelson (1987)

the income variable follows an exponential deterministic time trend of the form:

$$\ln Y_t = a_0 + a_1 t + e_t \quad (4.1)$$

This model is referred to as trend stationary (TS) and implies that the long run behaviour of the variable is deterministic i.e. it restricts the relevance of past values of the variable. The estimate of the transitory component is equivalent to the deviation from the trend.

The second method assumes that the time series is stochastic of the form:

$$\ln Y_t - \ln Y_{t-1} = a_0 + e_t \quad (4.2)$$

which describes a series said to be difference stationary (DS) implying that future values of the series is influenced by historical events. The estimate of the transitory component in this case is the forecasting error also referred to as innovations in income. This model describes a random walk with drift. The fundamental difference between the TS and DS is that under the DS assumption any movement in the short term will be influenced by some long run impact but very little impact under TS (Nelson et al, 1982). The error term in the TS model is only relevant in the current time period, t , whereas in the DS model the error term influences all future value of the variable. The third method is a special case of method two in which there is no constant term i.e. a simple random walk without drift.

Booms and busts using the three models above were estimated for total GDP, total export earnings and petroleum value added (See Appendix B for method of estimating booms based on the models above). Tests on all three series indicate that they are difference stationary processes. Due to the small sample size which can be a limitation on the confidence of this result the estimate of the boom was also done for the TS model.

The change in government final consumption (C_g) and investment (I_g) expenditure combined (G), as well as private

consumption and investment expenditure and total domestic absorption (total consumption and investment public and private) were regressed on the boom estimates and current income. The test was twofold—to see if government smoothed its expenditure over time and to see if there were excessive sensitivity to current income, the latter being a further test of the LCPIH implying that current consumption is dependent on past consumption and no other information from any other variable. Using the different models and series imply that the results are robust. It was found that the best estimate of the boom was provided by export earnings as shown in Figure 4.2.

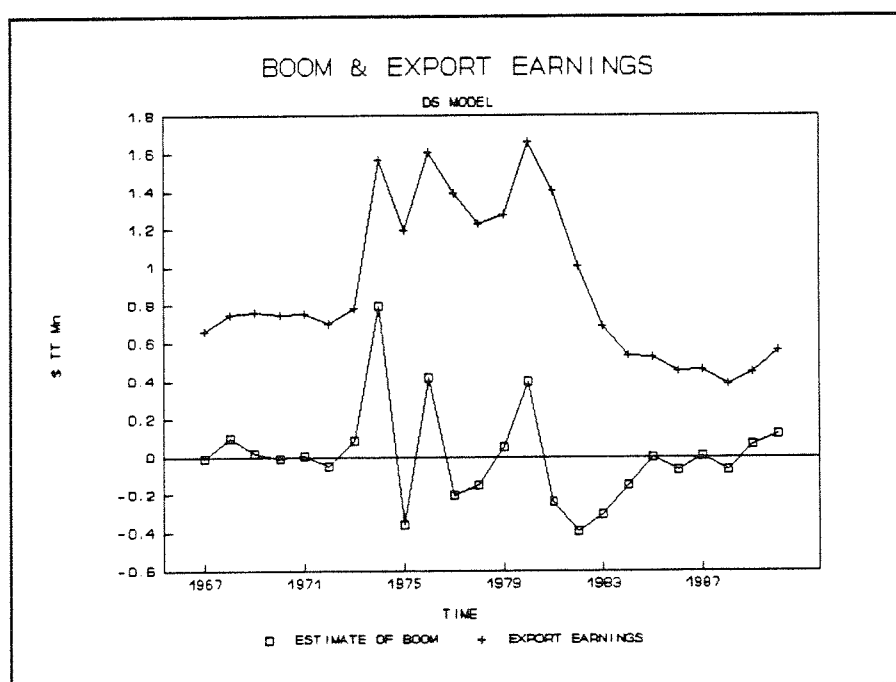


Figure 4.2 ESTIMATE OF THE BOOM IN EXPORT EARNINGS USING THE DS MODEL

In addition as reported above the Dickey-Fuller¹⁴ test showed that the model was DS so that the results reported below refer to this model and the export earning series.

¹⁴ Using t-statistic one may wrongfully conclude that a series is stationary due to downward bias of beta. The Dickey-Fuller tables address this problem. (Mills, 1990).

REGRESSION RESULTS

The following was the result of the analysis of the export earnings series - t statistics in parentheses and the D representing first differences of the variable:

$$DG = -67.7 - 0.06BOOM + 0.10EXP, \bar{R}^2 = 0.23 \quad (4.3)$$

(2.04) (-1.11) (2.8)

where DG - is the change in government consumption and investment expenditure;

BOOM - is the estimate of the boom using the DS model;

EXP - is total export earnings.

The result above indicates that there is insufficient evidence to reject the hypothesis that government's expenditure was based on the permanent income and therefore was smoothed over time. However further test of the LCPIH relative to the excessive sensitivity of government expenditure to current income shows that the coefficient is significantly different from zero at a 0.01 level of significance ($t_{0.99} = 2.583$ at 21 degrees of freedom). Recalling Figure 4.1 one can see the increase in government expenditures in the years following 1979.

As reported by Auty and Gelb (1985) the government saved most of its windfall earnings during the first oil boom but spent significantly during the second. Based on the excessive sensitivity test one can therefore conclude that government's expenditure was not in accordance with the LCPIH. Results for total private final consumption and expenditure combined (PCI) and total consumption and investment public and private (CI) are as follow:

$$DPCI = -389 - 0.01BOOM + 0.46EXP, \bar{R}^2 = 0.36 \quad (4.4)$$

(-3.18) (-0.05) (3.66)

$$DCI = -457 - 0.07BOOM + 0.56EXP, \bar{R}^2 = 0.39 \quad (4.5)$$

(-3.3) (-0.31) (3.95)

These results are similar to that of 4.3 above.

The following section will therefore shed some light on the

policy of the government relative to the findings above which will include a comparative analysis of Botswana's management of its diamond boom.

4.5 MANAGEMENT VERSUS MISMANAGEMENT-POLICY RESPONSES OF T&T AND BOTSWANA

THE CASE OF BOTSWANA

As described by Hill (1990) Botswana's consumption has been in accordance with the LCPIH in that the regressions of the rate of change of public consumption or recurrent expenditure on the boom are not significant. Botswana has been highlighted as a case of proper management of commodity booms by Hill (1990) & (1991), Hill & Mokgethi (1989). It has been described as having the most rapid rate of growth between 1965 and 1985 (World Bank 1987 cited in Lewis and Sharpley, 1988). In common with Trinidad, Botswana has a mineral led economy (diamonds in the case of the latter-oil for T&T) and a population of approximately 1 million.

Three elements have been identified by Harvey and Lewis (1990) which explain Botswana's economic performance. The first was luck in the form of a fifteen year wet weather cycle, access to markets for its beef exports, the discovery of two diamond mines and copper-nickel deposits, increased concessional aid to Africa. Secondly the economic management included the setting up of funds for the stabilization of reserves and for the servicing of public debt; institution of measures to deal with drought cycles in advance, such as environmental issues e.g. overgrazing of cattle; the pursuit of a counter-cyclical policy in the management of foreign reserves, and the monitoring of government cash balances paying close attention to the forecasts of export earnings. The government was able to withstand severe political pressure to spend everything in the treasury.

Thirdly the Botswana government's negotiating skills with outsiders enabled it to reap benefits for the economy including transportation through South Africa and exploitation of mining deposits by foreign companies.

Specific policies of the government were the avoiding of external debt problems, the promotion of exports other than the

resource as a means of diversifying the economy, and exchange rate management to avoid appreciation. The preference in economic diversification was in small and medium scale projects rather than large scale projects associated with an RBI strategy. The general policy was the maintenance of sustainable levels of expenditure during the boom, the building up of reserves in good years to utilize them in bad years and therefore avoiding income instability referred to earlier in this section. Export earnings declined in 1981 and adjustment policies were immediately instituted. One of the measures was the limiting of bank credit to 8% in 1982 from 50% in 1981 and the increasing of the prime lending rate. These policies therefore helped the Botswana government to avoid the adverse effects of the "Dutch disease". In fact Botswana's rate of growth of manufacturing value added for the 1965-85 period is amongst the highest for that period following only China, South Korea, Singapore, Indonesia and Libya (Lewis & Sharpley, 1988).

THE CASE OF TRINIDAD AND TOBAGO

The sectoral trends of Section 2 have suggested adverse changes in the economic structure of various industries which became increasingly evident after the boom. The modelling of the impact of oil in Section 3 has also conclusively shown that there were symptoms of "Dutch disease". Finally the analyses of this Section have found that government's consumption was based on permanent income. However there was excessive sensitivity of consumption to current income which does not support the LCPIH which as earlier discussed is considered an appropriate response.

As can be seen from the Table 4.1 the pre-1974 period even though it was characterised by internal and external imbalances, these were sustainable since the growth rate of real GDP was positive. The country during the pre-oil boom period had in fact undergone a period of tight economic management due to declining oil production (Auty, 1985 and T&T Budget speech 1973). The policies of the government during the 60's was one of industrialization in the mould of W. A. Lewis (1954) following

the coming into power in 1956 of the political party which was headed by the late Dr Eric Williams. Amongst the features of the strategy were the establishment of an Industrial Development Corporation geared to create the environment for industrial development through assisting industries in obtaining sites, the provision of factory shells for lease, and the implementation along with the Customs authority of duty free concessions on imported intermediate inputs. Emphasis was on the establishment on food processing, textile manufacturing as well as industrial chemicals.

TABLE 4.1. SELECTED INDICATORS¹⁵

VARIABLE	1969- 1973	1974- 1981	1982- 1987	1988- 1990
EXTERNAL DEFICIT TO GNP%	-8.9	6.7	-10.3	1.7
BUDGET DEFICIT TO GNP%	-2.5	13.4	-3.6	-2.6
DEBT SERVICE RATIO ¹⁶ %	4.2	3.5	12.9	13.5
RESERVES-CHANGES (TT \$Mn)	14.3	-947.4	1333.5	383.1
GDP GROWTH RATE%	3.1	6.1	-4.8	-1.9
% OIL EXPORTS	78.6	89	78	60
% OIL VALUE ADDED	23.8	41.1	25	25.8
% OIL REVENUE-GOV'T	38.2	67.9	39.7	35.1
% UNEMPLOYED	13.5	12.6	15	22.1
%INFLATION	5.2	14.3	10.5	9.9

SOURCE: REPUBLIC OF TRINIDAD AND TOBAGO-CENTRAL STATISTICAL OFFICE-NATIONAL INCOME & LABOUR FORCE REPORTS; WORLD DEBT TABLES-1990.

¹⁵ Figures are averages for the periods using current prices except for the GDP growth rates.

¹⁶ Total debt service payments to total exports.

During the period of the first oil boom the need for caution was recognised by the government which is gleaned from the following excerpt from the 1974 Budget Speech of the then Minister of Finance:

"...Prudence and foresight therefore, require us to plan our affairs on the assumption that the present situation may not be of long duration and to apply the income from this wasting asset as a defensive shield, to develop the foundation for long term economic vitality...properly managed the oil industry will provide benefits; improperly managed it can literally destroy the base of the economy..."

This caution was reflected in accumulation of foreign exchange reserves over the 1974/81 period. The policy of the government for the periods of the oil booms was one of economic diversification primarily through the creation of gas-based industrialization. Additionally there were extensive nationalisation of companies either as a means of gaining control of key industries in the economy or to preserve employment through rescuing ailing industries. It is noteworthy however that at present just under 50 % of the crude oil production and about 84 % of natural gas are under the control of a foreign owned company Amoco Trinidad Limited (AMOCO).

Several funds were established by the government in which appropriations of the revenue derived from oil were made. Some of these were Petroleum development fund, food development fund, fisheries development fund, omnibuses renewal fund, industrial sites and services fund and a Caribbean integration fund. The number of these funds was as high as fifty-one (51). Expenditure from these long term funds for the period 1974-83 was 15 \$TT Bn (T&T Accounting for the petrodollar 1973-83). The aim was to avoid wasteful expenditure by providing funds for capital expenditure only when project plans were properly designed. Secondly it was a means of setting aside the oil revenues for the long term restructuring of the economy with the availability of funds being subject to special parliamentary approval.

The policy objectives for the use of the oil revenues include the following:

- to increase the level of employment, to expand the domestic food supply and strengthen the productive base of the economy;
- to cushion to the extent possible some of the effects of rising external prices on the domestic cost of living and to reduce the cost of transportation;
- to redistribute income in favour of the low income groups and in particular to improve the position of the old age pensioners and those dependent on social assistance;
- to ensure that we will be able to proceed with our plans for the basic restructuring of the economy and for increasing national participation in the resource based industries;

(T&T Budget Speech 1974)

The above broad objectives encompass a wide range of measures all of which cannot be discussed here. I will therefore look at specific objectives such as agriculture, manufacturing, resource based industrialization and public building construction. Specific policies outlined for the agricultural sector were :

- the provision of funds for agricultural credit;
- development of large un-utilised areas for food production;
- the development of fishing;
- the launching of a grow more food campaign with assistance of the oil companies.

This was to be achieved by increasing the allocation to the Agricultural Development Bank (ADB), the provision of subsidies such as for fertilizers, guaranteed prices for export agriculture in spite of fluctuations in world prices, increased technical advice in systems of production, improved marketing facilities and enlarged processing facilities including a fishing complex.

For manufacturing, expansion and diversification of the industrial base was one of the principal strategies. Synthetics, plastics, metal fabrication, detergents and pesticides were some of the areas outlined. Special emphasis was to be placed on job

creation. Amongst the policies to develop manufacturing were establishment of infra-structural requirements, provision of long term credit needs through the Development Finance Company (DFC), adjustment of purchase taxes on selected consumer durables such as refrigerators, stoves, and motor vehicles, removal of purchase taxes on garments. A total of 7.2 \$TT Bn (1973-83) was the expenditure in nominal terms on subsidies such as for basic food, agriculture, manufacturing and petroleum (T&T Accounting for the petrodollar-1973-83).

At the onset of the RBI strategy it was recognised by the government that these projects are characterised by their high expenditure, complex and rapidly changing technology and the need for export markets. As a result the aim was to seek joint venture partners either private or official. A number of projects were identified within the purview of the RBI. These included two fertilizer plants (joint ventures), an iron and steel complex, petrochemical joint venture, construction of natural gas pipelines, and a liquified natural gas plant. In the development of these projects the government acquired long term debt stated to be 632.5 \$TT Mn for 1974-79 and 1,570.8 \$TT Mn for 1980-83 all in nominal terms (1980 Budget Speech).

Other key projects were in the area of construction including an electricity power plant, a large industrial estate and port facilities, expansion of a cement plant, water development works, construction of a medical complex including a teaching hospital and public buildings to house government offices and for the judiciary. These projects in construction were in addition to the system of public works geared to create employment opportunities in areas where jobs were scarce.

4.6 ASSESSMENT OF THE POLICIES OF TRINIDAD & TOBAGO

It is evident from the previous analysis of Sections II and III that government's thrust in agriculture and manufacturing did not succeed in maximising its use of oil revenues for restructuring and development in these two areas. One of the critical feature was the erosion of export agriculture, the rate of growth of output for the post oil boom period 1982/87 being

-5.8%. The consumer goods industry catered more for domestic than export demand. For 1977 for example there were decreases in the exports of radio (77.1%), televisions (85%), refrigerators (44.6%), the only increase being in exports of stoves (82%). In general there were fluctuations in the exports of these items in the post 1977 period reflecting possibly the difficulty to maintain markets for these items. Export sales of motor vehicles are not available but production did decline.

The RBI strategy was definitely a drain on the resources and also a means of increasing the indebtedness of the country. Actual expenditure in nominal terms on the RBI projects amounted to 3.4 \$TT Bn for the period 1974-83 (T&T Accounting for the petrodollar 1973-83). This leads us to a discussion as to whether these highly capital intensive projects are best suited for small countries. RBI is an opportunity for industrialization using the mineral resource as a base for downstream processing. The direct benefits of resource based industrialization as listed in Auty (1990) are higher net foreign exchange earnings, increased government revenues through taxation of higher value added as well as economic rents, and higher employment. The costs of RBI include "overstretched managerial and implementation capacity, and a projection of the problems of the mineral economy such as the effects of the "Dutch disease" into the industrialization thrust.

Amongst the disadvantages for the oil exporting countries (which were not high capital surplus exporters) as described by Auty was the highly capital intensive nature of these projects which created tension between these projects and the expansion of employment intensive activities.

Effective macroeconomic policy Auty also stated creates conditions conducive to successful RBI. These policies include: maintenance of stable and effective price signals through a realistic exchange rate for non-resource tradeables; fiscal balance including the sterilization of oil windfall gains until they can be efficiently absorbed in the domestic economy in investments; prudently chosen subsidies; broadening of the tax base to reduce dependence on the resource sector. As earlier

stated this paper is not concerned with the assessment of economic diversification of the country being studied. However governments policy during the oil boom in so far as it entailed the RBI strategy contributed to the demise of the economy in the post oil boom period and therefore exacerbated the effects of the "Dutch disease". There has been some returns in the period 1988-90 in sales of fertilizers and ammonia but the question is at what cost to the economy.

The area of construction and special public works programme fuelled by government expenditure was detrimental to agriculture and manufacturing in that it drew resources from these areas. Wages in construction were generally high relative to that in agriculture. The public works programme was generally characterised not only by higher wages but also by the fact that the number of hours worked per day was negligible. In addition cost overruns on public building construction such as the Mount Hope Medical Science Complex further escalated expenditure to unsustainable levels.

4.7 CONCLUSION

In conclusion one can compare the experiences of both countries and generalize on the issue of management versus mismanagement. Some of the policies¹⁷ of Botswana previously cited include:

- prudent management of foreign exchange reserves during the boom through accumulation;
- exchange rate management to assist traded sectors and to control inflation;
- the avoidance of external debt problems;
- achievement of diversification in small and medium term projects and the avoidance of excessive expenditure of RBI projects.

Trinidad and Tobago did in fact accumulate reserves but these were used up by the early 80's with the twin deficits, fiscal and external reappearing after the year 1981. Their mistakes would

¹⁷ Sources include Hill & Mokgethi (1989); White unpublished PhD thesis (1990)

have been:

- costly subsidies to agriculture and industry and credit facilities which did not assist in the restructuring of these sectors but became an expense after the boom;
- an RBI strategy which quickly drained the oil revenues and created a situation of indebtedness;
- subsidization of utilities, state enterprises without adequate supporting data of substantial sums;
- the imprecision of estimates by consultants and miscalculations of costs of projects resulting in incorrect decisions by the government;
- delays in project execution and implementation;
- improper work attitude resulting in productivity losses;
- failure to consider future expenditure outlays for operations and maintenance of investment projects.

Some of these points were noted in the Budget Speech of 1981 by a former Prime Minister, the late Dr Eric Williams.

The issue of management versus mismanagement can be gauged through what is considered an appropriate response to commodity booms. In the case of T&T even though there was no significant relationship between expenditure and transitory income there was in fact excessive sensitivity to current income. The policies of the government exacerbated the "Dutch disease" problem of the traded sector, created problems in the non-traded sectors after the boom through the inability to sustain expenditure in areas such as construction. The cost of subsidies and the RBI strategy both policies of which were meant to achieve economic diversification, resulted in the erosion of the oil income.

Excessive expenditure in itself is bad. Expenditure for economic diversification even though justifiable, if it fails to achieve such, or if it is done at massive cost to the economy in the short to medium term cannot be justified. Whatever savings

efforts were accomplished through accumulation of reserves during the first oil boom was destroyed by lack of prudence in later expenditure as cited above.

"..the responsibility for the efficient use of our resources and for guaranteeing of a stable economy for the future generation does not lie entirely with the government. A great responsibility lies with the managers, both public and private, public servants, and of course organised labour and its members and the citizens in general.."

(T&T Budget speech 1981)

SECTION 5 SUMMARY AND CONCLUSION

The objective of this paper was to analyse the impact of oil on the economy of Trinidad and Tobago-1966-90. The critical areas were the modelling of the impact of oil and the analysis of the role of government in managing the oil revenues. The analysis was centred on the real impact of the oil boom and not the monetary aspects.

The model utilised was based on the Benjamin et al's model of oil in the Cameroon which allowed for the possibility of the traded sector expanding, a reversal of the standard "Dutch disease" results. The crucial assumption was that of imperfect substitution between imports and domestically produced traded goods in developing countries which may lessen the impact of expenditure switching into imports as income increases. Their model also held import prices and labour employed in the traded and non-traded sectors constant in order to isolate the impact of oil. In order to have a better representation of reality these two assumptions of the model were adjusted.

Allowing for changes in import prices and the labour employed, it was shown that the general tendency was an appreciation of the real exchange rate which was not consistent with the Cameroon model.

With the adjusted model also, traded and non-traded output expanded but negligibly. In general the impact on prices and incomes resulted in larger increases from the oil boom in the adjusted model but these increases were still negligible compared to the scenario when import prices and labour are held constant. The use of a more realistic model therefore dampened or even reversed the results of the original Cameroon model and points to the fact that "Dutch disease" symptoms were present in the economy despite the increases in output and income.

Another interesting feature was the fact that with the decline in oil revenues there was not a corresponding immediate decline in income due to the availability of accumulated reserves and foreign borrowing. This enabled the government to finance its expenditure beyond the oil price decline. This highlights the lack of symmetry of the model and reality.

The analysis of the impact of oil was extended to consider the management aspects as a means of assessing the role of the government relative to the "Dutch disease" effects. Here the issue was one of consistency with the life cycle-permanent income hypothesis which as was stated is the appropriate policy response to temporary booms in the absence of liquidity constraints. The expenditure of the government was analysed to see if they saved sufficiently during the boom to cushion the adjustment that is required in the economy after the boom. One of the highlights of the analysis was also to see if the expenditure was excessively sensitive to current income in which case if it were, this implied that savings were not in accordance with the LCPIH.

Indications were that the expenditures were not consistent with the LCPIH, there being excessive sensitivity of consumption and investment to current income. This implies that the change in expenditure was not consistent with the change in permanent income but reacted more to transitory income. A similar result was obtained for domestic absorption in the economy.

The above results led to a review of government's policies which may have fuelled excessive expenditure. Policies of subsidization of agriculture, manufacturing and utilities which were not cost-effective characterised the expenditure of the oil windfalls. As is common in other developing countries there was downward rigidity of expenditure after the boom (post 1981) resulting in the appearance of fiscal and external deficits.

Botswana on the other hand which was highlighted as a case of good management was able to immediately adjust through expenditure reduction measures consequent on the slump in diamond exports. The strategy of resource based industrialization which was avoided by Botswana in preference to smaller projects was adopted in T&T as part of the process of economic diversification. This further fuelled cost escalation of projects and external indebtedness. A macro-economic crisis was the outcome.

What then can be learnt from the experience of this small oil exporting country?

A country experiencing windfall gains according to the

"Dutch disease" theory or its variants may expect the tradeable sector to be affected to varying degrees, particularly if allowances are made for other exogenous shocks occurring simultaneously. The extent of the impact however depends on the policies pursued by the government in managing the windfalls. One can point to the ineffective use of subsidies as not being an ideal way of ensuring economic diversification.

Similarly for such a small country capital intensive, exorbitantly expensive projects such as RBI need to be carefully evaluated in terms of cost (including future), risks and returns, and markets. Preferable projects for T&T would have been those cited for Botswana- more small to medium size. The whole area of project management and evaluation in areas such as construction including an evaluation of future operating and maintenance costs need to be address in a professional manner. The avoidance of excessive indebtedness is another policy that can be pursued. Finally like the LCPIH hypothesis suggest you save when your earnings are high to cushion the effects of future downfalls of income. This research is another episode in the curse of wealth (Roemer, 1983). Future commodity booms including oil and natural gas may occur - it is hoped that this story does not fall on 'deaf ears'.

APPENDIX A

In what follows the sign $\hat{\cdot}$ will indicate the relative change in the variables.

By algebraic manipulation of the above equations the derived equations indicative of percentage changes are as follows :

$$\hat{Y} = \gamma_N(\hat{P}_N + \hat{N}) + \gamma_D(\hat{P}_D + \hat{D}) + \gamma_F\hat{F} \quad (\text{A.10})$$

$$\hat{D} = -\sigma\hat{P}_D + \hat{M} \quad (\text{A.11})$$

Since $P_M=F$ under the assumptions given above.

$$\hat{M} = \hat{F} \quad (\text{A.12})$$

$$\Rightarrow \hat{D} = -\sigma\hat{P}_D + \hat{F} \quad (\text{A.12a})$$

which is the demand equation for the traded sector as in (A.11)
The other demand equation for the non-traded sector N is:

$$\hat{N} = -\hat{P}_N + \frac{\gamma_D(1-\sigma)\hat{P}_D}{1-\gamma_N} + \hat{F} \quad (\text{A.13})$$

The supply equations for the two sectors are:

$$\hat{D} = [\alpha(1-\lambda)\hat{P}_D - \alpha(1-\lambda)\hat{P}_N] (1 - \beta\lambda - \alpha(1-\lambda))^{-1} \quad (\text{A.14})$$

$$\hat{N} = (-\beta\lambda\hat{P}_D + \beta\lambda\hat{P}_N) (1 - \beta\lambda - \alpha(1-\lambda))^{-1} \quad (\text{A.15})$$

Finally in order to assess the impact of the increase in oil revenues on the two sectors the simultaneous solution of the demand and supply equations for \hat{P}_D and \hat{P}_N will in turn through substitution in either the demand or supply equation give output

of the traded and

non-traded sectors in terms of \hat{F} as follows:

$$\hat{D} = \frac{\xi(1-\sigma)y_F/(y_D+y_F)\hat{F}}{\xi[1-(1-\sigma)y_D/(y_D+y_F)] + \sigma(\mu+1)} \quad \begin{matrix} < 0 & \text{for } \sigma > 1 \\ > & < \end{matrix} \quad (\text{A.16})$$

$$\hat{N} = \frac{-\mu(1-\sigma)y_F/(y_F+y_D)\hat{F}}{\xi[1-(1-\sigma)y_D/(y_D+y_F)] + \sigma(\mu+1)} \quad \begin{matrix} > 0 & \text{for } \sigma > 1 \\ < & < \end{matrix} \quad (\text{A.17})$$

where $\xi = \alpha(1-\lambda)/(1-\beta\lambda-\alpha(1-\lambda))$

and $\mu = \beta\lambda/(1-\beta\lambda-\alpha(1-\lambda))$

It can be shown that as $\sigma \rightarrow \infty$ the non-traded sector expands and the traded sector contracts which follows exactly the standard "Dutch disease" results. As shown above these equations can be unambiguously signed for values of σ greater than 1 or less than 1. For $\sigma=1$ both equations equal zero i.e there is no change in output of traded or non-traded goods. However for $\sigma < 1$, the results of the standard model are reversed. In this case the numerator and denominator of equation (A.16) are both positive whilst the numerator of equation (A.17) is negative and the denominator positive resulting in this equation being negative. The critical factor is $+(1-\sigma)$ in equation (A.16) and $-(1-\sigma)$ in equation (A.17). This implies that the traded sector expands and the non-traded sector contracts for values of $\sigma < 1$ with the opposite occurring for $\sigma > 1$.

These results are related to the assumption of domestically produced traded goods and imports being imperfect substitutes the relationship of which was expressed in equation (3.6). The determining factor of the consumption of these two goods is the degree of substitutability and their relative prices and therefore expresses the extent of expenditure switching between the goods. For $\sigma=1$ if $P_D \uparrow$ then M must fall to enable the same level of consumption of D since equation (A.11) implies that for this value of σ , the difference between the change in consumption of the two goods will be exactly decreased by the change in the domestic price (import price assumed to be a constant). For $\sigma > 1$ the goods are less imperfectly substitutable and there is a more than proportionate increase in P_D relative to the price of imports with expenditure switching occurring towards imports and

output of traded goods falling due to decreasing demand. Similarly for $\sigma < 1$ the goods are more of imperfect substitutes with the increase in P_o being less than proportionate and there is the possibility of D increasing.

If import price, P_m and the labour supply, L are allowed to vary the corresponding equations to (A.16) and (A.17) above representing the output of the traded and non-traded sectors in terms of the changes in the exogenous variables are (with the output of the non-traded sector being able to be expressed below as a function of the traded sector plus an additional term in L):

$$\hat{D} = \frac{\xi(1-\sigma)\gamma_r[\hat{F}-\hat{P}_m]}{\phi} + \sigma\xi\hat{L}\left[\frac{(1-\beta)(1+\mu)}{1-\lambda} + \frac{\mu(1-\alpha)}{\lambda}\right] \quad (\text{A.18})$$

$$\hat{N} = -\frac{\mu\hat{D}}{\xi} + \frac{\mu\hat{L}[(1-\beta) + \frac{(1-\alpha)}{\lambda\xi}]}{1-\lambda} \quad (\text{A.19})$$

Equation (A.18) implies for $\sigma < 1$ that if the increase in oil is greater than the increase in import prices then this will have a positive impact on the increase in output of the traded sector in addition to a fraction of the increase in labour employed and the reverse effect for $\sigma > 1$ except the increase in the labour employed will produce an offsetting positive impact.

If however for $\sigma < 1$, the rate of change of import prices exceed that of oil revenues then this will have a negative impact on traded output which is offset by a fraction of the increase in labour. If the increase in import prices and the increase in oil revenue are equal then the only change in traded output is due to the change in labour employed.

In effect the impact of import prices and oil revenue on traded output is symmetrically opposite. Equation (3.8) states that the oil revenues are spent on imports so that increasing import prices use up the increasing oil revenues and so the full effect of the oil increase is not transmitted to increased output of traded goods hence the adverse impact described above. For the non-traded sector the impact is in the opposite direction subject to the additional impact of the change in L which may imply an increase, the magnitude relative to D being dependent

on the size of the factor μ/ξ which is equal to $\beta\lambda/\alpha(1-\lambda)$. If $\beta\lambda > \alpha(1-\lambda)$ then the negative impact on N will increase as D increases.

APPENDIX B

The methods of estimating the boom were similar to that used in Hill (1990). For the TS model the boom based on trend value was calculated as:

$$\exp(\ln Y_t) - \exp(\ln \hat{Y}_t) \\ \text{where } \exp(\ln \hat{Y}_t) = \exp(a_0 + a_1 t)$$

using the values of a_0 and a_1 obtained from the regression of equation (4.1).

The estimate of the boom for the DS model which as stated describes a random walk with drift was calculated as:

$$\exp(\ln Y_t) - \exp(\ln \hat{Y}_t) \\ \text{where } \exp(\ln \hat{Y}_t) = \exp(\ln Y_{t-1} + a_0)$$

with a_0 obtained from the regression of equation (4.2).

Finally for the random walk without drift the boom was simply,

$$Y_t - Y_{t-1}$$

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