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**BOOMING HYDROCARBON EXPORTS, DE-  
AGRICULTURALIZATION AND FOOD SECURITY IN  
TRINIDAD AND TOBAGO**

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## **BOOMING HYDROCARBON EXPORTS, DE- AGRICULTURALIZATION AND FOOD SECURITY IN TRINIDAD AND TOBAGO**

**Roger Hosein<sup>1</sup>**

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### **ABSTRACT**

During the 1970s the Trinidad and Tobago (T&T) economy experienced an oil boom because of increases in the level and production of crude oil and in the price each barrel of crude oil fetched on the international market. In the late 1990s to the present, the T&T economy has benefited from another hydrocarbon boom. This paper traces the trends in export agriculture, sugar and domestic agriculture during the first and second oil booms. Using the falling share of labour employed in a sector as a reflection of de-industrialization, the analysis reveals that during the first oil boom all three components of the agricultural sector were de-industrialised although in the period until 1993 these same sectors showed clear signs of re-industrialization. During the second oil boom these agricultural subsectors were again de-industrialised, although in the case of sugar and domestic agriculture output per employed worker increased. The paper argues that given the likelihood of further hydrocarbon driven growth, the food security issue requires that efforts be made to preserve the output level of the domestic agricultural sector.

The structural changes to the economies of the Caribbean over the last few decades has been phenomenal; there has been a substantial decline in the importance of the agricultural sector both absolutely and relatively, while the manufacturing, mining and tourism sectors has provided the impetus for growth and development. In no other Caribbean country has the fall off in agriculture been so marked as in Trinidad and Tobago; the only country in the region to possess significant oil reserves. However, it should be noted that this is a basis for concern, especially within the context of long term growth and food security.

**Keywords: Trinidad and Tobago, food security, Dutch Disease.**

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### Dutch Disease and de-agriculturalization

It is possible that a boom in a tradable non-agricultural commodity can spark a decline in the agricultural sector on account of the influence of the Dutch Disease.<sup>1</sup> The exposition of the Dutch Disease engaged in this paper follows the analysis of Corden and Neary (1982). To illustrate some of the mechanics associated with the Dutch Disease, this paper progresses by decomposing the T&T economy into two substantive parts:

$$\begin{aligned}T + NT &= Y \\ T &= B + NB\end{aligned}$$

where T: a traded sector, NT: a non-traded sector, Y: is national income, B: the booming sector and NB: the non-booming sector.

With an oil boom, there is an increase in domestic demand (providing all of any increase in income is not expended on imports) and this in turn inflates the real effective exchange rate.

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<sup>1</sup> The term derives from the experience of the Dutch economy during the 1960s with the discovery of natural gas. *The Dutch Disease sheds light on the difficulty the government has in managing short term oil rents which arise from the export boom, without losing consistency with its long term objective of promoting economic development through the expansion of the non-oil tradables sector.*

This appreciation occurs irrespective of the economy's exchange rate regime.

Specifically, with a boom, the increasing marginal productivity of labor motivates an increase in wages in this sector. This is even more pronounced in small economies such as Trinidad and Tobago where labor costs are a small fraction of operating costs and the sector is dominated by Multinational Corporations wishing to minimize problems with the indigenous population. The rise in wages in the booming sector creates labor shortages in the non-booming sectors (the resource movement effect). Even if incomes are kept constant, the resource movement effect which manifests itself as a decline in the supply of non-tradable goods from  $S_0$  to  $S_1$  leads to an increase in the equilibrium price level in this market. If the constraint on income is relaxed, then domestic expenditure rises on account of expanding wages in the booming sector. Wages also increase in the non-booming sector as markets respond to labor shortages therein (the spending effect). Rising incomes trigger even further excess demand in the non-tradable sector, the consequence of which is a further increase in the price of non-tradable goods and services from  $P_1$  to  $P_2$ .

$Q_2$  is likely to be higher than  $Q_0$  because the income elasticity of demand for non-tradable goods (usually services) is typically in excess of one.

In summary, in the Dutch Disease theory, the resource movement should lead to an increase in the output of the booming tradable good, a fall in the output of the non-booming tradable and an increase in the output of the non tradable sector (spending effect outstripping resource movement effect). The net implication is that a boom in a tradable good leads to an increase in the price of non-tradable goods ( $P_{NT}$ ) and hence an appreciation of the real exchange rate.

This paper investigates the impact of the oil boom on both the tradable and non-tradable agricultural sector of the T&T economy. Section 1 describes various statistical issues associated with the data collection process, whilst section 2 focuses on the importance of agriculture to the economic development process. In section 3 an analysis of the first oil boom, with specific reference to export agriculture, sugar and domestic agriculture is undertaken. Section 4 develops the same issues as section 3 but with reference to the second oil boom. Section 5 focuses on domestic agriculture and domestic food policy trends, whilst section 6 draws conclusions and policy conclusions from the preceding sections.

### **1. Definitional Data Issues**

The agricultural sector of the Trinidad and Tobago economy as defined by the

Trinidad and Tobago Central Statistical Office subsumes three main subsectors:

- (1) Export agriculture
- (2) Domestic agriculture and
- (3) Sugar cane farming, sugar manufacturing and distilleries.

Export agriculture is defined as consisting of the production of cocoa, coffee and citrus. Domestic agriculture consists of several sub-activities including:

- (1) coconut growing;
- (2) bananas and plantains;
- (3) rootcrops, pulses, vegetables, tobacco and rice;
- (4) poultry and eggs;
- (5) dairy beef and other meat;
- (6) pork fattening;
- (7) state lands;
- (8) forestry;
- (9) fishing; and
- (10) agricultural services.

### **2. Agriculture's importance to the economic growth process**

As early as 1954, Sir Arthur Lewis espoused a strategy in which the industrial sector could draw on the stock of surplus labour in developing economies. In Lewis' labour surplus model, the agricultural sector acted as a handmaiden to the industrial sector, in the sense that the sector's predominant purpose was to facilitate the

transformation of the developing economy.<sup>2</sup>

Traditionally, the agricultural sector was supposed to:

- Provide labour for the industrial sector;
- Provide a stable and reliable source of food for the country as a whole;
- Provide a source of savings to facilitate some of the financial capital necessary for the transformation of the industrial sector;
- Purchase some of the produce from the industrial sector;
- Provide a source of foreign exchange which could be used for the imports of foreign capital; and
- Provide primary materials which could be used for the establishment of an agroprocessing base (Delgado et. al. 1994 and Timmer 1995).

In the early stages of the development of an economy, a substantial amount of its resources is devoted to the production of food. In these early stages, the respective totals of the share of agricultural value added

and the share of agricultural employment are very high.

However, with economic development these shares fall, principally because of the slow increase in demand for food as compared to manufactures and services when income increases. In addition, the rapid increase in the supply of food motivated by improvements in the level of technology deployed in the agricultural sector, results in an increase in food supply per hectare and per worker. The decreasing relative importance of agriculture sometimes sends a confusing signal to policy makers, that agriculture is unimportant. Furthermore the decreasing real price levels in agriculture encourage investors to shift resources out of agriculture into other more attractive areas of investment (Tyers and Anderson 1992).

### **3. Main agricultural trends in the period 1966-1993 in Trinidad and Tobago**

This paper focuses on two distinct periods of time, 1966-1993 and 1994-2003. The first segment of the paper concentrates on the period 1966-1993 which, in turn, is sub-divided into the periods 1966-1972 (the pre-oil boom), 1973-1982 (the first oil boom) and 1983-1993 (recession and germination of the Structural Adjustment Program). In Table 1 below, the trends in selected macroeconomic indicators for the

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<sup>2</sup> The specific factors under which Lewis' transformation of the economy would transpire, were that food had an income elasticity of demand less unity, and the possibility that farm output could expand even if farm labor decreased existed.

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petroleum sector of the Trinidad and Tobago economy are indicated.

Prior to the oil boom, the price of oil in T&T was moderately dormant, averaging US\$1.3 per barrel for the period 1966-72. In 1973, the Yom Kippur War between Israel and the Arab nations erupted, the consequences of which was an increase in the price level of crude oil to US\$11.2 per barrel in 1974, 261.3% greater than the US\$3.1 which prevailed the year before. The price of crude oil remained moderately buoyant until 1978, but with the war between Iran and Iraq in 1979, oil prices again spiked very sharply, remaining moderately buoyant until 1985 but thereafter decreasing gradually to US\$16.8 per barrel by 1993.

During this period (1973-1996), the production of crude oil and natural gas in Trinidad and Tobago also varied. Oil production dipped from 149.6mn barrels in 1966 to 129.2mn barrels in 1971. Thereafter, Amoco's discovery of a huge deposit of crude oil led to an increase in crude oil production which peaked at 229.5mn barrels per annum in 1978, 77.6% more than 1971. After 1978, the production of crude oil in T&T declined almost continuously so that in 1993, the output of crude oil was 53.2% of the level which prevailed in 1978. The production of natural gas, on the other hand, decreased by 12.3% from 1966 to 1972, but increased considerably thereafter, so that by 1993

natural gas production was 2.4 times the 1972 level.

These changes in the hydrocarbon sector, especially in the price and production of crude oil, affected a number of significant macroeconomic variables in the T&T economy. Real GDP expanded from TT\$11,155.1m in 1966 to TT\$22,297.5m in 1982, an increase of 99.2%, although with the subsequent decline in the price and production of crude oil, real GDP contracted to TT\$16,057.5m in 1993, 72% of its 1982 level and 1.4 times its 1966 level.

In current prices, the increase in the price and production of crude oil led to an increase in the amount of oil export revenues received by the T&T economy from US\$124.5mn in 1966 to US\$2,360.3mn in 1981, although by 1993, oil revenues declined to US\$832.1mn. The rapid increase in government revenues consequent to the oil boom led to a fiscal balance which stood at 19.6% of GDP in 1981. Significantly though, as export revenues fell this ratio declined to 1.4% in 1993. The increase in oil sector activity was also matched by an increase in government oil revenues which stood at 71.4% of total government revenues in 1980.

As output in the petroleum sector expanded, so too did a number of economic attributes associated with that sector including Foreign Direct Investment (FDI) inflows, wages,

employment and the capital intensity of the sector. In particular, FDI in the petroleum sector increased from US\$216.9mn in 1975 to US\$301.04mn in 1981, although with the maturation of some of the oil fields in Trinidad and Tobago and subsequent fall off in production of crude oil (after 1978), there was a decline in the level of FDI inflows to the petroleum sector to US\$64mn in 1990. However, FDI inflows to the petroleum sector recovered sharply to US\$348.9mn in 1993. For the period 1975-1993 FDI inflows to the petroleum sector as a percentage of total net FDI inflows averaged 86.6%.

Increases in the level of economic activity in the petroleum sector also facilitated a rapid increase in petroleum sector wages and employment. Specifically, employment in this sector increased from 15,550 employees in 1975 to 17,704 employees in 1982, an increase of 14.43%. By 1993, however, falling oil prices and production levels resulted in the employment level in the petroleum sector falling to 14,124. At the same time, the petroleum sector became much more capital intensive.

### **3.1 Trends in real effective exchange rate**

In classic Dutch Disease style the real effective exchange rate of the T&T economy escalated between 1972 and 1985. After 1985 the intervention of a

series of currency devaluations by the government of T&T helped to moderate the trend increase in the real effective exchange rate.

### **3.2 Deagriculturalization and Reagriculturalization**

Building on the work of Saeger (1997), it is possible to define deagriculturalization as a fall in the share of employment attributable to the agricultural sector.<sup>3</sup> Saeger's definition is supplemented in this paper by reference to trends in the share of value added from the respective sectors in aggregate GDP.

Table 3 below helps to illustrate the resource movement effect out of the agricultural sector. The labour force in the export agriculture sector fell from 2,021 (0.63% of total employment) in 1973 to 700 (0.17%) in 1984. In 1993 the employment level in this subsector was 2,800 (0.69%) or 38.5% more than in 1973 and 75% more than in 1984. The export agriculture segment of the T&T economy was therefore, initially de-industrialised but subsequently reindustrialised. Similar trend patterns were observed for the sugar and domestic agriculture sectors for the period 1973-1993.

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<sup>3</sup> Saeger, focused on de-industrialization and argued that *de-industrialization is best reflected in a declining share of the manufacturing sector employment in total employment and used a variety of arguments to justify his position.*



The trend performance of real value added in export agriculture mirrored its employment pattern, that is, falling from 1966 until the mid-1980s and thereafter improving only marginally. The production and export of coffee decreased from 2,920,000 kg in 1966 to 852,000 kg in 1984, a decrease of 70.8%. Production of this agricultural commodity remained depressed until 1993. Cocoa production followed a similar declining trend until 1984 but levelled off by 1993. In 1966, 42,963,000 kg of citrus were produced and by 1982, this had decreased by 95.7% to 1,836,000kg. In 1993, 7,088,000 kg of citrus were produced providing some indication that the sector at that point was recovering.

The share of the sugar sector contracted from 2.14% in 1966 to 0.43% in 1984 as a percentage of GDP. The level of GDP of the sugar industries sector of the economy decreased from TT\$266.5mn in 1972 (just at the dawn of the oil boom) to TT\$80.5mn in 1984, although by 1993 real value added in this sector showed some definite signs of recovery tallying TT\$231.3mn. Estate canes reaped fell from 22,916 in 1972 to 10,741 in 1990. The production of sugar canes also decreased from 154,700 tonnes in 1966 to 48,300 tonnes in 1982, a decline of 68.7%. By 1993 the production of sugar canes had expanded to 104,700 tonnes. The cane-sugar ratio increased from 10.89 tonnes

of cane per tonne of sugar in 1966 to 11.6 in 1993.

### **3.3 Domestic agriculture**

With the resource boom there is an expansion in the income level of factors of production employed in the non-tradable sector given the influence of the resource movement (which creates a shortage of workers and increases the wage level) and the spending effect which triggers excess demand for the commodity, assuming a marginal propensity to import that is less than unity.

In Table 6 below, it can be observed that in the domestic agricultural sector there was a virtual doubling of value added from TT\$169.7m in 1966 to TT\$337.5m in 1993. In the period 1966-1975, domestic agriculture's real value added expanded, with the TT\$258.7m value added in 1975 being 52.4% more than in 1966. However, after 1975, domestic agriculture's output contracted to TT\$231.4m by 1981, providing some signs that even the output level of domestic agriculture was deindustrialised during the oil boom. After 1981 real value added in domestic agriculture expanded gradually to TT\$337.5m by 1993, 45% more than in 1981.

In summary, for the period 1966-1982, there was deagriculturalization of export agriculture and sugar agriculture in T&T, but in the recession which

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followed there was a general re-agriculturalization of these two sectors. Similarly, in the domestic agriculture sector, during the oil boom, there were clear signs of deagriculturalization, although in the period until 1993 there were definitive signs of reagriculturalization.

#### **4. The Second Oil Boom, 1994-2003**

After 1982, with the twin decline in the price and production of crude oil, the T&T economy stagnated and the government was forced into the compromise of accepting assistance from the multilateral lending institutions. The realignment of resources along greater efficiency lines in the context of the Structural Adjustment Programme (SAP) helped economic activity within the T&T economy to flourish.<sup>4</sup> A switch in the

government's policy stance in favor of foreign direct investment (FDI) also helped to usher in a wave of FDI to the petroleum sector, the net consequence of which has been an increase in output from the hydrocarbon intensive sector. Fortunately for T&T, this period has also been partly characterised by buoyant price levels for some of these commodities (see Table 7 below). Note that 20,357,000 barrels of crude oil were exported in 1999 at a price of US\$17.7 per barrel. In 2003, T&T would have

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except in special circumstances, foreign based firms executing a contract locally will be required to have a local firm associated with it ... .. The policy of localization of foreign-owned firms in important areas of the economy will continue. Further, we will exercise greater surveillance over the tendency of certain foreign-owned firms to shift functions abroad, to reduce the involvement of nationals in their operations and to reduce tax receipts in the process" (Budget Speech 1972 pg. 543).

However, the attitude of the government towards FDI changed during the recession, and one commentator observed at this stage it became very clear (as first argued by Lewis) that:

"The need for technology, markets and investment resources now *overrode* concerns about controlling the 'commanding heights' of the economy or of foreign penetration of key sectors." (Ramsaran 1993, pg. 225).

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<sup>4</sup> *The direct position of the state, concerning foreign investment, was categorically stated in the Third Five-Year Plan (1969 – 1973) in the form of a "Statement of Policy on Foreign Investment." This position was emphasized in the 1972 Budget Speech where it was clearly expressed that:*

"Our economic circumstances require positive discrimination in favor of local enterprises. To this end, all firms inviting bids for contracts will be required to include locally established enterprises in their bids; they will be encouraged to provide a reasonable domestic preference margin to such local enterprises. Further,

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received US\$33.1 per barrel of the 26,002,000 barrels of crude oil exported. It follows therefore that oil export revenues and hence government oil revenues would have expanded substantially.

A number of factors have combined to indicate that the T&T economy may be experiencing another boom, a significant influencing factor being the rapid increase in the production of natural gas, a portrayal of which is shown in the diagram below.

This increase in the production of natural gas has in turn led to an increase in the real value added of the petroleum sector from TT\$4,287.1m in 1994 to TT\$6,516.2mn in 2003, an increase of 52%.<sup>5</sup> Aggregate GDP increased by 52% in the same time interval or from TT\$16,630m in 1994 to TT\$25,225.5m in 2003. In this same period the unemployment rate decreased from 18.4% to 11%. Some indication that the T&T economy is operating near full employment is provided by changes in the price level which in the period 1995-1999 averaged 3.9% per annum, whilst in the four year period thereafter it averaged 4.2% per annum, indicating in part, the pressure of increasing domestic demand. Between 2000 and 2003 the unemployment rate in T&T actually

increased marginally from 10.8% to 11%! The increase in the output of the hydrocarbon sector was facilitated by the rapid expansion in the inflows of FDI which for the period 1994-2001 cumulated to US\$4,287.3mn (see Table 8 below).

#### **4.1 Resource movement effect of the second oil boom**

The increases in the price and production of crude oil and the general expansion of the petroleum sector have facilitated an increase in the number of workers employed in the petroleum sector from 15,789 in 1994 to 18,010 in 2003. The relative increase in demand for workers in the petroleum sector amidst buoyant price and production levels, resulted in an increase in both absolute and relative wages in that sector. Specifically, while in 1994 minimum wages in the petroleum sector was 133.9% of that in all industries by 2001 it had expanded to 149.8%. The rapid inflow of FDI to the petroleum sector has led to a greater degree of capital intensity in the petroleum sector.<sup>6</sup>

The data in panel 9b of Table 9 above indicates that the relative share of

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<sup>5</sup> In current price terms, the corresponding increase in the value added of the petroleum sector was from TT\$8,760.6mn in 1994 to TT\$21,237.3mn in 2003, an increase of 142.4%.

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<sup>6</sup> To obtain constant price capital data for the petroleum sector, data on gross capital formation for the sector were cumulated (starting from 1966) and deflated by the retail price index.

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skilled workers increased in both the petroleum and non-petroleum sectors.

#### **4.2 Spending effect of the oil boom**

The increase in output of the petroleum sector is expected to lead to an increase in the income of the booming petroleum sector and an increase in aggregate demand in the overall macroeconomy. To reflect the spillover from the booming to the non-booming sector the graph below illustrates that the output of non-tradable goods from T&T increased substantially from TT\$12,342.9m in 1990 to TT\$19,424.9m in 2003 an increase of 57% (compare this with the growth in the production of non-tradables of 45.1% for the period 1966 to 1993).

In this second oil boom, the real effective exchange has also shown clear signs of an improvement. The rest of this paper focuses on the macroeconomic effects of the booming hydrocarbon sector on the agricultural sector of the T&T economy, investigating in particular whether the sector was deagriculturalized.

#### **4.3 Export agriculture sector**

The level of employment in the export agriculture sector of the T&T economy decreased from 3,300 in 1994 to 800 in 2003. Gross capital formation in the

agriculture sector (including domestic agriculture and sugar) did not show any significant and consistent compensatory positive trend. The decline in employment and the failure to make adequate capital injections combined to result in real value added for this sector falling from TT\$34.5m in 1994 to TT\$15.1m in 2003.

The production of coffee, cocoa and citrus all showed distinct signs of “deagriculturalization”. Specifically, coffee production decreased from 1,015,000 kg in 1994 to 247,000 kg in 2002, with a similar element of decline in citrus production. Cocoa production also decreased, but less sharply than either coffee or citrus. The export of these commodities have declined sharply (in the case of cocoa ) or ceased entirely (in the case of citrus). Coffee has shown some degree of rejuvenation in the last two years of the data period under discussion, but overall the export of these agricultural commodities appears to have fallen by the way. It is in fact possible, that some of the decline in the share of export agriculture’s employment may have been on account of falling export prices for the output of this sector.

Even more than this, the prices of some of these agricultural crops in the near future are not expected to be buoyant, especially when evaluated over the period indicated in Table 11 above.

#### **4.4 Sugar Agriculture**

Employment in the sugar sector declined from 12,900 in 1994 to 7,900 in 2003. The amount of estate cane reaped in the sugar sector fell from 11,013 hectares in 1994 to 8,234 in 2003, a decline of 33.7%. In this same period, raw sugar production decreased from 131,100 tonnes in 1994 to 67,600 tonnes in 2003, a decline of 48% while the cane/sugar ratio increased from 11 to 12.9. Sugar, in the context of falling labour shares, was clearly deindustrialised during this second oil boom.

Table 13 also tells a powerful story concerning the declining profitability of the sugar sector vis-a-vis the oil and natural gas refining subsector of the economy. While the productivity of all employees in the sugar sector had increased only marginally by 2001 as compared to the strong productivity performance of the oil sector, relative wages in both sectors remained broadly the same in 2001 as in 1995.

#### **4.5 Domestic agriculture**

GDP in the domestic agriculture sector expanded from TT\$301.7m in 1994 to TT\$381.9m in 2003, an increase of 26.4%, although the share of domestic agriculture in total GDP declined from 1.81% to 1.51% in the same interval of time. More definitively though, for the domestic agricultural sector, employment decreased from 35,600 in

1994 to 28,000 in 2002. Panels b and c of Table 14 below show trends in the production of selected food and meat products. With the exception of mutton, all of the listed agricultural products experienced increases in output.

#### **4.6 The long view position of agriculture: employment and value added**

Between 1973 and 2003 there was a 68.2% expansion in the size of the employed labour force but the level of employment in each of the components of the agricultural sector shown in the Table 15, contracted. If real value added is used as a reference indicator for deagriculturalization, the export agriculture sector experienced a decline of 78%, while the domestic agriculture sector more than doubled in real size. The relative share of employment and real value added in each of the agricultural subcomponents fell for the data years listed in Table 15.

The first oil boom in T&T was more dependent on a rapid increase in the price level. The second oil boom is motivated more by an increase in the production of hydrocarbon output. Whilst in the first oil boom the main hydrocarbon output was crude oil, in the second boom the main factor is natural gas and associated downstream natural gas products.

Hosein and Tewarie (2004) estimated the revealed comparative

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advantage position of the T&T economy (see Table 16 below). The indication from these estimates is that the T&T economy has experienced a worsening of its comparative advantage position in sugar, cocoa (observe that T&T never enjoyed a comparative advantage in either sugar or cocoa production in the time period listed in the Table), crude petroleum and refined petroleum products. At the same time the revealed comparative advantage indices indicate that the T&T economy has gained comparative advantage ground in the production of gas products and commodities intensive in the use of gas, for example, ammonia, methanol and urea.

### **5. Domestic agriculture and domestic food security**

In common with the first oil boom period, however, the clear indication is that the agriculture sector continues to attract a small fraction of the workforce, with this negative trend being most pronounced when the economy is growing. The medium term forecast for the T&T economy is for continued real per capita GDP growth (Ministry of Planning 2004). Empirically, and as Fig 6 below reflects, the expectation in the context of increasing real income is for continued deagriculturalization (falling labour shares) of the domestic agriculture sector of the economy.

Note that falling employment levels in the domestic agricultural sector only pose a problem if productivity levels are not improving commensurately. In the context of T&T, for the period 1973-2003, the productivity rate, measured as real value added per employee, remained buoyant. All efforts have to be made to preserve this trend.

### **6. Policy Implications of the analysis**

Dynamic Heckscher Ohlin theory suggests that a nation should produce and export those commodities in which it has an abundance of factors of production and import those commodities which call for factor proportions in the opposite direction.

In this regard, the de-agriculturalization of the agricultural sector in T&T is not surprising. But this type of theoretical position is founded on extremely restrictive assumptions and whilst the de-agriculturalization of the economy may occur because of a natural pathological trend in the economic development process of a country, in a world characterized by an increasing threat of disruption on account of terrorism it may be pragmatic to slow or even reverse any de-agriculturalisation trends which are emerging. Specifically, the events of the last few years, including the emergence of terrorism as a threat to global stability and supply chains, provide some degree

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of support for the premise that growing some proportion of the food requirements of the domestic community can help to partially insulate this segment of the national economy from external shocks.

Furthermore, it is well established that as the income of consumers in an economy expands there is an increase in demand for the health and safety, pleasure and ethical properties of food above the nutritional aspects of the food itself. The recent problem with foot and mouth disease in the European Union highlights the private and public values of animal health and safe food, including the costs associated with not supplying it.

A number of policy measures can be put in place to ensure that the domestic agricultural sector does not wither away as the economy matures. On the one hand the government can consider legislation which offers a minimum wage to workers in the agricultural sector. This minimum wage should be indexed against the cost of living index so that the real wage of agricultural sector workers is not sharply eroded.

Parallel types of incentives would include offering to farmers and their dependants preferential access to tertiary level funding. For example, with the Government Assistance for Tertiary Education (GATE) program currently on offer by the T&T government to nationals wishing to pursue tertiary level

education, specific legislation can be implemented to the effect that if an applicant's parent or parents were farmers then s/he should be granted favourable access to tertiary level funding. In this same vein of reasoning, the government may also wish to offer a select block of its national scholarships to students wishing to pursue agriculture related courses. In this way, some of our best problem solving minds would be exposed to the agricultural sector and this may help to stimulate the growth of the sector.

The government may also wish to promote greater training and re-training programs both in existing domestic agricultural practices and in areas where agro-processing is possible so that the value added from the domestic agricultural sector can be exhausted. These types of training programs can also help to ensure that productivity levels in agriculture remain buoyant.

Another reason why the government of T&T should pay more attention to the food production segment of the T&T economy is that it can help employ some of the workforce. As it stands, the T&T economy appears to be drifting towards full employment. The agricultural sector can be used to absorb some of the surplus labor in the T&T economy. However, efforts should be made to ensure that whatever labor is employed in the agricultural sector has a high level of productivity.

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Table 1: Selected macroeconomic indicators in the petroleum sector, 1966-1993

Year	Price per barrel of crude oil (US\$)	Crude oil production (000 barrels per day)	Natural gas production (m of cubic metres) per annum	Real GDP TT\$m	Gov't oil revenues US\$m	Oil export revenues US\$m	Gov't fiscal balance as a % of GDP	US\$m current revenues	Oil revenues as a % of total revenues	Petroleum exports as a % of total exports
1966	1.33	149.59	3367.6	11155	49.7	124.48	0.9	125.4	39.6	41.2
1967	1.33	178.05	3973.9	11746	50.7	141.94	0.8	130.3	38.9	43
1968	1.33	183.28	4288.4	12233	54.9	103.7	2.4	134	41	43.3
1969	1.28	157.3	3893.5	12105	54.3	143.2	3.5	151.8	35.7	37.9
1970	1.3	139.84	3480.1	12130	56.4	134.1	2.1	156.6	36	34.6
1971	1.65	129.15	3109.6	12287	70.1	117.68	-0.4	173.6	40.4	33.1
1972	2.7	140.28	2954.5	12966	75.6	145.47	-1	203.2	37.2	32.5
1973	3.14	170.44	3397.4	13621	96.1	219.75	1.2	232.6	41.3	35.2
1974	11.2	186.65	3632.8	14575	410.1	725.09	13.2	560.9	73.1	35.2
1975	10.6	217.14	3580.2	15531	514.8	870.24	15.8	688.6	74.8	36.2
1976	11.83	212.76	3906.5	16152	593.4	946.56	17.4	870.9	68.1	35.6
1977	12.84	229.06	4236.2	17417	737.7	1103.38	19.6	1145.5	64.4	34.8
1978	12.95	229.49	4471.3	19107	722.3	1089.13	13.4	1154	62.6	31.9
1979	29.22	214.35	4805.4	19468	988	1562.08	9.9	1518.2	65.1	29.4
1980	36.68	214.53	5601.2	20801	1723.5	2474.79	17.3	2414.8	71.4	27.1
1981	35.27	189.34	5604.1	21480	1772.1	2360.33	19.6	2761.9	64.2	23.5
1982	32.45	177.03	5841.7	22298	1364.3	1943.46	4.9	2786.2	49	21.5
1983	29.66	159.81	6318.9	19998	1025.6	1714.46	1.6	2634.5	38.9	21.3
1984	28.56	169.55	7229.4	18848	1149.9	1764.88	1.8	2728.5	42.1	24
1985	27.31	177.84	7413.3	18071	1002.9	1706.49	2.5	2596.4	38.6	26.6
1986	14.23	169.82	7585.5	17479	469.6	969.83	-0.8	1454.1	32.3	27
1987	18.15	156.06	7688.4	16681	543.9	996.31	1.4	1453.3	37.4	26.2
1988	14.72	152.13	7438.9	16028	400.6	827.45	-2.4	1285.7	31.2	27
1989	17.84	149.34	7239.4	15895	471.58	934.99	-2.1	1170	40.3	27.1
1990	22.97	152.23	6499.1	16134	545.15	1275.41	-0.1	1332.4	40.9	27.1
1991	19.33	144.08	7405.1	16567	639.29	1061.9	3.2	1595.1	40.1	26.6
1992	19.03	135.69	7410.6	16295	425.6	992.8	-1.3	1462.5	29.2	26.3
1993	16.8	122.19	7080.6	16058	317.9	832.12	1.4	1276.7	26.4	26.8

Source: Hosein and Tevarie (2004).

**Table 2: FDI, wages, employment and capital intensity in the petroleum sector of T&T, 1975-1993**

	FDI flows to Petroleum Industries US\$m	FDI flows to Petroleum Industries as a % of total FDI	Minimum wages in the petroleum sector (1975=100)	Employment in the petroleum sector	Capital to labor ratios in the petroleum sector (TT\$m) Constant prices
1975	216.96	107.0	100	15,550	352891.5
1976	104.47	97.6	128.95	16,418	376087
1977	104.17	74.4	144.30	15,928	406661.4
1978	108.42	85.4	146.49	17,264	414558.3
1979	147.33	84.9	190.35	17,005	413425.1
1980	102.75	75.0	237.28	17,654	411692.1
1981	301.04	98.9	281.14	17,673	412925.6
1982	210.04	81.6	339.47	17,704	441597.7
1983	90	78.2	378.51	17,693	461502.4
1984	101.58	89.7	417.11	17,566	456941.2
1985	24.03	71.1	438.60	15,631	482018.3
1986	30.83	154.8	489.47	14,976	489938.6
1987	24.17	72.9	520.18	14,448	506584.8
1988	55.4	87.9	547.37	15,022	511237.9
1989	86.7	58.2	553.07	14,429	519111.1
1990	64	58.5	576.32	14,175	498823.1
1991	125.1	86.8	591.23	13,614	507696.7
1992	153.2	89.6	602.63	13,847	498124.2
1993	348.9	93.6	647.81	14,124	527030.6

Source: Annual Statistical Digest (various years).

**Table 3: Employment in the agricultural sector of T&T, 1973-1993.**

YEAR	Employment					Share in aggregate employment			
	Total Employment	Total agriculture	Export Agriculture	Domestic agriculture	Sugar	Total agriculture	Export Agriculture	Domestic agriculture	Sugar
1973	321480	54188	2021	34581	17586	16.86	0.63	10.76	5.47
1974	333325	58926	2822	34908	21196	17.68	0.85	10.47	6.36
1975	332268	54215	2665	32138	19412	16.32	0.80	9.67	5.84
1976	340229	52345	2325	31150	18870	15.39	0.68	9.16	5.55
1977	348190	50476	1985	30162	18329	14.50	0.57	8.66	5.26
1978	364686	49912	1917	30813	17182	13.69	0.53	8.45	4.71
1979	370344	44818	1389	26250	17179	12.10	0.38	7.09	4.64
1980	386995	43097	1696	28931	12470	11.14	0.44	7.48	3.22
1981	388700	43700	3300	26800	13600	11.24	0.85	6.89	3.50
1982	400000	40100	1000	25900	13200	10.03	0.25	6.48	3.30
1983	399300	39300	1900	25300	12100	9.84	0.48	6.34	3.03
1984	406600	42100	700	30000	11400	10.35	0.17	7.38	2.80
1985	391600	45900	900	35300	9700	11.72	0.23	9.01	2.48
1986	390400	46800	3400	33700	9700	11.99	0.87	8.63	2.48
1987	372100	43600	3200	30400	10000	11.72	0.86	8.17	2.69
1988	371400	48400	2200	32900	13300	13.03	0.59	8.86	3.58
1989	365700	51000	2100	35700	13200	13.95	0.57	9.76	3.61
1990	373800	46400	2200	33500	10700	12.41	0.59	8.96	2.86
1991	400300	47100	3500	31900	11700	11.77	0.87	7.97	2.92
1992	405900	47400	3100	30400	13900	11.68	0.76	7.49	3.42
1993	404400	46100	2800	30700	12600	11.40	0.69	7.59	3.12

Source: Annual Economic Survey of T&T (various years).

**Table 4: Real value added in Export agriculture (TTmn) and trends in production of coffee, cocoa and citrus, 1966-1993.**

Year	Export agriculture value added	Production		
		Coffee 000 kg	Cocoa 000 kg	Citrus 000 kg
1966	68.4	2920	5416	42963
1967	67.9	3117	5283	37123
1968	85.1	4586	6874	33957
1969	53.9	3192	3464	21301
1970	69.5	2302	6213	28859
1971	58.2	3894	3767	9001
1972	58.7	3300	7542	12696
1973	46.3	2716	3162	13982
1974	46.9	1940	4161	12292
1975	66.2	4024	5240	4059
1976	48.5	2671	3249	6811
1977	45.2	2918	3345	3414
1978	50.6	2500	3398	7815
1979	47.4	2497	2628	6938
1980	40.9	2239	2380	6665
1981	44.7	2433	3145	4302
1982	34.9	1794	2246	1836
1983	31.7	1388	1732	2939
1984	28.8	852	1560	3264
1985	37.6	2142	1307	6079
1986	28.2	1334	1426	4322
1987	30.8	1842	1501	2869
1988	27.3	1524	1496	3492
1989	28.4	1206	1492	4116
1990	35.0	1935	2127	2230
1991	24.1	914	1512	3460
1992	18.8	706	1140	2212
1993	31.2	859	1556	7088

Source: Central Statistical Office, Annual Statistical Digest, various years.

**Table 5: Some economic attributes of the Sugar Cane sector, 1966 – 1993.**

Year	Share Sugar in Total GDP %	Sugar Industries Real value added (TTmn)	Estate Canes Reaped (000 tonnes)	Production of sugar canes (000 Tonnes)	Cane-Sugar Ratio tonnes cane to tonnes sugar
1966	2.14	238.17	21145	154.7	10.89
1967	1.91	224.38	22881	144.1	10.87
1968	2.08	254.97	22852	182.6	10.15
1969	2.13	257.34	22536	181.3	10.31
1970	2.13	257.87	21620	152.9	11.89
1971	1.92	236.34	22336	153	10.85
1972	2.06	266.51	22916	169	11.1
1973	1.60	217.71	21368	131.8	10.75
1974	1.61	235.35	19733	130	10.6
1975	1.33	206.54	15840	118.6	10.99
1976	1.59	256.47	19353	153	11.12
1977	1.33	232.34	19655	128.1	11.47
1978	1.11	212.40	19049	109.9	11.98
1979	1.12	217.32	19603	194.1	11.98
1980	0.90	187.15	19602	70.7	11.98
1981	0.77	165.20	12767	56	14.03
1982	0.75	167.20	13904	48.3	15.27
1983	0.61	122.20	13314	49.4	12.89
1984	0.43	80.50	13163	66.1	13.57
1985	0.62	111.20	12653	65.3	12.67
1986	0.73	128.00	13282	73.3	12.6
1987	0.76	127.30	12913	68.7	12.93
1988	0.87	139.80	12746	82.85	12.765
1989	0.93	148.60	12579	97	12.6
1990	1.11	179.00	10741	118.2	12.5
1991	1.26	209.40	12580	100.4	12.9
1992	1.26	205.40	11667	110.4	11.7
1993	1.44	231.30	11473	104.7	11.6

Source: Review of the T&T Economy, various years.

**Table 6: Value added (constant prices, TT\$m) and employment in the domestic agriculture sector, 1966-1993**

1966	169.7
1967	155.2
1968	157.4
1969	166.9
1970	194.1
1971	211.4
1972	236.4
1973	248.1
1974	244.8
1975	258.7
1976	225.8
1977	251.4
1978	244.2
1979	235.9
1980	227.0
1981	231.4
1982	289.1
1983	286.7
1984	293.7
1985	291.2
1986	285.8
1987	300.4
1988	275.3
1989	291.2
1990	339.5
1991	335.1
1992	329.1
1993	337.5

Source: National income of T&T various years).

**Table 7a: Divestment of State Enterprises in the Energy sector of T&T**

Company	Date Divested	Principal Investor	Value (US\$m)
Fertrin/TTUC – 100%	March 1993	Arcadian	132.1
Trinidad & Tobago Methanol – 31%	January 1994	Ferrostal/Helm	47.0
Trinidad & Tobago Methanol – 24%	January 1994	Ferrostal/Helm	18.0
Petrotrin Oxygen Nitrogen Plant – 100%	August 1994	Caribbean Ispat	1.2
Petrotrin Urea Formaldehyde Plant – 100%	August 1994	ARESTECH	2.9
Iron and Steel Company of T&T – 100%	December 1994	Ispat	70.1

Source: Review of The Trinidad and Tobago Economy (various years).

**Table 7b: Export Volumes of Selected Export Commodities for T&T, 1995-2002**

	Liquefied Natural Gas MCF	Fertilizers exports (000 tonnes)	Methanol exports (000 tonnes)	Natural Gas Liquids (000 barrels)	Petroleum Products Millions of Barrels per Day	Oil exports (000 barrels)
1999	225	3601.4	2190.7	5593	45.8	20357
2000	450	3449.7	2438.6	6800	44.4	19118
2001	450	3995.1	2807.9	7666	41.1	18323
2002	858	4226.2	2787.7	8766.93	43.4	24895
2003	1364	4595.0	2832.3	10505.1	44.4	26002

**Table 7c: Prices of Selected Export Commodities for T&T, 1995-2002**

Year	Ammonia fob Caribbean US\$/tonne	Urea fob Caribbean US\$/tonne	Methanol Rotterdam US\$/tonne	Billets fob Latin America US\$/tonne	Wire Rods f.o.b. Latin America US\$/tonne	US\$ per barrel of Oil, West Texas Intermediate
1999	91	82	109	177	226	17.71
2000	146	130	168	191	221	29.04
2001	138	114	203	171	221	19.83
2002	111	116	164	194	221	29.42
2003	201	157	257	245	278	33.1

Source: Central Bank of T&T Annual Economic Survey (various years).

**Table 8: Macroeconomic attributes of the T&T economy, 1994-2003**

Year	Real GDP	Real Petroleum GDP TT\$m (1985 Prices)	Inflation	Unemployment Rate %	FDI Petroleum Industries (\$US)
1994	16630	4287.1	8.8	18.4	274.87
1995	17288	4303.1	5.3	17.2	266.1
1996	17950	4387.2	3.3	16.3	334.7
1997	18456.3	4390.4	3.6	15	954.2
1998	19890.2	4582.7	5.6	14.2	559.7
1999	20763.1	5112.6	3.4	13.2	467.7
2000	22036.7	5450.2	3.5	10.9	613.7
2001	22760	5581.8	5.6	10.8	684.9
2002	23374.7	5835.2	4.1	10.4	684.8
2003 p	25225.5	6516.2	3.6	11	425.2

Source: Compiled from the Review of the Trinidad and Tobago Economy (various years).

**Table 9a: Employment, wages and capital intensity of the petroleum sector, 1994-2003**

Year	Petroleum Employment	Minimum Wage Petroleum	Petroleum wage as a % of all industries	Petroleum K/L Ratio Constant prices
1994	15789	151.1	133.9	546215.4
1995	16832	152.7	134.1	653473
1996	16879	171.6	145.1	763962.9
1997	16556	174.5	145.1	951043.6
1998	17734	179	145.1	1046361
1999	15660	186.4	148.7	1025722
2000	16608	192.1	149.2	993094.1
2001	16451	195.7	149.8	1025722.1
2002	17853	na	na	1023094.1
2003	18010	na	na	na

Source: Central Statistical Office, Annual Statistical Digest (various years).

**Table 9b: Changing Skill Intensity in Petroleum and Non-Petroleum sector, 1989-2001**

	skilled to unskilled in the petroleum sector	skilled to unskilled workers in the non-petroleum sector
1989	19.29	24.94
1990	17.76	25.47
1991	22.07	23.35
1992	28.57	24.06
1993	30.97	26.87
1994	23.2	24.85
1995	31.4	24.78
1996	27.91	26.31
1997	31.75	26.66
1998	30.6	26.52
1999	32.74	26.17
2000	31.67	25.84
2001	30	28

Source: Computed from data in the T&T Continuous Sample Survey of the Population



**Table 10: Employment, Capital, value added in Export agriculture and output and export levels of coffee, coca and citrus, 1994-2003.**

Year	Employment in the Export Agricultural sector	Gross Capital Formation in Agriculture	GDP Export Agriculture	Production			Exports		
				Coffee 000Kg	Cocoa 000Kg	Citrus 000Kg	Coffee 000Kg	Cocoa 000Kg	Citrus 000Kg
1994	3300	11.9	34.5	1015	1489	10418	42	1342	0
1995	3100	5.9	34.2	830	1762	10255	3	1428	0
1996	3100	18.2	41	353	2292	11798	0	1741	0
1997	1400	142.5	38.6	1102	1740	10443	0	1454	0
1998	1700	2.7	23	367	1270	7725	0	1319	0
1999	1500	31.8	26.4	343	1160	10677	0	1155	0
2000	2100	13.2	23.3	553	1536	7421	0	349	0
2001	1500	na	11.4	406	649	3897	0	719	0
2002	2600	na	20.6	247	1722	7495	590	1032	0
2003	800	na	15.1	699	912	284	517	855	-

Source: Continuous Sampling Survey of the Population (various years).

**Table 11: Global Commodity Prices and Price Projections Constant 1990 Dollars**

	1980	2004	2005
Cocoa c/kg	330.5	178.4	170.6
Coffee c/kg (mild)	440	164.7	169
Sugar c/kg	80.17	16	15.3

Source: Global Economic Prospects (2004).

**Table 12: Key Economic features of the sugar sector, 1994-2004**

YEAR	Sugar Employment	Sugar Industries GDP	Estate Canes Reaped (Hectares)	Production (000 Tonnes) Raw Sugar	Conversion Factor (Tonnes of Cane/Tonnes of Sugar)
1994	12900	257.6	11013	131.1	11
1995	12700	237.9	11520	117.1	11.3
1996	11400	262.4	11257	92	12
1997	13800	290.3	11250	90.8	11.8
1998	10400	247.6	10727	64.7	13.2
1999	1197.4	322.6	10993	68.5	13.7
2000	9500	364.6	10060	111	12
2001	11700	341.5	10311	90.6	11.4
2002	11800	413.7	10366	98.3	13.3
2003	7900	419.6	8234	67.6	12.9

Source: C.S.O's Annual Statistics Digest (Various years)

**Table 13: Trends in productivity and wages in the sugar, petroleum and all industries excluding petroleum**

Year	Productivity – All employees			Wages – all employees		
	Sugar	Oil and Natural Gas refining	(Oil/sugar) %	Sugar	Oil and Natural Gas refining	(Oil/sugar) %
1995	100	100	100.0	100	100	100.0
2001	116.7	323.1	276.9	133.5	134	100.4

Source: Calculated from data in CSO's Annual Statistical Digest.

**Table 14a: Key macroeconomic attributes of the domestic agriculture sector, 1994-2003**

	GDP domestic agriculture	Real GDP	Domestic Agriculture's value added share	Empl in Dom agric	Domestic Agriculture value added per employee
1994	301.7	16630.3	1.81	35600	8474.719
1995	314.1	17288.1	1.82	30400	10332.24
1996	327.8	17970.3	1.82	28300	11583.04
1997	321	18456.3	1.74	28800	11145.83
1998	318.8	19890.2	1.6	27200	11720.59
1999	338.6	20763.1	1.63	26900	12587.36
2000	343.3	22036.7	1.56	25000	13732
2001	350.5	22760.4	1.54	27300	12838.83
2002	356.8	23637	1.51	22300	16000
2003p	381.9	25225.5	1.51	23300	16390.56

**Table 14b: Production of Selected Food Crops (000 kg), 1989 – 2003**

Year	Tomato	Cabbage	Cucumber	Dasheen	Pigeon peas	Pumpkin	Melongene
1994	2005	1281	3917	1806	2095	4915	2125
1995	2000	1864	3697	894	3308	7559	1721
1996	2847	1450	3452	1478	3179	6653	1324
1997	1832	1471	2684	2405	2724	7550	2182
1998	1548	2660	3861	1929	915	7657	1795
1999	2728	1533	2494	3458	2613	2064	1320
2000	2728	1533	2494	3458	2613	2064	1320
2001	2734	1421	3503	923	785	11449	947
2002	2411	2251	4708	2286	1642	5795	1856
2003	n.a	1780	3607	6858	2780	5799	2200

**Table 14c: Trends in the production of various types of meats**

Year	Chicken	Supply of Beef	Pork	Supply of Mutton	Eggs
1994	13134	4841	2121	1149	4315
1995	15532	3604	1905	1304	4445
1996	15333	3712	3442	793	4328
1997	13986	4269	3568	2099	4766
1998	14543	4394	4009	1454	4586
1999	15319	4576	4424	1195	4761
2000	19240	3862	3837	702	4890
2001	23852	3767	4870	972	5022
2002	31016	3588	5239	574	5542
2003	29575	4629	7247	966	5404

Source: Annual Statistical Digest (various years).

**Table 15a: Employment in the agricultural sector, 1973-1993**

YEAR	Total Employment	Export Agriculture	Domestic agriculture	Sugar
1973	321480	2021	34581	17586
2003	540693	800	23300	7900
% change	68.19	-60.42	-32.62	-55.08

**Table 15b: GDP in the agricultural sector**

1966	11155	68.4	169.7	238.17
2003	25225.5	15.1	381.9	419.6
% change	126.14	-77.92	125.04	76.18

**Table 15c: Share of labor employed in the various agricultural subsections**

YEAR	Export Agriculture	Domestic agriculture	Sugar
1973	0.63	10.76	5.47
2003	0.15	4.31	1.46

**Table 15d: Share GDP in the agricultural sector**

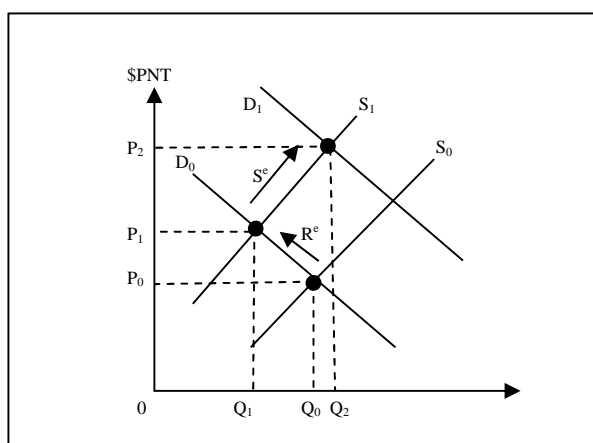
1966	0.61	1.52	2.14
2003	0.06	1.51	1.66

Source: Tables, 3, 4, 5, 6, 10, 11, 12, 13 and 14.

**Table 16: Revealed comparative advantage indices for various export commodities of T&T, 1970-1999.**

Year	061	072	111	333	334	341	642	673	52251	56216	512/5121
	sugar etc	cocoa	Non alcoholic beverages	crude petroleum	Petroleum products refined	Gas, natural and manufactured	Paper, etc, precut, arts of	iron and steel products	Ammonia	urea	methanol
1970	0.59	0.28	0.03	0.16	2.83	0.05	0.1	n.a	n.a	n.a	n.a
1975	0.34	0.13	0.14	0.29	1.4	0.01	0.11	0.22	1.55	n.a	n.a
1980	0.1	0.08	0.02	0.26	1.39	0.03	0.05	0	3.55	0.22	0.01
1985	0.21	0.07	0.14	0.57	0.83	0.02	0.03	0.19	13.07	4.77	0.7
1990	0.36	0.22	0.69	0.64	1.19	0.03	0.11	0.96	22.81	4.74	0.8
1995	0.61	0.15	1.59	0.42	1.54	0.29	0.28	1.46	42.72	9.14	2.99
1996	0.36	n.a	1.53	0.32	1.43	0.21	0.29	1.4	36.85	8.04	1.9
1997	0.63	n.a	1.78	0.24	1.23	0.22	0.37	1.55	36.38	8.22	3.08
1998	0.57	n.a	2.47	0.17	1.87	0.3	0.46	1.92	48.73	7.14	n.a
1999	0.58	n.a	1.58	0.14	1.7	0.91	0.41	1.51	n.a	n.a	n.a
str change (1999-1975)	-0.01	-0.1	1.55	-0.02	-1.13	0.86	0.31	1.29	47.18	6.92	3.07

Source: computed from data in the United Nations International Trade Statistics Yearbook, various years.



**Fig. 1: Resource Movement and Substitution Effect as a result of an oil boom**

