ON UNBALANCED PRODUCTIVITY GROWTH IN THE CARIBBEAN: A TRADABLE - NON-TRADABLE ANALYSIS

by

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INTRODUCTION

The consequence of unbalanced productivity growth in different sectors of the economy was first identified by Martin and Lewis(1956). Using the private versus public sector dichotomy, they suggested that one of the reasons "why we might expect the proportion spent on public services to rise is the relatively slow growth of productivity in this sector of the economy". This hypothesis of 'differential productivity' growth has since then been formalised by Baumol(1967) and extended by Bradford, Malt and Oates(1969), Spann(1977b), and Provopoulos(1989) to examine the economic effects of the 'productive lag' in the public sector of various countries[1]. The more direct approach[2] is adopted here to look at the issue of unbalanced growth between the tradable and non-tradable sectors in Barbados, Jamaica and Trinidad and Tobago[3].

Since the first oil crisis in 1974, the non-tradable sector has grown at a faster rate than the tradable sector in the three Caribbean economies. This kind of unbalanced growth has been accompanied by deteriorating balance of payments positions[4]. Therefore, as Caribbean economies enter the decade of the 1990s,

unbalanced growth of the kind experienced since the 1970s remains a major concern.

The results of the model clearly demonstrate support for the theory of unbalanced productivity growth as exposed in the Martin-Lewis-Baumol model and would suggest therefore that measures are needed urgently to correct this imbalance, since it is the non-traded (foreign exchange user) sector that is less productive than the traded (foreign exchange earner) sector.

THE UNBALANCED GROWTH MODEL

This section sets out the theoretical model whose conclusions are subsequently compared with the observed phenomena. The model essentially assumes that the economy can be decomposed into two sectors: (i) a progressive one (identified here as the tradable sector) which exhibits a cumulative increase in productivity as a result of capital accumulation, economies of scale and innovation, and (ii) a non-progressive one (the non-tradable sector) where technological progress and hence productivity improvement is comparatively lower. It is further assumed that labour is the only factor input in the model. Thus the production functions for the tradable and non-tradable sectors respectively, are given by

$$Q_{Tt} = \alpha L_{Tt} e^{\gamma t} \qquad (1)$$

and

$$Q_{Nt} = \beta L_{Nt} \qquad (2)$$

where Q_{Nt} and Q_{Tt} are outputs in the different sectors (T for tradable and N for non-tradable). Likewise L_{Tt} and L_{Nt} are labour inputs utilized by the two sectors. γ is the rate of technological progress in the tradable sector. With these assumptions it is not to difficult to show that the relative price of non-tradable output is (see Provopoulos (1989))

$$P_{Nt}/P_{Tt} = \alpha e^{\gamma t}/\beta. \qquad (3)$$

The effect of the rising relative price of non-tradable goods and services on the rate of growth of real non-tradable output depends on how the demand for non-tradable goods and services reacts. If the demand for non-tradable goods and services is considered to be a function of the relative price of those goods and services and of income[5], the positive rate of productivity growth in the tradable sector relative to the non-tradable sector generates both a price effect and an income effect on the demand for the output of the non-tradable sector. The increasing relative price of non-tradable goods and services leads to a fall in the quantity demanded (price effect); while increases in real income, due to the positive rate of the tradable sector technological innovation, tends to increase the demand for these goods and services (income effect). It is thus necessary to introduce into the analysis a demand function for non-tradable goods and services. In this regard the constant elasticity of demand function so often

utilized in studies on the "median voter" theorem is employed, that is

$$Q_N/L = A\ (P_N/P_T)^{\eta}_t\ (Y/LP_T)^{\delta}_t \qquad (4)$$

where P_N/P_T is the relative price of non-tradable output, Y is nominal income, L is population (assumed to be constant)[6], η is the price elasticity of demand for non-tradable goods and services and δ is the income elasticity of demand for non-tradable goods and services. Taking logs and totally differentiating equation (4) gives

$$[d(Q_N/L)/dt][L/Q_N] = \eta[d(P_N/P_T)/dt][P_T/P_N] + \delta[d(Y/P_T)/dt][P_T/Y] \qquad (5)$$

which can be rewritten as

$$\dot{Q}_N = [d(Q_N)/dt][1/Q_N] = (\eta+\delta)\gamma \qquad \eta < 0,\ \delta > 0 \qquad (6)$$

where $[d(Y/P_T)/dt][P_T/Y] = [d(P_N/P_T)/dt][P_T/P_N] = \gamma$, the rate of of productivity growth in the tradable sector[7].

Equation (6) tells us that the rate of growth of the quantity of non-tradable goods and services demanded equals the rate of technological progress in the tradable sector times the sum of demand elasticities with respect to prices and income. Clearly, the non-tradable sector output will rise over time (assuming productivity is positive) if $\delta > |\eta|$ and vice versa. $|.|$ denotes the absolute value.

Also of importance is the relationship which determines the rate of growth in real non-tradable expenditure. Real non-tradable expenditure (E) can be defined as

$$E = Q_N\ (P_N/P_T)$$

and in growth rate terms

$$\dot{E} = [dE/dt][1/E] = (\dot{P}_N/P_T) + \dot{Q}_N \qquad (7)$$

or

$$\dot{E} = \gamma\ (\eta + \delta + 1) \qquad (8)$$

using the results from equation (6). Equation (8) implies that the rate of change in real non-tradable expenditure will be positive, if $\delta > |\eta| < \delta+1$. The income and price elasticities of demand and rate of technological progress are not directly observable but real non-tradable expenditure is. Therefore given estimates of the former three parameters, one can compare the prediction using the unbalanced productivity model, equation (8), with the actually observed rates in real per capita non-tradable expenditure. The results are presented below in the next section.

RESULTS

To test the tradable - non-tradable 'productivity lag' hypothesis the estimates of labour productivity in the tradable sector, and price and income elasticities of goods produced in the non-tradable sector are needed. For the former, the ratio of tradable output to total employment is employed. But this approximation -with the use of total employment - clearly will underestimate the level of labour productivity in the tradable sector. Employment in the different sectors was unavailable. To estimate the price and income elasticities, an OLS regression on equation (4), with the nominal income deflated by the GDP deflator rather than the price deflator in the tradable sector was ran for each country. The productivity, income and price estimates are combined in equation (8) to form an estimate of real per capita non-tradable output which is then compared to the rate of growth in real per capita non-tradable output (which is defined as real non-tradable output divided by total population).

The estimates of the price elasticity range from, -0.034 for Jamaica to -0.259 for Barbados, and are therefore within the inelastic range. Thus an increase in price leads to a higher level of expenditure in the non-tradable sector. The estimates of income elasticities vary from 0.425 for Trinidad to 1.015 for Jamaica. These values are such that a positive rate of change in real non-tradable output is predicted, that is, $\dot{E} > 0$, since $|\eta| > \delta+1$.

If we reduce Spann's(1977b) criteria from a generous absolute difference of 10% to 5% between the actual and predicted values, the model performs well, with the exception of the sub-period 1961-73 for Jamaica. The range of predicted growth rates for real per capita non-tradable output is 1.509(Jamaica), 1.09 (Trinidad and Tobago) and 5.77 (Barbados) for the period 1961-88. Actual real per capita non-tradable output grew at rates of 0.567 (Jamaica), 0.45 (Trinidad and Tobago) and 4.81 (Barbados) during the same period.

For the sub-periods, the model performs best between 1982 and 1988, and especially so for Barbados where the difference between the predicted and actual is a mere 0.19%. For Barbados real output in the non-tradable sector grew at 2.4% per annum while the tradable sector declined at a rate of 0.08% per annum. This is indicative of the kind of unbalanced growth that prompted the study. The model also predicts best for Trinidad during this period. In the case of Trinidad and Tobago both sectors declined; non-tradable by 5% per annum and the tradable at 2.3%.

Of importance is the performance of the model for the period 1974-81 for the oil-based economy of Trinidad and Tobago; as the disparity between the predicted and actual values for real per capita non-tradable output is greatest. The Trinidad and Tobago economy approached its potential ouput rather rapidly during the first oil crisis and so by the second oil crisis 1979-80, the

economy's growth potential was not considerable. As a result, productivity in the tradable sector was not expected to grow rapidly over the period. In addition, prices in the tradable sector increased faster than those in the non-tradable sector because of the phenomenal rise in oil prices. These two factors of relatively slower productivity growth and faster rising prices in the tradable sector led to a greater demand for non-tradable output. It is therefore not surprising that equation (8) predicted a value for real per capita non-tradable output much lower than the actual value. In some sense, the price elasticity was over-estimated whereas the income elasticity was under-estimated.

CONCLUSION

In this paper the theory of unbalanced productivity growth was applied to the tradable versus non-tradable dichotomy for three Caribbean economies. The empirical evidence gave sound support to the Martin-Lewis-Baumol view of unbalanced productivity growth for the period 1961-88.

The study verifies that lower productivity in the non-tradable sector leads to the increasing size of the sector, a major consequence of which is a deteriorating merchandise trade gap ceteris paribus. The adverse impact of unbalanced growth on the balance of payments became very obvious in the 1980's, when most Caribbean countries experienced deteriorating foreign reserves positions. There is reason to believe that the concern of unbalanced growth will be very real in the 1990's.

In this regard, the paper structures an issue that is widely recognised throughout the region as critical. Further research will therefore have to focus on the sectoral imbalances of 1) growth; 2) wage rates; 3) differences in productivity and utilisation of technology and 4) foreign exchange users versus earners.

TABLE 1

COMPARISON BETWEEN ACTUAL AND THEORETICAL DERIVED AVERAGE ANNUAL RATES OF CHANGES IN REAL NON-TRADABLE OUTPUT IN BARBADOS

Parameter Values	1961-73	1974-81	1982-88	1961-88
γ	6.75	1.06	2.27	4.81
η	-0.259	-0.259	-0.259	-0.259
δ	0.849	0.849	0.849	0.849
Q_N	8.49 (10.73)	1.06 (0.62)	2.27 (2.46)	4.81 (5.77)

Note: The theoretically derived estimates are in parentheses.

TABLE 2

COMPARISON BETWEEN ACTUAL AND THEORETICAL DERIVED AVERAGE ANNUAL RATES OF CHANGES IN REAL NON-TRADABLE OUTPUT IN JAMAICA

Parameter Values	1961-73	1974-81	1982-88	1961-88
γ	4.455	-3.745	-0.944	0.762
η	-0.034	-0.034	-0.034	-0.034
δ	1.015	1.015	1.015	1.015
$\dot{E}$	3.035 (8.825)	-4.199 (-7.419)	1.434(-1.870)	0.567(1.509)

Note: The theoretically derived estimates are in parentheses.

TABLE 3

COMPARISON BETWEEN ACTUAL AND THEORETICAL DERIVED AVERAGE ANNUAL RATES OF CHANGES IN REAL NON-TRADABLE OUTPUT IN TRINIDAD AND TOBAGO

Parameter Values	1961-73	1974-81	1982-88	1961-88
γ	2.308	1.872	-3.085	0.83
η	-0.116	-0.116	-0.116	-0.116
δ	0.425	0.425	0.425	0.425
$\dot{E}$	0.212 (3.021)	7.06 (2.45)	-6.65 (-4.038)	0.45 (1.09)

Note: The theoretically derived estimates are in parentheses.

FOOTNOTES

1. Bradford, Malt and Oates (1969) and Spann (1977a) tested the Martin-Lewis-Baumol hypothesis by computing productivity indices for various public sector activities which provide indirect evidence in support of the hypothesis for the U.S. Provopoulous (1989) provided evidence for the hypothesis for Greece using the more direct approach suggested by Spann (1977b)

2. See Footnote 1.

3. Gemmel (1987) adopts a general equilibrium approach of Baumol model to look at the market vs non-market sectors.

4. Worrell(1987) discusses the economic performance and structure in the Caribbean economies, demonstrating their susceptibility to demand and price changes in external markets.

5. In a competitive economy, labour receives the value of its marginal product; thus it is relatively easy to show that real income per capita will grow at the rate of technological progress (γ). (See Footnote 7)

6. In the case of a growing population, expenditure and output need to be placed on a per capita basis. If the output of the non-tradable sector is purely tradable then the Baumol model will remain unchanged under a growing population (See Spann (1977b)).

7. If $Y = P_gQ_g+P_pQ_p$

   then $Y/P_p = (P_g/P_p)\ Q_g+Q_p$.

   Putting equations (1) and (2) into the previous expressi

   $Y/P_p = be^{\gamma t}\ (L_g + L_p) = be^{\gamma t}L$

   then $d(y/P_p)/dt\ (P_p/y) = \gamma$

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