FACTOR ACCUMMULATION, TECHNICAL CHANGE AND THE TERMS OF TRADE IN THE EASTERN CARIBBEAN CURRENCY UNION (ECCU)

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ABSTRACT

Economic growth in the ECCU, averaging 4.6 per cent per annum, has resulted in a steady increase in average per capita GDP, since 1978. This paper identifies the sources of economic growth in the ECCU over the 1978 to 1996 period. Growth of capital and factor productivity was the main contributors to economic growth. The terms of trade had an overall positive impact on economic growth, for most countries within the ECCU. St.Kitts and Nevis enjoyed the highest growth in GDP per worker and per capita income over the period of analysis. On the other hand Grenada, and St.Lucia had the slowest rate of growth GDP per capital and GDP per worker respectively.

Keywords: ECCU, Economic Growth, Factor Accumulation, Technical change and Terms of Trade.

Work in progress

1. INTRODUCTION AND OVERVIEW

This paper reports on a comparative case study, which attempts to develop an understanding of the conditions, processes and outcomes that have governed the growth experience of the member countries of the EC Currency Union (ECCU).

The selection of the ECCU membership as a comparative case study was done for two main reasons. These economies are similar in important historical and institutional areas, while at the same time sufficiently dissimilar in their economic structure to be of interest as a useful comparative case study. The main areas of similarity rest with the shared institutions: These include the Eastern Caribbean Central Bank (ECCB), which administers the currency and the currency board arrangement, and regulates the financial system. Secondly, the legal system in the ECCU is another shared framework. In addition the public sector administrative structures and procedures was inherited from a common colonial master. Finally, all the economies at one time or another engaged in substantial production and export of traditional crops; sugar, bananas or spices. Moreover, they have all commenced a process of structural transformation to services. The ECCU member countries have experienced reasonable economic growth over the period 1978 to 1996. Notwithstanding, however, there exist considerable poverty across the currency union. In all member countries, total poverty as a proportion of adult population exceeds 10 per cent.

The economies in the ECCU differ, however, in the emphasis, which they have placed on human and physical capital as a mechanism for development. Moreover, some of the economies have been highly successful in transforming their economic structures from total agriculture to tourism. A further area of dissimilarity rests with the variability of economic growth performance. Of the countries in the analysis three experienced volatility of less than 100 per cent of their mean growth, of which St.Kitts was the lowest at less than 20 per cent. The other three countries experienced volatility in excess of 100 per cent of their mean growth, of which St.Lucia at 261 per cent was the highest over the period of analysis.

This paper will proceed as follows. Section 2, provides information on the growth performance of the ECCU member countries, focusing on human capital, government policy initiatives, structural transformation and the terms of trade performance of the ECCU member countries between 1978 and 1996. Section 3 then turns to a detailed analysis of total factor productivity growth (TFP) in the ECCU member economies. The results of the total factor productivity, analysis is provided in section 4. Section 5, concludes this paper.

2. THE GROWTH EXPERIENCE OF THE ECCU

2.1.   GDP Per Capita and GDP per worker

Table 1: Growth and Participation Rates (1978 –96)

	Antigua			Dominica		
	N	D	N-D	N	D	N-D
GDP per capita	4.8	-0.3	5.1	4.0	-0.3	4.3
GDPper worker	4.8	1.6	3.3	4.0	-0.3	4.3
Ex.Agriculture	*5.4*	*1.7*	*3.7*	*5.1*	*0.3*	*4.8*
Construction	*7.3*	*-3.0*	*10.3*	*6.7*	*1.8*	*4.9*
Manufacturing	*4.2*	*-5.5*	*9.7*	*6.1*	*2.9*	*3.2*
Services	*3.5*	*1.7*	*1.8*	*4.4*	*-1.6*	*6.0*
Agriculture	*-1.3*	*-1.8*	*0.5*	*0.9*	*0.4*	*0.5*
Δparticipation rate	78.4 →79.8			57→56.9		
Males	72.9 →75.2					
Females	37.5 →36.9					

	Grenada			St.kitts		
	N	D	N-D	N	D	N-D
GDP per capita	3.9	0.8	3.1	5.2	-0.1	5.3
GDPper worker	3.9	-0.1	4.0	5.2	-0.12	5.3
Ex.Agriculture	*5.0*	*1.1*	*3.9*	*6.1*	*1.1*	*5*
Construction	*3.5*	*1.7*	*1.8*	*6.8*	*15*	*-8.2*
Manufacturing	*8.3*	*1.7*	*6.6*	*2.3*	*-1.1*	*3.4*
Services	*1.8*	*-0.9*	*2.7*	*8.6*	*0.6*	*8*
Agriculture	*-0.9*	*-4.5*	*3.6*	*-0.26*	*-3.6*	*3.3*
Δparticipation rate	65 →52.5			73.1→ 74.5		
Males	83.4 →67.8			89.2 → 83.7		
Females	46.8 →38.2			59.2 → 65.4		

	St.Lucia			SVG		
	N	D	N-D	N	D	N-D
GDP per capita	5.0	1.5	3.5	4.9	0.8	4.1
GDPper worker	5.0	1.7	3.3	4.9	1.1	3.8
Ex Agriculture	*5.4*	*2.0*	*3.4*	*5.3*	*2.0*	*3.3*
Construction	*7.8*	*6.4*	*1.4*	*4.8*	*2.0*	*2.8*
Manufacturing	*5.3*	*8.1*	*-2.8*	*5.8*	*4.9*	*0.9*
Services	*5*	*8.2*	*-3.2*	*5.2*	*2.9*	*2.3*
Agriculture	*2.5*	*1.0*	*1.5*	*4.6*	*-0.9*	*5.5*
Δparticipation rate	66.4 →67.8			62.4 →62.3		
Males	85.4→ 82.4			86.3→ 80.8		
Females	47.3 →54.3			41.2 →44.3		

Notes: N – numerator, D- denominator

Source: Eastern Caribbean Central Bank National Income Accounts Digest; population censuses (1980, 1991) of individual countries.

Table 2: Dispersion of GDP Per Capita

	GDP	GDP per capita	CV of GDP per capita*
Antigua	3.6	3	69.8
Dominica	6.4	5.9	168.7
Grenada	2.7	1.2	30.8
St.Kitts	2.9	0.8	15.1
St.Lucia	4.8	4.7	261.0
St.Vincent	4.3	4.3	195.5
ECCU	2.4	1.96	49.5

*CV - coefficient of variation or dispersion of GDP growth as a percentage
of mean GDP per capita growth
Source: Author's calculations

2.2. GDP Per Worker

Three countries, Antigua and Barbuda, St.Kitts and Nevis and St.Lucia, have experienced a rise in participation rates. Participation rates in the other economies have remained constant or declined slightly.

There has also been a reduction in the percentage of the total labor force employed in agriculture in all economies except Dominica, see table 3. The largest reduction has occurred in Grenada from 26.6 per cent in 1980 to 14.6 per cent in 1991. Removing agriculture from the analysis lowers the growth rate of output per worker in three countries, Grenada (0.1 per cent), St.Kitts and Nevis (0.3 per cent) and St.Vincent (0.5 per cent) per annum respectively

Table 3: Employed Population by Industrial Activity, (In per cent of total)

	Antigua		Dominica		Grenada		St.Kitts		St.Lucia		St.Vincent	
	1980	1996	1980	1991	1980	1991	1980	1991	1980	1991	1980	1991
Agriculture	3.2	1.2	30.7	30.8	26.6	14.6	26.1	13.8	26.5	23.6	26.5	24.8
Mining	0.6	0.1	0.0	0.3	0.2	0.5	0.0	0.2	0.5	0.3	0.3	0.3
Manufacturing	11.2	4.3	5.6	8.2	5.2	7.5	15.7	14.0	7.3	13.7	5.2	8.4
Utilities	2.1	3.2	1.0	1.3	1.2	1.4	6.6	1.7	0.9	1.2	1.2	1.7
Construction	16.3	9.5	9.0	11.8	8.9	13.0	2.5	11.6	6.3	10.1	9.2	10.8
Wholesale	22.5	28.2	6.3	15.4	12.9	23.2	7.3	23.8	6.8	22.5	7.8	19.6
Transport	7.7	10.0	3.6	5.0	5.6	6.6	1.6	5.7	3.6	5.4	5.7	6.9
Fin & R.E.	4.2	7.3	1.0	3.4	1.2	3.5	4.7	5.9	1.1	3.9	1.1	4.2
Public Adm.	11.5	28.6	5.3	6.4	5.6	6.8	5.7	5.7	5.8	13.4	4.4	6.6
Comu. Services	15.5	7.6	6.7	10.1	8.6	11.5	7.5	11.1	5.4	5.2	7.4	12.1
Other Services	5.2	0.0	7.6	4.4	12.9	6.3	9.5	4.1	13.9	0.0	10.7	4.6
Not Stated	0.0	0.0	23.3	2.9	10.8	5.0	12.8	2.4	21.9	0.6	20.5	0.0
Totals	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Population censuses (1980, 1991) of individual countries and labour force statistics of Antigua and Barbuda.

2.3. Investment

Capital input has grown modestly in the ECCU. As shown in table 4, although the investment to GDP ratio has remained roughly constant in SVG, in the other ECCU countries investment to GDP ratios has generally fluctuated over time.

Table 4: Investment to GDP Ratios

Year	Antigua	Dominica	Grenada	St.Kitts	St>lucia	St.Vincent
1977	20.6	19.3	14.4	38.2	22.0	34.0
1978	19.3	20.3	10.1	27.2	33.8	27.0
1979	24.3	31.6	23.5	34.6	30.8	32.8
1980	34.8	46.1	25.8	38.2	33.8	38.2
1981	41.9	29.5	38.8	30.1	33.6	31.5
1982	39.4	27.1	38.0	34.0	28.6	27.9
1983	20.4	24.2	33.7	37.2	18.4	24.6
1984	23.6	32.0	25.0	30.2	19.2	27.6
1985	27.8	24.5	22.3	30.3	20.5	28.0
1986	35.7	19.6	27.8	27.3	20.6	29.0
1987	45.8	20.2	30.5	33.6	20.1	32.3
1988	39.8	27.1	28.1	55.9	24.3	30.2
1989	41.2	35.2	28.7	58.2	28.3	28.8
1990	32.4	34.5	31.8	55.4	24.6	31.1
1991	37.6	27.0	31.9	42.9	24.4	30.8
1992	34.8	25.4	25.0	39.0	23.2	26.6
1993	31.7	23.2	26.7	45.3	24.6	30.5
1994	32.4	24.1	30.8	38.1	24.4	32.5
1995	36.9	28.9	27.7	46.1	24.2	33.3
1996	39.5	23.2	28.5	31.2	25.4	34.1
Average	33.0	27.1	27.5	38.6	25.3	30.5

Source: Eastern Caribbean Central Bank national income accounts digest 1997.

2.4   Human Capital

Human capital accumulation in the ECCU has also been quite rapid in some countries. As shown in table 5, over the past decade on which data is available, the proportion of the population in the economy with a secondary education or more has risen significantly. In SLU the proportion has tripled from 14.9 per cent in 1980 to 43.5 per cent in 1991. In Grenada the ratio has risen by 2.3 times over the same period. In SVG the proportion of adult population with a secondary education or more has increased by 30 per cent, whilst in Dominica it rose by 17 per cent

Table 5: Educational Attainment of the Adult Population (per cent of total)

	Antigua		Dominica		Grenada		St.Kitts		St.Lucia		St.Vincent	
	1980+	1996	1980	1991	1980	1991	1980	1991	1980	1991	1980	1991
None	5.2	15.8	5.6	13.8	2.4	3.7	1.4	16.3	12.8	2	2.6	6.9
Primary	83.1	45	78.5	67.1	82.2	66.6	22.0	38.1	72.2	51.1	79.9	70.3
Secondary +	11.7	38.9	15.9	18.6	15.4	34.9	76.6	45	14.9	43.5	17.5	22.8

Source: Population censuses (1980,1991) of individual countries
+ The data in this column refers to 1960 for Antigua

2.5.   The Terms of Trade

The terms of trade of the ECCU countries over the 1977-96 period have been characterised by a general improvement averaging approximately 0.13 per cent per year.

Table 6: Terms of Trade Movement of the ECCU Countries.
(Percentage Change)

Period	Antigua	Dominica	Grenada	St.Kitts	St.Lucia	St.Vincent	Average
1977-82	0.52	-0.72	-0.6	0.37	-0.7	-0.52	-0.28
1983-89	0.22	1.24	0.4	-0.44	0.24	1.1	0.46
1990-94	0.20	-0.23	-0.5	-0.08	0.29	0.10	-0.04
1995-96	0.50	1.0	0.22	0.19	0.78	0.78	0.58
1977-96	0.33	0.26	-0.13	-0.002	-0.03	0.33	0.13

For most countries at least four different patterns and periods can be identified. The first period was between 1977 - 82, when there was a relatively sharp deterioration in the terms of trade of approximately 0.28 per cent on average per annum over the period. The second sub-period, 1983 to 1988, was characterised by a strong improvement in the terms of trade of approximately 0.46 per cent per annum.

The growth of tourism activity and the banana boom of mid to late 1980s can explain the terms of trade improvement in this period. In the third sub-period, 1990 - 94 there was a

deterioration in the terms of trade, of approximately 0.04 per cent per annum, as banana prices fell, along with a slow down in the tourism sector. Finally, from 1995 - 96 the terms of trade improved on average by 0.58 per cent per annum.

3. TOTAL FACTOR PRODUCTIVITY GROWTH IN THE ECCU

3.1 Methodology

3.1.1 The translog index of total factor productivity growth

Growth accounting provides a transparent framework to determine the proximate causes of economic growth. It is used merely as a framework for assembling quantitative "facts" and quantified hypothesis about growth causality in a coherent way. The growth accounting methodology is based on an aggregate production function for the economy, equation (1). The idea is to present the various processes which contribute towards economic growth within a consistent framework. Gollop and Jorgenson (1980) and Jorgenson, Gollop and Fraumeni (1987), Solow (1957), Denison (1962), Young (1995) did the pioneering work in this field.

$$Ln[Y_t-Y_{t-1}]=\varepsilon kLn[K_t-K_{t-1}]+\varepsilon lLn[L_t-L_{t-1}]+TFP_{t-1,t}$$

Where, Y is output, K is capital stock, L is labour, TFP, the translog index of TFP growth ($TFP_{t-1,t}$), which provides a measure of the amount by which the log of output would have increased had all inputs remained constant between the two discrete time periods. εk, εl are the average elasticities of output with respect to capital input and labor input in year t-1 and in year t.

This basic framework can be applied in different ways to assess the importance of different factors to the growth process. Indeed, capital and labour the basic inputs can be

augmented, for quality, etc. In addition, however, it is usually important to assess the impact of supplementary influences additional to augmented joint factor productivity. Following Maddison (1987), the index for this full blooded growth accounting approach is,

$$TFP^* = [(Y_t - Y_{t-1}) - \alpha^*(L_t - L_{t-1}) - (1-\alpha)^*(K_t - K_{t-1}) - (S_t - S_{t-1})]$$

Where S_t is an index of supplementary factors, which influence growth. In this case supplementary influence are the terms of trade and structural change.

TFP* is perhaps best referred to as the residual, which is the residue of unmeasured influences, including disembodied technical progress, statistical and other errors. The justification for including supplementary elements is clear because the total factor productivity measure, even in its augmented version still leaves an important amount of growth unexplained, and particularly in the case of the ECCU countries, with a balance of payment constraint.

3.1.2 Measuring Factor Supplies
Labour

- No country in the ECCU continuously monitors their national labor force.

- Population census estimates at ten-year intervals. There have been three population censuses, 1970, 1980 and 1990.

- The labor force and unemployment numbers obtained from these censuses were extrapolated for the ten-year intervals, based on year to year population estimates (ECCB National Accounts Statistics, 1997).

- The measure of labor was adjusted for educational attainment.

Capital

The aggregate capital stock for individual economies was based on the perpetual inventory method. That is

$$K_t = I_t + (1-\phi)*K_{t-1},$$

Where, I_t is investment flow at time t, and K_t is the current period capital stock, K_{t-1} is the previous period capital stock and ϕ represents the rate of depreciation of the existing capital stock.

3.1.3 Measuring factor Shares

- The factor, shares were motivated by mainly the national account numbers.

- Over the period the labour share is estimated to have averaged approximately 58 and capital 42 per cent.

- The factor shares reported ought to be viewed as approximations of their true values.

3.1.4. Measuring Structural change

- Structural change is measured by comparing the outturn under the actual realizations and a scenario, which assumes that the structure of the economy did not change.

- The basic indicator of structural change in this work is the output and employment in the agricultural compared with the non-agricultural sectors.

3.1.5. Measuring the terms of trade

- In this work the terms of trade is of course an index of export prices divided by an index of import prices.

- These indices are not readily available for the ECCU countries and so had to be constructed using proxies.

- It must be emphasised that this index is only to be regarded as a proxy (indicator) of the likely movement in the terms of trade in the ECCU countries.

4.   RESULTS

4.1.   Aggregate Productivity Growth

Table 7: Aggregative Productivity Growth (period average 1978-96)

Country	TFP growth
Antigua	0.6
Dominica	1.4
Grenada	0.6
St.Kitts	3.6
St.Lucia	0.01
St.Vincent	-0.2

4.2. Sources of Economic Growth

Table 8: Sources of Economic growth in the ECCU (1978-96)

Country	Capital	Labour	Structural change	Terms of trade	Productivity
Antigua	68.5	25.7	-8.25	2.0	12.11
Dominica	50.4	6.4	7.6	1.0	34.6
Grenada	81.7	-4.0	4.0	-3.6	21.9
St.Kitts	37.5	-9.9	5.7	-0.4	67.5
St.Lucia	92.1	13.7	-3.1	-3.0	0.38
St.Vincent	69.4	17.2	12.9	6.1	-5.6
Average	**66.6**	**8.2**	**3.2**	**0.35**	**21.8**

4.3 The Implied real rates of return on Capital

Measured as the capital share in output divided by the capital-output ratio.

Table 9: Implied real rates of return on capital

Country	1978-96	1978-86	1990-96
Antigua	27.1	32.1	22.2
Dominica	32.6	34.8	36.7
Grenada	28.4	36.7	24.8
St.Kitts	15.7	16.2	16
St.Lucia	45.3	48.8	41.4
St.Vincent	19.6	22.5	16.6
Average	28.1	31.9	26.3

Summary and Conclusions

Main insights

The paper identified the importance of capital accumulation and productivity to the growth processes in the ECCU.

ii.   The growth in importance of TFP may be as a direct result of the diffusion of improved techniques introduced by significant FDI inflows – especially in the tourism &telecom sectors.

iii.   Provided estimates of the relative contributions of the different factor inputs to economic growth between 1977-96.

iv.   Estimates of the contribution of the terms of trade. As small open economies the BOP is critical to the standard of living. Without increasing output, national income can rise because of favourable changes in relative prices.

Policy implications of the research

i.   Engage in economic activities, which benefit from a secular rise in the terms of trade.

ii.   Further growth through capital accumulation is unlikely given the measured trend decline in the real rates of return on capital

iii.   Further improvement in productivity is required. Measures are measured which enhance social capability

    a. Improvements in the management capability of public & private sectors.

    b. Improvements in the financial management of the public sector finances, which would by necessity, include reducing the debt overhang of some countries. Such a policy stance ought to remove the credibility problem for governments, which debt over hang creates

Area for future research

i.   Towards an empirical explanation of the factors, which determine private sector investment within the context of the currency union.

ii.   The determination of factors, which influence the evolution of the terms of trade in the currency union

iii.   A full analysis of economic growth in the ECCU from the demand side. Such an investigation may seek to uncover the system properties of the currency union.

iv.   Finally a project to extent and develop consistency among the various bits and pieces of available economic data, especially on GDP, labour force, government finance and the balance of payments can go a long way towards providing a comprehensive data set as it relates to economic development and performance.

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[i] The ECCU consists of the following countries: Anguilla (ANG), Antigua and Barbuda (ANT), Dominica (DOM), Grenada (GRN), Montserrat (MON), St.Kitts and Nevis (SKB), St.Lucia (SLU) and St.Vincent and the Grenadines (SVG). Anguilla and Montserrat are both British dependent territories.