

An examination of the sources of economic growth in Cameroon

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AERC Research Paper 116
African Economic Research Consortium, Nairobi
March 2002

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Published by: The African Economic Research Consortium
P.O. Box 62882
Nairobi, Kenya

Printed by: The Regal Press Kenya, Ltd.
P.O. Box 46116
Nairobi, Kenya

ISBN 9966-944-72-9

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Abstract

Using the aggregate production function as the basic model, the study examines the main components of Cameroon's growth rates between 1961 and 1997 and the driving force behind the sources of growth in the economy. Both parametric and non-parametric approaches are used.

The results show that the contribution of the growth of factor inputs is greater than the contribution of total factor productivity, with capital input playing a larger role. At the sector level, input growth greatly influenced the primary sector output growth. The capital input tends to be the most important factor influencing output growth in both the secondary and tertiary sectors. In these two sectors, labour's role is not effectively used or has not been boosted to effectively perform its crucial role in the economy.

In developed economies studies show that total factor productivity growth plays a greater role than factor input growth. The results here suggest that factor inputs play more important roles than total factor productivity (TFP) growth with emphasis on increasing return to scale and input growth both in quantity and quality. The technology factor is not a big contributor to growth in Cameroon, which may be because of certain constraints in the economy. The results do show high growth rate of total factor productivity, thus suggesting the potential and growing importance of TFP in the growth process. Policies that would improve the quality of factor input, particularly labour, would tend to enhance the contribution of total factor productivity. Hence the policy implications are to improve human capital development as the main mover of other factors in the economy.

1. Introduction

Cameroon's economy performed very well for the period 1961–1985, with agriculture supporting the economy during 1961–1977 and petroleum production taking the lead in 1978–1985. For these periods, Cameroon's economy was regarded as well managed and the country had one of the highest per capita incomes in sub-Saharan Africa. Cameroon had such a steady economic growth rate that it seemed to be unaffected by the external shocks of the 1970s and early 1980s. During the period when agriculture was the dominant economic activity, it accounted for almost 34% of GDP, employing 80% of the labour force and providing 85% of exports. The share of industry was just 17% of GDP. But after the mid 1970s, the share of petroleum output increased to 18% of GDP. The economic growth rate was as high as 12% per year for the period 1977/78–1980/81, and despite the high population growth rate (3.1%) the per capita income was quite high. Public investment increased in this period, but tended to be unproductive. To a greater extent, public expenditure in this area was wasteful (Subramanian, 1994).

The manufacturing sector grew rapidly, although on the whole the agricultural sector was stagnant with varied rates of growth across commodities. The food production sector grew, while the export crop production sector declined. After more than two decades of rapid economic growth, Cameroon's economy collapsed in the mid 1980s (partly because of the sharp fall in world prices for its main export commodities and poor domestic economic management). The decline in the GDP growth was sudden and severe, from 8% to less than -5% per year for the period. Because the period of economic expansion was much longer than that for economic contraction and given the stylized facts, the magnitude of the economic decline was unexpected and devastating (Figures 1 and 2).

The government's development strategy concentrated on expanding the public sector. The capital budget significantly increased during 1977–1986, hence public investment increased relative to private investment. Public agencies such as the marketing boards and public enterprises were established with government subsidies and expanded in nearly all the sectors in the economy. The transport sector was greatly affected by government intervention. The government set up public corporations in railways, air travel, urban transport and maritime transport. A complicated system (including interest rates) was put in place to regulate prices of both goods and services. At the same time quantitative and qualitative restrictions were imposed on external trade. These policy measures later posed serious challenges that could have been predicted.

It has been shown repeatedly, particularly in the developed economies, that growth depends on raising factor productivity. And increasing factor productivity requires investment in human and physical capital and new technologies. Increased labour

Figure 1: Evolution of Cameroon's GDP (billion CFAF)

Figure 2a: Sector output growth in Cameroon (billion CFAF)

Figure 2b: Cameroon's sector growth rate changes over time

Figure 2c: Cameroon's real GDP growth rates

productivity raises long-term growth in household incomes. The increased capital expenditures in the late 1970s and the early 1980s are reflected in Cameroon's improvement in social indicators of human capital and infrastructure. (Human capital development was not sustained and well utilized, however, and infrastructure was neither sustained nor maintained.) Yet poorly conceived investment policies can result in unproductive or idle resources. The little available information on sub-Saharan Africa shows that labour productivity has grown very slowly. This is said to be partly due to the low rate of accumulation. Even the physical and human capital that has accumulated has often been less productive than in other developing regions. The environment seems to have failed in promoting investment and encouraging proper use of resources to increase productivity (World Bank, 1995b).

Today, Cameroon's greatest desire is to carry out economic transformation and increase economic growth and development. But policy makers need more empirical input and guidance to carry out rational economic decisions, since there are few studies on Cameroon's economy to provide reasoned insights and guidance to policy. The ultimate aim of drastically reducing the poverty level, which has sharply increased because of the economic crisis (World Bank, 1995a, Cameroon 1989), cannot be accomplished without rapid economic growth.

And, in order to achieve sustained economic growth, increased production and productivity must be at the centre of an economic recovery strategy. But to formulate strategies for achieving sustained increased production and the rapid growth necessary for poverty eradication, relevant information is absolutely necessary. It is therefore important to decompose the structure of Cameroon's economy and its growth rate, to gain a better understanding of those factors that have produced differences in growth rates in the various periods and sectors of the economy.

Much growth literature has concentrated on studying and measuring growth; yet we still have little understanding of the sources of economic growth and the factors influencing these sources of growth, more so for African economies. To design sound macroeconomic policies and make rational economic decisions, appropriate information is necessary. Much evidence shows that countries that have used their policy instruments properly and wisely have succeeded in having sustained rates of economic growth (Lindernberg, 1993). Implementing proper economic policies also depends on decision makers having the relevant inputs for their decision making process. This study analyses growth in the overall economy as well as in the different sectors of Cameroon's economy and in different time periods with the goal of identifying the sources of variation in growth rates. This would contribute to the design of appropriate policies that might result in higher growth rates for the whole economy.

Research problem and objectives of the study

The Bretton Woods supported structural adjustment programme in Cameroon tried to redefine the state's role in the economy with the main aim of reversing the downward trend of the main macroeconomic aggregates and putting the economy on a sustainable

growth path. This has not been achieved as indicated. This may partly be because no study has rigorously examined or analysed the growth pattern of Cameroon's economy and factors underlying this growth. In fact, it is difficult to see how policy can respond rightly to what the economy has and has lost without a clear understanding of what the loss was and how it came about and how it could be recouped.

For a proper design of growth enhancing policies, policy makers should have good knowledge of the leading and dynamic sectors in the economy. They should know what accounts for variation in growth rates across periods and across sectors, what are the roles of the various factors in economic growth, and what the production structures and factors underlying them are. With the necessary information, policy makers can evaluate the possible effects on productivity. Examining the sources of growth, therefore, is an appropriate way of finding where policies can rightly respond to these issues. We decompose the economy and growth rates into different components and examine the role of the different factors in the economy in order to understand better Cameroon's growth process. With the stories behind them, we would gain better understanding about the sources of economic growth and thus provide useful information for more effective and appropriate public policy. To date this seems to be the very first attempt at examining the sources of growth in Cameroon's economy in this way.

Hence our purpose in this study is to analyse and seek to understand the factors underlying the changes in economic activities. Our broad objective is to identify and decompose the sources of economic growth and examine the factors or forces behind these sources of growth. This is done at the aggregate level as well as at the main economic sectoral level.

The sectors are agriculture, manufacturing/industry and services. Specifically we:

- Describe the stylized facts during the evolution of the economy of Cameroon. This includes a discussion on macroeconomic performance in terms of economic growth.
- Obtain detailed information on the composition and characteristics of the conventional inputs—labour and capital.
- Assess and provide insights into the differences in the growth rates of the different subperiods including factor accumulation and factor shares in these periods.
- Estimate or calculate the total factor productivity and factor contribution both at the aggregate level and at the sector level for the study period.
- Analyse the contributions of factors and total factor productivity, see their evolution or results, and if possible link them to economic events or regime changes.
- Provide an explanation of the growth and collapse of the economy on the basis of the quantitative and qualitative information (results) obtained.

In effect, we examine Cameroon's past economic performance as well as focus on the current situation with a view to bringing out policy implications.

Justification of the study and policy relevance

Recent empirical literature on the sources of growth of African economies is almost non-existent except for a few studies such as those by Dike (1995) and Onjala (1996). This study therefore not only contributes to the literature on sources of growth in African economies, but with its focus on Cameroon further contributes to the current debate on policy strategy for Cameroon's economy. The study tries to bring out policy issues to support a policy making process based on informed empirical analysis. Moreover, the study goes further to identify and analyse economic events and regime changes, linking them with the growth accounting results.

The study focuses on the whole economy based on aggregate production function as well as a detailed examination of the sources of growth of the main economic sectors. Equally important, we identify and analyse the forces behind the sources of growth at the sectoral level, which is critical as individual sectors have different economic and technical characteristics as well as linkages. The study concentrates on giving inputs for carrying out policies that are growth enhancing, as much as examining government's role in the economy based on past experience. The results should be of interest to decision makers, as an input into formulating economic policy, and for those concerned about formulating and analysing changes in the economy.

However, we must acknowledge certain fundamental problems pertinent to this type of study. One major factor in the scarcity of growth accounting studies for African countries is the difficulty of getting sufficient, quality data for the exercise. Also, most African countries have not experienced growth for some time. These countries have mostly been operating inside their efficiency frontier rather than performing along their production possibility frontier. The growth accounting literature depends on an assumption that an economy should be observed to be performing on its production possibility frontier (PPF) and not inside. Very few developing countries, if any, would meet this assumption. A country operating inside its PPF may not increase its output by increasing its inputs. However, we can assume that even inside the PPF, changes in output are resulting from changes in other factors including factor inputs. This may be regarded as being on the production possibility frontier.

2. Economic background

In the early phase of Cameroon's independence, the government put into place instruments for building the Cameroon nation and promoting economic development. A series of five-year economic and social development plans were initiated starting in 1961. The main objective of the first five-year plan (1961–1966) was to integrate the country politically and economically and to improve the standard of living of the population. This was mainly to be achieved by doubling the per capita income from 21,500 CFA francs in 1961 to CFAF 43,000 in 1980.

The establishment of the Federal State (East and West Cameroon) in 1961 increased the economic, demographic and political importance of the country. Development policies of the federated states were integrated in the second development plan (1966–1971) with the plan further focusing on again doubling the per capita income by 1980 and aiming to reduce socioeconomic inequalities between the regions of the country. The third plan stressed increased production and productivity of all sectors of the economy with significant investment expenditures directed towards the private sector. Between 1970 and 1984 many public enterprises were created, so that by 1985 the state enterprises receiving public subsidies employed over 100,000 people. Within this same period much road and rail infrastructure development was carried out. Before 1985, there was considerable emphasis on public investment and less labour intensive activities.

In the third plan (1971–1976), 63% of total investment was allocated directly to productive projects, compared with 46% in the second plan. While the second plan had relied mainly on external resources, the third plan relied essentially on national resources. The fourth development plan (1976–1981) coincided with the oil boom period. By 1985 oil's share in GDP had increased to 18% and to 45% of government revenue and 35% of exports. It was also the period when there were increases in world commodity prices. The plan stressed large public projects and import substitution industry, and salaries of civil servants were regularly increased with the main public salary scales established in 1970. In fact, between 1975 and 1982 there were yearly salary increases. During 1984–1993 the wage bill rose from 5.5% of GDP or 27% of total revenue to 10% of GDP and 64% of revenue; by mid 1993 wage arrears started accumulating. Increases in public sector wages strongly influenced private sector wages also.

At independence the population was 5.5 million people. The government felt that the country needed more people to attain its full economic potential. Pro-natal policies were implemented; for instance family allowances were provided for each additional child. Contraceptives were virtually banned by the 1969 law (number 29169). In the early 1980s, however, rapid population growth became a cause for concern and by 1986 the

government started feeling that population growth must be kept in balance with the national resources. The government established a population planning unit to help in examining the demographic concerns in development planning.

By 1985 oil's share increased to about 45% of government revenue and 35% of total export of goods (Table 1). Oil revenue allowed a rapid expansion of investment and growth of the non-oil sector. For the first time in the five-year development plans, the fifth plan (1981–1986) took into consideration the “oil boom and constraints on investment absorptive capacity”. Yet significant allocation went more to administrative equipment and ministerial building and little to the agricultural sector. Through the fourth and fifth plans, the public sector grew rapidly.

Table 1: Petroleum production and export in Cameroon ('000 tons)

Year	Production	Export
1980	2,700	1,612
1981	4,340	1,582
1982	5,331	1,872
1983	5,626	1,996
1984	7,400	1,213
1985	9,170	7,700
1986	8,800	7,300
1987	8,348	7,700
1988	8,295	7,300
1989	8,114	5,929
1990	7,835	7,410
1991	7,235	7,001
1992	6,790	6,620
1993	6,600	6,170
1994	5,810	3,830
1995	5,380	3,220
1996	5,200	3,110
1997	5,100	2,950

Sources: BEAC rapport d'activité 1987–1996, the *Economist* intelligence unit's country analysis 1997, 1998.

Between 1960 and 1985, the state intervened extensively in the economy. Prices of goods and services (including agricultural commodities) were regulated; public industries and agricultural inputs (for example fertilizers) were subsidized, coupled with the creation of many public enterprises. Industries operated under heavy protection. The public service was greatly expanded. The public sector still remains the largest employer and the largest sector in the economy, particularly in terms of expenditure in GDP. Between 1985 and 1987 the real exchange rate of the franc appreciated sharply, while the US dollar depreciated by 40% against the CFA franc; over the same period the terms of trade deteriorated by 47% (World Bank, 1995a; Amin, 1996) as oil output started to fall.

The sixth plan (1986–1991) marked a turning point as the economy collapsed and the structural adjustment programme adopted with the sixth plan was virtually abandoned. The government started internal adjustment, including measures in the areas of public

finances, price policy and institutions, by launching an austerity programme in 1987. As growth became negative in 1987, private sector incomes declined while civil servants' salaries were maintained until 1993. In 1987 the government began reducing its expenditures starting with cuts in capital and recurrent expenditures, particularly civil servants' amenities (Amin, 1998). Initially, the government was reluctant to curb recurrent expenditures and reform the non-productive public enterprises, so that the investment component of public expenditures bore the brunt of adjustment. The austerity programme was partly to reconstitute public savings and restore budgetary balance. The largest budgetary cuts led to the removal of the extra-budgetary expenditure with a variety of recurrent and capital expenditures, a freeze on the wage bill, and reduction in subsidies and transfers. But this was with increased interest payments and higher sales tax on petroleum products and alcoholic beverages.

Finally, by the beginning of 1993, there were public sector wage cuts of at least 15%; by mid that year wage arrears had started accumulating and by the end of the year, a drastic salary cut of up to 60% (of what remained of the initial cut of that year) was implemented. Further reduction in the wage bill through staff cuts and downsizing the civil service was also carried out. Many civil servants ended up earning less than 50% of their pre 1993 salaries.

In general, measures adopted to streamline the public sector and encourage the private sector included total price liberalization, which started in 1988/89, public service reforms and financial sector reforms. By 1994 civil service employees stood at 170,000 persons, with 42,000 in the security forces (World Bank, 1995a). Adjustments were strongly based on internal measures. To raise revenue, there was the implementation of the custom and indirect tax reform in 1994, wage restraint including no increase in non-wage expenditure and reduction of public sector investment. Up to June 1995, total adjustment was made difficult because of the drop in oil revenue. Oil output fell from CFAF 110 billion in 1992/93 to CFAF 62 billion in 1993/94 as output dropped from 8.9 million tons in 1985/86 to 5.8 million tons in 1993/94, along with a weakening of oil market prices. Also, the National Oil Company (SNH) had to pay its short-term borrowing and finance charges, amounting to over US\$200 million.

Measures were taken to increase revenue. The early 1990s witnessed the general liberalization of the economy. Significant trade liberalization measures were carried out. Tariffs were reduced well below the levels agreed by the Central African Custom Union, and all quantitative restriction was eliminated, with reduction in exemptions. Tax resources from international trade increased to CFAF 115 billion in 1994/95, 40% above the 1992/93 level. Individual income tax fell, but corporate tax increased as did profit tax receipts. General tax revenue increased, although in 1991 civil disobedience and social unrest led to a reduction of government revenue. However, internal adjustment seemed to have run its full course by the end of 1993.

In an attempt to limit capital flight from the Franc Zone, in August 1993 the convertibility between the Franc Zone and France was suspended and in September between the two Franc Zones, BEAC and BCEAO. This seemed to mark the beginning of external adjustment. The external adjustment was further carried out in January 1994 with the 50% devaluation of the CFA franc vis-a-vis the French franc, with the principal

aim of promoting economic recovery through boosting exports and local industries. Exports, of mainly primary products, increased after 1993.

Cameroon's economy is one of the most diversified in sub-Saharan Africa. It is a net oil exporter, as well as producer and exporter of cocoa, coffee, cotton, timber, banana, tobacco, rubber, palm products, sugar cane, aluminium, etc. The production of coffee (robusta and arabica), cocoa and cotton (the 3 Cs) fluctuates throughout but with an upward trend. A noticeable increase is observed as from 1994, when production moved sharply upwards (Figure 3a). Banana production went up especially after 1988, and rubber production increased slightly after 1988. Tobacco production had an upward trend and timber production, a downward trend, although after 1994 its production increased sharply. Sugar, palm oil and palm kernel production increased throughout the period, with palm oil production shooting up between 1988 and 1991. Palm kernel was stabilized at a lower level than that of palm oil. Production mainly for domestic consumption (subsistence crops) includes sweet potatoes, plantains, cassava, maize, millet and livestock.

Generally, the world prices fluctuated much more than the FOB prices and producer prices, as can be seen from producers' prices, FOB prices and world market prices for cocoa, coffee and cotton. The FOB prices moved together, while the producers' prices moved together at lower levels.

The devaluation of the CFA franc was supposed to promote economic growth, since devaluation plays an important role in the economy. It relates to domestic prices and costs and tends to make imports more expensive than exports, therefore encouraging exports. There was an increase in the output (or production) of major export commodities (cocoa, cotton, banana and timber) after 1994 (see Figures 3a–3g). Since the domestic consumption of these commodities is negligible, it can be assumed that all is produced for primary exports—which unfortunately do not contain many manufactured goods. Historically, no country has developed without transforming its primary products for exports. As it stands, even in a short run the devaluation seemed to have improved economic performance, without any structural changes, although the increase in price of imports initially increased the general price level.

Previous accords with the IMF and the World Bank went off track in the late 1980s and early 1990s. But the 1994 devaluation of the franc also permitted Cameroon to resume dialogue with the IMF and World Bank and promote economic growth, as data show an increase in economic growth rate after 1994 (Figures 1 and 2).

Figure 3a: Cameroon's production of cocoa (COC1), cotton (COT1), robusta coffee (COR1), and arabica coffee (COA1) in metric tons

Figure 3b: Cameroon's production of bananas (BAN1) and rubber (RUB1) in tons

Figure 3c: Cameroon's production of tobacco (TOB1) and timber (TIM1"000") in tons

Figure 3d: Cameroon's production of palm oil (PAM01), sugar (SUG1) and palm kernel (PAMK1) in tons

Figure 3e: Producer prices in Cameroon for cocoa (COC2), cotton (COT2) robusta coffee (COR2) and arabica coffee (COA2) in francs CFA



Figure 3f: FOB prices in Cameroon for cocoa (COC3), robusta coffee (COR3) and arabica coffee (COA) in francs CFA

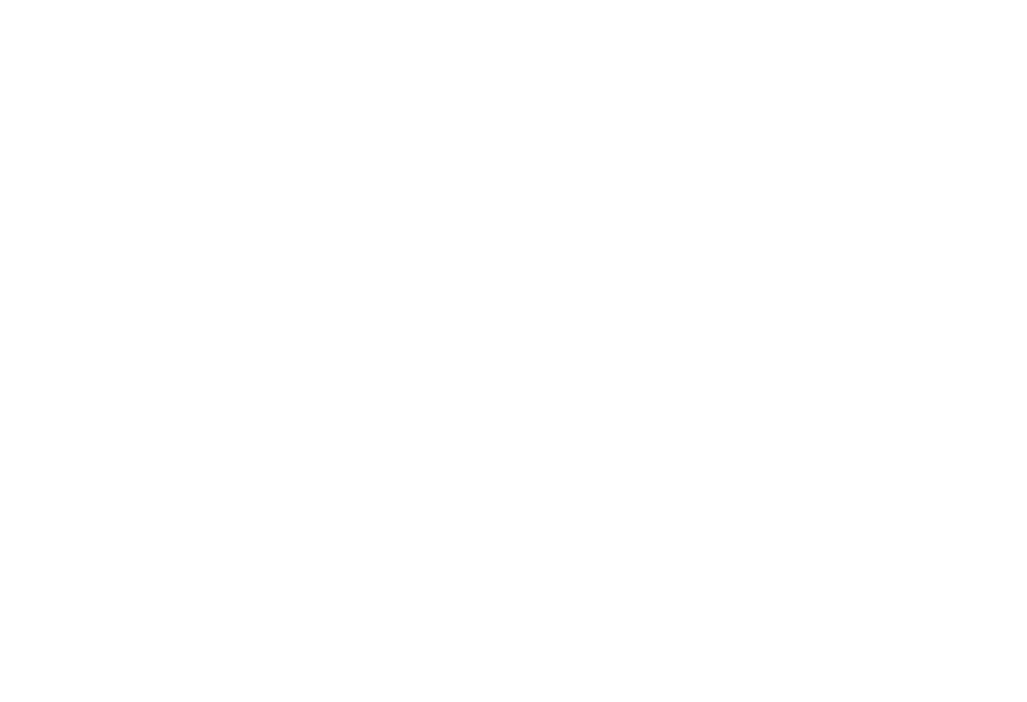


Figure 3g: World market prices for cocoa (COC4), cotton (COT4) robusta coffee (COR4), arabica coffee (COA4) and banana (BAN4) in francs CFA

3. Literature review

Since the 1960s the studies on the factors influencing long-run economic growth have greatly increased. Although some of the empirical research preceded formal models, Solow's work (1957) was the foundation of empirical exercises on the sources of economic growth. Solow's neoclassical growth model gave the theoretical framework for quantifying the contribution of traditional inputs and their total factor productivity to the gross domestic product (GDP).

There has been great extension of the neoclassical growth model, making it much more responsive to policy in contrast to where technological change was exogenously given. In the recent models or frameworks, technological change tends to be endogenous, implying that policy can have great impact on investment in both physical and human capital. That is, an appropriate policy regime could greatly influence the growth rate of a country's economy. Hence economists have used various approaches, depending on their objectives in studying the sources of growth in countries.

Studies have in general decomposed the growth rate of aggregate output into two main components—one component explained by the factor growth and the other component called the residual or categorized as unidentified total factor productivity growth. What accounts for the residual has generated much empirical study and discussion. One explanation has been to embody the technological progress into the factors, thus adjusting for shifts in quality. Another approach, originally developed by Denison (1962, 1967), has added other possible explanatory variables such as economies of scale or structural change, thus reducing the portion attributable to technical progress.

The literature reveals that many studies have been done on the economies of developed countries and very little on the developing economies, much less on African economies. Studies (World Bank, 1989, 1995b; Elias, 1992) that have examined the growth experience of developing countries show that the growth of labour and capital inputs and productivity changes of these inputs have accounted for the output growth. Only a few studies (Beanlieu, 1990; World Bank, 1991; Dike, 1995; Onjala, 1996; Shaaeldin, 1989) on the sources of growth have been done on African economies—and these on Nigeria and the East African countries. In the Nigerian case study, Dike (1995) concludes that the GDP growth is greatly attributed to changes in factor inputs, with total factor productivity (TFP) playing a marginal role. That is, labour and capital changes contributed 94.4%, leaving 5.6% to TFP. Similar results were obtained in the case of Kenya (Onjala, 1996). Sectoral analyses of the sources of growth give different results.

These studies further confirm the role of input growth in the variations of the rate of output growth. Although an examination of sector growth rates showed that while in the

manufacturing sector the source of growth was less explained by total factor productivity, a very high proportion of source of growth was explained by the total factor productivity in the agricultural sector. These studies follow Denison's attempt to break down the inputs in order to separate the effects of characteristics of labour and various forms of capital. Furthermore, the residual is decomposed so that technical change is only a component of the residual.

In the World Bank (1995b) study it was observed that productivity growth was much slower in the developing countries than in the developed economies. In the 70 countries examined, the use of capital made substantial contribution to changes in output. "But the key to explaining the differences in the growth of output from country to country is the growth of productivity" (World Bank, 1995b: 4). Accordingly, the engine of growth and development is productivity. And technological progress drives productivity. Technological progress is influenced by many factors including education, institutions and policies. There is very strong evidence linking capital and the "quality of the economic environment".

Psacharopoulos (1991) shows that with education yielding high returns at the individual and social level, the high returns are also reflected at the level of the economy. From his review of the literature he concludes that introducing human capital or the quality of labour into the production function has explained a large portion of the residual. This conclusion confirms his own findings, which show that investment in education explains twice the percentage of economic growth in African countries as it does in the developed economies.

It has now been established that long-term economic growth has been greatly influenced by the literacy level of the population. Classic cases are the examples of Japan, Korea and Taiwan, where the educated base provided the necessary institutions and infrastructure for industrial advances that generated economic successes beyond anyone's dreams (Lau and Klein, 1990). In fact, the rising level of human capital in these countries will continue to increase the technological levels and promote the upgrading of the industrial structures. Examining sources of Chinese economic growth, Hu and Khan (1997) found that contrary to the tradition, efficiency was the driving force behind the Chinese economic boom, with sharp productivity increases explained by economic reforms that started in 1978. Little was said about education. In general, we need more information to explain the variation in factors contributing to output growth, more so as sector analyses may give different outcomes. Recently Easterly and Levine (1999) have stressed that most of the income and growth differences across nations are accounted for by the "residual"—total factor productivity—and not factor accumulation, which tends to persist while growth does not. These stylized facts of economic growth seem to be seen in developed economies more than in the developing economies.

Ghura's (1997) study of Cameroon's growth performance used an endogenous growth model, which is quite differently specified from the growth accounting model. More so, his specification is completely different from the one used in this study. According to him, investment, human capital and policy variables substantially influence economic growth. He categorized investment into public and private investment, with both types influencing growth. The labour factor was adjusted for human capital development. There

seem to be some methodological problems in estimation, although the results tend to be somewhat plausible. Some of the right-hand variables were found to be non-stationary and therefore needed “differencing”. And, accordingly, because of cointegration, an error correction model is usually required. This procedure was not followed. We contribute to the growth literature by doing further growth accounting for a single country and the three sectors (agriculture, manufacturing, services) by disaggregating the economy into primary, secondary and tertiary levels.

4. Conceptual framework

Two main approaches are usually used to study the sources of growth—the parametric and non-parametric methods. The non-parametric approach involves the decomposition of the gross domestic product (GDP) into its constituent parts. In addition, formulas and ratios are used. According to Elias (1992: 33), “Output growth equals labour contribution plus capital contribution plus technological contribution, which is equal to labour income share by gross and quality growth of labour plus capital income share by gross and quality growth of capital plus technological contribution”. The parametric method uses the production function approach, where the marginal contribution of individual factor inputs and technical progress or total factor productivity is estimated. The flexibility in this method makes it possible for factor substitution and returns to scale to be empirically tested, although returns to scale is more relevant as a firm level concept. It has been observed that the rate of growth of output through time has been more than the growth rate attributed to the rate of growth in conventionally defined inputs such as labour and capital (Nicholson, 1978).

The residual has generally been attributed to technical progress (TP) but TP involves many other elements as well, so it is not clear precisely how TP enters the production function. Also, the inputs could be of different types. But because of the flexibility of the production function, different assumptions of whether it is neutral, biased or embodied could be made to accommodate technical progress. The inputs could also be disaggregated. The analysis can become very complex as we develop tools to deal with these many factors as well as collecting the relevant information for accurate measurement.

Growth analysis

Growth has been expressed in many ways, sometimes as identities. For instance, growth has been expressed as a ratio of investment (I) to output productivity (Q) with $\Delta Q/I$. That is, growth output is

$$\Delta Q/Q = I/Q \times \Delta Q/I \quad (1)$$

Growth is therefore expressed in two components: the productivity of investment ($\Delta Q/I$) and the ratio of investment to output (I/Q) of a country. Hence slow growth is due to either low output or a low investment ratio. This implies that more investment resources would generate faster growth. A rapid change in output would be a result of increased investment.

Alternatively, labour has tended to be the driving force behind output growth; that is,

$Q = (L) (Q/L)$, product of total labour (L) and output per unit of labour (Q/L).

So that output growth is given as

$$\Delta Q/Q = \Delta L/L + \Delta(Q/L)/(Q/L) \quad (2)$$

where labour productivity is given as $\Delta(Q/L)/(Q/L)$. That is, the rate of growth of the labour force ($\Delta L/L$) and labour productivity $\{\Delta(Q/L)/(Q/L)\}$ generate the growth rate.

Faster growth is attributable to the rate of growth of labour productivity and the work force or both. But how does productivity of labour grow or investment increase? Is it through capital accumulation, technical progress or what? This is not explained by these simple formulations.

These two equations do not constitute a theory of growth, as we require a testable model of the growth process. Hence we use the production function to test the growth process and to understand the sources of growth and quantify the contribution of each source to the measured rate of growth. It is an approach that has been used extensively in developed economies and recently has been applied in developing economies. The use of this approach can be justified. First, it is now widely used and there is no serious alternative, although we must be aware of its limitations. Second, in using the production function, we carry out discussions in an analytical framework in a way that makes them possibilities for testing hypotheses. In fact, it is useful to have an idea of contributions made by growth of inputs to measured output growth in the past. Knowing the rough contribution helps greatly in putting the growth discussion in perspective, even if we don't know why the growth of factor inputs and technical progress differs among countries or regions or across time periods. A desirable property of this approach is that the analysis of growth in aggregate is embedded in the production function concept of the theory of the firm. This is therefore based on a microeconomic foundation. Hence the aggregate output (Q) can be expressed as a function of traditional factors of production and the existing technology. That is,

$$Q = f(\text{land, labour, capital, technology}) \quad (3)$$

Here we can distinguish three broad sources of growth within the production function framework: changes in factor supplies, (increasing) returns to scale and technical progress. Technical progress is used here in a broader sense to include anything increasing the productivity of factors besides increasing returns. An important issue is how to separate empirically what a growth of factor inputs contributes to growth from other factors that lead to greater output. This includes technology, such as the economies of scale resulting from technical change and increases in factor supplies, factor input quality improvement, knowledge advancement, and improved factor organization.

The model

Studies of advanced economies have shown that the nature of technical progress suggests that the neutrality assumption is a fair working hypothesis. Studies show elasticity of substitution to be fairly close to unity, and technical progress depends on factor accumulation, which can easily be accommodated in the Cobb–Douglas production function framework. For the elasticity of substitution to matter, the factor would have to grow strongly at different rates, but studies show that it is always close to unity (Thirlwall, 1994). The aggregation of inputs can pose serious problems since some cannot be physically measured directly. However, techniques of aggregation have been developed to deal with the problems successfully in many studies (Thirlwall, 1994).

For practical purposes we define our aggregate production function implicitly as:

$$Y = Af(K, L,) \quad (4)$$

where A could be regarded as an index representing total factor productivity for our purpose; whether A is inside or outside the production function makes no difference to the final result. K is capital input and L is labour input. For initial simple analysis we limit ourselves to two inputs. We could extend it to other inputs as possible, but this aggregate production function relates potential output ($Y = \text{GDP}$) to the factor input levels of labour and capital, and multi-factor productivity (A). The multi-factor productivity concept embraces all variables that affect output for any given level of factor inputs. It includes factors like human and physical capital improvements, technical progress, and efficiency in allocation of resources.

The Cobb–Douglas production function is usually used in fitting the aggregate data to empirically distinguish the three main sources of growth. The C-D function can be explicitly expressed as:

$$Y_t = A_t K_t^\beta L_t^\alpha \quad (5)$$

where Y_t represents real output at time t , K_t is an index of capital stock or capital services all at constant prices, L_t is an index of labour input (or person-hours) at time t , β is the partial elasticity of output with respect to capital, and α is partial elasticity of output with respect to labour. (We assume changes in technology are exogenous and independent of changes in the inputs.) There is neutral technical progress. A , α and β are the estimable coefficients. The function could be constrained if values to these coefficients were assigned in advance. If $\alpha + \beta < 1$, that is diminishing marginal productivity of factors. If $\alpha + \beta = 1$, that is constant returns, and if $\alpha + \beta > 1$, it is increasing returns.

Assuming $\alpha + \beta = 1$ means constraining the function to constant returns, an increase or decreasing returns being reflected in A , the total factor productivity index. Increasing returns biases A upwards. In practice, the Cobb–Douglas production function is mostly used in its constrained form, where $\alpha + \beta = 1$ with the values of α and β assigned according to the share of labour and capital in the national output (or income).

This is done with the underlying assumption of perfect competition where production is subject to constant returns and input factors receive the value of their marginal products and factor shares reflecting the elasticity of output with respect to each factor. Both in less developed countries and some developed countries perfect competition conditions don't really hold. Yet empirically estimated values for a and b have not been markedly different from the factor shares of the national product, hence values for a and b are usually assigned on the bases of their factor shares. So in separating the main sources of growth, we transform the Cobb–Douglas production function into a rates of growth form, and then express it as the annual rate of change of the variables.

The Data

We use mainly secondary data in carrying out the estimates. The data set includes macro and micro data because the study involves aggregate as well as sector data on the main economic sectors.

Data on capital input

Initially we used imports of agricultural machines as agricultural capital, private investment as capital for the manufacturing/industrial sector, and total investment depreciated at 2.5% as capital input for the tertiary sector. Our results improved when we based our estimates on the total capital stock from Nehru and Dharehwar (1993). We obtained the aggregate capital stock series and then disaggregate the series by share of each sector in the total GDP in the initial period. The initial ratios are for agriculture (0.30879), industry (0.24946) and tertiary (0.44174). From this calculation we have our sector capital stock series. The capital–GDP ratio shows initial high ratios. We found it surprising to see very high ratios, up to 8.6 although it declines to 1.8. According to Ghura (1997), Cameroon for the period 1960–1990 had capital–GDP ratios of 1.5, higher than the value for Latin American countries. It seems as if Cameroon had a high saving rate up to 1976 and from then the saving rate declined. The capital stock series continued to increase from then, but later on not as much as the GDP. Some authors have noted that low capital–output ratios around one are characterized by low-saving countries, with high-saving countries having capital–output ratios of about three. The meaning of the value of these ratios, however, depends on how the country accumulates and uses its capital for productive purposes. The way the capital stock is maintained is also very important. This is because a country with a high capital–output ratio may not necessarily generate the appropriate growth if the capital is not properly utilized and maintained.

Sources of data

We collected data for the period 1961–1998 from various sources, but our major source was the Cameroon public sector, which is the main provider of data on the economy. Other secondary data sources were international publications by the World Bank, International Monetary Fund (IMF), UNESCO, World Resource Institute (WRI), Food and Agriculture Organization (FAO), International Labour Organization (ILO), African Development Bank (AfDB), and African Central Bank (BEAC).

Another source was the national census surveys and various studies on Cameroon's economy, as well as relevant studies such as that of Nehru and Dhareshwar from where we obtained data on capital stock.

Because we collected data from various sources, and Cameroon's data system is weak, the reliability, availability and comparability of data may be affected by many factors. Hence, putting together the relevant and appropriate data for our study required some judgement and creativity. For example, data needed should be in real terms, so in certain cases we used the consumer price index in the absence of consistent deflators. Of equal importance is the collecting of data from studies. To have a complete series it was sometimes necessary to piece the data together from different sources.

5. Estimating the sources of growth

Growth accounting gives a decomposition of economic growth into different components, which are related to changes in input factors, with the residual reflecting technological progress and other factors. The importance of growth accounting can be seen much more when the fundamental determinants—crucial for economic growth—are not strongly dependent on those that involve technological progress. This may not generally be the case, however. In other words, a growth accounting exercise could be seen as a good step for analysing the fundamental determinants of economic growth, which are linked to the different factors that contribute to growth, technological change and public policies. While we are looking at public policies, the presentation here focuses on primal and dual approaches to growth accounting and the econometric approach. That is, we are using both parametric and non-parametric methods.

Since Equation 5 is static, showing that the quantity of output depends on inputs in a specific period of time t , we derive a dynamic version that describes output as changing over time. That is, the growth rate can be disaggregated into different components related to technological progress and factor accumulation. We differentiate Equation 4 with respect to time and divide by Y , which gives the following equation after rearrangement of terms. As we differentiate with respect to time, for simplicity, we leave out the time factor in our results. Thus

$$\Delta Y/Y = a + (F_K K/Y) \Delta K/K + (F_L L/Y) \Delta L/L \quad (6)$$

or

$$G_Y = G_A + E_{Y,K} G_K + E_{Y,L} G_L \quad (6.1)$$

F_K and F_L are marginal products of the respective inputs $\{F_K K/Y = E_{Y,K}$ and $F_L L/Y = E_{Y,L}$ are elasticities of output with respect to capital and labour inputs} and a or G_A the growth rate of technological change ($a = G_A = \Delta A/A$). If the technological factor is Hicks-neutral in production, we have $F(A, K, L) = A \cdot F(K, L)$, then $G_A = a = \Delta A/A$. These two equations, 6 and 6.1, are in growth rates.

Parametric approach: Econometric

Empirically, we can carry on an econometric estimation on Equation 6 or 6.1 using time series data by regressing $\Delta Y/Y$ on $\Delta K/K$ and $\Delta L/L$ and the constant or intercept reflecting the total factor productivity (TFP). The coefficients are the factor growth rates measuring $F_K K/Y$ and $F_L L/Y$. One good thing about this approach is that we do not have to assume that marginal products are reflected by their respective real factor prices (i.e., $F_K = R/P$; $F_L = W/P$), with R the price of capital, W the price of labour and P the general price level. On the other hand, there are some econometric problems involved in the use of these approaches. First, $\Delta K/K$ and $\Delta L/L$ are not really exogenous with respect to changes in TFP, so that “the factor growth rates would receive credit for correlated variation, in observable technological changes” (Barro, 1998: 5). Technological changes may be reflected in the factor growth rates, except that we are able to break these factor inputs into quantity and quality components. This is usually a difficult process because of data problems.

Second, measuring $\Delta K/K$ and $\Delta L/L$, with error, would produce inconsistent estimates of the coefficients of the variables (estimates of $F_K K/Y$ and $F_L L/Y$ would be inconsistent). And within this approach, the extension to allow for time variations in TFP growth rate and the factor shares may pose problems. However, we still use this approach, partly to cross check the results of non-parametric estimates. Hence we use both the primal and dual approaches.

Non-parametric approach

Primal approach

From Equation 6 we can calculate total factor productivity (TFP) as a residual:

$$\begin{aligned} a &= G_A = G_Y - E_{YK} G_K - E_{YL} G_L \\ &= \Delta Y/Y - (F_K K/Y) \Delta K/K - (F_L L/Y) \Delta L/L \end{aligned} \quad (7)$$

The problem with this equation is that we cannot observe (F_K, F_L) , marginal products of the factor inputs. For practical purposes we assume that the marginal products reflect the observed input prices; we then use the factor prices. And if factor inputs receive (or are paid) their marginal products, we have the real wage rate (W) equal to labour marginal product, and the real rental price (R) of capital equal to its marginal product. The primal estimate of TFP growth is then

$$a = \Delta Y/Y - S_K \Delta K/K - S_L \Delta L/L \quad (8)$$

as in Equation 7, where $S_K = (RK)/Y$ and $S_L = (WL)/Y$ are the shares of respective factor inputs in the total output. The total sum of growth rate of each input multiplied by the

respective shares of factor inputs from the growth rate of total output gives the estimates of TFP. This is the primal means of measuring the TFP.

Dual approach

We obtain the dual by equating factor incomes to the output (Y).

$$Y = R K + W L \quad (9)$$

We differentiate this equation with respect to time, divide by Y and rearrange terms with the following result:

$$\Delta Y/Y = S_K(\Delta R/R + \Delta K/K) + S_L(\Delta W/W + \Delta L/L) \quad (10)$$

S_K and S_L are the respective factor shares. Taking the factor quantity term to the left side of the equation and noting the Solow residual (TFP) as given in Equation 8, we write the Solow residual as:

$$a = \Delta Y/Y - S_K \Delta K/K - S_L \Delta L/L = S_K \Delta R/R + S_L \Delta W/W \quad (11)$$

This shows that the Solow residual is equal to the primal ($\Delta Y/Y$ minus the share weighted growth in factor quantities), which is equal to the dual (share weighted growth of factor prices).

The dual and primal use the factor income shares (S_L , S_K); the dual involves changes in the factor prices while the primal uses the changes in the factor quantities. On the dual side, for any given factor quality, factor price increases can be maintained and sustained only when output rises for given input. So the average of growth rate of factor prices measures the extent of the Solow residual growth rate.

It is important to note that the estimated dual equation is derived from only one condition—total output is equal to the factor incomes with no assumptions established about either the relationship between factor prices and marginal product or the production function. The primal equals the dual, if $Y = RK + WL$ holds, and the estimates of TFP from the two approaches would give the same value.

In general, growth accounting is based on an important assumption: factor prices are equal to their respective marginal product. A violation of this assumption means that the calculation of a or G_A from either primal or dual would deviate from the true Solow residual. This may be because of various factors such as externalities and increasing returns, and environments with different taxes. Theoretically, models could be developed to deal with specific situations (Barro, 1998). In this part of the study we assume no violation of that assumption partly to cross check the results with the parametric results.

6. Sector analysis

An examination of the sources of growth of the main economic sectors—primary, secondary and tertiary—underscores the importance of each of them in the performance of the overall economy. Traditionally, agriculture, industry/manufacturing and services have represented these sectors, respectively. Agriculture is a national priority in Cameroon. In Cameroon's national accounts agriculture is classified as the primary sector; it includes livestock, hunting, fishing, forestry and logging, and crops. These are also subdivided into subsectors. For instance, the crop subsector includes crops produced mainly for export and crops produced mainly for domestic consumption.

The period 1960–1976 witnessed a strong agricultural sector with great potential in a wide variety of raw materials but with modest production techniques. However, Cameroon's agriculture is dominated by smallholder production. The sector is greatly in need of modernization and increased productivity, as major production units remain in the traditional sector producing very low yields, partly because of low level production techniques and basic equipment. The small-scale farmers engage mainly in subsistence farming, but a modern sector made up of large plantations managed by both public and private enterprises exists alongside the traditional mode of farming.

In a developing economy like Cameroon, agriculture is generally considered the most important sector providing and generating crucial inter-linkages with the growth of other sectors and the whole economy, so that the growth of other sectors may depend on the primary sector. The major feature of agriculture is its dependence on natural resources, with land productivity being very important. This could be reflected in labour productivity and technological systems, for instance if biochemical and mechanical technology are used. Agriculture dominates in terms of labour (employing more than 60% of the population) and a potentially high growth rate, which may start with modernization and transformation, thus underscoring the relationship with industry and other sectors.

Cameroon's secondary sector is relatively diversified. It consists of the extractive industries (including mining and quarrying), transformation of raw materials, food and beverage industries including the sugar industry, cement industry, aluminium industry, textiles and leather industries, woodland and wood products, chemical and chemical products, electricity, gas and oil refinery, public works, and construction. Today about 30 large enterprises dominate this sector in Cameroon, with a few medium-sized enterprises and many small enterprises employing under ten persons. The major industrial concerns include Alucam (aluminium producer), Cimencam (cement manufacturer), SONARA (national refinery), SosuCam (sugar company) and Cicam (textile and clothing manufacturers). There are also large agro-industries that produce primary products and transform some of the products into manufactured goods. This sector is supposed to

produce much value added output, especially from the primary sector, and contribute greatly to the transformation of the economy. Initially, as the government created institutions to contribute in promoting industrialization, the provision of funds for small and medium-sized enterprises became crucial. The government further created the National Investment Corporation (SNI), which became a big holding concern. Hence in the 1970s and early 1980s industrial and manufactured output rose sharply. Today, industrial production is in a general decline. The beverage (particularly beer) industry is one of the few noticing an increase in production and sales. Part of the decline is due to the high cost of inputs, ageing production plants and obsolete technology. This has very serious implications for production and competitiveness.

The tertiary sector covers trade, hotels and restaurants, tourism, transport and communication, financial activities, real estate, and public administration. The service sector embraces a wide spectrum of economic transactions—transactions carried out in offices, outside offices through beauty salons, for example, insurance activities, international transactions. It is often difficult to measure the contribution of services to the economy because of their intangible nature, but Cameroon's tertiary sector growth started before a sharp increase in manufactory/industrialization. Yet the local industrial expansion did not necessarily come as a result of improved techniques in agricultural production, as agriculture largely remains still in the traditional sector.

The public sector is a large component of the service sector and initially absorbed much of the educational output. The tertiary sector therefore has tended to have a relatively very highly trained labour force, which may partly explain why the wage rate in the tertiary sector is relatively higher than in other sectors. The public sector as part of the tertiary sector in Cameroon has been involved in producing tangible goods, including consumer goods, besides providing services. On the whole, the public sector has been regarded as hindering the proper performance of the economy. This sector is now considered to be too large and inefficient. In the broad sense, this sector provides or should provide facilitating activities. Hence the technological impact on employment in services could be seen from these characteristics. The inter-relationships between facilitating goods producing activities and other activities may vary.

A shift from agriculture to manufacture/industry, is one characteristic of economic development and then the expansion of the service sector especially in terms of employment and output. The service sector then absorbs workers from the other sectors. Labour productivity (output/worker) tends to grow more slowly in the agriculture and service sectors than in the manufacturing/industrial sector. Increase of employment share in the secondary sector may mean movement of labour from agriculture to the manufacturing/industrial sector.

According to Engel's Law, as income grows people tend to spend relatively smaller proportions of their income on food (demand-side effect). This means that as incomes increase, people spend a greater and greater proportion on other things, such as manufactured goods and services. On the supply side, productivity growth in agriculture permits production of more food with fewer workers, resulting in a decline in employment in agriculture. So both demand and supply effects shift or should shift employment from agriculture to manufacturing/industrial sectors. The sector also releases workers into the service sector. Hence there is an important link between agriculture and other sectors.

7. Some key variables

Capital

There are many difficulties encountered in estimating the capital stock. Many of these difficulties stem from the unavailability of appropriate data. To the extent possible we examine the different components of the capital stock as well as the aggregate capital stock.

In using the capital stock, at both aggregate and sector levels, we assume a proportional decay function of capital (or the asset). The capital in a year is reflected by the recursive condition:

$$K_t = (1 - \delta) K_{t-1} + Inv_t \quad (12)$$

where K_t is value of capital stock in year t , δ is the rate of depreciation and Inv_t is the level of investment in year t . The classification could be done to sort out the quality element. There are important classifications, such as firms and non-firms sectors, domestic and imported goods, goods composition, nonresidential and residential structures, equipment, or machines particularly in agriculture and manufacture. We use the public and private total investment as the proxy for capital in the manufacturing and service sectors, and use capital stock from Nehru and Dhareshwar (1993) at the aggregate level. If investment is used as a proxy of capital stock, it means that the depreciation factor is set equal to one. This is quite a strong assumption.

Labour and human capital

A pool of human resources, which includes labour, is a major source of economic growth in most developing countries. It may be discussed in terms of quantity and quality. Labour is heterogeneous with different productivity, yet only labour aggregates are considered in theoretical models, so that empirical study tends to overlook the diversity of labour. Improvements in the quality of labour increase the human capital. Increases in the accumulation of human capital mean increased skills and capabilities of workers. These are acquired through schooling, experience and training, as well as improvements in health and nutrition. This accumulation of human capital tends to increase productivity growth.

Since the 1960s educational enrolment at primary, secondary and tertiary levels has sharply increased. This has yielded a significant increase in human capital of workers. But recent downward trends in the level of educational attainment in Cameroon could have long-run negative effects on the quality of the labour force and consequently on future growth.

We could define labour input as the total hours worked in a period. The literature usually uses simple aggregators like the sum of all workers or the aggregate labour force. This may not reflect the quality of labour with productivity differentials, but it is quite simple and the data are easily available. We use labour employed (working population) as our labour input.

Embodied technical progress

This involves factor input, especially capital and labour inputs. When capital at all ages is treated as in the equation above, technical change in capital investment then becomes a component of the residual factor in the growth equation. This is similar to the treatment of labour. Adjusting capital stock for embodied technical change makes the rate of growth more responsive to alterations in the capital accumulation rate. We don't know the rate of progress in order to comment on the effect of technical progress.

However, there are some ways to adjust for these effects in both capital and labour: Gross capital can be measured at current prices or adjusted for price changes so that technical change in capital is included in the price variable, with disembodied technical change as the residual factor. This tries to stress the relative importance of embodied technical progress. As a method of disembodied technical progress where an exponential time trend is added to the production function, the time trend then represents a constant rate of productivity advance, and the residual includes the effects of embodied progress. One problem is that embodied technical progress can grow exponentially. Another is that not all technical progress is embodied.

The vintage approach allows for a more formal and accurate measure of the rate of embodied technical progress. A separate valuation is given to additions to capital stock each year—the weighting system assigns higher weights to more recent capital assuming that it is more productive. One problem is assigning the weights. How much of output growth is due to embodied technical change, how much to disembodied forces, how much to change in the vintage distribution of capital as the vintage is changing. Knowing the rate of growth of total productivity and the vintage distribution of capital, and all technical progress taken to be embodied, the changes in capital and effects of vintage distribution change can be calculated.

Similarly, a range of questions must be asked about labour input. To what extent is labour underestimated in the process of growth? How is the unexplained growth overestimated by ignoring changes in the quality of labour? New additions to the labour force need not necessarily be more productive than the average for the average quality to increase. The factors that increase the personal efficiency of labour and labour productivity may operate generally in a disembodied way.

Adjusting labour and capital

Adjusting for quality changes in labour and capital could change the estimated equation. Disaggregating the inputs can contribute in explaining the quality of the input. For instance, human capital accumulates as the quality of labour input improves continuously. The inputs can be disaggregated as:

$$\Delta Y = \sum i W_i \Delta L_i + \sum j (p_j + d_j) \Delta K_j + \Delta R \quad (13)$$

where i may vary over different types of education, training, skills and characteristics such as gender, age, occupation, region, etc. These may produce different market wages. Similarly, j would vary over different types of capital. We bring out these issues to show the complexity of measuring the sources of growth, but because of the dearth of data we could not bring all these variables into our measurement. These factors must therefore be taken into consideration in discussing the results.

8. Empirical results and analysis

We carried out estimates of the relevant parameters at the aggregate level and the three sectors of the economy. Here are the results for the parametric approach.

Sources of aggregate output growth

On the economy, we regress output growth on the growth of the factor inputs. Here we limit ourselves to two factor inputs—labour and capital—with the following results:

$$\text{DLGDP} = .0601 + .6707 \text{ DLCAPGDP} + .3803 \text{ DLLABGDP}$$

(2.962) (3.016) (1.001)

$R^2 = .4219$; $F(2, 33) = 4.6513$; $DW = 0.823$; t -values are in parentheses.

DLGDP = growth of real GDP

DLCAPGDP = growth of physical capital stock

DLLABGDP = growth of labour employed in the economy

The capital and constant coefficients have high t -values, and therefore are highly significant. The labour coefficient is not significant. Still, the changes in the two inputs seem to explain the changes in the output (GDP). For the period 1961–1996, the elasticity of output with respect to capital and labour is 0.6707 and 0.3803, respectively. That is, if labour were increased by 1%, output would increase by 0.38%. If we were to assume perfect competition (constant returns) and that factors of production receive the value of their marginal products, then the elasticity with respect to each factor input represents the factor shares. But we do not need to do that, since the production is not constrained.

Here the sum of the estimated coefficients is greater than one ($0.6707 + 0.3803 = 1.051$). This shows increasing return to scale, with capital input playing a more significant role than labour in the economy. Yet technical progress is also important, with a coefficient of 0.06. That is a growth of 6%.

Our results here are similar to Ghura's (1997) in terms of showing increasing return to scale. But while Ghura uses public and private investments for capital input, we use the capital stock as the capital input. His addition of policy variables seemed not to affect the impact of private investment on growth. That is, his regression results indicate that private investment strongly increases growth. In fact, it does not seem plausible (or even proper) to use investment and policy variables and then talk of return to scale.

Our concern is mainly for factor inputs, which differ from Ghura's. Ghura uses an

endogenous growth model with policy variables playing a significant role in economic growth as expected. Our growth accounting method concerns factor inputs, and policy variables become involved indirectly. That is, the policy variables can directly affect the factor inputs.

Sources of agricultural output growth (primary sector)

On the primary sector, agriculture output growth is regressed on three factor inputs—capital, labour and land—with the following results:

$$\text{DLAGR} = 0.050 + 0.794 \text{ DLCAPAGR} - 0.134 \text{ DLLABAGR} + 1.412 \text{ DLLAN}$$

(2.865) (6.583) (0.561) (1.671)

$R^2 = 0.598$; $F(3,32) = 15.910$; $DW = 1.31$; t-values are in parentheses.

DLAGR = growth of agriculture output

DLCAPAGR = growth of agriculture capital stock

DLLABAGR = growth of labour employed in the sector

DLLAN = growth of agriculture land

The constant and capital coefficients are significant. The land coefficient shows more than 1% increase in output with 1% increase in land; this indicates the importance of land in the agriculture sector. The labour coefficient is not significant, but negative, reflecting a negative impact on agriculture. The period (1961–1996) shows the growth rate of agricultural output to be mostly influenced by factor inputs growth—particularly land and capital. The labour coefficient is negative, yet this sector shows increasing return to scale. Throughout the period, labour's contribution appeared to be much less than that of other factor inputs. This result may be due to poor data quality, which also shows up in large errors. The sector employs a very large amount of labour relative to its share in gross domestic product. Further, the labour input in agriculture is quite old and generates declining productivity, so labour inefficiency and other complementary inputs may produce such results.

Sources of growth in the industrial (secondary) sector

The secondary sector here represents the manufacturing/industrial sector. Industrial output growth is regressed on the growth of two factor inputs with the following results.

$$\text{DLIND} = 0.04652 + 0.683 \text{ DLLABIND} + 0.9481 \text{ DLCAPIND}$$

(2.5) (0.312) (7.763)

$R^2 = 0.646$; $F(2,33) = 30.2315$; $DW = 1.0518$; t-values are in parentheses.

$R^2(\text{adj}) = 0.627$

DLIND = growth of industrial/manufacturing output

DLLABIND = growth of labour employed in the sector

DLCAPIND = growth of capital stock in the sector

The constant coefficient is significant and the capital input coefficient is highly significant at the 5% level. The labour input coefficient is not significant, yet it shows its contribution to growth. In this sector, capital input growth is seen as the major source of growth. The capital input growth was highest in the period 1978–1985 (the oil boom period).

Source of growth in the service (tertiary) sector

With the tertiary sector, output growth is regressed on the growth of two factor inputs—capital and labour. The service here stands for the tertiary sector, which includes the public subsector. Results are as follows:

$$\text{DLSER} = 0.0586 + 0.7075 \text{ DLCAPSER} - 0.5481 \text{ DLLABSER}$$

(3.541) (5.926) (0.411)

$R^2 = .516$; $F(2,33) = 17.588$; $DW = 1.220$; t-values are in parentheses.

$R^2(\text{adj}) = 0.487$

DLSER = growth of output of the service (tertiary) sector

DLCAPSER = growth of capital stock in the sector

DLLABSER = growth of labour employed in the sector

The coefficients of capital and constant are significant but the labour input is negative and not significant. This sector also employs much labour, but the proportion of output of this sector in the total output is not commensurate with the amount of labour employed in the sector. Capital input contributes much more than labour input to the growth of the sector.

The DW statistics are quite low, showing the presence of positive autoregression at 5% level of significance, particularly in the aggregate equation. The other equations give relatively better results, showing almost no autoregression. We tried to correct for the autoregression but there was no improvement in the results. Hence we leave the estimates as they are, noting that there may have been some loss of efficiency in retaining them. That is our only option.

The non-parametric estimates

We also use the non-parametric method to estimate the source of growth for the economy and the three sectors. We assume perfect competition and constant return to scale, and that factor inputs receive their marginal products and the elasticity with respect to each factor input represents their factor shares. The analysis is limited to two factor inputs—labour and capital. We obtain results for the primal for the three sectors

and for the primal and the dual for the economy. Since one equals the share of labour income plus share of capital income, we obtain the share of capital income by subtracting labour's income share from one. Increasing returns to scale are shown in the econometric estimates. In non-parametric estimates we are restricted to constant returns to scale, biasing the total factor productivity component upwards. The results are as follows:

Agriculture: Labour's share was greater than capital's share for the period 1961–1977, and it was again greater for the period 1985–1993. The share of capital input sharply increased from 1993 (Figure 4a).

Industry and service: In the industrial sector the share of capital in the sector's output has been much higher than that of labour. The situation is similar in the service sector (Figure 4b).

Total factor productivity: Over the period, the total factor productivity (TFP) varied around zero for all three sectors, with the means for the period being 0.0501 for agriculture, 0.0473 for industry and 0.0389 for services (Figure 5).

Economy: For the economy, both the primal and the dual are done using the same shares of factor inputs. Prior to 1977, labour's share in GDP was greater than that of capital, but from 1978 the share of capital dominated that of labour (Figure 6). The primal and the dual results show the TFP moving almost together over the whole period (Figure 7). However, comparing the TFPs from the primal (0.050), dual (0.045) and econometric estimates (0.066), there are only slight differences as seen from their means.

Comparison with other results

From the parametric estimates we observe that the estimates for the three main sectors of the economy and the coefficients of the input variables in each of the sector are greater than one. The estimated production functions therefore exhibit increasing returns to scale.

On the aggregate production function of the economy, we further break down the series of data into different periods. This is to permit us to compare the Cameroon results with the Nigerian results as shown in Tables 2 and 3, using the non-parametric method. We try as much as possible to have the same periods.

The output growth rates are different, as are factor contributions. While the factor contributions are substantial in both the Nigerian and Cameroonian economies, labour input is more important in Nigeria according to Dike's study, and capital is more important than labour in the Cameroonian economy. On the whole, total factor productivity plays a much less important role as seen in Tables 2 and 3. The comparison of the results of the two countries brings out two important points. First, total factor productivity is still to play a significant role in the economic growth of these two countries, which could also be the case in other African countries. The results from the econometric estimates show very high growth of TFP, but this may be from very low initial levels. So with time and appropriate policies one would expect TFP to play a much greater role in the economy. Second, the role of factor inputs and increasing return to scale is important. The different inputs vary in their importance from country to country and from period to period, however, depending on the accumulation and utilization of the factor inputs.

Figure 4a: Share of labour (SLA2) and capital (SCAP) in Cameroon's agricultural sector

Figure 4b: Share of labour (SIS) and capital (SCAPSE) inputs in Cameroon's service sector

Figure 5: Total factor productivity (TFPGDP) for Cameroon's agriculture (TFPA), industry (TFPSE) and services (TFPI)

Figure 6: Share of labour and (CABSGOP) capital (CAPSGOP) inputs in Cameroon's GDP

Figure 7: Total factor productivity for Cameroon's economy for the dual (TFPDGDP) and primal (TFPGDP)

Table 2: Sources of Nigerian economic growth

Aggregate GDPgrowth rate per annum (L)	Contribution of labour (L)	Percentage contribution (K)	Contribution of capital (K)	Percentage contribution (%)	Contribution of total input productivity	Total factor productivity	Percentage contribution
1950-91	3.5	2.38	68	0.924	26.4	94.4	0.196
1960-85	3.4	2.187	64.3	0.627	18.4	82.7	0.586
1970-79	7.5	2.16	28.8	5.35	71.3	100.1	-0.01
							5.6
							17.2
							-0.1

Source: Dike (1995: 81)

Table 3: Factor and total factor productivity contribution to Cameroon's economic growth

Aggregate GDPgrowth rate per annum (L)	Contribution of labour (L)	Percentage contribution (L)	Contribution of capital (K)	Percentage contribution (K)	Contribution of total input (%)	Total factor productivity	Percentage contribution
1961-91	3.3	0.879	26.6	2.345	71.1	97.4	0.845
1961-85	8.1	2.034	25.1	4.926	60.8	86	1.14
1970-79	8.6	2.946	34.3	3.873	4.5	79.2	1.81
1980-91	1.3	2.2087	169.9	-0.679	117.85	-0.238	-18.3
1987-93	-4.3	0.376	-8.7	-3.762	78.75	-0.914	21.25
							2.6
							14.1
							21
							-18.3
							21.25

Source: Author's estimates.

9. Discussion of some constraints

Certain factors might have contributed to the loss of productivity and slowdown in investment and growth. The transportation infrastructure, in terms of road and railway networks, is inadequate and in poor condition. The road network consists of 11,000 kilometres of feeder roads and 14,000 kilometres of major roads, including 4,000 kilometres of paved roads. The network needs to be extended and well maintained. The government has started the privatization of road maintenance, so that the private sector would take over the maintenance of the road network. Besides making the system transparent, the government could go further to involve the road engineering branch of the armed forces in the construction and maintenance of the road network.

The 1,200-kilometre railway network is really limited, and at the same time most of the system's equipment is worn out or obsolete, requiring replacement and additional investment. The railway network possesses enormous potential for moving goods and persons, particularly between the southern and northern parts of the country. Resources need to be allocated to this sector more efficiently. Cameroon has five main ports, with the port of Douala catering for over 80% of external trade. The natural ports of Limbe, Tiko and Kribi could take a greater volume of trade, as the Wouri channel narrows and results in decline of the volume of traffic in the Douala port. Cameroon has 15 airfields and airports, including three international airports. Most of these could be closed and the resources reallocated to other networks. Above all, improving the management of all these transportation systems is crucial as they greatly facilitate the smooth and efficient functioning of the factors of production.

A second factor is the government's heavy intervention in the economy, thereby making the public sector the largest employer with the largest expenditure item on wages and salaries. Hence as the economy collapsed, the government was saddled with huge fiscal deficits that were also structural. The expenditures had to be drastically reduced as there was no way to raise fiscal revenues soon enough to cover the deficits. Drastic cuts were made, starting with investment components, from CFAF 213.3 billion in 1986 to CFAF 34 billion in 1987. Then current expenditures were reduced in the 1990s, with sharp cuts in civil servants' salaries and amenities. Furthermore, as the government was having liquidity constraints, it failed to pay its outstanding obligations to civil servants and to the suppliers of goods and services. The sharp budgetary cuts including the salary reductions resulted in demoralized and demotivated workers, and the fall in income resulted in reduced consumption.

The fall in world prices of Cameroon's major exports resulted in lower output and producers' income. The loss of some advantages by factors of production and the poor

transport system might have led to the breakdown of some links in the chain and contributed to the slowdown in investment and growth. This tended to have some cumulative negative effects, like the productivity loss and reduced incentive to invest. Addressing these breakdowns should generate huge gains for the economy, given the country's enormous resource base.

To boost morale and increase productivity, some type of rationalization with transparency and efficiency measures should be carried out in the public service. Already the government has started reducing the public service, but the salaries need to be raised and efficient means of promotion established. Public enterprises are also in the process of trimming, which needs to be carried out transparently and with care, taking into consideration the national interest. Above all, besides setting the national priorities right, let the expenditures reach their targets. If an expenditure head is earmarked for school textbooks, the stated amount allocated should really go to the purchase of the textbooks.

10. Conclusion

In general, changes of factor inputs (labour and capital) have been the principal sources of growth in the Cameroonian economy. Capital input seems to have been more important than labour input in terms of contribution to economic growth, as the econometric and growth accounting results show. This is seen particularly during the oil boom period (1978–1985), although the labour input was important, particularly in the agricultural sector, before the oil boom. At the sector level, capital again seems to be quite important. In the agricultural sector, land tends to be crucial, but this may only show the neglect of the labour input, which could greatly contribute to output growth if given the proper training and technology and if the severe constraints were removed.

In general, similar studies (Dike, 1995; Onjala, 1996) have shown labour's contribution to be more than that of capital input. It seems as if this depends on the period; in our study we found that in some periods labour's contribution is greater than that of capital but more often capital dominated despite the abundance of labour. The abundance of labour may also mean low marginal productivity, partly because of the constraints in the economy.

Total factor productivity growth has been more important in developed economies than in developing economies, as studies have shown. Our study shows more the importance of factor input (especially of capital) than of total factor productivity. Although the importance of capital is highlighted, the role of labour is equally important. Of similar importance is the knowledge that the “residual”—the total factor productivity—is yet to play a greater role in output growth in these African economies. This is very important as the growth rate of TFP is quite high and one would expect TFP to become very important in the economy. Because the technology level is low but growing very rapidly, more effort must be put into developing this component of growth, especially through research and development.

In periods when the economy has saved much or has grown more rapidly, it has tended to invest much more in physical capital than in appropriate human capital. Yet there should be a balance between investment in human and physical capital, with greater stress put on human capital development as the main mover of other types of investment, including investment in technology.

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