

# **Total factor productivity in Kenya: The links with trade policy**

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## List of abbreviations

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|      |                                       |
|------|---------------------------------------|
| FDI  | Foreign direct investment             |
| GDP  | Gross domestic product                |
| ISI  | Import substitution industrialization |
| LDCs | Less developed countries              |
| MPTX | Import penetration index              |
| NICs | Newly industrialized countries        |
| SSA  | Sub-saharan Africa                    |
| TFP  | Total factor productivity             |
| TFPG | Total factor productivity growth      |
| XPTX | Export penetration index              |

## Abstract

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As an objective of development policy, productivity growth has been difficult to achieve in many countries. For this reason, studies on sources of growth are a field of great importance to policy makers. Recent experience, particularly for East Asian countries, has highlighted the potential for achieving rapid and renewed growth in sub-Saharan Africa through appropriate trade policy orientation. In Kenya, however, where the last three decades have seen attempts to foster growth through shifts in trade policy orientation, convincing evidence on the linkage between trade strategies and productivity growth is still lacking.

This study explores productivity sources in the manufacturing and agricultural sectors using aggregated data over 1960–1995. Productivity is explained by: growth by factor inputs, and change in total factor productivity. Agriculture is seen as a dynamic sector producing important linkages with the growth of other sectors. The manufacturing sector, on the other hand, is important in growth-oriented analysis, which generally perceives it as crucial for increasing the rate of growth for the whole economy. The study establishes the direction of the links between TFP change in these sectors with trade policy episodes such as imports, export penetration and trade volume.

Nevertheless, the impact of trade policy on productivity remains inconclusive. Evidence suggests that more robust results with broader policy consensus could be obtained if the analysis were extended to a disaggregated level for each of the sectors.

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# 1. Introduction

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While economic growth can be viewed as a process involving the entire economy's output performance, it invariably depends on the productivity of the country in question.<sup>1</sup> Productivity, on the other hand, is essentially a microeconomic matter, focusing on how production units hire and use capital, labour, and other resource inputs in their output of goods and services. The direct link between productivity and economic growth is apparent in many ways. The sources of productivity growth over time, and of productivity differences among countries and regions, have today emerged as a central unifying theme of growth and development.

## The relevance of development policy to factor productivity growth

Both theoretical argument and empirical evidence support the view that the sustained growth of output requires that total factor productivity grow regularly in a fairly routine manner.<sup>2</sup> The basic strategy of growth policy must therefore put in place and maintain a policy environment that results in the continuing increase in productivity over wide sectors of the economy (Bruton, 1995).<sup>3</sup> It is evident, therefore, that the achievement of a growth objective requires an understanding of the sources of productivity growth. For many years, the approach to investigating economic growth has been to ask to what extent this growth could be explained by variations in factor inputs.<sup>4</sup> However, the “miracle” in economic growth has been a component that cannot be explained through changes in factor inputs—total factor productivity growth, or the residual. In recent years, the empirical task has concentrated on identifying economic policies that can explain this miracle.<sup>5</sup>

Since the rate of GDP growth per capita cannot be maintained over long periods of time unless labour productivity is somehow built into the system, the experiences of the newly industrializing countries (NIC) of East Asia, which are based on appropriate trade policy orientation, present African countries with a challenge to develop an indigenous growth process.<sup>6</sup> This calls for deeper understanding of the links between the trade strategies pursued so far and the growth and productivity phenomenon.



## Economic growth in Kenya

The process of economic growth in Kenya has been linked to various developments. During the first decade of independence, Kenya was remarkably successful in achieving steady growth. Virtually every indicator of performance was well above average compared with other countries at Kenya's stage of development. The gross domestic product grew at an average rate of 7% a year between 1964 and 1972. This success was attributed to many factors, but the chief credit was seen as a government that created the politically stable atmosphere conducive for private investment and exercised consistent and sound management of the economy (Burrows, 1975).

From 1973, the economy encountered serious crises whose combined effects interrupted the impressive economic performance established after independence. Domestic structural factors, especially in relation to expansion and diversification of exports, were seen to have precipitated part of the crises. The exogenous impediments cited include the oil crises of that decade and the drought of 1973/74, resulting in the dismal growth performance. The oil crises of 1970s and the consequent world recession, increased protectionism in developed countries, high external interest rates and decline in concessionary capital inflows, and droughts that led to massive food imports characterized the growth between 1975 and 1984. Other factors include the collapse of the East African Community in 1977, which greatly eroded the market for Kenya's non-traditional exports, and a coup attempt in 1982, which adversely affected investment and caused capital flight (Mwega et al., 1994).

In 1975, owing to the oil crisis, Kenya qualified for the International Monetary Fund's (IMF) extended fund facility. The IMF's facility was cancelled after the coffee boom in 1976 when the government did not find it necessary to proceed with the implementation of structural adjustment and stabilization measures. The economy grew by 5.6% and 8.8% respectively, in 1976 and 1977. By mid 1977, coffee prices had begun to fall. The expansionary impact of fiscal and monetary policy adopted during the coffee boom, combined with declining coffee prices, caused the balance of payments situation to deteriorate seriously in 1978. So far the trade policy strategy had been import substitution, but it was starting to be clear that emphasis had to shift to an export-promotion strategy.

A second structural adjustment loan agreement was signed with the World Bank in 1982 to introduce reforms in the industrial sector through reduction of protection, liberalization of the market, devaluation of the shilling, and introduction of a uniform tariff and an export insurance and financing scheme. In the same year, however, the economy was adversely affected by the coup attempt and a reduction in capital inflows. A stand-by agreement was negotiated with the IMF in 1983 in return for realignment of the exchange rate, increased agricultural prices and liberalization of the interest rate. At this time the country suffered a serious drought, resulting in massive food imports that caused a large balance of payments deficit and inflationary pressures, which deteriorated by 1985. Economic performance until 1984 was therefore strongly influenced by variations in the international terms of trade. It is indeed striking how the changes in growth of GDP and terms of trade evolved in the same direction in every single year. This was

because Kenya traded a major part of its value added with the rest of the world (Vandemoortele, 1985).<sup>7</sup> Figure 1 shows growth trends between 1965 and 1994.

In 1988, the government negotiated another industrial sector adjustment programme whose primary focus was to improve efficiency and competitiveness, expand investment, and increase exports by reviewing the Foreign Investment Protection Act and gradually removing controls and introducing a more flexible import licensing and foreign exchange allocation system. The period 1989–1993 was the worst to that time in terms of economic performance in Kenya's post-independence period. One of the factors that led to stagnation of the economy was the two-year suspension of donor financing in 1991 following the consultative group meeting in Paris, which cited poor implementation of economic and political reforms. Other factors include prolonged drought and growing political tension as Kenya entered into political pluralism, with adverse effects on foreign investment and tourism. The dismal performance of the economy was reflected in most of the sectors.

**Figure 1: GDP, agriculture and manufacturing output indexes in Kenya (1960–1994)**

## Sectoral growth

In terms of sectoral growth, the manufacturing sector remained the engine of growth even at the worst of times in Kenya. At the time of independence in 1963, manufacturing accounted for about 13% of Kenya's national product in the monetary economy. The sources of growth of manufacturing output between 1963 and 1971 were seen as (Gulhati, 1981): import substitution, 17%; domestic demand, 70%; and export demand, 13%. But despite considerable expansion in the manufacturing sector (showing more rapid growth than all the other sectors; see Figure 1), the agricultural sector remained the single most important sector in Kenya. The sector has also evolved tremendously since independence (see Figure 1 for trends of output), ensuring increased incomes and employment to the rural population, especially small-scale producers, who constitute over 75% of the population. Agriculture also supplies raw materials to industries and guarantees food security to the nation. Moreover, agricultural exports of coffee, tea and horticultural crops have consistently accounted for over 70% of forex earnings and a consensus seems to have emerged to the effect that productivity growth in the agricultural sector is essential if agricultural output is to grow at a sufficiently rapid rate to meet the demands for food and raw materials that typically accompany urbanization and industrialization.

Despite this realization, in Kenya and elsewhere in sub-Saharan Africa agriculture has been heavily taxed through protection of the manufacturing sector and macro policies that caused domestic prices of the manufactured products to increase relative to agricultural prices. For Kenya, this is evident in Table 1, which shows that the manufacturing sector was more protected over the years compared with agriculture.

**Table 1: Effective rate of protection by sector**

|               | 1967 | 1971 | 1976 | 1981 | 1986 |
|---------------|------|------|------|------|------|
| Agriculture   | 0    | 1    | 3    | 2    | 1    |
| Mining        | 121  | 260  | 59   | -24  | -34  |
| Manufacturing | 59   | 0    | 51   | 73   | 195  |
| Services      | -4   | -3   | -33  | -5   | -9   |

Source: Beaulieu (1990).

The high tax on agriculture was motivated in part by the belief that the manufacturing sector was the dynamic sector, while agriculture was static and non-responsive to policy. So economic growth in Kenya focused on shifting resources from agriculture to manufacturing. Schiff and Valdès (1992) have indicated that trade policies that lowered agriculture's terms of trade have been a major cause of the slow growth in developing countries—precisely the opposite of the intended effect from industry-led growth strategies. Cleaver's work in 1984 also points to this predominant view, that in sub-Saharan Africa trade and exchange rate policies had a negative impact on agricultural production, though his analysis suggested that these were not the most important factors impeding agricultural growth.

This scenario on the policy interface between agriculture and manufacturing raises several important questions. In particular, what has been the impact of changing trade regimes on agricultural and manufacturing growth and productivity in Kenya? Little is known empirically of the role of policy in accounting for sectoral growth successes and failures in Kenya since independence. For many years, an increase in trade restrictions was the normal response to balance of payments problems, with episodes of tightening and liberalization in response to changes in macroeconomic circumstances. Evaluating the role of these episodes is therefore an important theoretical and empirical task, especially considering that the production structure of the Kenyan economy became increasingly disarticulated once Kenya tacitly abandoned import-substituting industrialization (ISI) in the mid 1970s in favour of trade openness. Beyond stabilization and economic reform measures currently in place, there exists a problem of finding a dynamic policy regime to replace that pursued under ISI.

## Objectives of the study

The broad purpose of this study is to identify policy sources of productivity growth in the agricultural and industrial sectors. The study estimates total factor productivity (TFP) growth, and proceeds to assess the linkage between TFP in these sectors with trade policy orientation in Kenya. Specifically, we:

- Estimate total factor productivity in the agricultural and manufacturing sectors.
- Review trade policy episodes instituted in Kenya during the periods between 1960 and 1995.
- Analyse the link between productivity phenomena and trade policy episodes.

The first objective is fundamentally linked to an empirical test of the hypothesis that if real product and real factor input are accurately accounted for, the observed rate of growth of total factor productivity is negligible in both the manufacturing and agricultural sectors. Moreover, in line with the theoretical basis of trade liberalization measures, we expect trade policy changes to explain the periods of secular stagnation and high productivity in our analysis for Kenya.

## Scope and justification for the study

Successful economic development requires continued improvement in productivity, and therefore a study of the size and determinants of productivity as stipulated in this paper is important not only to researchers interested in economic development but also to people responsible for formulating development policy. The results of this study will contribute to the policy debate on the size of the impact of trade policy on total factor productivity in Kenya and help in evaluating the growth effects of trade policy orientation.

Most source-of-productivity studies focus on the aggregate economy (Elias, 1992; McCarthy et al., 1985; Norsworthy 1984). This study attempts to go beyond that, however, by measuring sources of growth at sector level in agriculture and manufacturing à la Chen (1977) and Rosegrant and Evenson (1992). Because these sectors of the economy are characterized by different economic and technical features, the focus of this study will improve the understanding of the dynamics of sectoral growth and their relation to trade policy. It is also desirable to investigate how sectoral differences in economic and technical features are related to productivity changes. Another issue—very important for economic growth policy and the scope of this study—is that productivity effects of trade policies cannot be sufficiently examined in an analysis that focuses on only one specific sector of the economy, say manufacturing; see, for example, Urata (1994), Kwak (1994), Fujita (1994), Shaaeldin (1989), and Chete and Adenikinju (1994) among others. It requires a broader analytical framework that encompasses several sectors.<sup>8</sup>

## 2. Sources of productivity growth

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Recent models of economic growth extend the neoclassical growth model so that productivity growth (i.e., TFP) is responsive to policy. Building on the works by Arrow (1962) and Phelps (1966), Romer (1986) makes technological change endogenous. According to these models, policy can affect productivity growth by impeding investment in human and physical capital, so that the rate of technological advancement slows. In addition, because of externalities to human and physical capital investment, appropriate public policies can help private agents internalize these externalities and thereby accelerate growth. Thus, the overall policy regime of a country, including taxes, property rights and macroeconomic distortions, can alter savings and investment allocation decisions in ways that alter growth. The “new” growth models provide a rich environment in which to study the role of government policies such as the operation of the financial markets or trade policy in economic growth and productivity.

### Literature and conceptual issues

Factors determining total factor productivity (TFP) can be divided into two broad categories (Urata, 1994). One includes those factors related to the sector environment in which production is carried on. These factors can be regarded as external to the industry. The other category includes factors related to the capabilities of the industry itself, and are internal or sector-specific. Among the factors external to the sector, competitive pressure is the most important one influencing TFP. For an industry to survive in the midst of competitive pressure, it needs to develop new production technologies and/or make efficient use of the factors of production. Conversely, when competitive pressure is weak, there is no need to improve production efficiency. Competitive pressure from foreign competitors is brought in via imports. Foreign direct investment (FDI) is also regarded as a factor exerting competitive pressure, especially for the manufacturing sector.

Productivity growth is also encouraged by continuing, uninterrupted growth. A stop/go sequence undermines research and development as well as investment (Bruton, 1995: 23). Productivity growth is a consequence of a great range of matters—incentives of the usual sort, physical and human endowments, institutions of many kinds, the nature and depth of the searching and learning idea (Bruton, 1995: 44; Yih-Chyi Chuang, 1996).<sup>9</sup> It needs a variety of activities and firms that more or less support or feed each other.

There have been many other variables tried on the right-hand side. The most widely considered and the ones that are most firmly based on theoretical arguments are political factors, foreign debt, government spending and religion, among others.

According to Rodrik (1992), a predictable policy environment is also very important since instability in policy not only can render policy ineffective in the sense of blocking the supply response in favoured sectors, but it can actually depress the overall level of physical investment that would have taken place at home.

Given the success stories of the East Asian countries, interest is growing in the links between trade policy and growth. Many developing countries have significant trade distortions, which generate rent-seeking behaviour and inefficient allocation of investment. A number of recent studies explore these issues within models of endogenous growth. Renelt (1991) focused on the application of models of endogenous technological change to trade issues. His study finds that the rent-seeking behaviour has significant growth effects through misallocation of resources, but the impact of tariffs and trade policy on growth depends on the sector that is targeted for protection. Studies by Rivera-Batiz and Romer (1991) identify a number of channels through which trade policy can affect growth besides through expansion of market size. Edwards (1992) has also brought new elements into the analysis of the way in which trade and other national policies affect economic growth. Using cross-country data to analyse the relationships among trade orientation, trade distortions and growth, his model shows that countries that liberalize trade and become more open tend to grow faster. He also investigates the effect of human capital accumulation, political instability, inflation and government size on growth.

## **Past and current methodological interests in factor productivity**

Many approaches exist for studying the sources of productivity growth, depending on the analytical objectives and problems to be examined. The neoclassical growth model provides a framework for growth accounting that quantifies the contribution of physical inputs and their total “productiveness” to growth. Analyses by Norsworthy (1984) and Chenery et al. (1986) suggest that physical factor inputs account for only 50–70% of the growth rate of output. Although there are arguments as to the precise percentage, total factor productivity (technological change) appears to be an important component of growth. The weakness of the neoclassical growth model is its assumption that the rate of technological change is given exogenously, hence it does not provide a useful framework for understanding the economic forces and policies behind technological change, which is an important component of growth (Easterly et al., 1991). Moreover, it does not take into account disequilibrium factors such as internal demand constraints, external market constraints, economies of scale, learning by doing and imperfect factor markets. Much of the recent work on growth and productivity, however, can be viewed as refining and formalizing the basic insights of classical and development economists.

A number of studies have been conducted on productivity growth in Southeast Asian and Latin American countries. A major weakness of this empirical literature is that despite considerable differences between developed and developing countries, it fails to address the range of TFP growth rates that one can reasonably expect in these countries. There are also weaknesses regarding the interpretation and how far the concept of the residual

should be extended in explaining the process of economic growth. For example, new insights into the current East Asian debate arising from Young (1994) on the contribution of total factor productivity to economic growth suggest that extraordinarily rapid and sustained growth of output per capita in these economies did not depend on productivity growth to the extent believed by many scholars. Other factors at play, such as factor accumulation, were more important, i.e., through rapid human capital accumulation. Interestingly, the results of his study also suggest, against a common premise, that productivity growth in the East Asian NICs, particularly in their manufacturing sectors, was not as extraordinarily high as suggested by earlier studies. Thus the NICs' success in manufacturing exports was more or less a product of appropriate trade policy interventions that were successful in eliminating disequilibrium factors such as internal demand and external market constraints, encouraging learning by doing, and correcting imperfect labour markets (Rodrik, 1992: 311). A study by Rosegrant and Evenson (1992) suggests that TFP growth explains about one-third of total output growth in the crops sector in India from 1957 to 1985.<sup>10</sup> They conclude that the main sources of productivity growth have been public research and extension and private research.

Very few studies have applied a growth accounting framework in Africa. In Kenya, policy determinants of growth and productivity have been examined only partially in several ways. The experience of these studies is diverse and interesting. Beaulieu (1990) analysed changes in the input structure of production affecting intersectoral relationships in Kenya and observed that such changes accounted for 11% of the growth of gross output between 1967 and 1986. Shaaeldin (1989) studied the sources of industrial growth in Kenya, Tanzania, Zambia and Zimbabwe between 1964 and 1983. The findings indicate an average negative growth rate of TFP for Kenya, Tanzania and Zambia; for Zimbabwe the TFP growth rate is found to be positive but insignificant. Hence for all these countries, increase in manufacturing growth is attributed mostly to factor inputs. Ritter (1988) looked at productivity change in the non-agricultural economy of Kenya for periods between 1964 and 1987. The findings of the foregoing studies are consistent with Chen (1977), who found that in the manufacturing sector, variations in the rate of output growth are largely explained by variations in the rate of input growth; in the agricultural sector, however, a very high percentage of sources of growth is explained by total factor productivity.

In a more recent study, Mwegu (1995) found that productivity growth in Kenya's manufacturing sector was dominated by labour and capital in the first two decades of independence (1965–1983) and by labour and TFPG in the third decade. TFPG declined substantially in the second decade from about 2.7% in 1965–1973 to 0.7% in 1974–1983, but recovered to 1.5% in 1984–1993. The results also show that while the contribution of labour was relatively stable, that of capital declined substantially in the last three decades. The paper also investigated whether changes in the various measures of the implicit tariff index were correlated with TFPG; none of the estimated equations showed any significant correlation between TFPG and the implicit tariff index over 1973–1993.



## Empirical methodology for measuring productivity growth

Empirical research on economic growth based on “growth accounting” estimates the proportion of growth attributable to changes in labour and capital units, with the residual assumed to represent total factor productivity growth. The sources-of-growth method estimates the determinants of growth and the underlying forces that explain sources of input growth. The basic hypothesis of the method states that the rate of output growth is equal to (1) the rate of growth of gross labour plus its quality, times the labour income share plus (2) the rate of growth of gross capital plus its quality, times the capital income share plus (3) total factor productivity change (Elias, 1992; Easterly et al., 1991; Chen 1977; among others).

There are two distinct approaches to studies on the relative contributions of factor inputs and productivity to growth. One is to estimate the rate of technical progress and the marginal contribution to the individual factors to output by using parametric techniques, a traditional residual approach in which neoclassical production functions are constructed and the changes in output unexplained by input changes are considered to be total factor productivity. In this method, rates of productivity change are estimated using production functions, which allows for the assumption of constant returns to scale to be empirically invalidated. The second approach, which is non parametric, involves an arithmetical construction and uses factor shares in national income as weights to combine the individual factor inputs and form an index of total factor input, then denotes that part of output growth that cannot be explained by increases in factor inputs as total factor productivity or technical progress. The non parametric approach seems to be more popular, though it imposes strong assumptions of constant returns to scale. It is popular because it involves straightforward construction of input and output indexes from which various productivity measures are derived. Compared with the parametric, it has the advantage that results are less sensitive to the type of data used. Notably, both approaches decompose sources of growth of factor inputs and of total factor productivity.

## Measuring total factor productivity growth in our study

The empirical framework adopted is a growth accounting approach based on the procedures by Elias (1992), Shaaeldin (1989), Ritter (1988), Chen (1977) and other scholars who have explained the process as follows:<sup>11</sup> Assuming a neoclassical production function,

$$Y = \dot{u}(K, L, t) \tag{1}$$

where  $Y$  is output,  $K$  and  $L$  are capital and labour inputs, respectively, and  $t$  is time. Taking the logarithm of the production function, and differentiating with respect to time, gives:

$$\frac{\delta Y/\delta t}{Y} = \frac{(\delta F/\delta K)(\delta K/\delta t)}{F} + \frac{(\delta F/\delta L)(\delta L/\delta t)}{F} + \frac{\delta F/\delta t}{F} \quad (2)$$

Denoting the proportional growth rates of output, capital and labour as  $Y$ ,  $K$  and  $L$ , respectively, obtains:

$$\dot{Y} = \frac{(\delta F/\delta K)K}{F} \dot{K} + \frac{(\delta F/\delta L)L}{F} \dot{L} + \frac{(\delta F/\delta t)}{F} \quad (3)$$

where  $[(\delta F/\delta t)]/F$  is the proportional shift of the production function. It is taken to represent total factor productivity or technical progress. Denoting it by  $A$  gives:

$$\dot{Y} = \frac{(\delta F/\delta K)K}{F} \dot{K} + \frac{(\delta F/\delta L)L}{F} \dot{L} + \dot{A}, \quad (4)$$

or

$$\dot{A} = \dot{Y} - \frac{(\delta F/\delta K)K}{F} \dot{K} - \frac{(\delta F/\delta L)L}{F} \dot{L}, \quad (5)$$

where  $[(\delta F/\delta K)K]/F$  and  $[(\delta F/\delta L)L]/F$  are the share of capital in income and share of labour in income, respectively. If it is assumed that income shares are constant over time, Equation 5 is reduced to:

$$\dot{A} = \dot{Y} - \beta_K \dot{K} - \beta_L \dot{L} \quad (6)$$

where  $\beta_K$  and  $\beta_L$  are capital and labour shares in income, respectively. Equation 6 is the basic equation used by growth economists to calculate the sources of growth. It is the same as the Solow index:

$$\frac{\delta A_t}{A_t} = \frac{\delta Y_t}{Y_t} - (\beta_L \frac{\delta L_t}{L_t} + \beta_K \frac{\delta K_t}{K_t}) \quad (7)$$

where  $\delta Y_t/Y_t$  is the rate of change of real value added,  $\delta L_t/L_t$  is the rate of change of labour,  $\delta K_t/K_t$  is the rate of change of real gross fixed capital,  $\beta_K$  is the share of capital in value added in year  $t$  and  $\beta_L$  is the share of labour in value added in year  $t$ .

Following the lead of Tybout (1992), Renelt (1991) and Lopez (1991), the growth accounting model can also take the approach to productivity measure in which a neoclassical production function at the sector or industry level is specified as:

$$Q_i = \dot{u}(v, t) \quad (8)$$

where  $Q_i$  = value added in sector  $i$ ;  $v$  is a vector of primary inputs, and  $t$  is the time index that allows the function to shift with technological innovations or improvements in the efficiency of existing technologies. The elasticity of output with respect to time,  $\varepsilon_{Q,t} = (\delta f / \delta t) / Q$ , is hereafter referred to as total factor productivity (TFP) growth. The role of productivity growth is typically isolated by expressing Equation 8 in growth terms and rearranging:

$$\varepsilon_{Q,t} = \frac{\dot{Q}}{Q} - \sum_{j=1}^k \theta_j \left( \frac{\dot{v}_j}{v_j} \right) \quad (9)$$

Here a dot over a variable indicates its total derivative with respect to time, and  $\theta_j = (\delta f / \delta v_j) / (v_j / Q)$  is the elasticity of output with respect to the  $j$ th factor. Making the assumption of perfect competition, where each factor is paid the value of its marginal product, one may replace output elasticities with factor shares ( $s_j$ ) and estimate TFP growth using a Divisia index (Jorgenson and Griliches, 1967: 252):

$$\varepsilon_{Q,t} = \frac{\dot{Q}}{Q} - \sum_{j=1}^k s_j \left( \frac{\dot{v}_j}{v_j} \right) \quad (10)$$

Defining  $v_j$  as labour and capital, respectively, this amounts to fitting a regression:

$$\frac{\dot{Q}}{Q} = \beta_0 + \beta_1 \sum_{j=1}^k s_j \left( \frac{\dot{v}_j}{v_j} \right) + v \quad (11)$$

Since the pioneering work of Solow (1956, 1957), productivity growth or technical progress as stated in Equation 10 has been associated with the time derivative of the production function. This formulation is a useful conceptualization, but it is not convenient for actual measurement of productivity using index numbers. The reason is that index number procedures entail comparisons using discrete data points and therefore require a discrete approximation of the time derivative.<sup>12</sup>

A superlative index often used—for which the foregoing aggregator function is exact—is the Törnqvist quantity index (Diewert, 1976). An advantage of the Törnqvist index is

that it also accounts for changes in the quality of inputs. Because current factor prices are used in constructing the weights, quality improvements in inputs are incorporated to the extent that these are reflected in higher wages and rental rates. The Törnqvist index provides consistent aggregation of inputs and outputs under the assumptions of competitive behaviour, constant returns to scale, Hicks-neutral technical change, and input-output separability. Moreover, Caves et al. (1982) have shown that Törnqvist indexes are also superlative under very general production structures, i.e., nonhomogeneous and nonconstant returns to scale, so they should provide consistent aggregation across a range of production structures (Rosegrant and Evenson, 1992). Estimating Equation 10 requires that the instantaneous time derivatives be replaced with discrete changes using a Törnqvist index where  $S_i$  is replaced with averages of current and previous period shares. A flexible functional form for which the Törnqvist index is exact is the translog production function, which can be stated as (Okamoto, 1994: 466; Chete and Adenikinju, 1994: 27):

$$\ln\left(\frac{TFP_t}{TFP_{t-1}}\right) = \ln\left(\frac{Y_t}{Y_{t-1}}\right) - \frac{1}{2}\sum_i S_{i,t} \ln\left(\frac{X_{i,t}}{X_{i,t-1}}\right), \quad (12)$$

where  $t$  denotes time and  $Y$  denotes real output.  $S_i$  represents the share for factor  $i$ , and  $X_i$  represents the input of factor  $i$ .

or:

$$\begin{aligned} \Delta \log TFP_t = \Delta \log Q_t - \left[ \frac{S_L(t) + S_L(t-1)}{2} \right] \\ \Delta \log L_t - \left[ \frac{S_K(t) + S_K(t-1)}{2} \right] \Delta \log K_t \end{aligned} \quad (13)$$

where  $S_L$  is the share of labour income in value added,  $L$  is labour input,  $S_K$  is the share of capital income in value added,  $K$  is the capital input, and  $S_L + S_K = 1$ .

An alternative check on the TFP estimates from the growth accounting method can be done, usually by estimating a production function. Most source-of-growth studies imply a Cobb–Douglas production function, though any form of neoclassical production function should be compatible with this approach (Chen, 1977). The translog function, which is flexible and does not impose *a priori* restrictions on output elasticities of factor inputs, has been adopted to check on the estimates derived in the non parametric approach à la Elias (1992) and Chete and Adenikinju (1994).<sup>13</sup> Another attractive feature of the translog functional form is that it can treat time symmetrically with other inputs. This permits us to examine, simultaneously, TFP change and the substitution possibilities among inputs with respect to such chronological variables as enterprise age, labour force experience and technology vintage. The translog function is specified as:

$$\ln Q_{i,t} = \alpha_0 + g_t + \beta_L \ln L + \beta_K \ln K + \beta_{LL} (\ln L)^2 + \beta_{KK} (\ln K)^2 + \beta_{LK} \ln K \ln L + \varepsilon_i \quad 14$$

where  $Q_t$  is real output,  $t$  represents time, and  $K$  and  $L$  are capital and labour, respectively. The coefficient  $g$  represents the exponential rate of Hicks neutral technical change while the error term  $\varepsilon_i$  is white noise. In this case, the presence of technological innovations or improvements is considered as a function of time. It should be noted that the production function approach allows a very elastic treatment of the technology factor, either as a new variable or as embodied in the different inputs already defined.  $\alpha_0$  is the rate of TFP change at the point of expansion of the translog production function. Under normal conditions  $\alpha_0$  should be non-negative;  $g^t$  is the rate of TFP change and takes on a positive, negative or zero value depending on whether there is acceleration, deceleration or constancy in the rate of TFP change. Such a check was not conducted for this study because of problems of estimation, however, hence the final equation used in estimating TFP is (13).

### 3. Identification of trade policy episodes in Kenya

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There are two kinds of trade policies (Little et al., 1995: 264). One consists of price-oriented measures: tariffs, export taxes or subsidies, retention schemes, duty exemptions, and import deposits. The other includes quantity-oriented measures: import quotas, import bans, licensing of imports, and export quotas or price measures related to export targets. The focus for this study is on quantity-oriented measures. Since all the instruments have an effect on the volume (or quantity) of exports and imports, the size of export production, import volume and the entire trade (exports + import volume) reflect, indirectly, trade policy episodes. By examining trade policy episodes, therefore, we would be reviewing changes in the quantitative indexes and providing a narrative of the same.<sup>14</sup>

Trade policy has been prominent in Kenya's development strategy since independence in 1963. This is evident in the studies by Hopcraft (1972), Wagacha (1976), Low (1977), Cleaver (1984), Sharpley and Lewis (1988), Reinikka (1994), Little et al. (1995), Mwega (1995), and World Bank (1995), which have identified and characterized trade regimes and episodes in Kenya. From 1963, the trade regime was considered almost entirely as the sideeffect of policies aimed at first stage import substitution<sup>15</sup> in which import substitutors were surrounded by benefits. By 1970, Kenya had largely completed the first phase of import substitution by the replacement of consumer goods. Only 28% of domestic consumption was supplied by imports; nevertheless, Kenya still remained dependent on the outside world for 61% of her intermediate goods and 68% of capital goods. The ISI strategy changed in the late 1970s when it was blamed for inefficiency and poor export performance.

The variation of trade policy was in most cases an important instrument of balance of payments policy. Tariffs, quantitative restrictions,<sup>16</sup> import duty drawbacks on inputs, as well as administrative controls, were widely used to promote finishing industrialization and exports. The popularity of these restrictive devices arose from their ease of application for multiple purposes. Until 1977, however, the main instrument for import protection in Kenya had always been quantitative restrictions because Kenya could not unilaterally alter the common external tariff within the East African Community (World Bank, 1995: 7). According to Little et al. (1995), trade policy tightenings were highly related to the current account balance, where the natural tendency was to tighten quantitative import restrictions, usually by shifting items from a free to a restricted list when a current account problem developed (trade policies have been liberalized by increasing the number of items on the free list). Both import tightening and exchange rate policy were used as substitute instruments in the encounters of balance of payments problems.<sup>17</sup> Improvements in the current account were less likely to lead to liberalizing episodes than deterioration

was likely to lead to tightenings. Nevertheless, as noted by Little et al. (1995), most liberalizations by Kenya in the second decade could be explained by the favourable effects of the coffee boom.

Since the 1980s, reform of trade policies has been premised on a paradigm shift that viewed liberal, outward-oriented trade policies as superior to restrictive, inward-oriented ones.<sup>18</sup> Kenya has attempted to transform trade policies from 1980 through a World Bank financed structural adjustment loan facility by removing quantitative controls, expanding export incentives and rationalizing import protection. By 1993, the government had removed all import controls, scrapped import licensing and removed foreign exchange allocations. In 1994, the government relaxed foreign exchange controls, paving the way for a free floating exchange rate, and allowed remittance of dividends, interest, royalties, expatriate income and new investment income. Exporters were allowed to maintain foreign accounts while importers were free to purchase foreign currency from the market to meet their needs.

In their study, Sharpley and Lewis (1988) attribute fluctuations in Kenya's macroeconomic performance to shifts in trade policies in five periods: (1) the late 1960s with low protection; (2) the early 1970s in which import licensing became a major feature of balance of payments control and protection to the manufacturing industry; (3) the late 1970s when the coffee and tea price boom permitted a rapid expansion of imported intermediate goods and tariffs, other protective controls and use of exchange rate controls rose substantially, leading to appreciation in the value of the Kenya shilling; (4) the early 1980s, encompassed by a major balance of payments crisis followed by the beginning of stabilization and adjustment programmes by 1984; and (5) the 1990s, which saw a major breakthrough in the implementation of liberalization policies.<sup>19</sup> Out of the 25-year period of analysis of trade policy by Sharpley and Lewis, a fairly clear-cut picture emerges: the average rate of tariffs combined were important tools for trade policy, thereby directly regulating the volume of trade with other countries.

The Sharpley and Lewis study describes episodes of trade policy by using price measures such as exchange rate and import duties. The Sharpley and Lewis treatment also shows how the trade policy elements affected manufacturing growth up to 1984. The linkage with manufacturing is given in a narrative and qualitative manner.

Table 2 presents an overview of trade policy episodes, openness and exchange rate regimes in Kenya by analytical periods. Here there is an attempt to look at events in each episode as summarized by Little et al. (1995), and also relate each episode with the policy developments (consequences) such as the evolution of annual growth rates of imports ( $M_t/M_{t-1}$ ), changes in trade tax (trade taxes include import duty, value added tax on imports, etc.) and trade ratios  $[(X+M)/GDP]$ , thereby depicting the extent to which these developments are interlinked within an episode.

The evolution suggests that the Kenyan economy was less open in the first decade, 1960–1975; but became more open between 1976 and 1979: In 1976/77, there was an improvement in the balance of payments resulting from a large increase in the world prices of coffee and tea. The improved BOP position induced the government to relax quantitative restrictions. The economy was then less open between 1980 and 1985, and more open between 1986 and 1995.

**Table 2: An overview of trade policy episodes, openness and exchange rate regimes in Kenya by analytical periods**

| Period    | Episode <sup>1</sup>  | Import response <sup>2</sup> | Trade tax revenues <sup>3</sup> | Trade ratios <sup>4</sup> |
|-----------|---|------------------------------|---------------------------------|---------------------------|
| 1960–1964 | (+)<br>(1960–64)  | 3<br>(1960–64)               | 1.5<br>(1960–64)                | 0.40><br>(1960–64)        |
| 1965–1970 | (+)<br>(1965–70)  | 5<br>(1965–70)               | 6.5<br>(1965–70)                | 0.40><br>(1965–69)        |
| 1971–1975 | (+)<br>1971–75<br>fixed rate  | -9<br>(1971–75)              | 10<br>(1971–75)                 | 0.60<br>(1970–74)         |
| 1976–1979 | (-)<br>1976–78<br><br>devaluation in<br>1974 fixed rate<br>thereafter | 23<br><br>(1976–78)          | 27<br><br>(1976–78)             | 0.64<br><br>(1975–79)     |
| 1980–1985 | (+)<br>1979–84<br>devaluation in 1982                                 | -7<br>(1979–84)              | -6<br>(1979–84)                 | 0.56<br>(1980–85)         |
| 1986–1990 | (-)<br>1988–89<br>adopted flexible rate                               | 1<br>(1988–89)               | -13<br>(1988–89)                | 0.50<br>(1985–90)         |
| 1991–1995 | (-)<br>1994<br>free floating rate<br>(1990–95)                        | 2.4<br>(1990–95)             | -7<br>(1990–95)                 | 0.55<br>(1991–95)         |

**Notes:**

1. Negative and positive signs indicate liberalizing and tightening episodes, respectively.
2. Average annual growth rate of imports.
3. Annual average growth rates for trade tax revenues.
4. Trade ratios = Imports and exports of goods and non factor services in US dollars as a ratio of GDP, at market prices in US dollars.

Source: Adapted from Little et al. (1995).

From Table 2, one can see that the identification and characterization of trade policy episodes presents difficulties in Kenya as the individual policy instruments with their developments tend to give conflicting positions. Indeed, as rightly pointed out by Reinikka (1994: 2), this has made interpretation (and comparison) of empirical findings much more arbitrary than if a common quantitative criterion had been used.



The actual policies tend to move in opposite directions and interact with one another, making it difficult to identify the episodes with confidence, hence the need for quantitative measures of trade liberalization (Mwega, 1995: 11). This fact is illustrated in figures 2, 3 and 4. The presentation of trade policy episodes fails to show the possible linkages among the actual policies, quantitative changes in the flow of trade and the policy episodes.

Reinikka discussed the use of various quantitative indexes as measures of trade episodes. Depending on the indexes chosen, some ambiguity remains in the use of such indexes as the implicit tariff index (which is the ratio of the domestic price of a given group of importables relative to their world price) and the import consumption (import penetration) index as measures of trade policy due to contrasting inferences from actual changes in policies.

An illustrative case is the average implicit tariff index (calculated as the ratio of the domestic ex factory price index and the import price index), which has a strongly declining trend, implying that substantial trade liberalization had taken place in Kenya since the late 1960s. Yet as pointed out by Reinikka (1994) and Mwega (1995), this contrasts with snapshots of the actual levels of protection (i.e., nominal and effective rates of protection), which indicate that protection has been increased instead of reduced since the late 1960s.

In view of such inconsistencies, many of the empirical indexes are to be based on a subjective criterion, i.e., on various quantitative criteria such as effective rate of protection, actual tariff rates, real exchange rate, degree of openness (sum of imports and exports over GDP), and the gap between foreign and domestic terms of trade.

The current study derives a lot from the identification of trade policy episodes from the studies discussed above, especially in guiding the choice of trade policy indexes. Much as the price indexes discussed by Reinikka (1994) and Sharpley and Lewis (1988) cannot be used successfully to identify an episode, figures 2 (representing a price index), 3 and 4 (representing quantitative indexes) point to some consistency in the pattern of trade and may help iron out ambiguity in the use of price indexes.

**Figure 2: Nominal exchange rate in Kenya (US\$/Ksh) 1960–1994**

**Figure 3: Volume of imports and trade trends in Kenya for 1960–1994**

**Figure 4: Export trends in Kenya, 1960–1994**

## 4. Productivity growth and trade policy

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All the factors that influence productivity tend to point to a trade related environment. It is not surprising, therefore, that the trade policy link with productivity growth is an issue of concern in many developing countries. However, if such improvements in production efficiency are also to occur through research and development (R&D), then there arises an issue of “reaction time” to trade policy in empirical work.

### Theoretical inferences

There are divergent theoretical positions on the trade policy–productivity growth nexus. The standard neoclassical model as reviewed by Ram Rati (1985) and Havrylyshyn (1990), among other scholars, suggests that outward trade orientation or more openness contributes to economic growth, for example by (a) increasing specialization benefits of comparative advantage, (b) offering greater scale economies through the enlargement of the effective market size, (c) affording greater capacity utilization, and (d) inducing more rapid technological change, an implicit “change–response” mechanism induced by competition and forcing domestic industries to adopt new technologies, reduce X-inefficiency and generally cut costs where possible. These arguments suggest that export expansion is good and that while a policy of increasing imports may restrict the market for domestic goods, it also increases competition and hence induces greater efficiency (Nishimizu and Sherman, 1984: 178). Trade policy is also seen as affecting growth and productivity through foreign exchange constraints and invariably leading to poor productivity performance by limiting imported inputs. Any policies that limit the availability of imports, or make them more expensive, lead to poor productivity performance.

Another conceptual postulation is based on increasing returns. According to this view, when markets expand as a consequence of freer trade, production costs decline and, as a corollary, efficiency is enhanced. According to Tybout (1992) however, the increasing returns as with X-efficiency arguments are ambiguous. The net effect of trade policy on productivity depends on specific demand shifts accompanying policy orientation, ease of entry/exit and the nature of competition. In view of the importance of this theoretical linkage, many empirical studies are being instituted to evaluate the role of trade policy in economic growth.<sup>20</sup> A major challenge in testing the effect of trade policies on productivity is finding good, internationally comparable measures of trade policy.

Despite the theoretical positions showing strengths of outward-looking strategies,

doubts about the gains from such trade orientation remain strong in Africa. One of the most important reasons for doubt is that the empirical work in the older literature on growth and trade, despite its robustness in other respects, has not adequately quantified the large gains offered by trade policy (Reinikka, 1994). One of the critical issues affecting this linkage lies in the identification and accurate measurement of trade policy episodes.

In the context of this paper, competitive pressure in the economy can arise from increased volume of imports and cause under-utilization of existing capacity. This can in turn lead to inefficiency and lower productivity. Alternatively, increased imports could be a source of searching for and learning about cheaper intermediate inputs that will cause adoption of efficient techniques. On the other hand, the growth of export volume may imply a broader market size, scale economies and efficiency in production. The learning effect also seems more directly related to exporting, especially of non-traditional products, than a general measure of openness. It may lead to higher productivity in the export sector since in addition to inducing a search for new technology, a strong export market (for non-traditionals) is an effective way, perhaps the most effective way, of importing immediately usable technical and organizational knowledge.

Productivity growth in the manufacturing sector might also be linked to market size, to the availability of foreign exchange to import inputs and hence to trade policy. Since the Kenyan manufacturing sector is inward oriented (particularly after the collapse of the now recently resurrected East African Community) the source of competition for the firms is mainly their domestic rivals, as about 80% of domestic manufacturing output is sold directly to domestic end-users. Liberalization is likely to lead to capacity under-utilization.<sup>21</sup> This might also depend on technological development, which can constrain the ability of local firms to adopt more efficient and competitive techniques to cope with external pressure. Productivity growth in manufacturing is also linked to institutional support from a number of institutions that provide technology support to the manufacturing sector: the Kenya Bureau of Standards, the Kenya Industrial Research and Development Institute, the Kenya Textile Training Institute, and the universities.

The agricultural market sector comprises livestock and products (50%), permanent crops (30%), temporary industrial crops (6%) and cereals (6%). Much of the import and export pressure is likely to affect the cereals, temporary crops and livestock products in the short run. Productivity growth in the agricultural sector appears to be linked to the vagaries of the weather and macroeconomic and political stability. The weather is a climatic variable of major importance in Kenya: Kenya's recovery of the early 1980s was interrupted by a serious drought in 1984, which pushed GDP growth to less than 1%. Although the weather's effect is not often as dramatic as in 1984, agriculture, and hence the whole economy, has often been adversely affected by too little, or too much, rain.

The pattern of agricultural growth and performance has been influenced by a number of other factors as well. These include (a) government involvement in the seed sub-sector, which guaranteed high yielding seed varieties, (b) support to research centres, i.e., Kenya Agricultural Research Institute (KARI), (c) extension and veterinary services to farmers, (d) development of rural infrastructure, i.e., rural access roads, (e) provision of subsidized credit facilities through cooperatives to acquire farm inputs such as fertilizers,

tractor hire service, etc., and (f) participation in marketing (through National Cereals and Produce Board, Kenya Planters Cooperative Union (KPCU), Kenya Cooperative Creameries (KCC), etc.), which protected domestic producers from the vagaries and instabilities of world markets. There is increasingly a shift in policy to reorient the role and strategic involvement of the government so as to effectively facilitate private sector initiatives.

A number of macroeconomic and sector-specific policies designed to boost agricultural production have been put in place since the 1960s. Unlike the industrial sector, where the shift in policy stance has been more pronounced, government intervention in the agricultural sector was very strong and consistent throughout our period of analysis, except for the late 1980s and early 1990s when liberalization began to take root. We have alluded to the fact that over the years, agriculture remained overtaxed at the expense of manufacturing, which received the protection (see Table 1). In terms of periodization, the level of intervention was prominent between 1970 and 1990, but declined rapidly between 1991 and 1994. In addition, trade policy changes have had a considerable influence on agricultural performance. For example, the deregulation of exchange rates and the resultant depreciation of the shilling served to restore agriculture's international competitiveness.

## Models of TFPG and trade policy links

The effect of trade policies on productivity (TFP) is explained using selected quantitative (vis-a-vis price based) trade policy indexes. The choice of quantitative variables has been dictated by their analytical relevance, data availability and the need to maintain a realistic scope for this study. Import and export penetration ratios have therefore been adopted. To establish the causal links between trade policy episodes and productivity, there are two ways that can be followed, but they amount more or less to the same thing (Bruton, 1995: 4). The first way is simply to add to the variables in equation 1 or 8 any additional ones presumed to act on output. Thus one could write:

$$Q = A' K^a L^b X_i^c \quad (15)$$

The  $X_i$  refer to these additional trade policy variables. In Equation 15,  $A'$  will be different from  $A$  in Equation 1, because part of the effect of  $A$  in Equation 1 is now picked by the  $X_i$ . Interesting results have been achieved with this approach, but it is awkward and misleading because Equation 15 implies that the  $X_i$  enter directly into the production process in the same way that capital and labour do. A second approach is to try to explain TFP with its own equation. Thus the ideal approach (Bruton, 1995) is to express the equation in the following manner and use correlation analysis or econometric methods to determine the links between TFP growth and  $X_i$  (trade policy variables).

$$TFP = f(X_1, X_2, X_3, \dots) \tag{16}$$

Equation 16 has the advantage also of making the basic question very explicit.

In Equation 17, *MPTX* is the import index, introduced in order to measure the productivity effect of domestic pressure brought about by imports. *XPTX* is introduced to measure the productivity effect of export promotion.

$$\log TFP_{ij} = \alpha_0 + \alpha_1 \log TRADEX_t + \alpha_2 \log MPTX_t + \alpha_3 \log XPTX_t + \varepsilon_t \tag{17}$$

The rationale for including the import penetration ratio and the export penetration ratio is that they capture the effects of foreign competition and greater openness on productivity. Accordingly, Equation 17 has been used to capture the links between TFP and trade orientation in Kenya.

To test for shifts in the TFP during episodes of tightening and liberalizing, a dummy variable (*D*=1 for liberalizing and 0 for tightening) was introduced in Equation 17 to form Equation 18 à la Chete and Adenikinju (1994). The specification of the equation to capture the effect of trade orientation and elimination of the noise element in the estimates was stated in a semi logarithmic equation as:<sup>22</sup>

$$\log TFP_{i,j} = \alpha_0 + \alpha_1 T + \alpha_2 D + \alpha_3 TD + \varepsilon_t \tag{18}$$

where *T* is time trend to eliminate the noise element, *t* is time, *j* is the sector and *TD* is the multiplicative dummy variable to test the shifts. In this equation, a positive coefficient of the multiplicative dummy (*TD*) would indicate acceleration of growth of *TFP* during a liberalizing episode. This approach also allows estimation of compound growth rates over the period of analysis, indicating if the differences in growth rates for the two broad episodes of tightening and liberalization are significant.

## 5. Analysis of the results

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Results are presented in three sections: TFP growth for the aggregate economy, for the agricultural sector and for the manufacturing sector. A discussion of the data sources and the definition and computation of variables is contained in Appendix A.

### Factor productivity growth for the aggregate economy

The results for the aggregate economy given in Table 3 show variations in sources of growth, with factor inputs accounting for a major part of output in all the periods. TFPG appears to have played an important role in the years before 1971 and after 1985.

**Table 3: Total factor productivity growth for the aggregate economy**

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| Period    | Explanation of sources of growth by factor inputs |                     |                                  |
|-----------|---|---------------------|----------------------------------|
|           | Capital input growth                              | Labour input growth | Total factor productivity growth |
| 1961–1970 | 2.197<br>(36.16)                                  | 2.591<br>(42.65)    | 1.287<br>(21.19)                 |
| 1971–1975 | 8.003<br>(78.44)                                  | 3.387<br>(33.20)    | -1.187<br>(-11.63)               |
| 1976–1979 | 6.819<br>(66.02)                                  | 3.341<br>(32.35)    | 0.168<br>(1.63)                  |
| 1980–1985 | 4.269<br>(62.38)                                  | 3.062<br>(44.74)    | -0.487<br>(-7.12)                |
| 1986–1995 | 2.241<br>(33.99)                                  | 2.907<br>(44.09)    | 1.780<br>(21.92)                 |

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Note: Percentage points, with percentage distribution in parentheses.



Between 1970 and 1985, therefore, TFPG did not contribute to the growth of the economy. Much of the output is explained by the change in factor inputs. Kenya being a labour surplus economy, one would have expected capital to play a minor role in explaining growth but this has not been the case.

## Factor productivity growth for the agricultural sector

As shown in Table 4, growth in the agricultural sector is dominated by factor productivity. This finding confirms a hypothesis stated under our second objective, but contrasts with the findings for Asian countries by Chen (1977), which suggest that variations in the rate of agricultural growth are also strongly explained by total factor productivity. It is evident that during 1971–1980 TFPG did not contribute to output growth in the agricultural sector. Growth of output is largely explained by the growth of factor inputs during that period.

**Table 4: Total factor productivity growth for the agricultural sector**

| Explanation of sources of growth by factor inputs |                      |                     |                                  |
|---|----------------------|---------------------|----------------------------------|
| Period  | Capital input growth | Labour input growth | Total factor productivity growth |
| 1961–1970   | 2.037<br>(19.23)     | 4.909<br>(46.34)    | 3.648<br>(34.43)                 |
| 1971–1975   | 1.864<br>(40.10)     | 2.818<br>(60.63)    | -0.034<br>(-0.731)               |
| 1976–1979   | 4.268<br>(66.37)     | 2.949<br>(45.86)    | -0.786<br>(-12.22)               |
| 1980–1985   | 1.311<br>(27.33)     | 2.754<br>(57.41)    | 0.732<br>(15.26)                 |
| 1986–1995   | 1.414<br>(22.99)     | 2.957<br>(48.07)    | 1.780<br>(28.94)                 |

Note: Percentage points, with percentage distribution in parentheses.

## Factor productivity growth for the manufacturing sector

In the manufacturing sector, again in line with the empirical literature cited earlier, increase in growth is mainly attributed to factor inputs (predominantly the labour input). The contribution of TFPG does not exceed 13%. This is in contrast with the agricultural sector, where TFPG has reached over 30%. In light of the hypothesis stated under our second objective, that TFPG is a substantial source of growth in the sector, the null hypothesis is hereby rejected.

**Table 5: Total factor productivity growth for the manufacturing sector**

| Explanation of sources of growth by factor inputs |                      |                     |                                  |
|---|----------------------|---------------------|----------------------------------|
| Period  | Capital input growth | Labour input growth | Total factor productivity growth |
| 1961–1970   | 4.238<br>(42.70)     | 5.973<br>(60.19)    | -0.287<br>(-2.90)                |
| 1971–1975   | 10.724<br>(81.34)    | 4.228<br>(32.07)    | -1.768<br>(-13.41)               |
| 1976–1979   | 7.071<br>(40.33)     | 8.277<br>(47.20)    | 2.187<br>(12.47)                 |
| 1980–1985   | 2.501<br>(55.30)     | 2.404<br>(53.15)    | -0.382<br>(-8.45)                |
| 1986–1995   | 1.987<br>(41.60)     | 2.414<br>(50.54)    | 0.375<br>(7.85)                  |

Note: Percentage points, with percentage distribution in parentheses.

A few estimates of TFPG rates for manufacturing sectors in Kenya and other African countries have been made, mainly by World Bank staff for official use.<sup>23</sup> Table 6 reproduces some TFPG estimates for Kenya, while more examples are attached in Appendix B. These illustrations contrast with those of the current study partly because of the approaches adopted in computation. However, there are also serious variations of TFPG within these illustrations across the same period of analysis (see Table 6). Between 1964 and 1973, for example, the TFPG estimates from Shaaeldin are -0.54, while those from Mwega are 2.7, yet the period of analysis is nearly the same.

**Table 6: Factor productivity growth in Kenya: A comparison of previous estimates**

| Year             | Labour        | Capital         | TFPG          |
|------------------|---------------|-----------------|---------------|
| <b>Shaaeldin</b> |               |                 |               |
| 1964–73          | —             | —               | -0.54         |
| 1973–83          | —             | —               | 0.13          |
| 1964–83          | —             | —               | -0.11         |
| <b>Mwega</b>     |               |                 |               |
| 1965–73          | 3.8<br>(32.8) | 5.1<br>(44.0)   | 2.7<br>(23.3) |
| 1974–83          | 3.3<br>(45.8) | (3.2)<br>(44.4) | 0.7<br>(9.7)  |
| 1984–93          | 1.9<br>(43.2) | 1.0<br>(22.8)   | 1.5<br>(34.1) |

Source: Shaaeldin (1989) and Mwega (1995).

A number of factors may be very important in explaining variation in TFPG in the different subperiods. One such factor is capacity utilization. There is a possibility that bias may have been introduced in the sectoral estimates because of the existence of excess capacity.<sup>24</sup> Capacity under-utilization can slow or lead to negative total factor productivity growth. According to Shaaeldin (1989: 30), estimates indicated capacity utilization in the range of 70–80% between 1960 and 1983 in the manufacturing sector. In the agricultural sector, a major factor influencing capacity utilization has been the poor incentive structure, i.e., pricing of produce and state of the weather. The degree of capacity utilization in Kenya has been linked to trade orientation in so far as the latter determines the size of the market and the availability of foreign exchange (Shaaeldin, 1989: 31).

## Summary of results on TFPG

The findings of this study reveal that total factor productivity growth contributes more to output growth in agriculture than in the manufacturing sector in Kenya. However, it forms a small portion of growth in all sectors. In the manufacturing sector, output growth is mainly explained by factor inputs. Except for 1971–1975, labour input takes a precedent in explaining growth in all the other years, where its contribution ranges from 47 to 60%. The contribution of capital input ranges between 42 and 55%, and that of total factor productivity varies between -8.45 and 12.47% in those years.

The study also shows that:

- In the agricultural sector, output growth is still dominated by factor inputs. Except for 1976–1979, labour input plays a major role in explaining growth in all the other

years, where its contribution ranges between 46 and 61%. The contribution of capital input ranges between 19.23 and 40.10% and that of total factor productivity varies between -0.731 and 34.43% in those years. The agricultural sector has recorded the highest TFPG in the study, compared with manufacturing and the aggregate economy.

- For the aggregate economy, output growth is again dominated by factor inputs. Capital and labour appear to have played an interchanging role. Between 1961 and 1970, labour input dominated growth with 42.65% of output explained by labour and 36.16% by capital input. From 1971 to 1985, growth was dominated by capital input growth ranging between 62.38 and 78.44% and labour input ranging between 32.35 and 44.74%. Total factor productivity growth was highest between 1986 and 1995 at 21.92%.

## 6. The links between TFPG and trade policy

An analysis of correlation relationships between productivity growth and indexes of trade policy has given diverse results, depending on the index used and the method of analysis.

### Correlation between total factor productivity and trade policy indexes

Indexes of export penetration, import penetration,<sup>25</sup> trade openness, import duties and real exchange rates (REER) under different trade episodes give different results, as evident in Table 7.

**Table 7: Correlation matrix of TFP growth and indexes of trade policy**

| Sector            | Episode | Trade ratio | Export penetration | REER   | Import duty | Import penetration |
|-------------------|---------|-------------|--------------------|--------|-------------|--------------------|
| Agriculture       | 1960–70 | -0.071      | -0.304             | -0.325 | -0.204      | -0.185             |
|                   | 1971–75 | -0.477      | -0.941             | 0.553  | -0.550      | -0.310             |
|                   | 1976–79 | 0.302       | -0.755             | 0.990  | 0.980       | 0.999              |
|                   | 1980–85 | -0.499      | 0.111              | -0.701 | 0.088       | -0.555             |
|                   | 1986–95 | -0.277      | -0.278             | 0.651  | 0.301       | -0.337             |
| Manufacturing     | 1960–70 | -0.256      | -0.246             | 0.290  | -0.349      | -0.382             |
|                   | 1971–75 | -0.812      | -0.784             | 0.823  | -0.539      | -0.742             |
|                   | 1976–79 | 0.147       | 0.834              | 0.897  | -0.390      | -0.614             |
|                   | 1980–85 | 0.468       | 0.627              | -0.208 | 0.452       | 0.627              |
|                   | 1986–95 | -0.782      | -0.793             | 0.947  | -0.715      | -0.803             |
| Aggregate economy | 1960–70 | -0.215      | -0.168             | 0.415  | -0.128      | 0.061              |
|                   | 1971–75 | -0.777      | -0.938             | 0.891  | -0.614      | -0.408             |
|                   | 1976–79 | 0.829       | 0.892              | 0.194  | -0.064      | -0.221             |
|                   | 1980–85 | 0.338       | -0.067             | -0.283 | -0.293      | -0.499             |
|                   | 1986–95 | 0.155       | 0.059              | 0.493  | 0.372       | -0.016             |

Table 7 suggests that there are conflicting scenarios within the different trade episodes:

- In agriculture, trade policy appears to have had the most influence on productivity between 1976 and 1979, when the policy proposals (real exchange rate, import duty and import penetration) had a strong positive correlation with TFPG. In general, agricultural productivity appears correlated strongly with the real exchange rate and import and export penetration.
- For the manufacturing sector, fluctuations in TFPG appear more strongly correlated with the real exchange rate, followed by import penetration and by export penetration.
- For the aggregate economy, none of the policy proposals appear individually to show a strong correlation with productivity fluctuations, particularly after 1980.
- Except for 1980–1985, the real exchange rate had a positive correlation with TFPG in all the sectors. Between 1986 and 1995 the correlation was particularly strong in the manufacturing sector.
- Export penetration and the real exchange rate appear to have had an important correlation with TFPG in all sectors between 1971 and 1975.
- No systematic pattern of correlation between policy variables and TFPG emerges from the table.

## Further analysis of factor productivity links with trade policy

Further analysis was conducted using the ordinary least square (OLS) techniques to see the effect of each policy variable over the entire study period. The results are given in Table 8.

**Table 8: Regression analysis of TFP growth and indexes of trade policy**

| Independent variable | Intercept | Trade ratio       | Rainfall index | REER index | Import duty index | Export penetration | Import penetration |
|----------------------|-----------|-------------------|----------------|------------|-------------------|--------------------|--------------------|
| Log (TFP)            |           | Agriculture       |                |            |                   |                    |                    |
| Coefficient          | 1.088     | 0.050             | 0.020          | 0.095      | 1.108E-05         | -0.095             | -0.002             |
| S.E.                 |           | 0.049             | 0.015          | 0.035      | 4.076E-06         | 0.035              | 0.003              |
| T-Stat.              |           | 1.001             | 1.348          | 2.723      | 2.718             | -2.685             | -0.745             |
| Log(TFP)             |           | Aggregate economy |                |            |                   |                    |                    |
| Coefficient          | 2.001     | 0.017             |                | 0.088      | 3.323E-06         | -0.069             | 0.001              |
| S.E.                 |           | 0.057             |                | 0.088      | 7.859E-06         | 0.095              | 0.001              |
| T-Stat.              |           | 0.304             |                | 0.996      | 0.423             | -0.727             | 0.215              |
| Log(TFP)             |           | Manufacturing     |                |            |                   |                    |                    |
| Coefficient          | 0.497     | -0.053            |                | -0.009     | 1.335E-05         | 0.025              | -0.001             |
| S.E.                 |           | 0.165             |                | 0.033      | 2.862E-05         | 0.045              | 0.006              |
| T-Stat.              |           | -0.318            |                | -0.284     | 0.466             | 0.560              | -0.180             |

Except for agriculture, all the other elasticities in the regression are not significant at the 5% level. Contrary to the results of correlation analysis, elasticities of trade volume (openness), export growth and import growth change their signs. Although the effect of rainfall on TFP appears insignificant, it is significant when some of the trade variables are dropped. Overall:

- No systematic pattern in the links between policy variables and TFPG emerges from the results in Table 8.

There was also an attempt to examine TFPG trends within the broad trade episodes of tightening and liberalizing policy to see if there was any shift in the productivity phenomenon (see Equation 18). The results are summarized in Table 9.

**Table 9: Acceleration in TFP growth during liberalizing episodes\***

| Dependent Variable: Log(TFP Index) |             |            |         |         |            |                |
|------------------------------------|-------------|------------|---------|---------|------------|----------------|
|                                    | Sector      | Intercept  | Time    | Dummy   | DummyXTime | R <sup>2</sup> |
| Agriculture                        | Coefficient | 2.7004     | -0.1933 | 0.4402  | -0.1010    | 0.1614         |
|                                    | S.E.        | (0.7021)** | 0.2059  | 0.4109  | 0.3285     |                |
| Manufacturing                      | Coefficient | 2.3137     | -0.1011 | 0.0907  | -0.1131    | 0.0455         |
|                                    | S.E.        | (0.1718)** | 0.1472  | 0.2730  | 0.2619     |                |
| Aggregate economy                  | Coefficient | 0.34001    | -0.0081 | -0.0346 | 0.0026     | 0.4078         |
|                                    | S.E.        | (0.0369)** | 0.0026  | 0.0976  | 0.0042     |                |

\* The episodes are summarized in Table 2.

\*\* Significant at 5% level.

Unlike for the aggregate economy, the shift parameters for agriculture and manufacturing are negative, suggesting that liberalizing (as opposed to tightening) had a negative influence on total factor productivity growth in Kenya. Please note that these coefficients are not significant at the 5% level, and the explanatory power for each equation (R<sup>2</sup>) is also very low. In view of these results, the evidence provided so far does not establish a conclusive quantitative link between trade policy and productivity growth in Kenya. Equally interesting are the coefficients for the non multiplicative dummy (Dummy), which do not suffer from the effect of a time multiplier. These coefficients seem to suggest that liberalizing had a positive influence on the agricultural and manufacturing sectors' productivities, while the productivity of the entire economy was negative. As in the previous case, these coefficients are not significant at the 5% level and are therefore open to question.

## 7. Conclusions and policy implications

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On the links between trade policy orientation and total factor productivity growth, diverse results were revealed (tables 3, 4, 5):

- In the manufacturing sector, total factor productivity was very low in the broad episodes of “tightening” in 1961–1970, 1971–1975 and 1980–1985. However, during the broad episodes of “liberalizing” in 1976–1979 and 1986–1995, total factor productivity was highest and positive.
- In the agricultural sector, total factor productivity was highest during a period of tightening (1961–1970) and, again surprisingly, lowest during a period of liberalizing (1976–1979). This shows that other dynamic factors were more important to productivity in this sector than trade variables. Comparing the other periods, productivity appears to have done much better during the liberalizing episode in 1986–1995 than during the periods of tightening in 1971–1975 and 1980–1985.
- For the aggregate economy, productivity performance was highest during the broad episodes of liberalizing in 1976–1979 and 1986–1995 and, surprisingly, during episodes of tightening in 1961–1970. Productivity performance was lowest during the episodes of tightening in 1971–1975 and 1980–1985.

In terms of the trade policy correlates (Table 7), one does not see a consistent story like the one provided above:

- Export performance and productivity performance in all the sectors of the economy (agriculture, manufacturing and aggregate economy) was strongly negative during an episode of tightening (1971–1975). This performance improved during the liberalizing episode of 1976–1979 with productivity in manufacturing and the aggregate economy, but not agriculture. What is surprising is that during the 1986–1995 liberalizing episode, the manufacturing sector had a strong negative correlate with export performance.
- Trade ratio and productivity performance show that in general this association has been positive for the aggregate economy, except for the period of tightening between 1961 and 1975. This association was negative for manufacturing and agricultural productivity in 1971–1975 and 1986–1995.
- The results for import ratio and productivity performance show a negative association



for the aggregate economy. There was a strong positive linkage with agriculture during the liberalizing episode of 1976–1979, and a strongly negative link for manufacturing in 1986–1995.

In trying to reconcile the findings from productivity performance in the broad episodes with the observations derived from trade policy correlates, a problem of inconsistency arises since these correlates do not appear to give a definite pattern that conforms to desired results. Otherwise, on the basis of TFPG trends and the broad trade policy episodes characterized, it is possible to conclude that productivity performance improves with liberalization for agriculture and manufacturing, but not for the economy as a whole.

One conclusion that emerges with force from this and similar work is that we should approach the reported results with scepticism (Tybout, 1992: 206). This is because problems of measurement error and aggregation bias can easily create the illusion of trends and correlations that have no basis in the economic processes we hope to capture. We have undertaken rigorous effort to ensure that the validity and reliability of the results, in so far as they apply to Kenya, are sustained.

## Policy implications

Much has been said about the obvious gains that arise from outward trade orientation. This study contributes to that debate by focusing on the role of trade policy in changing productivity performance in Kenya. The debate is conclusive when we look at productivity performance in general without tracing it to any individual trade policy variable. The debate is inconclusive when we look at the correlates for productivity and *unmodified* trade policy variables. Part of the explanation for this is that the consequences of policies get modified when they interact with the economic, political and social structure of the economy. In view of this, policy makers should not overlook the qualitative dimensions of policy in different countries.

## Research agenda

Our analysis was performed at the sector level because of the quick availability of the data. In order to gain a deeper understanding of the effect of trade policy changes such as the liberalization of foreign trade and foreign direct investment, an examination of individual firms, crops, etc., could provide insightful findings. This is an area where future study needs to be carried out.

The analysis in this study has room for improvement. Here, the inter-relationship between the trade policy indexes and productivity was conducted on an ad hoc basis, ignoring effects of other factors that may have influenced total factor productivity. The method adopted does not specify how a particular policy change or joint effects of policy changes contribute to total factor productivity change.<sup>26</sup> A more direct and theoretically polished analysis would introduce a range of policy measures that could affect total factor productivity change.

## Notes

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1. In the current East Asian TFP debate arising from Young (1994), “The Tyranny of Numbers”, the contribution of TFP to growth is highly disputed.
2. According to Bruton (1995), countries that are now rich in GDP terms are those in which such a process has been in place for a century or more.
3. The East Asian TFP debate arising from Young (1994), does not attribute even growth in the manufacturing sectors to changes in the TFP growth.
4. See, for example, the works of Solow (1956).
5. Stiglitz (1996) has made the most recent attempt to understand the policy environment that contributed to growth in East Asia.
6. This view of the *liberalizers* has been debated by Rodrik (1992) as neglecting the qualitative aspects, hence contributing to various exaggerations concerning the role of trade policy.
7. Table 2 provides a column on trade ratios for Kenya. A country with a ratio in excess of 0.40 is considered “open”; see Little et al. (1995: 264–97) for details.
8. Although the possibility of intra-sectoral distortions implies the need to measure the links between trade policy for disaggregated sectors or activities within sectors, this might be undertaken at a later time.
9. In Taiwan’s manufacturing industry, trade-induced learning accounted for about half to three-quarters of the measured external effect. Yih-Chyi Chuang (1996) also found that imports and exports of machinery from and to developed countries (mainly the USA and Japan) had the greatest induced learning for Taiwan’s manufacturing industries.
10. Five major crops (rice, wheat, sorghum, pearl millet, maize) and ten minor crops are included in the output index. Farm prices are used to aggregate the outputs. Inputs included in the input index are land, irrigation, labour, animal labour, tractors and fertilizer. Inputs are aggregated using farm rental prices, with differentiation

of rental prices for irrigated and non-irrigated land. The weather variables include Yearrain, Junerain and Julyrain, which are annual, June and July/August rainfall (the last two measures representing important monsoon periods).

11. The accounting approach is most often associated with the names Denison, Solow and Kendrick.
12. See Caves et al. (1982) for further explanation.
13. Young (1994) is based on a translog index of total factor productivity growth and not growth accounting.
14. According to Little et al. (1995), an important subgroup of liberalization episodes can be described as regime changes.
15. The import substitution policy package usually consists of selective and highly differentiated taxes on imports (or selective quotas and outright bans) combined with over-valued domestic currency.
16. As in most developing countries, the most common and effective method of regulation has been the quantitative restriction of imports.
17. econometric evidence by Little et al. (1995) confirms the hypothesis that trade policy tightening and devaluations were substitutes up to 1983.
18. The view that liberalization/openness was the “right” policy emerged largely from the experiences of Korea and Taiwan, rather than from basic theoretical reasoning. The successes of these countries and the patent failures elsewhere informed this stance.
19. This last period is not attributed to categorization by Sharpley and Lewis (1988).
20. Havrylyshyn (1990) has provided a review of studies that provide direct evidence through explicit analyses of trade policy and productivity.
21. Evidence by Mwegu (1995) suggests that trade liberalization does not seem to be positively correlated with productivity growth but is positively correlated with output and employment growth in the manufacturing sector.
22. In the case of agricultural productivity it was necessary to introduce the agroclimatic variable also in order to eliminate the noise effect.
23. The author did not have a chance to look at these estimates. The remarks are mainly attributed to Shaeldin’s study.

24. This was not adjusted because of the severe constraint imposed by the availability of data on capacity utilization in Kenya.
25. Shown below is the Spearman rank correlation coefficient between TFP growth and the import-penetration ratio from a study by Urata and Yokota (1994: 454). Earlier period (1976–1982), -0.450 (33) significant at the 1% level; later period (1982–1988), -0.287 (39) significant at the 8% level.
26. Levine and Renelt (1992) showed that by including additional variables such as government consumption as a share of GDP or investment in the regressions the effect of trade share becomes statistically insignificant.

## References

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- Arrow, Kenneth. 1962. "The economic implications of learning by doing". *Review of Economic Studies*, 29 (June): 661–69.
- Beaulieu, Eugene. 1990. "Structural change in Kenya, 1967–86." Technical Paper 90-09. Long-Range Planning Unit, Ministry of Planning and National Development. Nairobi, Kenya.
- Bruton, J. Henry. 1995. "Total factor productivity growth". *Research Memorandum Series*. RM-139. The Center for Development Economics. Williams College.
- Burrows, John. 1975. *Kenya: Into the Second Decade*. Report of a mission sent to Kenya by the World Bank. Baltimore and London: The Johns Hopkins University Press.
- Caves, W.D., L.R. Christensen and W.E. Diewert. 1982. "The economic theory of index numbers and the measurement of input, output, and productivity". *Econometrica*, vol. 50, no. 6 (November).
- Chen, K.Y.E. 1977. "Factor inputs, total factor productivity, and economic growth: The Asian case." *The Developing Economies*, vol. XV, no. 1 (March): 121–43.
- Chenery, Hollis B., S. Robinson and M. Syrquin. 1986. *Industrialization and Growth: A Comparative Study*. Oxford: Oxford University Press.
- Chete, N.L. and A.F. Adenikinju. 1994. "Productivity growth in Nigerian manufacturing and its correlation to trade policy regimes/indexes (1962–1985)". Final report to African Economic Research Consortium.
- Cleaver, K. 1984. "The impact of price and exchange rate policies on agriculture in sub-Saharan Africa". *Discussion Paper No. 279*. Institute for Development Studies, University of Nairobi.
- Diewert, W.E. 1976. "Exact and superlative index numbers". *Journal of Econometrics*, vol. 4: 115–45.
- Easterly, William, Robert King, Ross Levine and Sergio Rebelo. 1991. "How do national policies affect long-run growth? A research agenda". *Working Paper WPS 794*. The World Bank, October 1991.
- Edwards, S. 1992 "Trade orientation, distortions and growth in developing countries". *Journal of Development Economics*, vol. 39, no. 1 (July): 31–57.
- Elias, Victor Jorge. 1992. "Sources of growth in Latin American countries." *Review of Economics and Statistics*, 60 (August): 363–70.
- Fujita, N. 1994. "Liberalization policies and productivity in India". *The Developing Economies*, vol. XXXII, no. 4 (December): 509–24.
- Gulhati, Ravi. 1981. "Industrial strategy for late starters: The experience of Kenya, Tanzania and Zambia". *World Bank Staff Working Paper No. 457*. May.

- Havrylyshyn, O. 1990. "Trade policy and productivity gains in developing countries: A survey of the literature." *World Bank Research Observer*, vol. 5 (January): 1–24.
- Hopcraft, P.N. 1972. "Outward looking industrialization: The promotion of manufactured exports from Kenya." *Working Paper No.141*. Institute for Development Studies, University of Nairobi.
- Hulten, Charles R. 1978. "Growth accounting with intermediate inputs". *Review of Economic Studies*, 45: 511–18.
- Jorgenson, D.W. and Z. Griliches. 1967. "The explanation of productivity change". *Review of Economic Studies*, 34 (July): 249–83.
- Kwak, Hyuntai. 1994. "Changing trade policy and its impact on TFP in the Republic of Korea". *The Developing Economies*, vol. XXXII, no. 4: 398–422.
- Levine, Ross and David Renelt. 1992. "A sensitivity analysis of cross-country growth regressions". *American Economic Review*, vol. 82: 942–63.
- Little, I.M.D., R.N. Cooper, W.M. Corden and S. Rajapatirana. 1995. *Boom, Crisis, and Adjustment: The Macroeconomic Experience of Developing Countries*. New York: Oxford University Press.
- Lopez, Ramon. 1991. "How trade and macroeconomic policies affect economic growth and capital accumulation in developing countries". Working Paper WPS 625. The World Bank
- Low, Patrick. 1977. "Trade policy as a determinant of industrial structure: The case of the Kenyan pharmaceutical industry". Working Paper No. 329. Institute for Development Studies, University of Nairobi.
- McCarthy, F. Desmond, J. Hanson and S. Kwon. 1985. "Sources of growth in Colombia, 1963–1980". *Journal of Economic Studies*, vol. 12: 3–4.
- Mwega, F.M. 1995. "Trade liberalization, credibility and impact: A case study of Kenya, 1972–94." Draft final report prepared for the AERC Collaborative Project on Trade Liberalization and Regional Integration in Sub-Saharan Africa.
- Mwega, F.M., N. Mwangi and F. Olewe-Ochilo. 1994. *Macroeconomic Constraints and Medium-Term Growth in Kenya: A Three-Gap Analysis*. Research Paper No. 23. African Economic Research Consortium, Nairobi.
- Nishimizu, Mieko and Robinson Sherman . 1984. "Trade policies and productivity change in semi-industrialized countries". *Journal of Development Economics*, 16: 177–206.
- Norsworthy, J.R. 1984. "Growth accounting and productivity measurement". *Review of Income and Wealth*, Series 30, No. 3: 309–29.
- Okamoto, Y. 1994. "Impact of trade and FDI liberalization policies on the Malaysian economy". *The Developing Economies*, vol. XXXII, no. 4 (December): 460–78.
- Pack, Howard. 1972. "Employment and productivity in Kenyan manufacturing". Discussion Paper No. 149. Institute for Development Studies, University of Nairobi.
- Phelps, E.S. 1966. "Models of technical progress and the golden rule of research". *Review of Economic Studies*, 33: 133–45.
- Ram Rati. 1985. "Exports and economic growth: Some additional evidence". *Economic Development and Cultural Change*, 12: 59–74.
- Reinikka, Ritva. 1994. "How to identify trade liberalization episodes: An empirical

- study on Kenya". *Working Paper Series*, Centre for the Study of African Economies WPS/94.10.
- Renelt, David. 1991. "Economic growth: A review of the theoretical and empirical literature". *Working Paper WPS 678*. The World Bank.
- Republic of Kenya. 1986. *Sessional Paper No. 1 on Economic Management for Renewed Growth*. Nairobi: Government Printer.
- Republic of Kenya. 1983. *Report of the Presidential Committee on Unemployment 1982/83 (Wanjigi Report)*. Nairobi: Government Printer.
- Ritter, A.R.M. 1986. "The labour force, employment and unemployment in Kenya". *Technical Paper 86-04*. Long-Range Planning Division, Ministry of Planning and National Development. Nairobi: Kenya.
- Ritter, A.R.M. 1988. "Productivity change in the non-agricultural economy of Kenya, 1966–1987". Mimeo. African Economic Research Consortium (AERC) library.
- Rivera-Batiz, L.A. and M.P. Romer. 1991. "Economic integration and endogenous growth". *Quarterly Journal of Economics*, vol. 102, no. 2 (May): 531–55.
- Rodrik, Dani. 1992. "Conceptual issues in the design of trade policy for industrialization". *World Development*, vol. 20, no. 3: 309–20.
- Romer, Paul. 1986. "Increasing returns and long-run growth". *Journal of Political Economy*, 94: 1002–1037.
- Rosegrant, M.W. and R.E. Evenson. 1992. "Agricultural productivity and sources of growth in South Asia". *Center Paper No. 466*. Economic Growth Center, Yale University.
- Schiff, M. and A. Valdès. 1992. *The Plundering of Agriculture in Developing Countries*. Washington, D.C.: The World Bank.
- Shaaeldin, Elfatih. 1989. "Sources of industrial growth in Kenya, Tanzania, Zambia and Zimbabwe: Some estimates." *African Development Review*, vol. 1 no. 1: 21–39.
- Sharpley, J. and S.R. Lewis. 1988. "Kenya's industrialization, 1964–84". Discussion Paper 242. Institute of Development Studies, University of Sussex.
- Solow, Robert. 1956. "A contribution to the theory of economic growth". *Quarterly Journal of Economics*, 70, no.1. (Feb): 65–94.
- Solow, Robert. 1957. "Technical change and the aggregate production function". *Review of Economics and Statistics*, vol. 39, no. 3: 312–20.
- Stiglitz, E. Joseph. 1996. "Some lessons from the East Asian miracle". *The World Bank Research Observer*, vol. 11, no. 2: 151–77.
- Tybout, J.R. 1992. "Linking trade and productivity: New research directions". *World Bank Economic Review*, vol. 6, no. 2: 189–212.
- Urata, S. 1994. "Trade liberalization and productivity growth in Asia: Introduction and major findings". *The Developing Economies*, vol. XXXII, no. 4: 363–72.
- Urata, S. and K. Yokota. 1994. "Trade liberalization and productivity growth in Thailand". *The Developing Economies*, vol. XXXII, no. 4: 444–59.
- Vandemoortele, Jan. 1985. "Causes of economic instability in Kenya: Theory and evidence". *Eastern Africa Economic Review*, vol. 1 no. 1.
- Vandemoortele, J. 1984. "Kenya data compendium: 1964–1982". Occasional Paper No. 44. Institute of Development Studies (IDS), University of Nairobi.

- Wagacha, B.M. 1976. "An analysis of the trade regime in Kenya". Working Paper No. 281. Institute for Development Studies, University of Nairobi.
- Wilson, L.S., G.M. Barber and W. Milne. 1992. "Capital stock estimates for Kenya by industry and asset 1972–1992." Technical Paper 86-04. Long-Range Planning Division, Ministry of Planning and National Development. Nairobi, Kenya.
- World Bank. 1995. TEP Study on Trade Policy Reform in Sub-Saharan Africa: The Case of Kenya: Trade Policy as a By-product of Macroeconomic Policy. Mimeo.
- Yih-Chyi Chuang. 1996. "Identifying the sources of growth in Taiwan's manufacturing industry". *The Journal of Development Studies*, vol. 32, no. 3.
- Young, Alwyn. 1994. "The tyranny of numbers: Confronting the statistical realities of the East Asian growth experience". NBER Working Paper No. 4680, March.



# Appendix A. Data sources and definition and computation of variables

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## Data sources

Some of the data sources used in the study are:

- Output: *Statistical Abstracts, Economic Surveys*, historical economic data compiled by the Long-Range Planning Unit, Ministry of Planning and National Development.
- Capital stock: Vandemoortele (1984), on capital stock by industry; Ritter (1986) and Wilson et al. (1992) have also compiled similar data based on information from the Central Bureau of Statistics (CBS).
- Wage levels for skilled and unskilled labour: CBS records on employment and earnings in various years.

Other sources included International Financial Statistics (IFS), International Monetary Fund (IMF) and International Labour Organization (ILO) records. It would have been gratifying to report that the data from these sources are completely error free, but this is certainly not the case. A number of issues are still anticipated: (1) There are errors of aggregation. (2) Because of the fragmented character of data sources and coverage, estimates of employment, wages, capital stock and output have had to be constructed.

## Estimating variables

### ***Sectoral output***

Real output data were preferred to value added. This choice was justified by the fact that value added statistics suffer from several defects, i.e., informal sector output appears to be largely omitted from value added estimates, since in Kenya, a large number of people are employed in informal or traditional sector activities. There is also a difficulty in measuring the value of output accommodating improvements in product quality that neither reduce production costs nor raise product prices.

### ***Capital stock***

Because estimation of capital stock is always imprecise, official estimates are not available for Kenya. However, Wilson et al. (1992) have computed data on investment and capital stock by industry for Kenya for the period from 1972 to 1991. These were improvements and update of earlier capital stock estimates by Vandemoortele (1984) dating back to 1954. The capital stock data were computed using the perpetual inventory approach, i.e.,

estimates for successive years are arrived at by (1) depreciating the previous year's stock and then (2) adding new investment according to the following relationship:

$$KAP_t^{ij} = KAP_{t-1}^{ij}(1-\delta^{ij}) + INV_{t-1}^{ij}$$

where  $KAP_t^{ij}$  represents capital stock of type  $j$  in sector  $i$  at time  $t$ ,  $\delta^{ij}$  represents the rate of depreciation for capital of type  $j$  in sector  $i$ , and  $INV_{t-1}^{ij}$  represents the level of investment of type  $j$  in sector  $i$ . There are six kinds of capital inputs considered in the existing data ( $k_1, k_2, k_3, k_4, k_5, k_6$ ) where:

$k_1$  = non-residential buildings

$k_2$  = construction and works

$k_3$  = land improvements and plantation development

$k_4$  = transport equipment

$k_5$  = machinery and other equipment

$k_6$  = breeding stock and dairy cattle

Hence  $K_t = \sum k_{it}$  where  $i = 1, \dots, 6$ .

Jorgenson and Griliches (1967: 254) have demonstrated how, beginning with the data on the value of transactions in each type of capital, this value can be separated into price of capital and quantity of capital service.

### **Human capital**

Ideally, the labour input should be reflected by the total hours worked, but data limitations preempt this. In many developing countries where there are many problems with information on employment and skill level, there is a problem of omitting the self-employed in the official employment statistics, hence in some cases it is only possible to obtain the figures of persons receiving regular payment in the sector. Hence some country studies refer to the concept of labour force rather than employment. This study used wage employment data for the manufacturing sector, while the agricultural sector includes non-wage employment estimates. Recent empirical work by Romer (1986) focusing on the role of human capital accumulation captures the quality component of the labour variable using the level of secondary education attainment. Other studies have used classification of labor occupations, e.g., professional occupations, to capture improvement in labour quality, although measurement is still complicated by the problems of measuring absence and turnover to determine regularity and stability of labour input. Work methods and organizational factors may also be of overriding importance in Kenya where, in addition to underdevelopment, ways of doing things may be largely influenced by traditional orientations as opposed to theoretical economic rationality.

Agricultural employment is given as the sum of wage employment in agriculture and rural agricultural self-employment. Self-employment in agriculture is difficult to estimate, and there seem to be very few persuasive attempts to do so. Various estimates of agricultural self-employment are noted in Appendix B, Table B8. The rationale in the Wanjigi Report (1983) and Sessional Paper of 1986 were not presented in their reports

so that evaluation is difficult. Ritter (1986) has computed data on “self-employment” in agriculture as a residual after all identified types of rural employment are deducted from the estimated rural labour force. Equally difficult is the identification of those other types of rural employment that have to be deducted.

### ***Rainfall***

The weather variable was computed from annual rainfall totals in 19 main stations in Kenya: Kiambu, Nyeri, Nanyuki, Njoro, Kitale, Kakamega, Kisumu, Kisii, Embu, Machakos, Kilifi, Kericho, Garissa, Kajiado, Nyahururu/Thomson’s Falls, Meru, Mombasa, Eldoret and Nakuru. These data are available in *Statistical Abstracts* and from the Meteorological Department. Issues to contend with include the distribution and timing of rainfall within a year, and the fact that too little or too much rainfall can lower productivity.

### ***Trade Indexes***

**Trade volume/Openness.** For this variable there have been several measures used in the past. The most common perhaps is imports plus exports as a proportion of GDP. This measure is open to question because almost all large countries have relatively small ratios simply because they are large while small countries have relatively large ratios because they are small (Bruton, 1995). Furthermore, in these small countries, variations in foreign exchange tend to inflate the imports scenario. These effects are difficult to remove. In view of this, the study adopted an average of the sum of quantum indexes for exports and imports.

**Import and export penetration indexes.** Import-penetration ratio = total imports/(gross output + imports - exports). It should be noted that the import ratio reflects not only the changes in trade regimes but also other economic factors such as the level of economic activities and the level of economic development. The decline in the import ratio may also reflect a growing domestic supply rather than increased restriction of imports. The study used quantum indexes of imports.

## Appendix B: Data-sets generated in other studies

**Table B1: TFPG in the agricultural sector**

| Country    | 1957–85 | 1957–65 | 1965–75 | 1975–85 |
|------------|---------|---------|---------|---------|
| India      | 1.01    | 0.81    | 1.22    | 0.98    |
| Bangladesh | 0.78    | 1.81    | -0.09   | 0.84    |
| Pakistan   | 1.07    | 1.65    | 1.86    | -0.36   |

Source: Rosegrant and Evenson (1992).

**Table B2: Average annual rates of growth of total factor productivity growth, 1961–1988**

| Region | Number of countries | Regional mean | Maximum  |      | Minimum     |       |
|--------|---------------------|---------------|----------|------|-------------|-------|
|        |                     |               | Country  | Rate | Country     | Rate  |
| EMENA  | 7                   | 0.55          | Malta    | 1.72 | Iraq        | -1.70 |
| LACAR  | 21                  | -0.24         | Brazil   | 1.90 | Haiti       | -4.81 |
| AFRICA | 21                  | -1.51         | Tanzania | 1.64 | Madagascar  | -4.64 |
| SASIA  | 5                   | -0.72         | Burma    | 1.47 | Bangladesh  | -3.63 |
| EASIA  | 8                   | 0.22          | Taiwan   | 1.69 | Singapore   | -2.82 |
| OECD   | 24                  | 0.68          | Greece   | 1.63 | New Zealand | -1.01 |

EMENA - Europe, Middle East and North Africa; LACAR – Latin America and Caribbean; SASIA - Southeast Asia; EASIA - East Asia; OECD - Organization for Economic Cooperation and Development.

Source: Fisher (1993: 36) in Hulten (1978: 7).

**Table B3: Total factor productivity growth by country and industry**

|                          | USA<br>1960–79 | Japan<br>1960–79 | Argentina<br>1956–73 | Chile<br>1960–81 | Korea<br>1960–77 | India<br>1060–77 | Singapore<br>1970–79 |
|--------------------------|----------------|------------------|----------------------|------------------|------------------|------------------|----------------------|
| Food                     | 1.31           | -1.24            | -0.82                | 0.12             | 5.26             | 0.24             | 0.62                 |
| Beverages                | 1.31           | -1.24            | -0.82                | 4.74             | 5.26             | -0.90            | 1.73                 |
| Tobacco                  | -0.68          | -1.24            | 2.83                 | 2.26             | 5.26             | -0.64            | 3.22                 |
| Textiles                 | 1.92           | 0.31             | -0.27                | 0.19             | 4.51             | 0.30             | -3.23                |
| Fabricated textiles      | 1.09           | 1.01             | -0.27                | -1.33            | 1.62             | 0.30             | -2.11                |
| Leather and footwear     | 0.25           | 0.69             | -                    | -2.07            | 2.80             | 0.27             | -6.50                |
| Wood and products        | 0.09           | 1.88             | -1.66                | -                | 5.62             | -0.19            | -6.57                |
| Furniture and fixtures   | 0.26           | 0.95             | -1.66                | 6.57             | 4.88             | 0.96             | -2.44                |
| Paper and products       | -0.16          | 0.84             | -                    | 2.91             | 4.52             | 0.12             | 2.18                 |
| Printing and publishing  | 0.58           | -0.08            | -                    | 0.08             | -                | 0.01             | -1.36                |
| Rubber                   | 2.59           | 0.59             | 1.42                 | -1.50            | 5.88             | -0.81            | -1.57                |
| Chemicals and products   | 1.21           | 2.44             | 3.22                 | -0.18            | 4.49             | -0.36            | 2.30                 |
| Petroleum and coal       | -1.79          | -3.16            | -                    | 3.69             | 0.68             | 0.26             | 1.49                 |
| Non-metallic minerals    | 0.07           | 1.20             | 1.52                 | 3.29             | 4.53             | -0.50            | 1.44                 |
| Ferrous metals           | -0.59          | 0.90             | 0.55                 | 0.35             | 1.87             | -0.55            | 3.41                 |
| Non-ferrous metals       | -0.59          | 0.12             | 0.55                 | -                | 1.87             | -0.55            | 3.41                 |
| Metal products           | 0.50           | 1.91             | -                    | 5.04             | 6.01             | -0.55            | -3.59                |
| Non-electrical machinery | 0.36           | 1.29             | 6.49                 | -                | 5.73             | -0.03            | -3.28                |
| Electrical machinery     | 1.58           | 3.28             | 3.28                 | -1.91            | 7.25             | 0.24             | -0.04                |
| Transport equipment      | 0.65           | 1.41             | 6.49                 | -                | 5.10             | -0.27            | 1.27                 |

Source: Pack (1972); Bruton (1995), Table 8, p. 18.

**Table B4: Total factor productivity growth (annual averages)**

|             | 1913–50 | 1950–73 | 1973–84 |
|-------------|---------|---------|---------|
| France      | 1.42    | 4.02    | 1.84    |
| Germany     | 0.86    | 4.32    | 1.55    |
| Japan       | 1.10    | 5.79    | 1.21    |
| Netherlands | 1.25    | 3.35    | 0.81    |
| UK          | 1.15    | 2.14    | 1.22    |
| USA         | 1.99    | 1.85    | 0.52    |
| Average     | 1.30    | 3.58    | 1.19    |

Source: Maddison (1987), Table 11a, p. 665 in Bruton (1995), Table 4, p. 11.

**Table B5: Factor productivity growth in Kenya's manufacturing sector**

| Year    | Labour        | Capital       | TFPG          | Total           |
|---------|---------------|---------------|---------------|-----------------|
| 1965-73 | 3.8<br>(32.8) | 5.1<br>(44.0) | 2.7<br>(23.3) | 11.6<br>(100.0) |
| 1974-83 | 3.3<br>(45.8) | 3.2<br>(44.4) | 0.7<br>(9.7)  | 7.2<br>(100.0)  |
| 1984-93 | 1.9<br>(43.2) | 1.0<br>(22.8) | 1.5<br>(34.1) | 4.4<br>(100.0)  |

Source: Mwega (1995).

**Table B 6: Growth of GDP and TFP for selected developing countries in Asia and Latin America**

|                      | 1970-1980  |            | 1980-1990  |            |
|----------------------|------------|------------|------------|------------|
|                      | GDP growth | TFP growth | GDP growth | TFP growth |
| <b>Asia</b>          |            |            |            |            |
| Korea                | 8.3        | 0.8        | 8.9        | 2.8        |
| Taiwan               | 9.3        | 5.1        | 7.4        | 3.9        |
| Singapore            | 8.6        | 0.7        | 6.8        | 1.6        |
| Thailand             | 6.5        | 1.2        | 7.5        | 2.8        |
| Malaysia             | 7.6        | 2.5        | 5.8        | 0.7        |
| Indonesia            | 7.0        | 3.1        | 5.5        | -0.1       |
| Philippines          | 5.7        | 0.8        | 1.6        | -2.2       |
| India                | 3.0        | -0.9       | 5.4        | 2.1        |
| China                | 6.0        | 1.1        | 8.3        | 2.8        |
| <b>Latin America</b> |            |            |            |            |
| Chile                | 2.5        | 0.5        | 2.8        | -0.1       |
| Argentina            | 2.6        | 0.1        | -1.2       | -1.6       |
| Mexico               | 6.4        | 1.1        | 1.6        | -2.1       |
| Brazil               | 8.2        | 0.4        | 1.5        | -1.9       |
| Colombia             | 5.3        | 0.8        | 3.4        | 0.4        |
| Peru                 | 3.7        | 0.3        | -1.1       | -3.0       |
| Venezuela            | 3.1        | -2.4       | 0.7        | -0.6       |

Source: Urata (1994: 367).

**Table B7: Agricultural self-employment or non-wage agricultural employment (thousands)**

| Year        | Wanjigi Report<br>(incl. pastoralists) | IDS/Vandemoortele | 1986 Sessional<br>Paper No. 1 |
|-------------|--|-------------------|-------------------------------|
| 1964        | n.a.                                   | 3,746.5           | n.a.                          |
| 1971        | 2,589                                  | 3,981.3           | n.a.                          |
| 1974        | n.a.                                   | 4,086.4           | n.a.                          |
| 1976        | 3,005                                  | 4,158.0           | n.a.                          |
| 1981        | 3,476                                  | 4,342.0           | n.a.                          |
| 1982        | 3,579                                  | 4,380.4           | n.a.                          |
| 1983        | 3,685                                  | 4,418.5           | n.a.                          |
| 1984        | 3,794                                  | 4,457.0           | 3,860                         |
| 1985        | 3,906                                  | 4,495.4           | n.a.                          |
| Growth Rate | 2.96%                                  | 0.87%             | -                             |

Sources: "Wanjigi Report", Report of the Presidential Committee on Unemployment 1982/83, Nairobi, p. 8; J. Vandemoortele, Kenya Data Compendium, Institute of Development Studies, University of Nairobi, April 1984, p. 53; Government of Kenya, Sessional Paper No. 1 of 1986, Economic Management for Renewed Growth, Nairobi, 1986, p. 8.

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