The High 5

Growth Drivers in Kenya – A Supply Side Analysis

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Abstract

We empirically assess the drivers of output growth in Kenya using a Cobb-Douglas production function within a growth accounting framework. Our results show, contrary to earlier studies that the contribution of productivity growth to output growth has increased in recent years. This is attributable, among other factors, to reforms in the governance spaces (i.e., political, economic, and social). The results are robust to the use of alternative estimates on the share of capital in total output. We also find that the contribution of factor accumulation declined, not due to the workings of diminishing returns, as such (as Kenya is a capital scarce economy), but rather due to a decline in capital deepening. This suggests that additional room exists to further propel output growth by increasing physical capital. Furthermore, we find the contribution of human capital to output growth has declined (although not at the same rate as physical capital), thus partly contributing to the jobless growth. This situation is owing to unfavorable labor market dynamics, among other factors. An implication would be that the contribution of human capital to output growth could be enhanced by: (i) dealing with labor market rigidities through labor policy reforms, (ii) increasing employment elasticity by supporting the movement of labor from low to high labor-productivity sectors and directing investments toward sectors with higher labor absorptive capacity, and (iii) empowering the unemployed and new entrants into the labor market through human capital and entrepreneurship development.

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Growth Drivers in Kenya: A Supply-Side Analysis

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1. Introduction

Kenya is a low-middle-income economy. Its GDP has recently grown above the continental average. Nevertheless, growth has not been inclusive. The country is characterized by weak socioeconomic indicators compared with its regional peers. According to Kenya's Integrated Household Budget Survey (KIHBS) of 2018, poverty is high, estimated at 36 percent; higher than Ethiopia, at 23 percent in 2016, and Uganda, at 20 percent in 2012. With a Gini Coefficient of 47.7 percent, income inequality is also high. This is supported by the KIHBS. According to the survey, the poorest quintile accounts for 10 percent of the national consumption. The KIHBS puts unemployment at 7.4 percent and underemployment at 26 percent. The majority of the unemployed, accounting for 80 percent, are the youth. Kenya's successive development strategies plan to address perennial challenges of poverty, unemployment, and income inequality by lifting GDP growth to a higher trajectory in the medium to the longer term.[1]

Achievement of a higher GDP growth target requires knowledge about factors with higher potentials to drive growth. This helps define, *a priori*, short, medium, and longer-term policy options by exploring possibilities of increasing growth either by (i) increasing factors of production (labor and/or capital) — the case of factors of production-led growth, (ii) reallocating factors of production from low-productivity to high-productivity sectors (i.e., technical efficiency) — the case of productivity-led growth, and (iii) through technical change, i.e., an outward shift to the production possibility frontier.

There are not many studies documenting drivers of growth for Kenya. The ones we know of (see Saten and Gail, 2010; Kailo, Mutenyo, and Owuor, 2012; Bunini, 2017 and Misorimaligayo and Simiyu, 2018) could be criticized on two bases. First, they use older data series, most of them up to 2010, and therefore by construction, fail to recognize the impact of important recent reforms on productivity growth. Second, the share of capital in total output is an important parameter in any output growth decomposition exercise. The literature provides that the parameter can either be estimated from a production function or obtained from an Input-Output (IO) table. However, most studies done for Kenya relied on stylized values obtained from the empirical literature. They set the

[1] Vision 2030 targets an annual GDP growth rate of 10 percent, while the Medium-Term Plan (MTP-III) targets an annual GDP growth rate of 7 percent per annum, between 2018 and 2022.

parameter's value at 0.3, 0.4, or 0.5. This is a strong assumption, considering variations across as well as within regions in production organizations.

In this study, an attempt is made to contribute to the empirical literature by (i) extending the coverage of the data from 1961 to 2017, with the objective of capturing possible impacts of recent developments in the policy spaces; (ii) fitting a production function (rather than relying on stylized values) to estimate the share of capital in total output, to help decompose the contributions of factors of production, namely labor, capital, and total factor productivity to output growth. The remainder of the paper is organized as follows: Section 2 discusses the literature, Section 3 addresses methods, Section 4 contains results and discussion, Section 5 is on determinants of productivity growth, and, finally, Section 6 presents conclusions.

2. Literature Review

The literature on factors driving the growth path of economies has evolved over time, from what is called exogenous/traditional/neoclassical growth theories of the 1940s and 1950s, to various strands of growth theories known broadly in the literature as endogenous/New Growth Theories (NGT). Within the exogenous growth model context, we have the Domar (1946) Multiplier-Effect Economic Growth Model and the Solow (1956) growth model. The Solow growth model has dominated the empirical literature. This has to do with its ease of application emanating from its consideration of labor, capital, and technological progress as important determinants of production, on the one hand, and ease of production function formulation, on the other hand, as it is done within a constant returns to scale framework. An important feature of the theory is its proposition that growth, driven by factor accumulation, will have a temporal level effect on output and therefore cannot be sustainable. This has the implication that only technical progress (measured by total factor productivity (TFP)) can bring sustainable long-term growth.

The endogenous growth models have made important extensions to the Solow exogenous growth model. They emerged in opposition to Solow's proposition of a constant returns to scale (c.r.s) production function formulation. For them, unlike the exogenous growth model, technical progress is determined by internal sources. Therefore, capital investments, if modeled properly (i.e., used in innovative investments and intellectual capital) could lead to increasing returns to scale (i.r.s.).

The theoretical literature provides various endogenous growth models. They differ in the choice of which factor of production is augmented in an attempt to endogenize technical change. Examples include: the physical capital-based endogenous growth models of Frankel (1962); intellectual capital-based endogenous growth theories of Romer (1986), known as knowledge-based growth model; endogenous growth models of industrial innovation, such as Grossman and Helpman (1991), and Aghion and Howitt (1992); and Lucas (1988) human capital-based endogenous growth theories. The theoretical literature on endogenous growth models was further expanded, by incorporating in its functional form, factors that affect efficiency of capital, namely fiscal policy (Barro, 1990), exchange rates (Rodrik, 2008), and interest rates (Gelb, 1989).

Nevertheless, the two theoretical models have important similarities. They, in their original form, remain relevant in: (i) justifying the importance of the TFP as a major determinant of long-term output growth; (ii) understanding the importance of factor accumulation as an important driver of output growth in the short to the medium term, even under the assumption of diminishing marginal productivity; and (iii) explaining the importance of TFP growth to lift middle-income countries out of the so-called middle-income country trap.

Review of the empirical literature indicates that, regardless of the growth theory advanced (implied in most cases in the type of functional forms chosen), findings on the growth drivers are consistent with the level of advancement of an economy. Physical and human capital accumulation are major drivers of growth in developing economies, while it is TFP in advanced economies. For example, TFP accounted for 75 to 87 percent of the output growth in the United States (Denison, 1967), 67 percent in the OECD countries (Aghion and Howitt, 2007), and 30 percent in Latin American countries (Young, 1995). It is also well documented that the rapid economic growth in East Asian economies was led by adoption of advanced economies technologies (Romer, 1993). Furthermore, in Sub-Saharan Africa, growth is primarily driven by factor accumulation (Tahari, Ghura, Akitoby, and Aka, 2004). The above information suggests the need for transition of developing economies from a capital accumulation-led growth to a productivity (TFP)-led growth, not only to shift output to a higher growth trajectory but also to make growth sustainable.

The literature on growth is not much dedicated to estimating a production function to determine the share of capital in output (an important step to decompose growth into factors of

production). It is instead more focused on the derivation of the TFP from an assumed production function (mostly a Cobb-Douglas production function) by fixing the share of capital in total output at a certain value. In general, the empirical literature lists the following as important determinants of TFP growth: structural reforms (Misorimaligayo and Simiyu, 2018); economic, institutional, and trade policy reforms (Barro and Sala-i-Martin, 1997; Olsen, 1996; and Bosworth and Collins, 2003)); targeted government interventions (Krueger, 1993); and trade openness to allow importation of capital, improve foreign direct investment inflow and deepen the financial market (Renelt, 1991; Romer, 1993).[2]

This paper attempts to contribute to the existing empirical literature on Kenya by addressing specific gaps. The studies we found are relatively old (Saten and Gail, 2010; Kailo, Mutenyo, and Owuor, 2012). They do not document the period characterized by rapid growth, during which a relatively conducive environment for TFP growth was created. In addition, the majority of the studies relied only on one of three sources of factor share[3] identified in the literature to decompose output growth. They used a stylized value for capital share of output to decompose determinants of output growth from an assumed production function. Bunini (2017) set the output share of capital at 0.33; Kailo, Mutenyo, and Owuor (2012) used different values, e.g., 0.5, 0.3, and 0.2.

Fixing the share of capital at a certain value, was a dominant feature in the earlier phases of the empirical literature. There is heavy criticism for its assumption of equal levels of technology across countries (Senhadji, 2000). Fitting a production function is becoming a dominant practice in the recent empirical literature. However, it is not spared criticism either, which stems from the choice of the functional form of the production function to be estimated; assumptions made regarding returns to scale (a constant returns to scale is gaining traction due to its ease of application); and assumptions regarding the market structure in which agents are assumed to operate (see World Bank, 2000, for general criticisms of production function assumptions). In this study, an attempt is made to contribute to the empirical literature by extending the length of the time series data used, with the objective of capturing the impact of recent developments in the policy spaces

[2] The reader is referred to Section 4 for a review of the empirical literature on the determinants of TFP growth in Kenya.

[3] The other two sources for a factor share include the input-output (IO) table and fitting a production function. The IO approach, although fully supported by theory, is less applied in the empirical literature because countries seldom update their IO tables.

and by estimating output share of capital using a production function. Detailed discussions on these and other methodology-related issues are presented in Section 3.

3. Data and Methodology

The data used in this study were obtained from various sources. Data on employment and human capital were obtained from Penn World Tables (PWT) while GDP and gross capital formation, at 2010 constant prices, were obtained from the World Bank's World Development Indicators (WDI) database. Coverage of the time series data runs from 1960 to 2017.

The objective of this study is to deconstruct drivers of output/GDP growth in Kenya, which is done sequentially. First, a Cobb-Douglas production function is fitted to estimate the share of physical capital in total output. Second, a Solow (1957) growth accounting framework is fitted to decompose output growth into physical capital, human capital, and the TFP.

A production function within a constant-returns-to-scale Cobb-Douglas framework could take the form:

$$Y = AK^{\alpha}(E)^{(1-\alpha)} + \varepsilon, \qquad [1]$$

where, Y is real output, K is capital, E is employment, which is augmented by human capital, H (i.e., E=L*H), A is a measure of total factor productivity (TFP), α is share of capital in real output, and ε is residual term, $\varepsilon \sim N(\mu, \sigma^2)$.

In line with a constant-returns-to-scale Cobb-Douglas framework, a restricted function of the form may be obtained as:

$$\left(Y/_E\right) = B\left(K/_E\right)^{\alpha} + \varepsilon\ , \qquad [2]$$

where, $Y/_E$ is output per worker, and $K/_E$ is capital per unit of worker or capital deepening.

Applying an *equi-marginal* principle to Equation 1 and rearranging, assuming a perfectly competitive market, we obtain the share of workers in total output as: $(1-\alpha) = \frac{wE}{pY}$, where w represents wage, and p is the price of output. The share of capital in total output is thus given by α.

Output growth is decomposed into physical capital as:

$$K_c = \alpha K_g, \quad [3]$$

where K_c is the contribution of physical capital to output growth, and K_g is growth in physical capital. Labor is treated as: $L_c = (1 - \alpha)L_g$, where L_c is the contribution of human capital to GDP growth, and L_g is growth in human capital.

Employment intensity of growth is given by:

$$\gamma_l = \frac{\frac{Y}{E}}{\frac{\partial Y}{\partial E}} = (1 - \alpha), \quad [4]$$

where γ_l is the employment elasticity of growth.

4. Results and Discussion

4.1 The Share of Capital

The following standard steps were followed to establish the data generating process. The time series property of each variable entered into the production function was tested to determine the level of integration. Results indicated that each variable is integrated of order one, i.e., *I (1)* (see Table 1). This means differencing a variable only once is sufficient to convert it to a stationary series.

Table 1: Unit Root Test

Variable	**Unit root null on level t-statistic (p-value)**	**Unit root null - First Difference t-statistic (p-value)**
Y (real GDP)	-2.52 (0.32)	-5.21 (0.00)
K (Capital)	-1.98 (0.60)	-8.15 (0.00)
E (Employment)	-3.49 (0.98)	- 3.47 (0.01)

Source: Author's calculations, based on PWT and WDI.

Next, Equations 1 and 2 in unrestricted and restricted formats, respectively, were fitted in natural logarithms.[4] Table 2, column 2 confirms the stability of the long-run relationships among variables in the two equations. Table 2, column 3 presents results from a Wald test. The test cannot reject the constant returns to scale as null. In general, according to the results found, the share of capital in total output is $\alpha = 0.2$, which is true regardless of the functional form chosen — either unrestricted or restricted Cobb-Douglas production function. The value is close to the 0.3 found by Bosworth, Collins, and Chen (1995) but about half of the 0.43 calculated by Senhadji (2000) for a group of countries from Sub-Saharan Africa. Noting these similarities and differences, attempts are made in this study to see whether the results hold if the share of capital is increased to 0.3 and 0.43.

Table 2: Test for Cointegration and C.R.S

Equations	**Unit root null – Residuals t-statistic (p-value)**	**Constant returns to scale null (-1+α +(1 − α)=0 t-statistic (p-value)**
Unrestricted	-5.94 (0.00)	1.45 (0.19)
Restricted	-6.73 (0.00)	NA

Source: Author's calculations, based on Equations 1 and 2.

[4] While estimating both equations, outliers were detected based on the analysis of residuals. Their effects were controlled by introducing dummy variables.

4.2 Drivers of Growth

Output growth took an upward trend in the 1960s and 1970s, before changing course in the 1980s and 1990s. Thereafter it picked up again although at varied paces. In the following paragraphs, results from output growth deconstruction are discussed by setting the capital share of output, α, at 0.2. In addition, a higher estimate of $\alpha = 0.3$, calculated for Kenya by Bosworth, Collins and Chen (1995), and an even higher estimate of $\alpha = 0.43$, calculated by Senhadji (2000) for Sub-Saharan countries, were applied to check for the sensitivity of the results to higher values of α (see Appendix 1 for a summary of results).

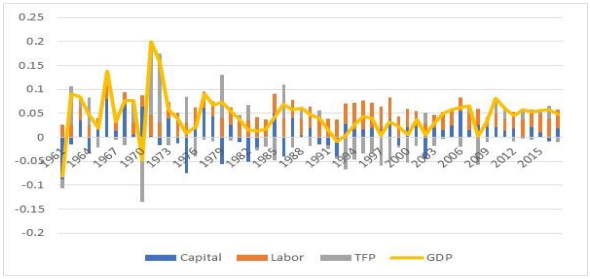
Table 3: Growth Decomposition Using Different Estimates of α

		$\alpha = 0.2$			$\alpha = 0.3$			$\alpha = 0.43$		
Period	GDP	Capital	Labor	TFP	Capital	Labor	TFP	Capital	Labor	TFP
1961–1970	0.044	0.014	0.026	0.004	0.022	0.023	0.000	0.031	0.018	-0.005
1971 1980	0.077	0.003	0.037	0.036	0.005	0.033	0.039	0.007	0.027	0.043
1981–1990	0.040	-0.002	0.038	0.004	-0.004	0.034	0.010	-0.005	0.027	0.018
1991–2000	0.019	0.008	0.046	-0.036	0.012	0.040	-0.034	0.018	0.033	-0.032
2001–2010	0.042	0.018	0.030	-0.005	0.026	0.026	-0.010	0.038	0.021	-0.017
2011–2017	0.053	0.010	0.036	0.008	0.015	0.031	0.007	0.021	0.025	0.007
1961–2017	0.045	0.008	0.036	0.001	0.013	0.031	0.002	0.018	0.025	0.002

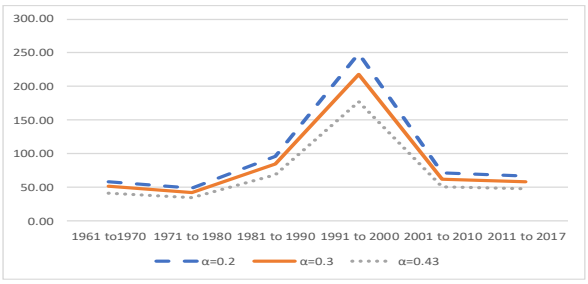
Source: Author's calculations.

Table 3 shows that regardless of the value of α chosen, overall, factor accumulation (i.e., labor plus capital) is an important driver of output growth in Kenya. However, a look into overtime trends paints a different picture. Its contribution to output growth declined from over 100 percent in the 1960s–2000s, to 85 percent in 2011–2017 (Figure 1). On the contrary, the contribution of TFP growth to output switched from a negative to a positive. It accounted for 15 percent of the 5.3 percent output growth realized from 2011 to 2017. See Section 5 for factors contributing to TFP growth.

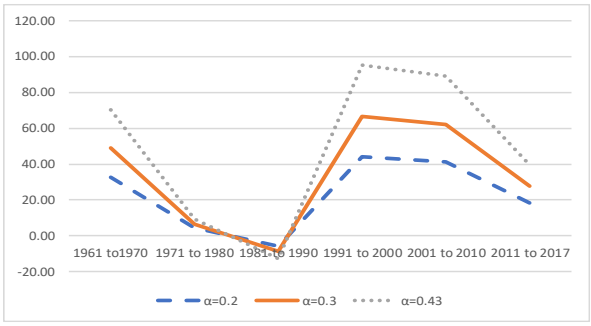
Figure 1: The Contribution of Factors of Production to Output Growth



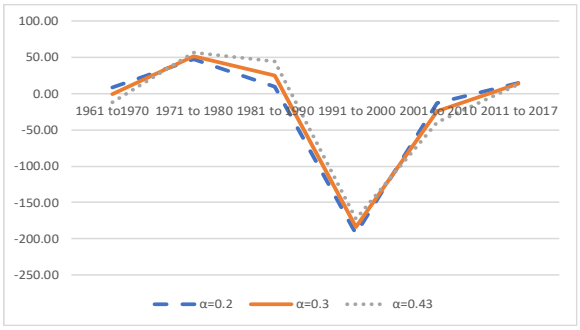
Panel a: Contribution of labor, capital, &TFP, percentage points $\alpha = 0.2$



Panel b: Contribution of labor, percent of total



Panel c: Contribution of capital, percent of total



Panel d: Contribution of TFP, percent of total

Labor (augmented by human capital) is an important driver of output growth in Kenya. It accounted, on average, for 57 to 78 percent of the output growth from 1961 to 2017. Its contribution increased steadily from 1961 to 2000; accounted for the entire output growth in the 1980s, 1990s, and 2000s; and stabilized thereafter, within the 48 and 68 percent range, from 2011 to 2017 (Figure 1, panel b).

Human capital's recent growth contribution performance points to the fact that demand for labor did not respond well to the rapid output growth, indicating that jobless growth is at play. This is reflected in the unchanged 9.5 percent average rate of unemployment estimated by the International Labour Organization (ILO). The jobless growth could be attributed, on the demand side, to the weak structural change (e.g., limited flow of investments into sectors with higher labor absorptive capacity), lower labor productivity (exacerbating the lower demand for labor growth) and relatively investment-unfriendly labor policy (e.g., higher cost of labor and labor unionization). On the supply side, jobless growth could be blamed on demographic factors (e.g., a youth bulge) and human capital development, reflected in the quality of the labor force.

The youth bulge is one of the important demographic factors that contributed to the overtime increase in the number of new entrants into the labor force. According to the WDI data, the number of new entrants into the labor market increased, on average, from 409,000 in 1992–2008, to 567,000 in 2013–2017. Kenya defines a youth as any person aged 15 to 34 years. The youth account for 35 percent of the population (KIHBS, 2016). According to the Kenya Integrated Household Budget Survey (KIHBS), in 2015/16, close to 67 percent of the youth were unemployed. The youth bulge is expected to continue impacting the labor force for the foreseeable future because 80 percent of Kenyans are less than 35 years old. Therefore, engaging the youth in productive activities remains critical for the country to benefit from an expected demographic dividend from the youth bulge.. On the demand side, according to the Kenyan National Bureau of Statistics (KNBS), the number of new jobs created increased, on average, by 4.5 percent[5] every year from 2013 to 2017 — lower than the 5 percent or higher growth needed to put a significant dent in the rate of unemployment. The average number of people employed increased from 10.7 million in 1991–2008, to 15.7 million in 2009–2017, a 46 percent increase.

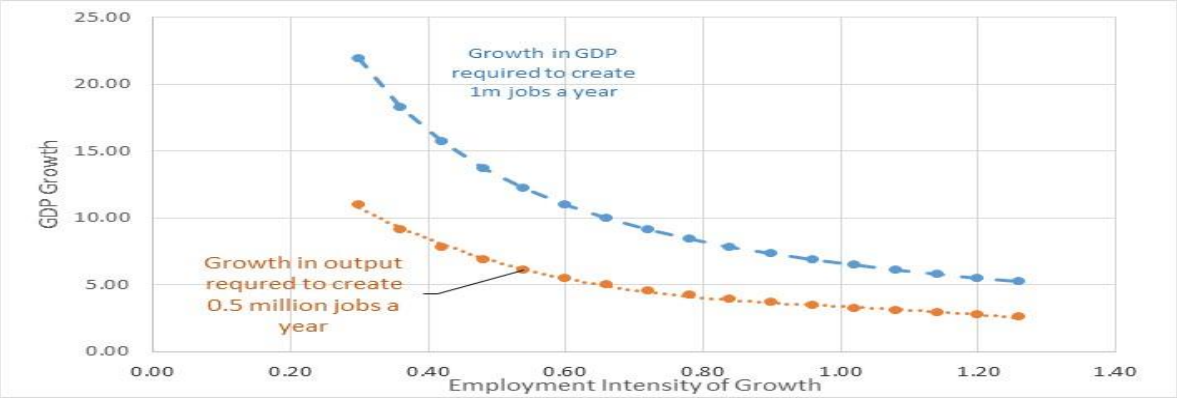
Next, two scenarios were run using an employment elasticity of 0.8, as calculated in this study (see Equation 4 for the method). We call the first scenario "business as usual" and attempted to calculate the rate at which output must grow to create half a million new jobs every year — equivalent to the average number of new entrants into the labor force since 2009. This is tantamount to keeping the rate of unemployment unchanged at its current level. The second scenario took as its target, determining the rate at which output must grow to create one million new jobs — over and above the number of new entrants into the labor market — which would be sufficient to reduce the rate of unemployment to 5 percent. According to the results found and presented in Figure 2, the first scenario indicates that with employment elasticity/intensity of growth (γ_l) fixed at 0.8, the economy needs to grow, on average, by 4.22 percent a year to create half a million jobs a year. As regards to the second scenario, results indicated that Kenya's economy must grow by at least 8 percent to reduce the rate of unemployment to 5 percent or less. Furthermore, results demonstrated that if the existing employment elasticity can be increased to 1 (i.e., the speed of the structural change is improved), a lower output growth rate of 3.2 percent is sufficient to create half a million

[5] There is a difference between the ILO's data and the KNBS's on the total labor force due to differences in definitions applied. Close to 86 percent of the new jobs created were in the informal sector.

jobs a year (i.e., no change to the rate of unemployment), while a 6 percent growth rate is needed to create one million jobs a year and reduce the rate of unemployment to less than 5 percent.

Figure 2: Output vs Employment Nexus

4.4 The Contribution of Physical Capital



Source: Author's calculations.

The contribution of physical capital to output growth, regardless of the value of α, oscillated, on average, between 19 and 40 percent, from 1961 to 2017. Its contribution to output growth underwent cycles of decline and increase during the entire period. In recent years, from 2011 to 2017, a period of rapid output growth, it registered a sharp decline, accounting for only 19 percent of the output growth if the value of α is set at 0.2 (Figure 1, panel c).

What does the recent sharp decline in the contribution of physical capital to output growth imply? Does it signal, in accordance with the neoclassical growth theory, that the law of diminishing returns is at play, or, in other words, that physical capital accumulation cannot play any further part in propelling output growth? Not necessarily, as Kenya is a capital-scarce economy. Rather, it implies that room exists for physical capital accumulation to contribute more to output growth than it recently has.

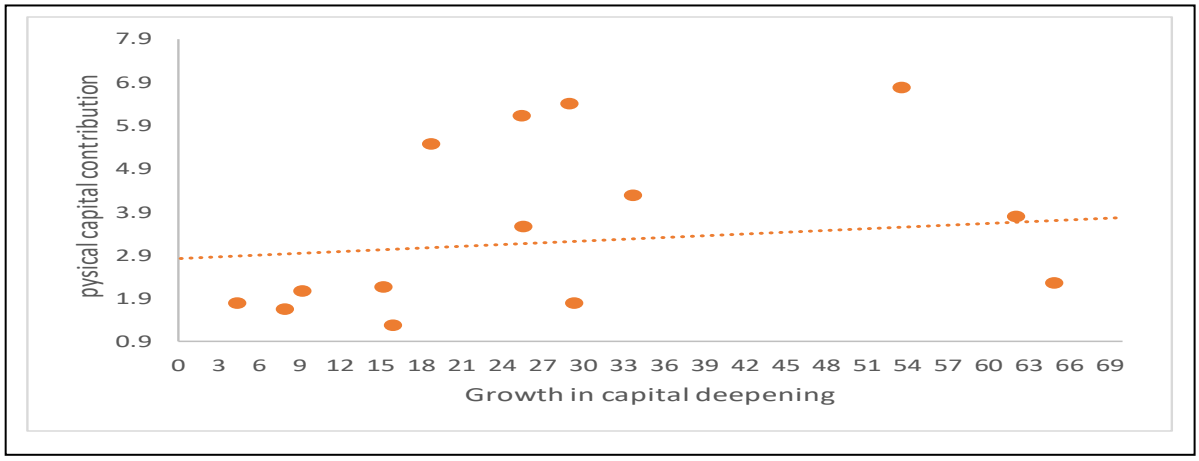
The recent decline in the contribution of physical capital to output growth had to do with the slow pace of growth in physical capital accumulation, relative to human capital growth — in other words, to the resultant lower capital-per-worker ratio (also known as capital deepening). This

means that increasing capital deepening through increased capital stock or technological improvement could reverse the declining trend in physical capital accumulation and hence capital deepening. This is expanded on in Figure 3, in which we plot the relationships between the contribution of physical capital to output growth on the vertical axis, and growth in capital deepening on the horizontal axis. The two are expected to be inversely related by construction.[6] This is especially so when an economy operates, in the neoclassical growth theory context, in the second stage of a production function. According to results from Figure 3, the two are positively correlated, which is typical of production organization in the first stage of a production function — a stage in a production function in which a factor of production, say, physical capita in our case, is scarce relative to human capital. This implies, in the absence of a technical change, the declining trend in the contribution of physical capital to output growth could be reversed by increasing the capital stock relative to human capital, or by altering/adjusting the way factors of production are fixed. Areas of policy intervention in this regard could include, among others, supporting private sector investment by improving private sector access to finance. Private sector credit growth averaged 4 to 6 percent recently, much lower than the double-digit private sector credit growth target of the Central Bank of Kenya (CBK).

The limited role that physical accumulation played in output growth during this period is evidenced by Table 5 and Figure 4, panel b. The figure decomposes drivers of output per worker growth (or labor productivity growth) into growth in capital per unit of worker and TFP. Results show that a significant percentage of the labor productivity growth was driven by growth in the TFP. The contribution of capital per unit of worker decreased significantly, as compared with the prior period, i.e., 2001–2010. This had to do, as indicated earlier, to the unproportionate growth in physical and human capital.

[6] Using Equation 2 in Section 3 we have $Y/E = B(K/E)^{\alpha}$, where Y, E, K, and B are defined as before. Differentiating productivity of labor (i.e., Y/E) with respect to capital deepening (i.e., K/E), we get $\left(\frac{\partial Y/\partial E}{\partial K/\partial E}\right) = \alpha B(K/E)^{\alpha-1}$. Rearranging the left-hand side of the equation, we obtain a marginal productivity equation of the form $\partial Y/\partial K = \alpha B(K/E)^{\alpha-1}$. This shows an inverse relationship between capital deepening and marginal productivity of capital. This is the case of the second stage of production function in the context of neoclassical growth theory. It means that an increase in the marginal productivity of capital is possible through technical change (i.e., change in B) or if an adjustment is made to the level at which factor inputs (i.e., K and E) are fixed.

Figure 3: Contribution of Capital to Output Growth vs. Capital Deepening



4.5 TFP Contribution to Output Growth

The TFP (productivity) is an important determinant of economic growth in the long run (Easterly and Levine, 2001). This is recognized by Kenya's successive development strategies. The Economic Recovery Strategy Paper for Wealth and Employment Creation (ERSPWEC) (2003–2007) and Vision 2030 (together with its Medium-Term implementation plan) identified lower productivity as an important challenge of economic growth in Kenya. According to the ERSPWE, a minimum of 2.5 percent growth in TFP is needed to achieve the 10 percent per annum GDP growth envisioned by Vision 2030. This is way above the average 0.8 percent TFP growth realized from 2011 to 2017. The ERSPWE identified adoption of technology, improved governance, reduced cost of doing business, and structural change as major determinants of productivity growth (Republic of Kenya, 2003). In this section, an attempt is made to analyze Kenya's performance as far as determinants of TFP growth are concerned.

Table 4: Contribution of Capital Deepening and TFP to Growth in Output per Unit of Worker

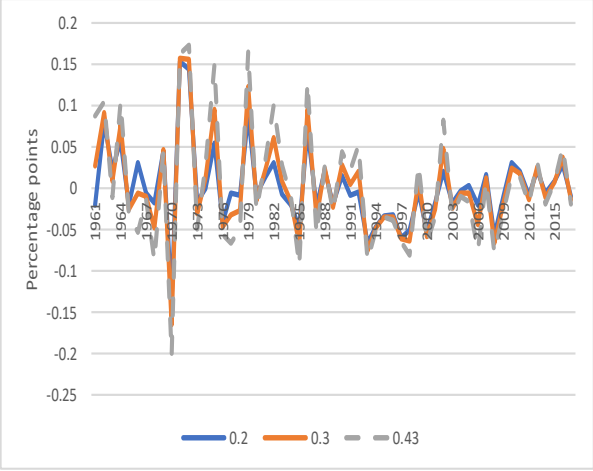
		$\alpha = 0.2$		$\alpha = 0.3$		$\alpha = 0.43$	
Period	Y/L	K/L	TFP	K/L	TFP	K/L	TFP
1961–1970	0.012	0.008	0.004	0.012	0.000	0.017	-0.005
1971–1980	0.030	-0.006	0.036	-0.009	0.039	-0.013	0.043
1981–1990	-0.008	-0.012	0.004	-0.018	0.010	-0.026	0.018
1991–2000	-0.039	-0.003	-0.036	-0.005	-0.034	-0.007	-0.032
2001–2010	0.005	0.010	-0.005	0.015	-0.010	0.022	-0.017
2011–2017	0.009	0.001	0.008	0.001	0.007	0.002	0.007
1961–2017	0.001	0.000	0.001	-0.001	0.002	-0.001	0.002

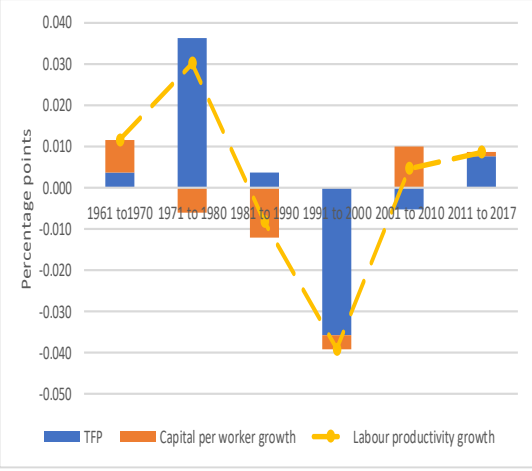
Source: Author's calculations, based on WDI data.

Figure 4, left-side panel, plots trends in TFP's contribution to output growth, obtained by setting the share of capital in output (i.e., α) at 0.2, 0.3, and 0.43. It shows that the contribution of TFP growth to output growth improved, regardless of the value of α used. This is particularly true during the period of rapid output growth from 2011 to 2017. Similarly, Figure 4, right-side panel, plots the trend in the contribution of TFP growth to growth in output per worker (labor productivity). It shows that when setting α at 0.2, TFP growth accounted, during the period of rapid GDP growth, for 89 percent of the labor productivity growth. The remaining 11 percent growth in labor productivity came from growth in capital per worker (capital deepening).

The above results imply the importance of enhancing TFP growth, not only to sustain the output growth momentum, but also to lift it to the higher growth trajectory of 7 percent envisaged by MTP-III. This requires supply-side interventions, including deepening ongoing policy, and institutional and regulatory reforms to boost TFP growth. This is necessary to surpass Kenya's output growth potential estimated by the World Bank (2019) at between 5.4 to 5.7 percent. Otherwise, attempts to achieve a higher GDP growth, though demand management policies alone, could only boost aggregate demand (a positive output gap), which could, in turn, bring attendant macroeconomic challenges.

Figure 4: The Contribution of TFP Growth to Output (Left) and Labor Productivity Growth





5. Determinants of TFP (Productivity) Growth

The literature on the determinants of factors driving TFP growth is vast. Here, we summarize, in Kenya's context, results on possible contributors to productivity growth within the realm of neoclassical and New Growth Theory theories. They include developments in the governance spaces (i.e., political,[7] economic, and social), such as improved security, human capital development,[8] infrastructure and financial market development, research and development, economic integration with the rest of the world, level of development of market institutions, factor allocations, size of government, technology transfer through foreign direct investment (FDI), economic policies (macro, sectoral, and micro), etc. Due to space limitations, economic indicators for which data is available are discussed here.

5.1 Structural Change

Shiyi, Garry, and June (2011) find positive correlation between structural change and productivity growth. This could occur via several channels, such as changes in the accumulation of physical and human capital, change in sector composition of economic activities and employment, changes in the location of economic activities, changes in demographic and distribution of income, etc. These changes could translate into productivity growth by increasing the quantity as well as quality of productive resources, creating productive employment opportunities, increasing the labor force, and improving living conditions.

Some elements of structural change are being experienced in Kenya, although slowly. Various drivers of structural change, namely sectoral shares in output and employment, drivers of labor productivity growth, and diversity of the GDP growth base are briefly discussed below.

First, the share of agriculture in total output and employment has declined while that of industry and services has increased (Table 6). The share of services in total employment increased relatively faster than that of industry. This is despite the fact that labor productivity in industry is about twice as high as that of services (Figure 5). The implication would be that the movement of

[7] According to Mo Ibrahim's Index of African Governance, Kenya has improved its ranking over the years. Kenya's best performing sub-indicators included safety and rule of law and sustainable economic opportunities.

[8] Kenya's ranking in the Human Capital Index has improved significantly over time.

labor across sectors is not guided by labor productivity differentials, and thus suggests the need to address demand- and supply-side distortions in the labor market.

Table 6: Output and Employment Shares

Agriculture				
	Share in total value added & growth in sector share in value added %		Share in total employment & growth in sector share in employment, %	
Period	Share	Growth	Share	Growth
1992-17	29	-0.95	54	0.83
1992-08	31	-0.62	52	1.51
2008-17	26	-1.58	59	-0.44
2013-17	25	-1.21	57	-0.44
Period	Industry			
1992-17	21	-0.2	9.4	-2
1992-08	21	-0.43	11	-3.8
2008-17	21	0.25	7	1.2
2013-17	21	0.02	7	1.2
Period	Services			
1992-17	50	0.66	36	-0.51
1992-08	48	0.63	37	-1.05
2008-17	53	0.71	34	0.52
2013-17	54	0.57	34	0.51

Source: Author's calculations, based on WDI data.

Second, as alluded to earlier, close to 75 percent of the growth in labor productivity is driven by sector productivity growth, while the remaining 25 percent is by reallocation of labor from low-productivity to high-productivity sectors. The latter increased over time, supporting the argument that structural change in Kenya is slow paced.

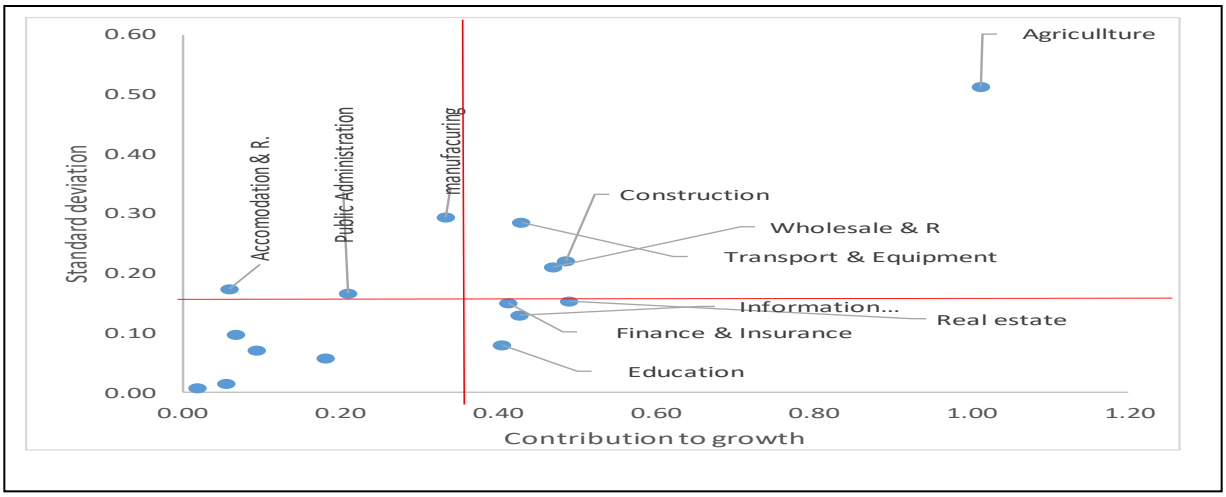
Figure 5: Sector Level Productivity

Source: Author's calculations based on WDI.

Lastly, output growth is coming from diversified but relatively volatile sources. Figure 6 classifies sources of GDP growth into four groups: high-growth-high-volatile (top right); low-

growth-high-volatile (top left); low-growth-low-volatile (bottom left); and high-growth-low-volatile (bottom right). The growth base is said to be diverse and stronger if a sizable number of activities fall within the high-growth-low-volatile quadrant. Of the 16 activities analyzed, only four, all coming from the service sector, fall into the high-growth-low-volatility quadrant, i.e., information and communication, real estate, finance and insurance, and education. Together they accounted for about 25 percent of the GDP growth. Agriculture and construction fall within the high-growth-high-volatility quadrant, while that of manufacturing is in the low-growth-high-volatility quadrant. These are activities considered to be relatively labor intensive and with higher backward and forward linkage effects.

Figure 6: Growth Contribution vs Growth Volatility



Source: Author's calculation based on KNBS data.

The following paragraphs present other determinants of TFP or productivity growth from the literature, namely trade openness, foreign direct investment (FDI) flow, improved business environment and level of development of trading partners. Where possible, Kenya's performance in these indicators is discussed.

5.2. Trade and Investment

The literature establishes the importance of trade to long-term growth by creating a link between investment and technology. Countries that are well linked to regional and global markets are believed to benefit from trade-instigated structural change. This happens by promoting factor mobility as well as finance mobility from the non-tradable to the tradable sectors. Trade could also promote the flow of FDI, which could take the form of cross-border mergers, acquisitions, or greenfields. Regardless of type, the FDI, supported by larger markets, which trade makes possible, could bring technology spillovers, economies of scale in research and development, and rewards to innovators. This could strengthen the trade-technology-productivity link and help alter production organization in favor of capital-intensive production. Andreas and Marios (2005) study channels through which foreign technology diffuses to a developing country and find that foreign R&D, technology embodied in imports of intermediate and capital goods, and FDI positively affect the growth of TFP. The empirical literature documents positive relationships between trade policy and investment (Baldwin and Seghezza, 1996a, 1996b), between trade policy investment and productivity growth (Marios, 2004), and between FDI and economic growth (Beatrice and Chrstine, 2018).

Kenya's trade policy has evolved through time from an import-substitution industrialization strategy, which dominated the period prior to the 1980s, to a more liberalized regime, which has held since the mid-1980s. Trade liberalization, in itself, has happened in several phases, all within a liberal trade policy framework — reductions in tariff rates for highly protected industries and a phasing out of non-trade barriers (e.g., import licensing) in 1986–89; export promotion to diversify the export base (e.g., Manufacture Under Bond (MUB) and Export Processing Zones (EPZ)) in 1986–89; the floating of the exchange rate in 1990–95, and the country's increased commitment to regional and global trade pacts — the East African Community (EAC), Common Market for Eastern and Southern Africa (COMESA), Word Trade Organization (WTO), and, recently, the Africa Continental Free Trade Area (ACFTA).

5.3. Business Environment

Lei, Z. and Bang, N.J. (2007), using FDI as a proxy for technology transfer, found a positive relationship between FDI and international R&D spillovers, an important channel of technology diffusion from developed to developing countries. Kenya has seen pro-business reforms recently,

which together with its strategic gateway position as a regional business hub, has contributed to increased FDI inflows. The pro-business reforms have helped in improving the country's ranking in the World Bank's Ease of Doing Business Index, World Economic Forum's Global Competitiveness Index, and World Bank's Logistics Performance Index, among others, and resulting in significant increases in FDI flows. FDI has come to Kenya in the form of mergers and acquisitions (M&A) and greenfield investments. Much of the FDI has gone into information technology and telecommunications, renewable energy, banking, real sector, manufacturing, agriculture, and tourism. Investment is coming from the United States, United Kingdom, India, Israel, Mauritius, Japan, the Netherlands, China, and South Africa.

5.4 Level of Development of Trading Partners Matters

Trading with a technologically advanced country is expected to result in technology spillover to less-advanced country when the latter has a stock of knowledge capital that is not far behind its trading partner and has the ability to exploit an international pool of knowledge. Such trade relationships could lead to a long-term rate of growth. On the contrary, theory has it that the relationship could retard growth if country B is far behind A in its stock of knowledge capital and B cannot tap into the international pool of knowledge (Grossman and Helpman, 1991). Kenya's merchandise exports have remained relatively flat at US$5.3 billion, while imports increased by nearly 50 percent, reaching US$16 billion recently. The surge in imports had to do with infrastructure projects, including industrial, transport and construction equipment, engineering products, tractors, etc. Kenya's exports to the EAC countries accounted for about 25 percent of its total exports, while its imports from the same represented only 2.1 percent of its total imports, the lowest compared with its EAC trading partners. Furthermore, at 44 percent, Africa is the major destination for Kenya's exports, much higher than the level of intra-Africa imports at 17 percent. On the contrary, Kenya's imports from the continent was low, at about 11 percent, the lowest compared with EAC countries and the continental average of 13 percent. Results indicate that Kenya's level of exports to EAC (24 percent) and the continent (44 percent) is high. This suggests that the country is relatively insulated from trade-related shocks originating from advanced economies. In addition, it implies that 90 percent of Kenya's imports come from outside the continent, from countries that are more technologically advanced than itself. The majority of Kenya's imports come from China, India, the United States, the United Arab Emirates, United Kingdom, and Japan. Therefore, one could argue that given Kenya's stock of knowledge capital

and ability to exploit an international pool of knowledge (as demonstrated in the telecommunications and mobile platforms), it is favorably placed to benefit from technology transfer as a result of its growing trading relationship with technologically advanced economies.

6. Conclusion

A growth accounting exercise is applied in this study to decompose output growth into growth in physical capital, human capital, and productivity growth. The literature on the topic is vast and growing. In this study, contrary to the available empirical literature for Kenya, which used stylized values for capital share of output, a production function was fitted to estimate the share of capital in output. By so doing, it avoided the common criticism leveled against available studies in assuming equal technology across countries. The Cobb-Douglas production function adopted here to estimate the capital share of output, is not without its share of weaknesses either. This emanates, first, from the choice of the functional form, which determines the nature of the returns to scale assumption to be imposed. A second criticism is the assumption that agents operate in a perfectly competitive market structure. In this study, an attempt was made to address the first criticism by testing for the validity of a constant returns to scale assumption before it was imposed. The second criticism remains valid and, as in many other similar studies, is an important weakness of this study.

Available data shows that the years from 2011 to 2017 can be characterized as years of relatively rapid output growth for Kenya. Output grew, on average, by 5.3 percent a year. According to results found, it is made up of growth in factor accumulation and factor productivity. However, compared with the prior periods, the contribution of the former gradually declined, while that of the latter increased. The decline in the contribution of factor accumulation had to do with slow growth in physical capital, relative to human capital. This is reflected in overtime decline in capital per unit of worker (i.e., capital deepening). Physical capital accumulation accounted for 19 percent of the output growth. Its poor showing had little to do with the workings of the law of diminishing returns (in line with the exogenous growth theory) because Kenya is a capital-scarce economy. Kenya continues to hold high potential to achieve higher output growth than realized by increasing its capital stock or through technological advancement.

Human capital augmented employment is an important driver of output growth. It accounted for about 67 percent of the 5.3 percent output growth realized from 2011 to 2017. Nevertheless,

like physical capital, its contribution to output growth declined over time. This could be attributed to: (i) the workings of diminishing marginal returns caused by a disproportionate increase in human capital relative to physical capital — this means that adjusting the proportions in which factors of production are combined (e.g., by investing more in capital stock) could reverse the declining trend in the contribution of human capital to output growth; (ii) The slow pace of structural change resulting in lower demand for labor; and (iii) the quality of the labor force on the supply side.

The slow pace of structural change could be evidenced by: (i) the diversified but volatile nature of the sources of output growth, (ii) the lower employment intensity of growth, requiring a higher output growth of at least 8 percent or more to reduce rate of unemployment, and (iii) movement of labor not in accordance with labor productivity differentials. Only 25 percent of the labor productivity growth realized recently was driven by reallocation of labor from low to high labor-productivity sectors. Labor moved from agriculture to the services sector, despite the fact that labor productivity in industry is twice as much as that of services. This calls for policy measures to correct labor market rigidities so as to enable labor-market-driven output growth. Measures could include, among others, introducing labor policy reforms, directing investments into sectors with higher labor absorptive capacity (structural change) to diversify the growth base, and empowering new entrants into the labor market through human capital and entrepreneurship development.

This study found that the contribution of TFP growth to output growth trended (albeit slowly) upward in recent years. This could be attributed broadly to recent improvements in governance indicators — political, economic, and social. Nevertheless, it is important to note that at 0.8 percent, the TFP growth realized is much lower than the 2.5 percent growth required to achieve the 10 percent per annum output growth envisaged by Vision 2030. The 5.3 percent average growth realized recently is almost the same as the 5.4 to 5.7 potential output growth estimated for Kenya by the World Bank. Regardless, it could be argued that the current rate of growth could be sustained and even lifted to a higher trajectory of 7 percent (envisaged by the MTP-III) provided that the potentials for further TFP growth could be exploited. According to the available literature, possible avenues through which TFP growth could be enhanced, among others, include maintaining political stability, building on existing macroeconomic stability, enhancing human capital development, liberalizing trade, improving the business environment, and implementing policies that guide the adoption and diffusion of technologies.

References

Aghion, P., and P. Howitt (1992). "A Model of Growth through Creative Destruction," *Econometrica*, Vol. 60 (2), 323-51.

——— (2007). "Capital, Innovation, and Growth Accounting," *Oxford Review of Economic Policy*, Vol. 23 (1), 79-93.

Andreas, S., and Z. Marios (2005). "International Technology Diffusion and the Growth of TFP in the Manufacturing Sector of Developing Economies," *Review of Development Economics*, Vol. 9 (4), pp. 482–501.

Baldwin, R.E., and E. Seghezza (1996a). "Testing for Trade-Induced Investment-Led Growth," NBER Working Paper No. 5416 (Cambridge, MA: National Bureau of Economic Research).

——— (1996b). "Trade-Induced Investment-Led Growth," NBER Working Paper No. 5582 (Cambridge, MA: National Bureau of Economic Research).

Barro, R.J. (1990). "Government Spending in a Simple Model of Endogenous Growth," *Journal of Political Economy*, Vol. 98 (5), 103-25.

Barro, R.J., and X. Sala-i-Martin (1997). "Technological Diffusion, Convergence, and Growth," *Journal of Economic Growth*, Vol. 2 (1), 1-26.

Beatrice, W.M., and N.S. Christine (2018). "Effects of Total Factor Productivity on Economic Growth in Kenya: An Empirical Analysis," *Journal of Economics and Finance*, Vol. 9 (6), 1-23.

Bosworth, Barry, and Susan M. Collins.2003. "The Empirics of Growth: An Update," Brookings Papers on Economic Activity, 2003:1

Bosworth, B., S. Collins, and Y. Chen (1995). "Accounting for Differences in Economic Growth," paper prepared for the conference, "Structural Adjustment Policies in the 1990s: Experience and Prospects," organized by the Institute of Developing Economies, Tokyo, Japan. October 5–6.

Bunini, M. (2017). Comparative Analysis of Sources of Growth in anzania, Uganda and Kenya, A Growth Accounting Approach, Working Paper Series No.5, International Training Centre of the International Labor Organization, pp 1-34.

Cass, D. (1965). "Optimum Growth in an Aggregative Model of Capital Accumulation," *Review of Economic Studies*, Vol. 32, 233-40.

Denison, E.F. (1967). *Why Growth Rates Differ* (Washington: Brookings Institution).

Domar, E.D. (1946). “Capital Expansion, Rate of Growth, and Employment,” *Econometrica*, Vol. 14 (2), 137-47.

Easterly and Levine (2001).” It is not Factor Accumulation: Stylized Facts and Growth Models,” The World Bank Economic Review, Vol. 15, 2, 117-219.

Frankel, M. (1962) The Production Function in Allocation and Growth: A Synthesis American Economic Review 52, 996-1022.

Franklin, M. (1962). “The Production Function in Allocation and Growth: A Synthesis,” *American Economic Review*, Vol. 52 (5), 995-1002.

Gelb, A. (1989). “Financial Policies, Efficiency, and Growth,” Policy Research Working Paper No. 202 (Washington: World Bank).

Grossman, G.M., and E. Helpman (1991). *Innovation and Growth in the Global Economy* (Cambridge, MA: MIT Press).

Jorgenson, D.W. (1995). *Productivity, Volume 1: Postwar U.S. Economic Growth* (Cambridge, MA: MIT Press).

Kalio A.M., Mutenyo J., & Owuor G. (2012) “Analysis of Economic Growth in Kenya: Growth Accounting and Total factor productivity”. *Journal of Business Management and Applied Economics,* 6, 1-22.

Kenya Integrated Household Budget Survey (KIHBS) (2018). Kenya National Bureau of Statistics.

Krueger, A.O. (1993), *Political Economy of Policy Reform in Developing Countries*, Cambridge: MIT Press.

Lei, Z., and N.J. Bang (2007). “International R&D Spillovers: Trade, FDI, and Information Technology as Spillover Channels,” *Review of International Development Economics*, Vol. 15 (5), pp. 955–976.

Lucas, R.E., Jr. (1988). “On the Mechanics of Economic Development,” *Journal of Monetary Economics*, Vol. 22, 3-42.

Marios, Z. (2004). “R&D-induced Growth in the OECD?” *Review of Development Economics*, Vol. 8 (3), pp. 423–439.

Misorimaligayo, B.W., and C.N. Simiyu (2018). “Effect of Total Factor Productivity on Economic Growth in Kenya: An Empirical Analysis,” *Journal of Economics and Finance*, Volume 9 (6), 1-23

Olson, M. (1996). “Big Bills Left on the Sidewalk: Why Some Nations Are Rich and Others Poor,” *Journal of Economic Perspectives*, Vol. 10, 3-24.

Renelt, David, 1991. "Economic growth : a review of the theoretical and empirical literature," Policy Research Working Paper Series 678, The World Bank, pp 1-34..

Rodrik, D. (2008). “The Real Exchange Rate and Economic Growth,” *Brookings Papers on Economic Activity*,365-412.

Romer, P. (1986). “Increasing Returns and Long-Run Growth,” *The Journal of Political Economy*, Vol. 94 (5), 1002-37

——— (1993). “Idea Gaps and Object Gaps in Economic Development,” *Journal of Monetary Economics*, Vol. 32 (3), 543-57.

Saten, K and Gail, P(2010). “What Determines the Long Run Growth in Kenya,”[Munich Personal RePEc Archive (MRRA), pp 1-17

Senhadji, A. (2000). “Sources of Economic Growth: An Extensive Growth Accounting Exercise,” *IMF Staff Papers*, Vol. 47 (1), 129–57.

Shiyi, C., H.J. Gary, and Z. June (2011). “Structural Change, Productivity Growth, and Industrial Transformation,” *China Economic Review*, Vol. 22 (1), pp. 133–150.

Solow, R.M. (1956). “A Contribution to the Theory of Economic Growth,” *Quarterly Journal of Economics*, Vol. 70 (1), pp. 65–94.

——— (1957). “Technical Change and the Aggregate Production Function,” *Review of Economics and Statistics*, Vol. 39 (3), pp. 312–320.

Tahari, A., D. Ghura, B. Akitoby, and E. Aka (2004). “Sources of Growth in Sub-Saharan Africa,” IMF Working Paper 04/176 (Washington: International Monetary Fund).

World Bank (2019). “Kenya - Inclusive Growth and Fiscal Management Development Policy Financing,” Report No. PGD82 (Washington: World Bank Group).

——— (2000). “Measuring Growth in Total Factor Productivity,” PREM Notes, No. 42 (Washington: World Bank).

Young, A. (1995). “The Tyranny of Numbers: Confronting the Statistical Realities of the East Asian Growth Experience,” *Quarterly Journal of Economics*, Vol. 110, 641-80

Appendix 1. Contribution to GDP Growth: Growth Accounting

Year	GDP	Contribution to GDP Growth α=0.2			Contribution to GDP Growth α=0.3			Contribution to GDP Growth α=0.43		
		Capital	Labor	TFP	Capital	Labor	TFP	Capital	Labor	TFP
1961	-8.1	-8.7	2.6	-2.0	-13.0	2.3	2.6	-18.6	1.8	8.7
1962	9.0	-1.6	2.6	8.0	-2.3	2.3	9.1	-3.3	1.8	10.5
1963	8.4	3.6	2.6	2.3	5.3	2.3	0.8	7.7	1.8	-1.1
1964	4.8	-3.4	2.6	5.7	-5.2	2.3	7.7	-7.4	1.8	10.4
1965	2.0	1.5	2.6	-2.1	2.2	2.3	-2.5	3.2	1.8	-3.0
1966	13.7	8.0	2.6	3.1	12.0	2.3	-0.5	17.2	1.8	-5.3
1967	3.3	1.3	2.6	-0.6	2.0	2.3	-0.9	2.8	1.8	-1.4
1968	7.7	6.8	2.6	-1.7	10.2	2.3	-4.8	14.6	1.8	-8.8
1969	7.7	0.5	2.6	4.6	0.7	2.3	4.6	1.1	1.8	4.7
1970	-4.8	6.4	2.4	-13.5	9.6	2.1	-16.5	13.8	1.7	-20.2
1971	20.0	0.3	4.4	15.3	0.4	3.8	15.8	0.6	3.1	16.3
1972	15.8	-1.7	3.0	14.4	-2.6	2.7	15.7	-3.7	2.2	17.3
1973	5.7	3.8	3.5	-1.6	5.7	3.1	-3.1	8.2	2.5	-5.0
1974	4.0	-1.1	5.1	0.0	-1.7	4.5	1.2	-2.4	3.6	2.7
1975	0.9	-7.6	3.0	5.4	-11.4	2.7	9.6	-16.3	2.2	15.0
1976	2.1	2.3	4.0	-4.1	3.4	3.5	-4.7	4.8	2.8	-5.5
1977	9.0	6.1	3.5	-0.6	9.2	3.1	-3.2	13.2	2.5	-6.6
1978	6.7	4.3	3.3	-0.9	6.4	2.9	-2.6	9.2	2.3	-4.9
1979	7.3	-5.6	4.0	8.9	-8.4	3.5	12.3	-12.1	2.9	16.6
1980	5.4	2.6	3.6	-0.7	3.8	3.2	-1.6	5.5	2.6	-2.6
1981	3.7	-1.0	3.3	1.4	-1.5	2.9	2.3	-2.1	2.3	3.5
1982	1.5	-5.2	3.5	3.1	-7.7	3.1	6.1	-11.1	2.5	10.1
1983	1.3	-2.1	4.1	-0.7	-3.1	3.6	0.8	-4.5	2.9	2.9
1984	1.7	0.1	3.6	-2.0	0.2	3.2	-1.6	0.3	2.6	-1.1
1985	4.2	4.9	4.1	-4.8	7.4	3.6	-6.8	10.6	2.9	-9.3
1986	6.9	-4.1	3.9	7.1	-6.1	3.4	9.6	-8.7	2.8	12.9
1987	5.8	4.0	3.9	-2.1	6.0	3.4	-3.6	8.6	2.7	-5.6
1988	6.0	0.3	3.5	2.1	0.5	3.1	2.4	0.8	2.5	2.7
1989	4.6	1.9	4.5	-1.9	2.9	4.0	-2.3	4.2	3.2	-2.8
1990	4.1	-1.5	4.0	1.6	-2.2	3.5	2.8	-3.1	2.8	4.4
1991	1.4	-1.6	3.9	-0.9	-2.5	3.4	0.5	-3.5	2.8	2.2
1992	-0.8	-4.0	3.7	-0.4	-6.0	3.2	2.0	-8.7	2.6	5.2
1993	0.4	2.8	4.2	-6.7	4.2	3.7	-7.5	6.0	3.0	-8.7
1994	2.6	1.7	5.4	-4.6	2.6	4.8	-4.8	3.7	3.9	-5.0
1995	4.3	1.6	6.1	-3.4	2.4	5.3	-3.4	3.5	4.3	-3.5
1996	4.1	1.9	5.3	-3.2	2.9	4.7	-3.5	4.1	3.8	-3.8
1997	0.5	1.6	4.7	-5.9	2.5	4.1	-6.1	3.5	3.4	-6.4
1998	3.2	3.8	4.5	-5.0	5.7	3.9	-6.4	8.1	3.2	-8.1
1999	2.3	-1.7	4.4	-0.4	-2.5	3.9	1.0	-3.6	3.1	2.8
2000	0.6	2.1	3.8	-5.3	3.2	3.3	-5.9	4.5	2.7	-6.6
2001	3.7	2.3	3.2	-1.8	3.4	2.8	-2.5	4.9	2.3	-3.5
2002	0.5	-4.6	3.0	2.1	-6.8	2.6	4.8	-9.8	2.1	8.2
2003	2.9	1.9	2.7	-1.8	2.9	2.4	-2.4	4.1	2.0	-3.2
2004	5.0	1.5	3.9	-0.4	2.2	3.4	-0.6	3.2	2.7	-0.9
2005	5.7	2.5	2.9	0.3	3.7	2.5	-0.5	5.3	2.1	-1.7
2006	6.3	5.5	2.8	-2.0	8.2	2.5	-4.4	11.8	2.0	-7.5
2007	6.6	1.6	3.4	1.6	2.4	3.0	1.3	3.4	2.4	0.8
2008	0.2	2.6	3.3	-5.7	4.0	2.9	-6.6	5.7	2.3	-7.8
2009	3.3	2.1	2.1	-1.0	3.2	1.9	-1.8	4.5	1.5	-2.8
2010	8.1	2.2	2.8	3.1	3.2	2.4	2.4	4.6	2.0	1.5
2011	5.9	1.3	2.6	2.1	1.9	2.3	1.7	2.7	1.9	1.3
2012	4.5	1.8	3.6	-0.9	2.7	3.1	-1.4	3.9	2.5	-1.9
2013	5.7	-0.1	3.7	2.1	-0.1	3.2	2.6	-0.1	2.6	3.2
2014	5.2	2.1	3.7	-0.6	3.1	3.3	-1.1	4.4	2.7	-1.9
2015	5.6	1.0	3.8	0.8	1.5	3.3	0.8	2.1	2.7	0.8
2016	5.7	-0.9	3.8	2.8	-1.4	3.3	3.7	-2.0	2.7	4.9
2017	4.7	1.8	3.9	-1.0	2.7	3.4	-1.3	3.8	2.8	-1.9

Source: Author's estimations based on various data sources – World Development Indicators and Penn World Tables.