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Growth Accounting: Sources of Economic Growth in Ethiopia*

Dawit Senbet[†] and Tadesse Wodajo[‡]

Abstract

In spite of Ethiopia's over a decade long double-digit economic growth that started in 2004, there seemed to be no significant change in the economic development of the country. This study sets out to investigate the factors that drive economic growth in Ethiopia and explain why the highly praised and rapid economic growth has led to little or no change in the welfare of the society. The study uses time-series data extending from 1950 to 2017 and employs descriptive statistics and a production function and growth accounting models to examine the factors that directly or indirectly impact major macroeconomic variables. Our findings show that real capital stock accounted for most part of the real GDP growth especially during the post-2004 period, while the contribution of labor or employment to economic growth was consistently low in the same period. Overall, while a disproportionately large share of the gains from economic growth accrued to a few capital owners, the bulk of workers, averaging about 41 percent of the country's population, ended up taking only a small share of the economic pie. This shows that the country's double-digit economic growth was not inclusive, and it has manifested itself by stagnant change in the welfare of the average citizen.

Keywords: Economic Growth; Economic Development; Production Function; Growth Accounting; Cointegration; Total Factor Productivity

JEL Classification Codes: O11, O15, O47, O55

* Disclaimer: The results and conclusion, as well as any views or opinions expressed herein, are those of the author and do not necessarily reflect the views of NOAA, or the Department of Commerce.

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1. Introduction

In the last decade and half, Ethiopia was dubbed as one of the fastest growing economies in the world for registering double-digit (or near double-digit) economic growth. However, there is little evidence as to whether such high economic growth enhanced the country's economic development by improving the wellbeing of the people (Hagmann and Abbink, 2013; Alem, Köhlin and Stage, 2014; Senbet and Wodajo, 2017; Martins, 2018 and Rodrik, 2018).

Senbet and Wodajo (2017) show the divergence between the reported high real GDP or real GDP per capita growth and the social wellbeing measures. The authors concluded that they could not find any significant evidence confirming the impact of the post-2004 double-digit economic growth on selected social wellbeing measures that capture improvements in the quality of life of the ordinary people. Having failed to find significant long-term relationships between the reported economic growth and the social wellbeing measures, the authors suggested conducting an in-depth study to investigate the sources of economic growth in Ethiopia.

Accordingly, this study explores the factors that drive economic growth in Ethiopia, particularly emphasizing on the post-2004 period when the country started registering a remarkable double-digit economic growth. We employ a descriptive statistics and time series econometric models to investigate the factors that directly or indirectly impact the most used aggregate economic performance measures. We breakdown the sources of the economic growth over a long time period spanning the Imperial regime (1950–1974), the Dergue regime (1975–1990), and the Ethiopian People's Revolutionary Democratic Front (EPRDF) regime (1991–2017).¹

To address the objectives of the study, we use the data discussed in section 2 to provide an overall overview of the macroeconomic performance of the country covering a period of 68 years (1950–2017) in section 3. In section 4, we discuss in detail the empirical analysis of the growth empirics to identify the sources of economic growth in Ethiopia and present our findings. Section 5 describes the growth accounting results and the last section outlines the conclusion and recommendations of the study.

2. Sources of Data

This study employs the Federal Reserve Economic Data (FRED), Real GDP at Constant National Prices for Ethiopia, compiled by the Federal Reserve Bank of St. Louis.² The data range from 1950 through 2017 and were originally developed by the Penn World Table (PWT).³ We chose the data from PWT because PWT provides data on capital stock and other relevant variables for our analysis. We also utilized the World Development Indicators (WDI) data.

Starting with version 8, PWT reintroduced data on capital stock estimated based on cumulating and depreciating past investments using the perpetual inventory method (PIM). PWT8.0

¹ In this study, the term “Dergue regime” is used to represent the military rule that took power as Provisional Military Administrative Council (PMAC) in September 1974, and which later transformed itself into a “civilian” government by establishing the People's Democratic Republic of Ethiopia (PDRE) in February 1985 and ruled the country until May 1991.

² Retrieved from <https://fred.stlouisfed.org/series/RGDPNAETA666NRUG>, November 23, 2020.

³ For more detailed information on PWT data, see Feenstra, et al. (2015).

developed a dataset for capital stock using investments in up to six assets with their corresponding depreciation rates, which are assumed to be common across countries and over time (Inklaar and Timmer, 2013).

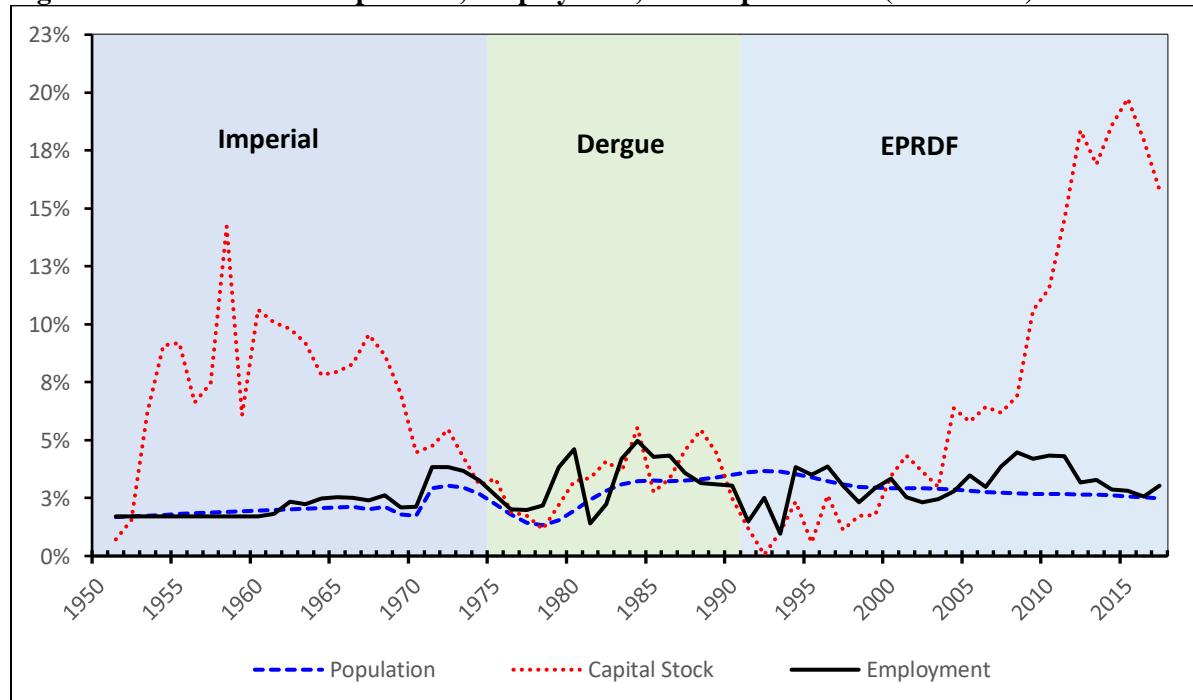
As PWT or other international agencies develop their database based on the official data originally submitted by or obtained from the various national government entities, there is no way for researchers like us to neither refute nor confirm the validity of such national data. Hence, in spite of a long-standing suspicion clouding the validity of the official data submitted to various international agencies, particularly in the past three decades, we conduct our analysis with the implicit assumption that the data we are using indeed depict the performance of the Ethiopian economy. As such, we feel obliged to put the disclaimer that the results in this study are as good as the accuracy and consistency of the data employed.

3. Macroeconomic Overview of Ethiopia (1950–2017)

This section discusses the overall performance of Ethiopia's economy in the period ranging from 1950 through 2017 using the data summarized in Appendix A and depicted by Figures 1 through 4. The analysis period covers 25, 16 and 27 years of the Imperial, Dergue and EPRDF regimes, respectively.

Starting at a low population of a little below 20 million in 1950, Ethiopia's population showed an annual average growth of 2.5 percent to reach a total population of approximately 105 million in 2017 (Figure 1). Although the growth of the part of population engaged in a gainful employment seemed to be fluctuating more than the general population, the fluctuation in capital stock growth was even higher. Overall, significantly higher capital stock growth was observed during the Imperial and EPRDF regimes. This is discussed in detail in later sections.

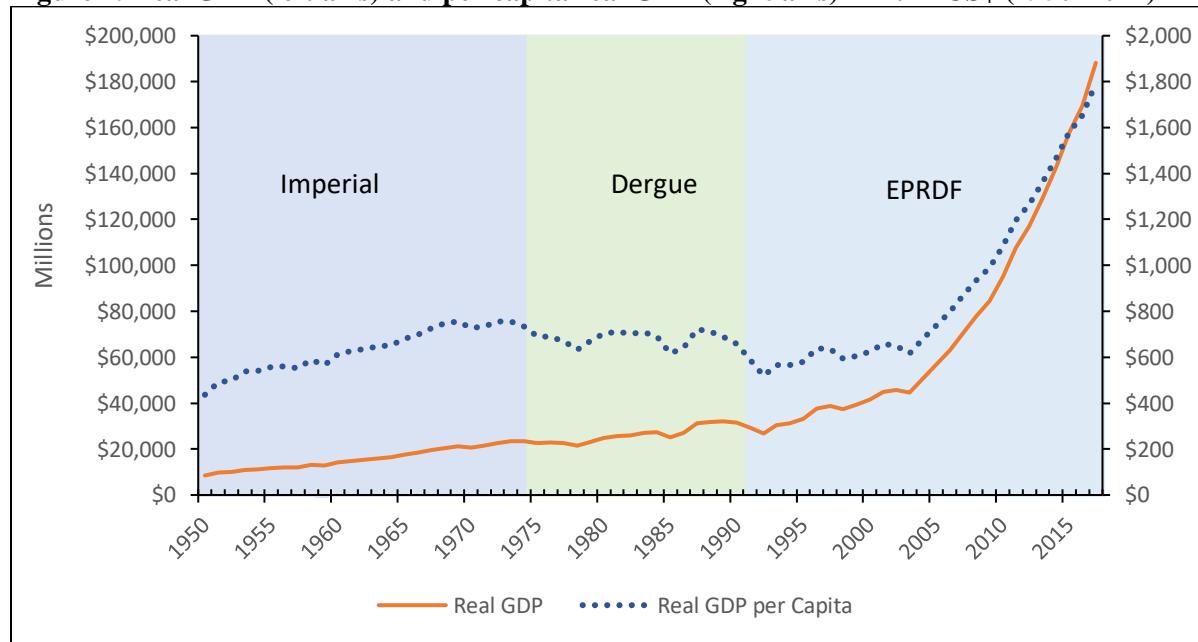
Figure 1. Growth Rates: Population, Employment, and Capital Stock (1950–2017)



Source: Authors' calculation using FRED.

Ethiopia's economy is characterized by low performance but marked by high volatility with sharp peaks and deep troughs, as depicted by the country's real GDP and per-capita real GDP and their corresponding growth rates in Figures 2 and 3, respectively. However, the period after 2004 is an exception, where after coming out of nearly 2 and 5 percent decline in real GDP and per-capita real GDP in 2003, respectively, the country achieved unprecedented growth rates of approximately 14 and 10 percent, respectively, for these variables. Not only that, the country also somehow managed to sustain higher growth rates until 2017 (the end of our analysis period).

Figure 2. Real GDP (left axis) and per capita real GDP (right axis) in 2011 US\$ (1950–2017)



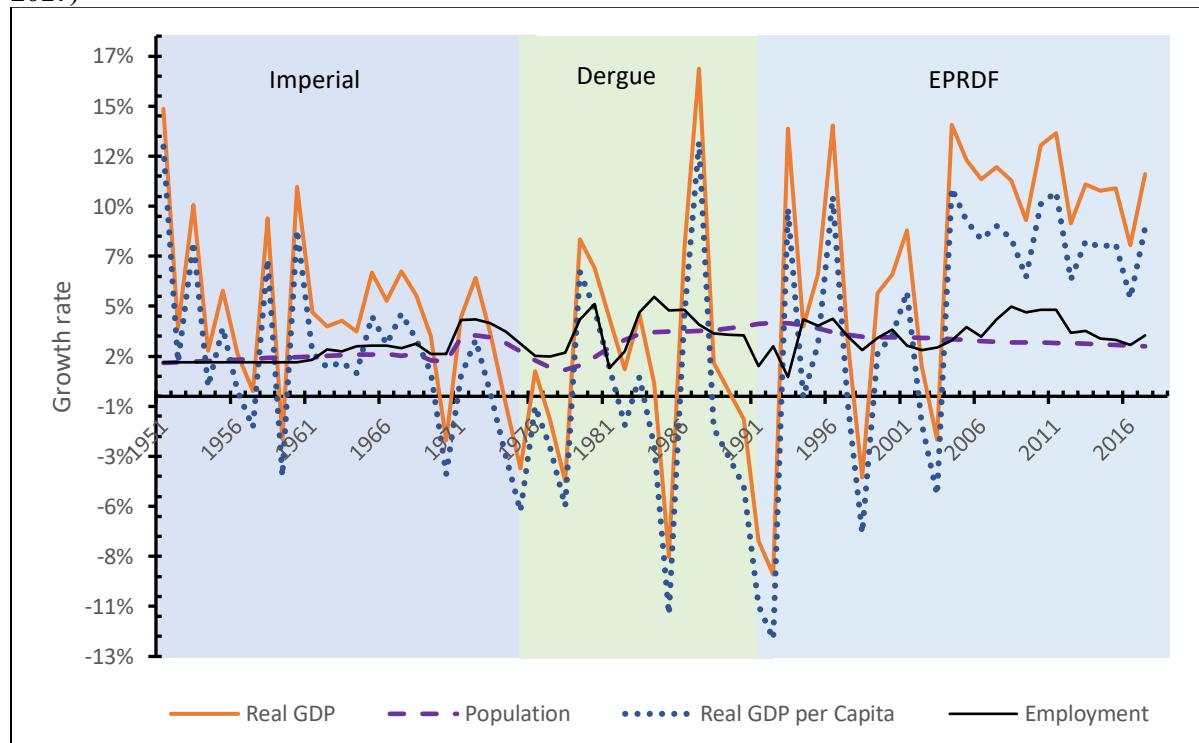
Source: Authors' calculation using FRED.

During the Imperial regime (1950–1974), Ethiopia was at an early stage of embarking on a new journey toward modernization. Despite the many political and economic problems inherent in the aristocratic system, the land tenure system and serfdom being the major age-old problems in Ethiopia, and the high fluctuations observed in the first ten years (1950–1961), the country was able to attain a relatively moderate economic growth during most part of the Imperial period and until the beginning of the 1974 revolution (Figures 2 and 3). The country faced one of its major economic downturns following the 1973/74 drastic drought and famine, which many believe had ignited the 1974 popular uprising that subsequently led to the downfall of the Imperial regime. Overall, the performance of the country during the Imperial period can be considered better than the Dergue regime.

After the military overthrew the Imperial regime in September 1974, it changed the ideological orientation of the country to the Soviet-style socialist system by imposing the doctrine of "Ethiopian socialism" in its December 20, 1974 declaration (Henze, 1985). The military government began forcefully implementing political and economic reforms, which started by

rescinding the macroeconomic and foreign policies pursued by the Imperial regime. The Dergue regime then undertook radical reforms to align itself with the policies of countries in the socialist bloc, which include: the January and February 1975 nationalization of manufacturing industries, banking and insurance firms, and large-scale trade enterprises; the March 1975 land-reform that transferred ownership of all rural land to the state and abolished tenancy and serfdom; and the July 1975 nationalization of all urban land and extra rentable dwellings. Such expansive state ownership and control was the groundwork for establishing a centrally planned and commanded economy based on socialist principles of large-scale regulation of economic activities and restrictive economic policies (Afrika, 2001). These subsequently led to major political and economic transformations that created disruptions in the country's economic activities, causing the economy to hit its lowest bottom, depicted by -3.6 and -5.7 percent real GDP and per-capita real GDP growth rates in 1975, respectively (Figure 3).

Figure 3. Growth Rates: real GDP, real GDP per capita, population and employment (1950 - 2017)



Source: Authors' calculation using FRED.

The regime was unable to forge a sound macroeconomic policy that would lift the country out of poverty due to the bloody internal power struggle, the war instigated by neighboring Somalia, and the many national movements and liberation fronts waging war in all parts of the country, particularly in Eritrea and Tigray regions. Worse, yet another round of drought and famine hit the northern part of the country in 1985, which claimed millions of lives and created internal displacement of millions of people (Vestal, 1985). As a result, real GDP and per-capital real GDP declined drastically by nearly 8 and 11 percent, respectively, in 1985 (Figure 3).

The economy was at a fast decline as the war in Eritrea and Tigray continued to intensify and engulfed the entire country. The war ultimately came to an end in May 1991 ousting the Dergue regime and replacing it with the power-sharing coalition of seemingly four rebellion groups who called themselves the Ethiopian People's Revolutionary Democratic Front (EPRDF). The Dergue regime's war-time economy ended with an annual average real GDP of \$26.4 billion and per-capita income of \$681 in 2011 US\$, not substantially higher compared to the Imperial period (\$15.9 billion and \$633 in 2011 US\$, respectively) (see Appendix A).

To alleviate the daunting social and economic challenges facing the country, the EPRDF-led government was forced to take the following bold measures, among others (Chole, 1993): issued an economic policy to privatize some state enterprises; prepared an Emergency Recovery and Reconstruction Project (ERRP) and signed agreement with the World Bank, the African Development Bank, the European Economic Commission and a few other donors to secure funding for the rehabilitation of the war-damaged economy; and agreed with the World Bank, the International Monetary Fund (IMF) and other international financial institutions to adopt the Structural Adjustment Programs (SAP).⁴

As was the case in other developing countries, there seemed to be no consensus on the outcomes of these reform programs. Nevertheless, a noticeable improvement was observed in terms of the overall performance of the Ethiopian economy (Figures 2 and 3). During the initial post-reform years (1993-2001), the country achieved a 6.1 percent average annual growth in real GDP and 2.8 percent in real per-capita income. Many have considered this an impressive achievement that has particularly resulted from the reform programs.

However, the economy started sliding back in 2002 and 2003, where the real GDP growth rate fell to -2.2 percent and real per-capita income to -4.9 percent in 2003. A few reasons ascribed for the slowdown of the reform programs include (Abegaz, 2001): the government's weaknesses in implementation capacity of the first generation reforms and its over-cautiousness in undertaking the second generation of reforms; some donors suspension of disbursements for the reform programs starting from 1999 following the 1998-2000 Ethio-Eritrean war; slow pace in privatizing state-owned enterprises and implementing the civil service reform; and failure to remove such policy bottlenecks as anti-export bias in the trade regime, burdensome exchange and trade regulations, and restrictions in foreign direct investment.

The EPRDF regime's reluctance to wholeheartedly undertake the radical transformation into a market economy might have transpired from the revolutionary democracy doctrine it was pursuing underneath the reform programs. At the time, the fervent assertion was that it is revolutionary democracy, not liberal democracy, that would enable the government to play a dominant role to bring about the required political, economic, and social changes in the country.

The EPRDF-led government subsequently made a critical change of direction by abandoning the adjustment programs, and with them the dictates of the international lending and donor institutions, and embarked on an ambitious development plan under developmental state framework (Brown and Fisher, 2020). In general, the concept underlying the developmental

⁴ SAP was a package of economic and social policy reforms advocated at the time as a panacea for sustainable economic growth in developing countries.

state was accelerating economic growth primarily by state-led funding of massive expansion in key sectors of the economy, such as communication, industry, hydroelectricity, and agriculture (Clapham, 2018), whereas the government had a heavy hand practically in every other aspect of the economy as well (Hauge and Chang, 2019). The government was able to garner the support of Western donors in funding its ambitious development programs, despite reports of wide human rights violations in the country, through political maneuverings and by providing donors with a rosy language and expansive concept to rationalize developmental state as a prominent alternative development model (Brown and Fisher, 2020).

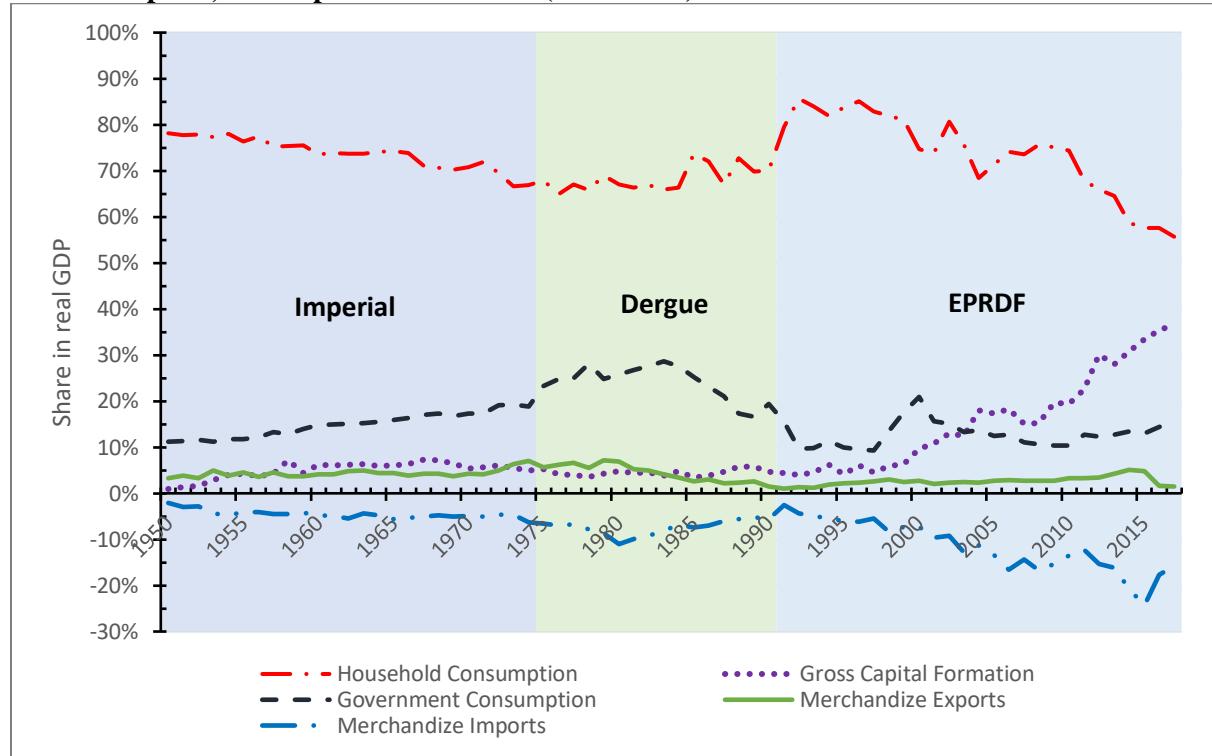
The country started achieving high economic growth in the post-2004 period, which also coincided with the period the government was widely propagating the developmental state program as the panacea for all the challenges the country was facing (Figures 3 and 4). Consequently, with the exception of in 2009, 2012 and 2016, the country was able to register a double-digit economic growth from 2004 through 2017, where the national income and per-capita income on average grew at about 11 and 8 percent annually, respectively. This was lauded as impressive achievement by the EPRDF-led government and international donors alike. However, it was also evident that these growth rates were showing a slight declining trend over time.

Figure 4 depicts the trends of expenditures in the national economy over time. As in most African countries, households' final consumption expenditure on consumer goods and services is by far the largest component of real GDP,⁵ and can be conceived as the driving force of the national economy. For Ethiopia, the share of consumers' expenditure accounted on average for about 72 percent of the national expenditure from 1950 through 1990, increased for a little longer than a decade to an average of 81 percent, and started to decline sharply after 2010 and reached a mere 56 percent in 2017, the lowest since 1950. Government expenditure had always been the second largest driver of the national economy, until it was overtaken by investment after 2003. With only a few exceptions, government expenditure remained at an average of nearly 13 percent of the national expenditure.

For the most part, the share of investment expenditure (i.e., gross capital formation) was very low in the country (averaging at only 5 percent) until 2000, but it started steadily rising since then and reached 37 percent of the national expenditure in 2017. This steady rise coincided with and obviously was the result of the EPRDF-led government's ambitious development plan under the developmental state framework discussed earlier. Notice that no significant difference is observed in the share of investment expenditure in the national economy during the three regimes between 1950 and 2003. While investment expenditure on average accounted for 5.4 and 4.5 percent of the national expenditure during the Imperial and Dergue regimes, respectively, it was only 5.9 percent during the first 13 years (1991-2003) of the EPRDF rule before it jumped to 27.1 percent in the post-2004 period.

⁵ In 2009, real household final consumption expenditure ranges between 65 and 75 percent in most African countries (AfDB, 2012).

Figure 4. Share of household consumption, gross capital formation, government consumption, exports, and imports in real GDP (1950–2017)⁶



Source: Authors' calculation using FRED.

The country's trade deficit became more pronounced during the EPRDF regime due primarily to the substantial increase in imports vis-à-vis exports. The average share of imports in the national economy (in absolute terms) nearly doubled during the EPRDF rule (14.4%) compared to the Dergue regime (7.3%) and tripled compared to the Imperial regime (4.7%) (Appendix A). Furthermore, even within the EPRDF rule, the share of imports was higher in the post-2004 period at an average of 16.7 percent. In contrast, the average share of exports to the national economy steadily declined from 4.5 percent in the Imperial period to 4.2 percent in the Dergue regime and to 2.9 percent during the EPRDF rule.

Overall, during the EPRDF regime (1991–2017), the annual average national income and per-capita income have risen to \$73.7 billion and \$898 in 2011 US\$, respectively. These are approximately 179 percent and 32 percent higher compared to what was achieved during its predecessor regime (\$26.4 billion and \$681), respectively (see Appendix A). As impressive it might look, such economic performance was far from generating enough momentum to improve the quality of life of the ordinary people when viewed in terms of selected social welfare and human development measures (Senbet and Wodajo, 2017). The question is then, where the economic growth has gone or who has taken the largest share of the economic pie. This study aims to answer this question focusing on factors believed to be driving economic growth.

⁶ The expenditure shares do not sum to 100 percent due to residual trade and GDP statistical discrepancy in real GDP computation.

In the following sections, we develop a production function and growth accounting models and analyze the economic growth attained during each of the Imperial, Dergue and EPRDF regimes, giving more emphasis to the post-2004 period of double-digit economic growth.

4. The Model and Empirical Results

4.1 Aggregate Production Function

Assume that the long-run aggregate production function that exhibits a constant return to scale depends on capital stock, workforce and total factor productivity (TFP). The latter is expected to grow exponentially with time. If we also assume that α is the share of output that goes to capital owners:

$$Y_t = A_t K_t^\alpha L_t^{1-\alpha} = A_0 e^{rt} K_t^\alpha L_t^{1-\alpha} \quad (1)$$

where Y_t is real GDP, A_0 is the initial TFP and r is its rate of growth, A_t is TFP at time t , K_t is capital stock at time t , and L_t is workforce at time t . Productivity at time t is obtained by diving both sides of equation 1 by workforce,

$$\left(\frac{Y}{L}\right)_t = A_0 e^{rt} \left(\frac{K}{L}\right)_t^\alpha \quad (2)$$

Taking the natural logarithms of both sides of equation 2 gives:

$$y_t = a_0 + rt + \alpha k_t \quad (3)$$

where y_t is the log of real output per worker, a_0 is the log of initial TFP, r is the rate of TFP growth, k_t is the log of capital stock per worker, α is the share of output that goes to capital owners, also known as the output elasticity of capital, and hence $(1-\alpha)$ becomes the share of output that goes to workers or the output elasticity of labor.

The above equation is modified to incorporate a dummy variable to account for the post-2004 period of double-digit growth (DDG) and a stochastic error term:

$$y_t = a_0 + \beta_k k_t + \beta_{DDG} DDG_t + \beta_t t + \varepsilon_t \quad (4)$$

where DDG_t is a dummy variable equal to 1 for post-2004 period and zero otherwise. The coefficient β_k captures the output elasticity of capital (α) and β_t captures the growth rate of TFP (r), both as defined above, and β_{DDG} captures the period of significant growth of output per worker in the history of the country. The signs of both β_k and β_{DDG} are expected to be positive.

4.2 Estimation of the Model

We start by examining the stationarity of each variable. The Augmented Dickey-Fuller (ADF) tests with and without trend are reported in Table 1. As discussed in Section 2, we use the Federal Reserve Economic Data (FRED) in this analysis.

Table 1: Unit root test (ADF test)

Variable	Level		First Difference	
	ADF Statistic with constant	ADF statistic with constant and trend	ADF Statistic with constant	ADF statistic with constant and trend
Log of real output per worker (y_t)	1.401 [1]	0.379 [1]	-5.533** [0]	-6.227** [0]
Log of real capital per worker (k_t)	-0.799 [1]	-2.526 [1]	-10.050** [0]	-10.033** [0]

Notes: ** denotes rejection of the null hypothesis (unit root) at 1 percent level.

Numbers in brackets are the lag length determined by Schwarz Info Criterion (SIC).

Table 1 shows that logarithms of both output per worker and capital per worker have unit root I(1) at level. However, both variables are stationary I(0) at first difference. Therefore, estimating equation (4) with simple OLS leads to a spurious regression where the model generates a statistically significant result even though there is no true relationship between the variables (Giles, 2007). In this case, it is important to find out if the linear relationship between the non-stationary variables is stationary (Engle and Granger, 1987) and, if so, estimate the long-run relationship of the cointegrated variables. Johansen (1988) developed a now commonly used estimation methodology of a long-run equilibrium relationships of cointegrated variables. Table 2 shows the cointegration rank using both Trace and Maximum Eigenvalue tests.

Table 2: Johansen cointegration tests

Hypothesized number of cointegrating equations	Eigenvalue	Trace Statistic	p-value ^T
None**	0.345	34.849	0.003
At most 1	0.141	9.724	0.140
Hypothesized number of cointegrating equations	Eigenvalue	Max-Eigen Statistic	p-value ^T
None**	0.325	25.126	0.007
At most 1	0.141	9.724	0.140

Notes: ** denotes rejection of the hypothesis at 1 percent level.

^T MacKinnon-Haug-Michelis (1999) p-values

The Johansen cointegration tests in Table 2 show that there is one cointegrating equation at 1 percent level of significance. That means, we can estimate the coefficients of the cointegrating vector (the long-run relationship). The results of the estimated coefficients normalized in terms of the log of real output per worker are presented in Table 3, with and without the *DDG* dummy variable.

Table 3. Normalized cointegrating vector

Model	y_t	k_t	t	DDG_t
Unrestricted	1.0000	-0.5582** (0.0398)	-0.0053** (0.0012)	-0.1596** (0.0533)
Restricted	1.0000	-0.5778** (0.0535)	-0.00038** (0.0013)	-

Notes: ** denotes significance at 1 percent level. Numbers in parentheses are standard errors.

The restricted model imposes the values of zero on the coefficient of DDG_t . The coefficients of both log of capital per worker and time trend are in the expected direction and stable in both models. However, the unrestricted model shows that the dummy variable for the post-2004 double-digit growth period is significant at 1 percent level. Therefore, the unrestricted model would be preferred. Then, the long-run equilibrium relationship between the variables becomes:

$$y_t - 0.5582k_t - 0.1596DDG_t - 0.0053t = 0 \quad (5)$$

As expected, the above result shows a positive long-run relationship between output per worker and capital per worker. The sign of the trend variable also indicates an upward trend, most likely attributed to the reported double-digit growth rate of the post-2004 period. However, the most important relationship is reflected in the coefficient of the capital per worker variable (capital's output elasticity) of 0.5582. It means that when capital stock per worker increases by 1 percent, output per worker rises by 0.5582 percent. We can also interpret this as the share of output that goes to capital owners, which in other words means that 55.82 percent of the income goes to capital owners while the rest (44.18 percent) is considered as the share of income by workers. This shows that the share of income that goes to capital owners is significantly higher in Ethiopia than in many countries, except for oil-producing economies in the middle east, where income is mainly derived from ownership of resources (Fields and Paul, 2019). Based on a panel study of 151 countries (including 37 countries in Africa), Fields and Paul (2019) found the average labor share of income to be somewhere between 60 and 70 percent.⁷ A similar study conducted by Kallon (2013) for Sierra Leone found that the share of capital income is 44.47 percent and that of labor income is 55.53 percent.

Given the fact that capital ownership is concentrated in the hands of a small percent of the population at the top of the income distribution, a fast economic growth is likely to lead to even higher inequality where majority of the gain is enjoyed only by the very few. The next section presents the growth empirics where the contribution of capital, labor and TFP are calculated for the Imperial, Dergue and EPRDF regimes. We also show a separate estimation for the post-2004 DDG period.

⁷ Ethiopia was not included in their study.

5. Growth Accounting

The growth rate of output over time is defined as the change in output divided by the output at the beginning of the period. The change in output is the derivative of output with respect to time. Hence, the derivative of output (given in equation 1) with respect to time is:

$$\frac{dY_t}{dt} = K_t^\alpha L_t^{(1-\alpha)} \frac{dA_t}{dt} + A_t L_t^{(1-\alpha)} \frac{dK_t^\alpha}{dt} + A_t K_t^\alpha \frac{dL_t^{(1-\alpha)}}{dt} \quad (6)$$

where:

$$\frac{dK_t^\alpha}{dt} = \frac{dK_t^\alpha}{dK_t} \frac{dK_t}{dt} = \alpha K_t^{(\alpha-1)} \frac{dK_t}{dt} \quad (7)$$

$$\frac{dL_t^{(1-\alpha)}}{dt} = \frac{dL_t^{(1-\alpha)}}{dL_t} \frac{dL_t}{dt} = (1 - \alpha) L_t^{(-\alpha)} \frac{dL_t}{dt} \quad (8)$$

Substituting equations 7 and 8 into equation 6 yields:

$$\frac{dY_t}{dt} = K_t^\alpha L_t^{(1-\alpha)} \frac{dA_t}{dt} + \alpha A_t K_t^{(\alpha-1)} L_t^{(1-\alpha)} \frac{dK_t}{dt} + (1 - \alpha) A_t K_t^\alpha L_t^{(-\alpha)} \frac{dL_t}{dt} \quad (9)$$

Dividing both sides of equation (9) by Y_t or $A_t K_t^\alpha L_t^{(1-\alpha)}$ gives the economic growth equation:

$$\frac{1}{Y_t} \frac{dY_t}{dt} = \frac{1}{A_t} \frac{dA_t}{dt} + \alpha \frac{1}{K_t} \frac{dK_t}{dt} + (1 - \alpha) \frac{1}{L_t} \frac{dL_t}{dt} \quad (10)$$

This equation can be simplified as:

$$\dot{Y}_t = \dot{A}_t + \alpha \dot{K}_t + (1 - \alpha) \dot{L}_t \quad (11)$$

where \dot{Y}_t , \dot{A}_t , \dot{K}_t , and \dot{L}_t denote the rate of growth of real GDP, TFP, real capital stock and workforce, respectively. Modifying the above equation by including the post-2004 DDG period and rearranging we get:

$$\widehat{\dot{A}_t} = \dot{Y}_t - \hat{\alpha} \dot{K}_t - (1 - \hat{\alpha}) \dot{L}_t - \hat{\beta} DDG_t \quad (12)$$

where $\widehat{\dot{A}_t}$ is the estimated TFP growth rate, and $\hat{\alpha}$ and $(1 - \hat{\alpha})$ are the estimated shares of output that go to capital owners and workers, respectively, and $\hat{\beta}$ is the estimated share of the significant growth of output during the DDG period. Given that the estimated shares, $\hat{\alpha}$ and $\hat{\beta}$, are already estimated to be 0.5882 and 0.1596 as shown in Table 3, it follows that:

$$\widehat{\dot{A}_t} = \dot{Y}_t - 0.5582 \dot{K}_t - 0.4418 \dot{L}_t - 0.1596 DDG_t \quad (13)$$

Based on equation 13, we can estimate the respective contributions of capital growth, labor growth and TFP to output growth. The results are summarized in Table 4 for the whole analysis period.⁸ Figures 6 through 8 display the breakdown of the results for the Imperial, Dergue and EPRDF regimes in a graph.

⁸ We divided the periods into roughly five-year blocks to conserve space. However, detailed estimation results for each year of the analysis period are available upon request.

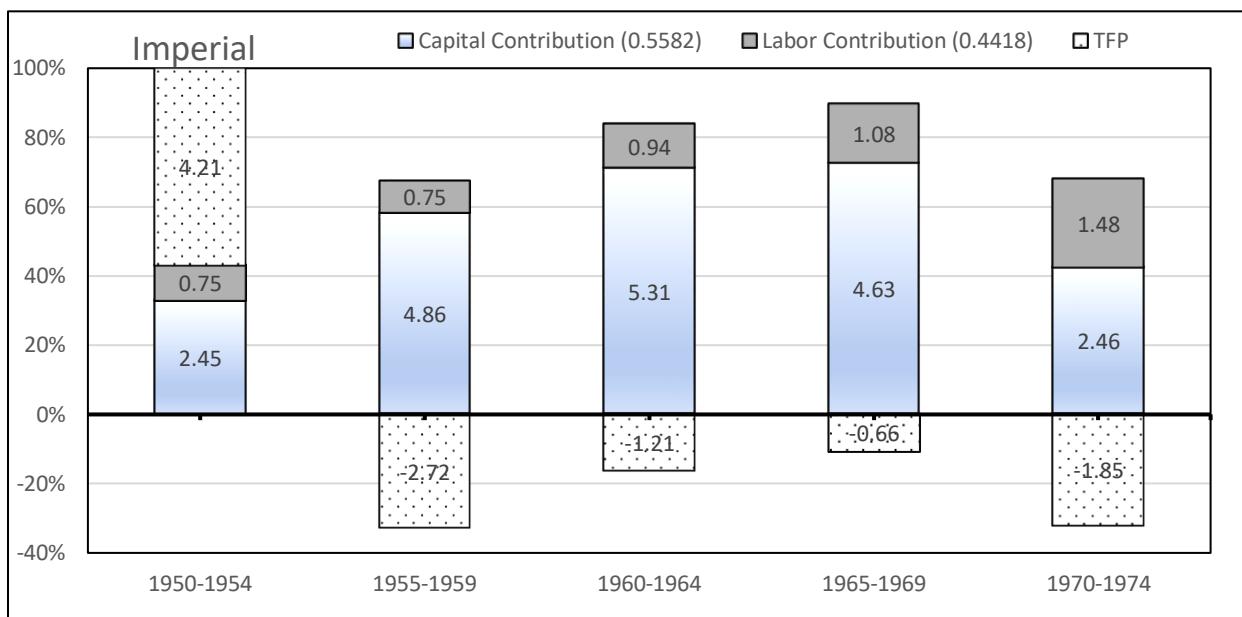
Table 4. Sources of economic growth (1950–2017)

Regime	Period	Real GDP Growth	Factor Growth		Estimated Factor Contributions		
			Real Capital	Labor (Engaged)	Capital Contribution (0.5582)	Labor Contribution (0.4418)	TFP
Imperial	1950-1954	7.41	4.39	1.70	2.45	0.75	4.21
	1955-1959	2.89	8.71	1.70	4.86	0.75	-2.72
	1960-1964	5.04	9.51	2.12	5.31	0.94	-1.21
	1965-1969	5.05	8.30	2.44	4.63	1.08	-0.66
	1970-1974	2.09	4.40	3.34	2.46	1.48	-1.85
	1950-1974	4.37	7.17	2.28	4.00	1.01	-0.64
Dergue	1975-1979	0.02	2.06	2.53	1.15	1.12	-2.25
	1980-1984	3.27	3.98	3.49	2.22	1.54	-0.49
	1985-1990	2.75	3.83	3.57	2.14	1.58	-0.97
	1975-1990	2.06	3.32	3.22	1.86	1.42	-1.22
EPRDF	1991-1995	1.37	1.04	2.47	0.58	1.09	-0.30
	1996-1999	4.37	1.81	3.03	1.01	1.34	2.02
	2000-2003	3.43	3.60	2.66	2.01	1.17	0.25
	2004-2008	11.69	6.33	3.51	3.54	1.55	6.61
	2009-2013	10.75	14.38	3.86	8.03	1.70	1.02
	2014-2017	9.83	18.02	2.83	10.06	1.25	-1.47
	1991-2017	7.02	7.50	3.08	4.19	1.36	1.47
	1991-2003	2.93	2.07	2.70	1.15	1.19	0.58
	2004-2017	10.82	12.55	3.44	7.00	1.52	2.30

Source: Authors' calculation using FRED.

The Imperial Regime (1950–1974): The growth rate of real capital outpaced that of labor (or employment) throughout this period (see Table 4 and Figure 5). As a result, the contribution of capital to real GDP growth remained higher than that of labor. The highest average annual GDP growth rate of 7.41 percent was registered between 1950 and 1954, and it was mainly driven by the change in TFP. In this period, real capital grew by an annual average of 7.17 percent and labor only by 2.28 percent. Real GDP grew on average by 4.37 percent annually and capital contributed most to this economic growth (4.00 percent), where labor accounted only for 1.01 percent of the economic growth.

Figure 5. Sources of economic growth during the Imperial regime (1950–1974)⁹

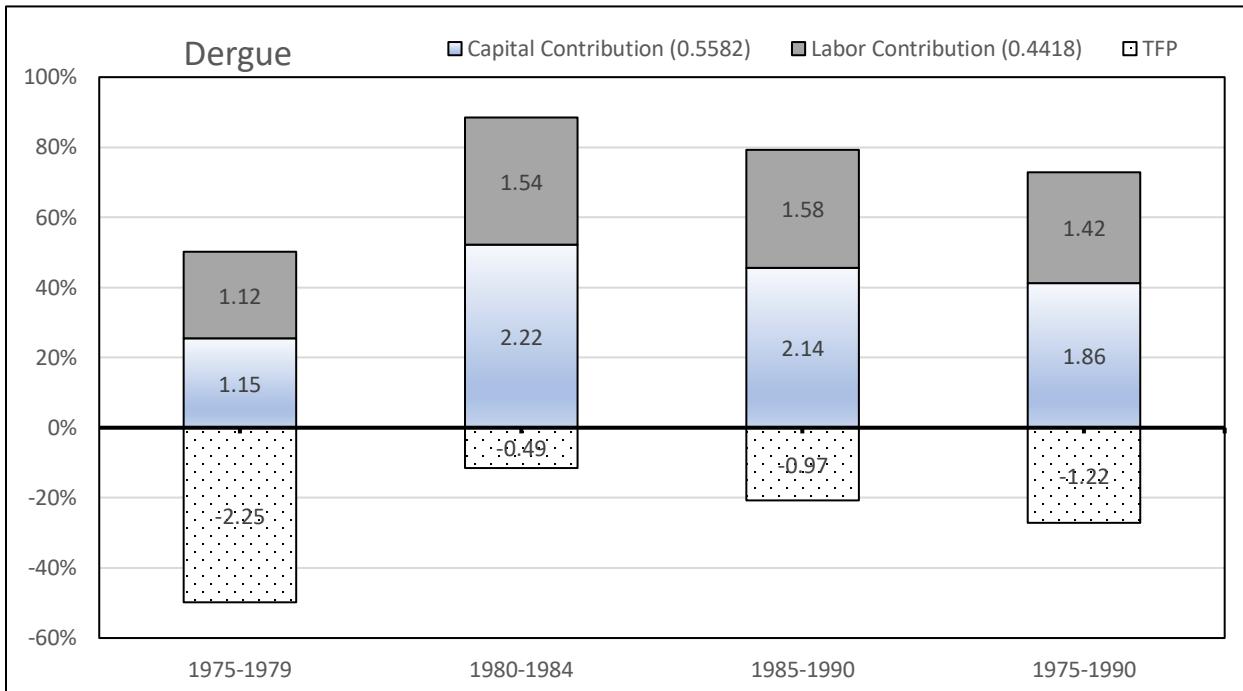


Source: Authors' calculation using FRED.

The Dergue Regime (1975–1990): As discussed above, this was a period where the country was in a constant turmoil, which resulted in a significantly lower overall economic performance compared to the Imperial regime (see Table 4 and Figure 6). In fact, the economy was performing worse particularly at the beginning of the Dergue regime, where the growth rate for real GDP was negative during three of the first five years (1975–1979), effectively resulting in a 0 percent average real GDP growth rate. During this regime, real GDP grew by an annual rate of just over 2 percent. Capital and labor grew by an annual rate of 3.32 and 3.22 percent, respectively. The average contribution of capital to real GDP growth was 1.86 percent per year while that of labor was 1.42 percent. The contribution of TFP to real GDP growth averaged at -1.22 percent per year. It is important to note that the contribution of labor to real GDP growth was relatively higher during the Dergue regime compared to both the Imperial and EPRDF regimes.

⁹ In Figures 5 through 8, the vertical lines depict the share of each factor as percentage of the average economic growth. For example, in Figure 5, of the average 7.41 percent economic growth in 1950–1954, growth in capital accounted for 2.45 percent. If expressed as a percentage share, this amounts to approximately 33 percent of the average economic growth (i.e., $(2.45 \div 7.41) \times 100$).

Figure 6. Sources of economic growth during the Dergue regime (1975–1990)

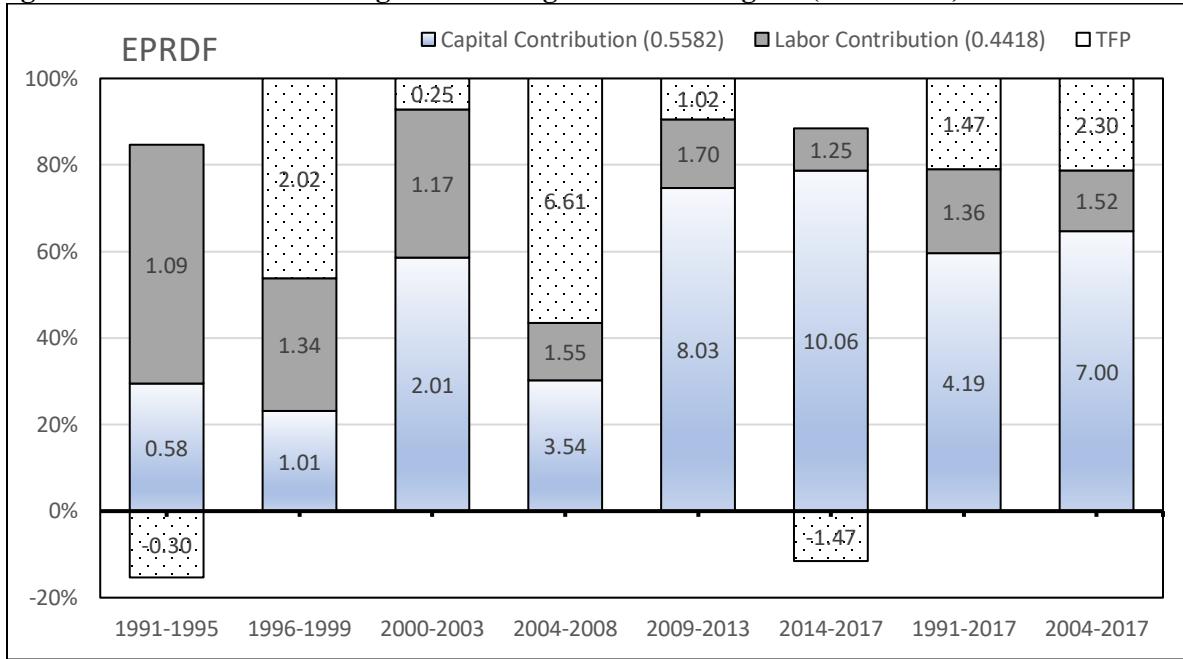


Source: Authors' calculation using FRED.

The EPRDF Regime (1991–2017): This is a period of particular interest to this study, as we set out to explore the possible reasons why the low standard of living in Ethiopia remained stagnant despite the double-digit economic growth reported for more than a decade. Thus, we analyze the performance of the economy in this period, focusing first on the entire EPRDF period and then on the post-2004 period of the double-digit economic growth.

During the first nine years of the regime (1991–1999), the growth of capital stock lagged behind that of labor, and hence the contribution of labor to economic growth was larger (see Table 4 and Figure 7). After 2000, the growth rate of capital consistently remained higher than that of labor making capital the major driving force of economic growth. During the entire EPRDF period (1991–2017), GDP grew at an annual average rate of 7.02 percent. Capital stock grew by an annual average rate of 7.50 percent and labor by 3.08 percent. Breaking it down by the sources of growth, we can see that 4.19 percent of the economic growth was due to capital, while only 1.36 percent was the contribution of labor. The remaining 1.47 percent was attributed to the change in TFP. In this period, the contribution of capital to economic growth was more than three times larger than the contribution of labor. This evidently skews the distribution of the national income more toward owners of capital than to the people earning their livelihood through employment.

Figure 7. Sources of economic growth during the EPRDF regime (1991–2017)

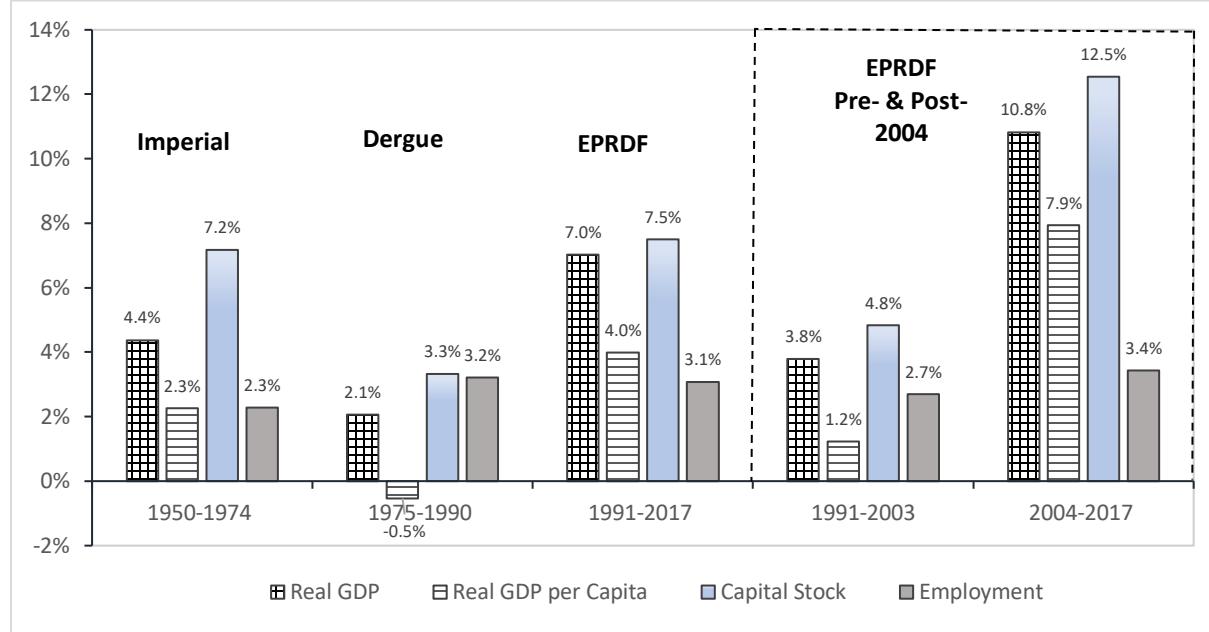


Source: Authors' calculation using FRED.

The Double-Digit Economic Growth Period (2004–2017): Since 2004 Ethiopia started reporting unusually high economic growth (averaging at 10.82 percent) leading to praises from regional and international communities. What is more interesting is that, over the same period, capital stock was growing at a staggering annual rate of 12.55 percent, dwarfing the 3.44 percent growth in labor (see Table 4 and Figure 7). As a result, capital's contribution to real GDP growth became 7.00 percent, while labor's contribution remained low at a mere 1.52 percent. In other words, during the rapid economic growth, capital's contribution stood at more than four and half times larger than that of labor. The change in TFP accounted for the remaining 2.30 percent, the second highest after the 4.21 percent contribution reported at the beginning of the Imperial period.

Overall, the share of capital in the economic growth was increasing over the entire EPRDF period, at a higher rate particularly after 2004. For instance, during the last four years of analysis (2014–2017), labor contributed only 1.25 percent to economic growth, while capital's contribution stood at 10.06 percent – about eight-fold larger than labor's contribution. This means that the gains in income from economic growth is highly skewed toward capital owners. As shown above, capital owners' income has increased by five to eight times compared to labor income.

Figure 8. Comparison of the three regimes (using average growth rates)

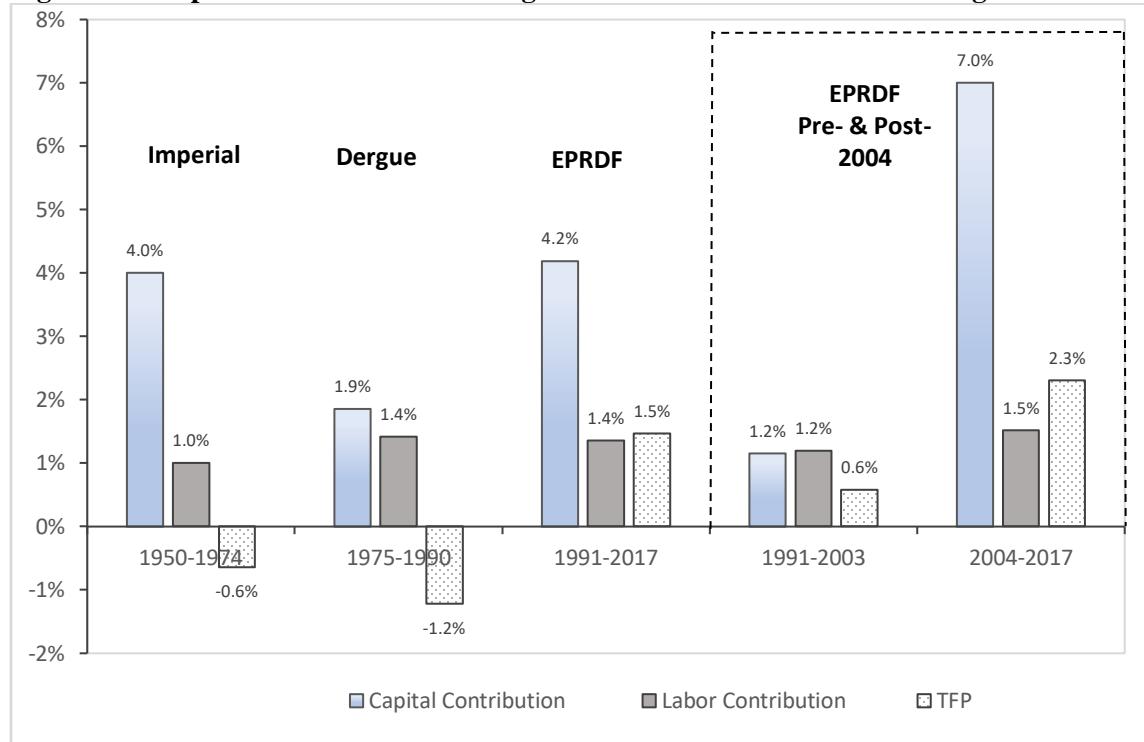


Source: Authors' calculation using FRED.

The growth accounting analysis reveals that, overall, throughout the analysis period (1950-2017), capital seemed to account for the lion's share of Ethiopia's economic growth compared to that of labor (see Figures 8 and 9). This gap was narrower only during the Dergue regime, where the shares of capital and labor contributions were relatively close. But during the EPRDF regime, the importance of capital to economic growth continued to increase over time. More importantly, the gap between capital and labor contribution to economic growth was magnified in post-2004 period, when the country started registering high economic growth rates for consecutive years. Nevertheless, the gains attained from economic growth during this period were accruing mainly to the few owners of capital, leaving the large group of workers whose livelihood was dependent mainly on labor income behind. This might explain, at least partially, the paradox why Ethiopia still remained at the top of the list of countries suffering from acute multidimensional poverty¹⁰ despite registering double-digit economic growth for more than a decade.

¹⁰ The Oxford Poverty and Human Development Initiative (OPHI) develops an international measure of acute poverty, known as Multidimensional Poverty Index (MPI). The index is based on micro level surveys of households covering about 78% of the world population. For more information, see <https://ophi.org.uk/publications/national-mpi-reports/> or <https://ophi.org.uk/2018-global-mpi-resources>.

Figure 9. Comparison of estimated average factor contributions to real GDP growth



Source: Authors' calculation using FRED.

6. Conclusion and Recommendations

The study shows that economic growth was fueled mainly by capital accumulation in Ethiopia. Particularly, accounting for nearly two-thirds of the double-digit real GDP growth attained in post-2004 period, capital was the dominant source of economic growth in the country. This high economic growth, which extended for over a decade, seemed to have benefited the few owners of capital, failing to transform the standard of living of the majority of the country's population. This can be explained by the fact that capital is more concentrated in urban than rural areas and in services and industry sectors than in agriculture. Agriculture being the mainstay of the rural population both in terms of employment and production, it is by far the major sector of the economy, accounting for the largest share of total employment and production until recently. For example, in 2017 about 80 percent of the population 15 years and above lived in the rural areas and worked in the agriculture sector that absorbed about 67 percent of the national employment and created about 34 percent of the value added to the national economy (Appendix C).¹¹

Contrary to its largest contribution to total employment at national level, the per-capita share of agricultural workers in the national production is the lowest compared to workers in other sectors. For example, the annual average value added per agricultural worker was only \$405 (in 2010 US\$) for the period of 1991-2019, compared to \$1,399 and \$997 (in 2010 US\$) for workers in services and industry sectors, respectively. This shows that the rural areas in general

¹¹ The results reported in this section present authors' calculations using World Development Indicators (WDI) data drawn from the World Bank database for the specified years.

and the agriculture sector in particular are deprived of capital and hence receive the lowest share from the gains of the much-acclaimed double-digit economic growth. As a result, the majority of the population continues to live in abject poverty: suffering from malnutrition, absence of basic services (health and education) and other infrastructure (transportation, communication and markets) as captured by the global MPI.

Such sectoral discrepancy in productivity might have resulted from differences in investment (and hence level of capital stock), level of workers' education, and type of products (primary, secondary, or tertiary). For instance, the farmers in the agricultural sector were contributing less per head to the national economy, and hence receiving small share of the national income, because they were engaged in a traditional farming, which is devoid of capital-intensive agricultural implements and that mainly focused on primary agricultural produce. In contrast, the services and industry sectors appeared relatively more productive due to the use of capital-intensive technologies to produce secondary or tertiary products that required creating additional values to generate high revenues in the market. Consequently, the few capital owners in the services and industry sectors ended up reaping the lion's share of the gains from the capital-induced economic growth attained in the post-2004 period. This shows that the economic growth in Ethiopia was not inclusive. It is, therefore, no surprise that this high economic growth has manifested itself by a stagnant change in the welfare of the average citizen.

As a developing country, Ethiopia has high potential for economic development. Accordingly, the main recommendation of this study is for policy makers to design policies directed toward inclusive growth and transform the achievements in economic growth to economic development. This requires devising policies and initiatives that promote pro-poor and labor-intensive investments targeted at improving labor productivity. Doing so would enhance the contribution of labor to economic growth, leading to a higher share of income going to workers.

As shown in Appendix C, during the last few years of the double-digit economic growth, agriculture gave way to services and industry in terms of value added (as percent of GDP). The value added per worker showed an increasing trend in both the services and industry sector, while only a small change took place in agriculture, the sector on which the majority of the country's population depends for its livelihood. Conversely, agriculture is still the highest export earner, mainly based on unprocessed primarily products. These would create an opportunity for the government to retool its policies on labor-intensive investments in agriculture, such as expanding small-scale agroindustry that produce semi-processed secondary agricultural outputs in the rural areas. In effect, we recommend that agricultural productivity should get the center stage to enhance economic growth in rural Ethiopia. These policies should also address youth unemployment in urban areas. Finally, we believe that it is past time to lay the groundwork for creating a framework for social safety net using some of the gains from the economic growth. This would help address the abject poverty prevalent in both urban and rural areas.

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Appendix A. Summary of Ethiopia's major macroeconomic and demographic indicators (1950–2017)

Regime	Period	Real GDP	Household Consumption	Investment	Government Consumption	Export	Import	Residual	Real GDP per-Capita	Capital Stock	Population (million)	Employment (million)
Imperial	1950-1954	\$10,100	\$7,856	\$229	\$1,154	\$392	-\$355	\$824	\$501	\$11,223	20.1	7.7
	1955-1959	\$12,446	\$9,453	\$595	\$1,592	\$496	-\$531	\$841	\$565	\$16,182	22.0	8.3
	1960-1964	\$15,410	\$11,374	\$947	\$2,331	\$690	-\$751	\$821	\$635	\$25,454	24.3	9.2
	1965-1969	\$19,399	\$13,948	\$1,295	\$3,242	\$786	-\$994	\$1,122	\$721	\$38,372	26.9	10.3
	1970-1974	\$22,324	\$15,416	\$1,234	\$4,113	\$1,195	-\$1,142	\$1,507	\$741	\$51,149	30.1	11.9
	1950-1974	\$15,936	\$11,609	\$860	\$2,486	\$712	-\$755	\$1,023	\$633	\$28,476	24.7	9.5
		100.0%	72.9%	5.4%	15.6%	4.5%	-4.7%	6.4%				
Dergue	1975-1979	\$22,537	\$15,082	\$947	\$5,678	\$1,408	-\$1,662	\$1,084	\$671	\$59,142	33.6	13.7
	1980-1984	\$26,194	\$17,419	\$1,170	\$7,157	\$1,274	-\$2,354	\$1,527	\$703	\$68,292	37.3	15.9
	1985-1990	\$29,818	\$21,107	\$1,419	\$6,018	\$698	-\$1,819	\$2,395	\$672	\$84,891	44.3	19.5
	1975-1990	\$26,410	\$18,072	\$1,194	\$6,267	\$1,100	-\$1,937	\$1,714	\$681	\$71,657	38.8	16.6
		100.0%	68.4%	4.5%	23.7%	4.2%	-7.3%	6.5%				
EPRDF	1991-1995	\$30,188	\$25,034	\$1,408	\$3,392	\$458	-\$1,421	\$1,317	\$564	\$95,947	53.5	22.5
	1996-1999	\$38,263	\$31,647	\$2,183	\$4,784	\$994	-\$2,605	\$1,260	\$619	\$102,910	61.9	25.8
	2000-2003	\$44,250	\$33,741	\$5,102	\$7,157	\$1,047	-\$4,336	\$1,539	\$637	\$115,602	69.5	28.8
	2004-2008	\$63,672	\$46,459	\$10,602	\$7,615	\$1,729	-\$9,385	\$6,651	\$804	\$146,218	78.9	32.9
	2009-2013	\$106,756	\$73,598	\$26,183	\$12,613	\$3,703	-\$15,574	\$6,233	\$1,180	\$243,695	90.1	40.0
	2014-2017	\$164,430	\$94,228	\$56,419	\$23,538	\$5,137	-\$31,856	\$16,963	\$1,622	\$501,867	101.2	46.0
	1991-2017	\$73,735	\$50,516	\$16,511	\$9,630	\$2,154	-\$10,633	\$5,557	\$898	\$196,697	75.7	32.6
		100.0%	68.5%	22.4%	13.1%	2.9%	-14.4%	7.5%				
	1991-2003	\$24,110	\$17,891	\$1,422	\$4,207	\$849	-\$1,569	\$1,311	\$645	\$59,485	37.6	15.4
		100.0%	74.2%	5.9%	17.4%	3.5%	-6.5%	5.4%				
	2004-2017	\$107,847	\$69,800	\$29,257	\$13,950	\$3,408	-\$18,016	\$9,448	\$1,172	\$282,645	89.2	39.2
		100.0%	64.7%	27.1%	12.9%	3.2%	-16.7%	8.8%				

Source: University of Groningen and University of California, Davis, Real GDP at Constant National Prices for Ethiopia [RGDPNAETA666NRUG], retrieved from FRED, Federal Reserve Bank of St. Louis; <https://fred.stlouisfed.org/series/RGDPNAETA666NRUG>, November 23, 2020.

Notes: All dollar values are at 2011 national prices (in million 2011 US\$). But real GDP per capita is not in million.

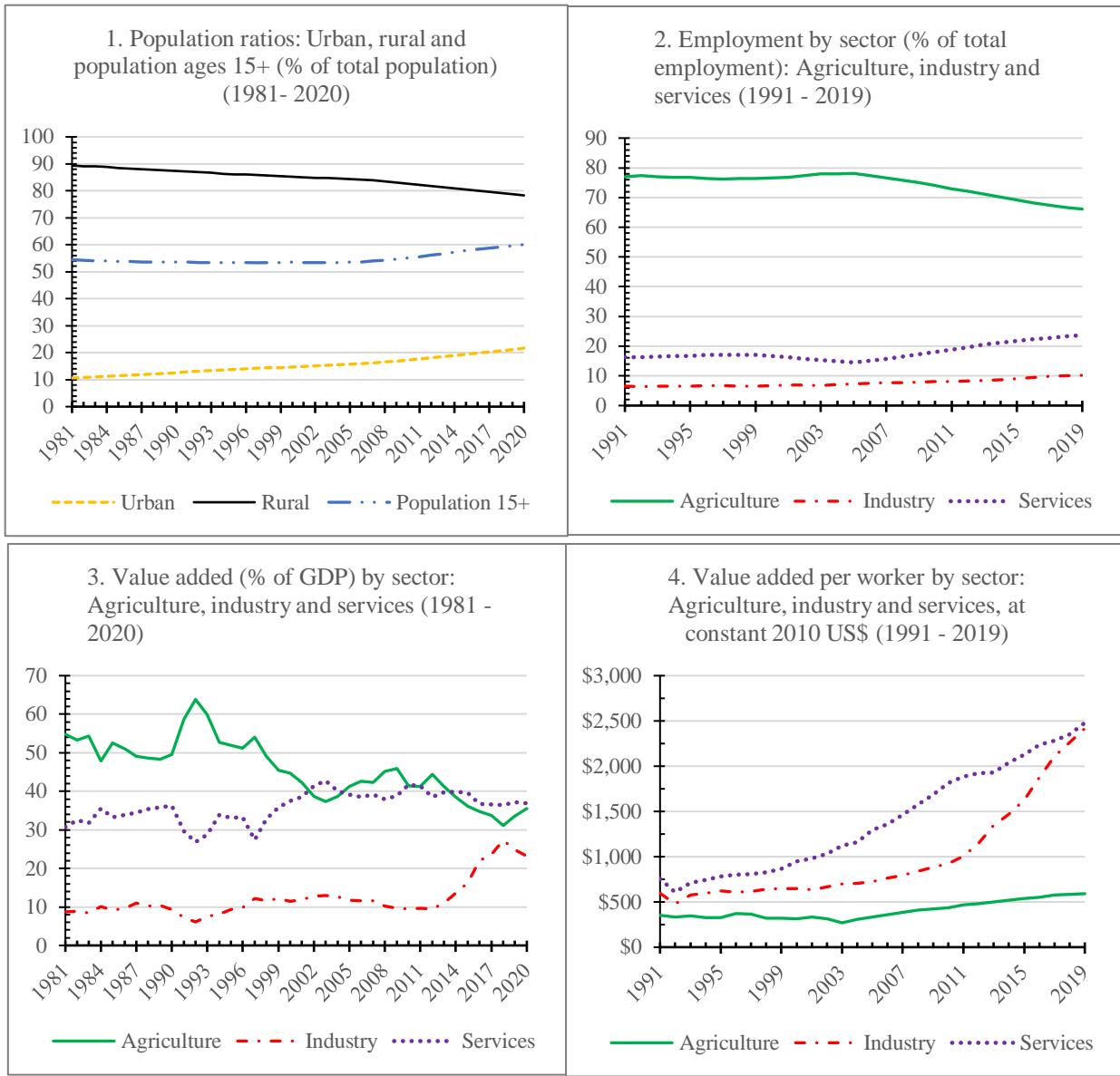
Household consumption, investment, government consumption, export and imports do not sum to real GDP due to residual trade and GDP statistical discrepancy.

Appendix B. Summary of average growth rates for major macroeconomic and demographic indicators (1950-2017)

Regime	Period	Real GDP	Real GDP per Capita	Capital Stock	Employment	Population
Imperial	1950-1954	7.4%	5.6%	4.4%	1.7%	1.7%
	1955-1959	2.9%	1.0%	8.7%	1.7%	1.9%
	1960-1964	5.0%	3.0%	9.5%	2.1%	2.0%
	1965-1969	5.1%	3.0%	8.3%	2.4%	2.0%
	1970-1974	2.1%	-0.6%	4.4%	3.3%	2.7%
	1950-1974	4.4%	2.3%	7.2%	2.3%	2.1%
Dergue	1975-1979	0.02%	-1.6%	2.1%	2.5%	1.7%
	1980-1984	3.3%	0.6%	4.0%	3.5%	2.7%
	1985-1990	2.7%	-0.6%	3.8%	3.6%	3.3%
	1975-1990	2.1%	-0.5%	3.3%	3.2%	2.6%
EPRDF	1991-1995	1.4%	-2.1%	1.0%	2.5%	3.6%
	1996-1999	4.4%	1.3%	1.8%	3.0%	3.1%
	2000-2003	3.4%	0.5%	3.6%	2.7%	2.9%
	2004-2008	11.7%	8.7%	6.3%	3.5%	2.8%
	2009-2013	10.7%	7.9%	14.4%	3.9%	2.7%
	2014-2017	9.8%	7.1%	18.0%	2.8%	2.6%
	1991-2017	7.0%	4.0%	7.5%	3.1%	2.9%
	1991-2003	3.8%	1.2%	4.8%	2.7%	2.5%
	2004-2017	10.8%	7.9%	12.5%	3.4%	2.7%

Source: University of Groningen and University of California, Davis, Real GDP at Constant National Prices for Ethiopia [RGDPNAETA666NRUG], retrieved from FRED, Federal Reserve Bank of St. Louis; <https://fred.stlouisfed.org/series/RGDPNAETA666NRUG>, November 23, 2020

Appendix C. Summary of population distribution and employment and value added by sector



Source: Authors' calculation using the World Development Indicators data from the World Bank database.
Last updated: 12/16/2021