Structural Change and Economic Growth in Ethiopia, 1991-2017

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Abstract

Ethiopia undertook far-reaching economic reforms since 1991. For the past three decades, its economy has exhibited a structural change both in terms of sectoral share of employment and their contribution to GDP. For 1991- 2017, the contribution of the agriculture sector to GDP has declined from 58.7% to 33.8% and its share to total employment from 90.1% to 68.22%. Similarly, the value-added contribution of the service sector has increased from 29.6% to 37% and its share of employment from 16% to 21.5% while the contribution of manufacturing sector to GDP remain stagnant. Therefore, this study determines whether the change in the production structure of the country affects the GDP growth rate of the country. As a result, the structural change increases GDP growth rate both in the short run and long run through the relocation of labor mainly from the agriculture and manufacturing sectors to the service sector.

***Keywords**: Structural change, labor relocation, Shift-share analysis, Economic growth*

1. INTRODUCTION

Since 2004, Ethiopian economy has been growing 11.2% on average which is above the Sub-Saharan African average growth rate of 5.23%, based on world development indicators (WDI). Besides, there was a shift in the relative importance of major sectors in terms of their contribution to GDP and employment. The service sector has been growing faster than the agriculture and manufacturing sectors in both accounts. For example, for the year 2014, the service sector accounted for 46% of GDP [(Eshete and Kumuyu (2016) and Martin (2014)] that makes it a dominant sector in the economy. The share of the manufacturing sector to the total GDP is very low (Oyelaran-Oyeyinka and Lal, 2016). Based on WDI, the average share of the sector to overall GDP for 1991-2017 is 4.73%. However, it has shown a plodding improvement in its contribution to GDP since 2004. The average growth rate of the value-added contribution of the manufacturing sector from the year 1991 to 2017 is 2.986%. However, according to Nuhu (2017), slow transformation towards the manufacturing sector didn't result in an improved economy-wide productivity.

The economic growth performance of the country is not triggered by structural change surplus (Eshete and Kumuyu, 2016). Relative productivity of griculture has been increasing but at a very low (2.6%) level of economy-wide labor productivity growth (Timmer *et al.* 2014). Consequently, unlike the result by Cao and Birchenall (2013) for post-reform China, relocation of labor from agriculture to the non-agriculture sector may not increase aggregate labor productivity and by implication economic growth in Ethiopia. But, Diao *et al.* (2017) disagreed. They claim that Ethiopia has experienced growth-promoting structural change. In general, several studies on the structural change in Ethiopia agreed that the country is realizing a slow change in the structure of the economy even with low-level TFP in the non-agricultural sector. But there is no agreement on whether structural change helps to achieve a high level of GDP growth rate. Martin (2014) gives more recognition to demographic changes in motivating a higher level of growth rate than structural change. Hence, these discussions call for new studies that indicate the effect of structural change on the GDP growth rate of the economy both in the short-run and long-run. Therefore, this study determines the effect of structural change on the GDP growth rate of the Ethiopian economy by taking both investment fundamentals and structural change constituents as the two major sources of economic growth. The analysis follows two steps. In the beginning, the change in aggregate labor productivity is decomposed into structural change term and within labor productivity change by applying the shift-share method (McMillan and Rodrik, 2011). And the result displays that the country has gained labor productivity from both structural change and within-sector productivity but in a different magnitude.

The second step can be considered the centerpiece of the study. At this step, the autoregressive distributive lag (ARDL) model is estimated to determine whether structural change is contributing to the GDP growth rate. Accordingly, structural change is found to have a positive and significant effect on the GDP growth rate of the country both in the short run and long run. This implies that a change in labor productivity as a result of the relocation of labor towards a more productive sector, the service sector in this specific case, has an increasing effect on the growth rate of GDP in Ethiopia. This result contradicts Moro (2015) who claims that an increase in the share of the service sector to GDP reduces both TFP and GDP growth rates.

This paper is divided into five further sections. The first section describes a brief overview of overall economic reforms in Ethiopia since 1991. In this section, the main economic reforms and overall economic performance of the country are summarized. The second section presents the nexus between structural change and economic growth theoretically so that it can be used as a foundation for our analysis. The third section discusses the methodologies while the fourth section offers a detailed analysis of structural change and within-sector productivity of labor and their interaction with economic growth and the fifth section concludes.

2. A BRIEF OVERVIEW OF ECONOMIC REFORMS IN ETHIOPIA

Structural change and achieving a high level of economic growth rate have been the main concerns of several economic policies in Ethiopia by different regimes in the past. Before 1991, the country had a command economic system that allows a limited role for private sectors in the economy. During the Derg regime (1974-1991), the nationalization of private enterprises and the introduction of different restrictions on private sectors regarding investment caps and price controls discouraged entrepreneurship and active participation of the private sector in the economy which further affected economic growth and structural change. According to Manyazewal and Shiferaw (2019), even though state-owned manufacturing firms were established during this regime, their performance was poor due to maladministration. Furthermore, frequent droughts and the civil war in the northern part of the country exacerbated the economic problem of the country.

As a result, it was difficult for the country to achieve structural change with the existing poor level of economic growth. Especially, during the end of the 1980s and the beginning of the 1990s, the economy was characterized by the combination of slow or negative GDP growth rates with a very slow rate of structural change. As figure 1 illustrates, the GDP contribution of sectors didn't show any significant change for ten years between 1981 and 1990. For most of the 1980s, based on WDI, the average contribution of agriculture sector to the overall GDP was 53%. Similarly, the average contribution of the manufacturing

sector to the overall GDP was only 4.5%. Therefore, during this period, the country achieved very slow economic growth with a low level of structural change.

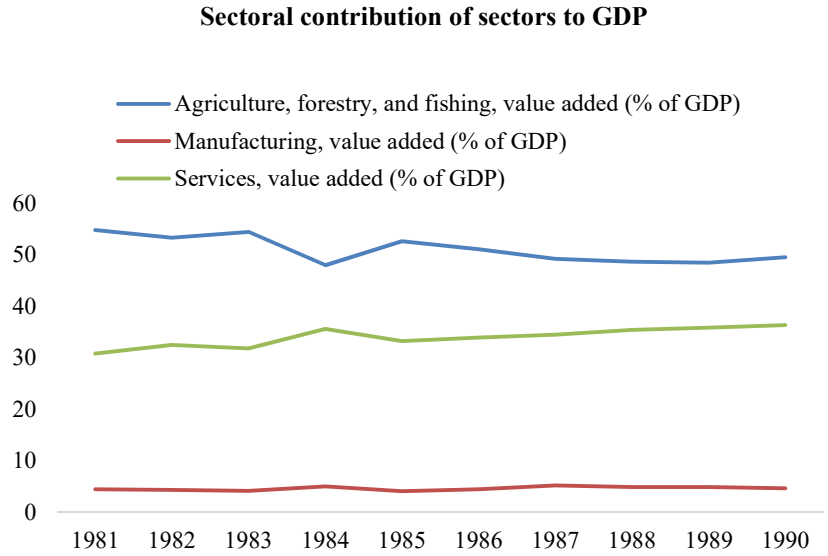

Figure 1. The contribution of sectors to the country's GDP from 1981 to 1990

Source: World development indicators (WDI)

However, after 1991, the transitional government of Ethiopia implemented a series of economic policies in collaboration with international development agencies to achieve macroeconomic objectives: macroeconomic stability, rehabilitation of damaged infrastructures and boosting private sector participation. The initial policy reforms that the government started to implement included lifting different restrictions on the private sector, reinstalling market forces, reducing international trade restrictions, especially tariffs on imported products, and finally devaluation. But the first and most comprehensive economic policy since 1993 is Agricultural Development Led Industrialization (ADLI). This policy aimed at enhancing productivity growth in smallholder agriculture through the provision of modern agricultural inputs, extension services and road networking with the objective of industrialization (Manyazewal and Shiferaw, 2019). Hence, it is safe to say that ADLI was a policy of structural change. The foundation behind this policy is raising agricultural productivity at small-scale farms which is believed to trigger the

establishment of agro-processing firms and increase the demand for industrial consumer goods, therefore, the structure of the economy changes.

Following the implementation of ADLI, the growth rate of agricultural GDP has increased from 1.9% per annum during the 1980s to 2.5% per annum by the year 1990s (Manyazewal and Shiferaw, 2019). But it is difficult to establish whether it is due to the implementation of ADLI. The fastest growth rate in agricultural GDP is achieved between 2000 and 2014. During this time, agricultural GDP was increasing with an average growth rate of 13.45% based on the WDI. However, it is not clear whether the increase in the growth rate of agricultural GDP led to the expansion of manufacturing sector as it was predicted by ADLI. Meaningful structural change was not achieved until the early 2000s. But after 2000, the GDP contribution of agriculture and its share of employment have been declining while the contribution of the service sector in both accounts were increasing. The data from WDI confirms that the share of agriculture to the overall GDP has been declining since 1991. The contribution of the agriculture sector to GDP by 1991 was 58.7% but it has declined to 33.8% by 2017. Similarly, the share of agricultural employment has also declined from 90.1% by the year 1991 to 68.22% in 2017. However, there is no empirical evidence that claims the structural change is a result of a rise in the productivity of agriculture.

As it is concluded by Eshete and Kumuyu (2016), the prediction of ADLI regarding the causal link between productivity in agriculture and structural transformation couldn't be established. That is why the government preferred to try other options and proposed a series of growth and transformation plans (GTP-I and GTP-II) intending to join middle-income countries by 2025. Specifically, with GTP I, the objective was to maintain an average growth rate of GDP at 11% so that Millennium development goals (MDGs) can be attained between 2010/11 and 2014/15. But it was too ambitious to achieve all the objectives. Therefore, GTP II is introduced to keep the momentum of achievements and increase the share of manufacturing to GDP to 10% between the years 2015 and 2020.

3. Structural change and economic growth: theoretical framework

Lewis (1954) showed how economic growth can be achieved through the relocation of labor in a dual economy. Based on this approach, the availability of labor in urban areas for the manufacturing sector at a constant wage is dependent on the existence of family farming in rural areas which are believed to have an unlimited supply of labor at least at the early stage of development. Hence, only the rise in wages in the manufacturing sector can draw labor out of agriculture. With this process, labor will be relocated to the modern sector to increase labor productivity and by implication economic growth. In other words, according to Lewis (1954), the overall productivity in a country increases when labor from the less productive traditional agricultural sector is relocated towards the more productive manufacturing sector. A similar theory is proposed by Chenery and Syrquin (1980) by focusing on establishing the link between the "rise in industry and level of per capita income". The central idea here is that countries that manage to transform their productive resources into the manufacturing sector have achieved a high level of per capita income.

On the other hand, Solow (1956) developed a neoclassical growth model that shows how economic fundamentals determine the growth rate of an economy. According to this model, economic growth is the result of changes in the saving rate, population growth rate and rate of technological advancement. In other words, two countries with the same population growth rate, saving rate and rate of technological progress will have an equal level of GDP growth rate. Taking this into consideration, Rodrik (2013) came up with a unified framework of the above two traditions in the economics of growth. The dual economy approach of Lewis (1954) is combined with the neoclassical growth theory of Solow (1956) to explain economic growth. In this approach, economic growth is determined not only by the relocation of resources from the traditional agriculture sector to modern and highly productive non-agricultural sectors but also through the incentives to save, accumulated physical and human capital, and innovation of new products and production systems. Therefore, Rodrik (2013) and Rodrik *et al.* (2016) considered them as the two basic challenges of economic growth: structural change and 'fundamentals' challenges in growth. While the former deals with the relocation of resources, the latter is focusing on developing broad capabilities. Hence, the nature of growth a country can achieve is dependent on the relative success that countries are removing structural transformation and fundamental challenges. A country is expected to achieve rapid, sustained growth if it manages to achieve a rapid structural

change with a high level of investment in fundamentals. Rodrik (2013) summarized the hypothesis as follows:

Table 1. Typology of growth patterns and outcomes

		Structural transformation	
		Slow	Rapid
Investment in fundamentals	Low	No growth	Episodic growth
	High	Slow growth	Rapid, sustained growth

Source: Rodrik (2013)

The important message here is that growth can be modeled by a unified framework of the neoclassical growth model with structural change. Therefore, adding a structural change variable into the neoclassical growth model helps to better predict the growth rate of GDP.

4. METHODOLOGY

By definition, structural change term is an index that measures the gain in labor productivity due to relocation of labor between sectors. A shift-share decomposition technique is employed to calculate structural change term as follows. Assuming aggregate labor productivities at t and $t-1$ are given as Y_t and Y_{t-1}, sectoral labor productivities and share of employment of each sector i at time t and $t-1$ are also given as y_t^i and y_{t-1}^i and θ_t^i and θ_{t-1}^i respectively, then, structural change term is calculated as follows:

$$\sum_{i=n} \frac{(\theta_t^i - \theta_{t-1}^i)\overline{y_{\iota,t}}}{Y_{t-1}} = \frac{Y_t - Y_{t-1}}{Y_{t-1}} - \sum_{i=n} \frac{(y_t^i - y_{t-1}^i)\overline{\theta_{\iota,t}}}{Y_{t-1}}$$

Where the left-hand side of the equation is structural change effect which is calculated as the difference between the percentage change in overall labor productivity and the percentage change in within-sector labor productivity due to internal factors (also known as "intra-effect"). Therefore, when the relocation of labor is towards a more productive sector, structural change term will be positive and helps to increase economy-wide productivity growth.

Following the estimation of structural change, econometrics model is employed to determine the effect of structural change on economic growth in Ethiopia by taking additional control variables into account. To start with the classical growth model, Markus and Francis (2013) employed the following to predict GDP growth rate:

$$lny_t = \beta_0 + \beta_1 lnl_t + \beta_2 lnk_2 + \beta_3 lnH_3 + \varepsilon_t$$

Where y is GDP, l is labor, k is capital and H is human capital. However, this model cannot only accommodate the main objective of the study but also abandoned the duality nature of the structure of the economy. Therefore, the level value of the structural change parameter which is estimated from the shift-share analysis is incorporated into the model. With a slight adjustment, the following explanatory and dependent variables are chosen, and the model is estimated by using ARDL technique.

Table 2. Dependent and explanatory variables for our model

VARIABLES	
Dependent variable	Explanatory variables
GDP growth rate	Rate of employment
	Structural change term
	Human capital index
	Openness index
	Total factor productivity index

5. RESULTS AND DISCUSSION

Results and discussion are presented in two steps. In the first step, the characteristics of the variables are explained by using descriptive statistics. And in the second step, we define how the structural change term affects the GDP growth rate of a country by using ARDL model.

5.1 Descriptive statistics

Table 3. Descriptive statistics of major variables involved in the analysis

SN.	Variable	Mean	Standard deviation	Minimum	Maximum
1	GDP growth rate	6.90	6.16	-8.67	13.57
2	The growth rate of employment	0.03	0.002	0.03	0.04
3	Structural change term	0.12	1.20	-2.74	2.08
4	Within labor productivity	2.54	4.05	-7.31	9.13
5	Openness	0.39	0.25	0.13	1.02
6	TFP growth rate	0.49	3.71	-8.50	6.5

Source: Author's calculation based on WDI

Hence, as it is indicated in table 3, Ethiopia has achieved an average GDP growth rate of 7% for 1991 - 2017. Especially after the year 2000, the average growth rate of GDP jumped to 9.02%. The highest GDP growth rate is achieved by 2014 with 13.57%. This puts the country as one of the fastest-growing economies in Africa for three consecutive years starting from 2011.

On the contrary, structural change trend has been slow with an average growth rate of 0.12%. This is way below the sample of developing countries' average which was 0.8%. This conclusion is supported by McMillan and Rodrik (2011). They have revealed that in countries like Ethiopia, the growth rate of labor productivity in the non-agricultural sectors is very low, therefore, relocation may not result in a high level of labor productivity. Particularly, the average growth rate of labor productivity in the manufacturing sector has been 0.033% and it was stagnant for a long period of time. Especially, between 2006 to 2017, sectoral labor productivity in the manufacturing sector was even lower than that of agriculture.

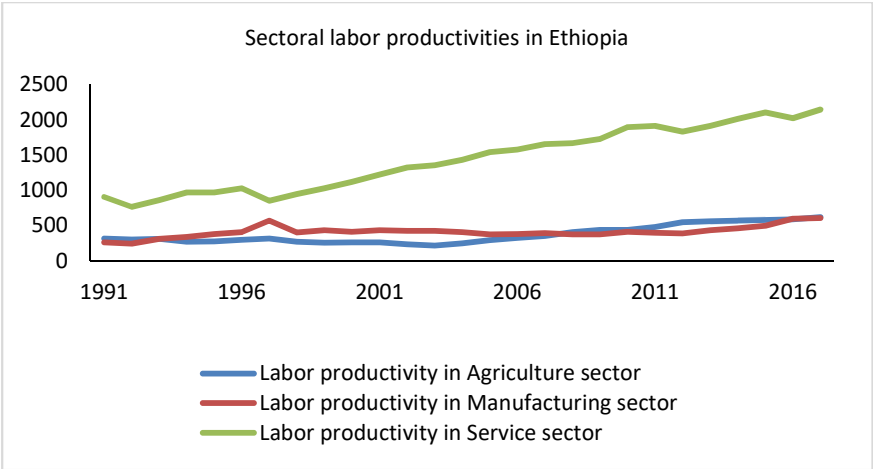

Figure 2: Sectoral labor productivities in Ethiopia

Source: Author's calculation based on WDI

This implies that the service sector is contributing more to the growth of aggregate labor productivity in the country than other sectors both through structural change and within sector labor productivity. Similarly, the within sector labor productivity growth also contributes to the growth of aggregate labor productivity in the country. Its contribution is greater than structural change term for almost all years considered in this study. To be more specific, the average annual growth rate of the gain in labor productivity due to technological advancement from each sector is 2.5%.

Table 4. Decomposition of average growth of labor productivity in Ethiopia from 1991 to 2017

SN.	Measurement	Agriculture	Manufacturing	Service	Total
1	Structural change term	-0.46395	0.122935	0.56065	0.1196
2	Within sector labor productivity change	1.07533	0.14290	1.32082	2.5390
3	Total	0.61138	0.265835	1.88147	2.6586

Source: Author's calculation based on WDI

When it comes to structural change at sectoral level, it has been negative for the agricultural sector which contradicts the theory given that the share of employment in this sector is declining. But the number of labor force joining the sector is higher than that of leaving the sector. But labor productivity has increased because within labor productivity growth rate has been positive and compensates for the decline in the structural change term. Except for the agricultural sector, aggregate labor productivity change is generated from both structural change and the change in within sector labor productivity. On an average basis, while 68.2% increase in aggregate labor productivities is from service sector while 22.2% is from agriculture sector. And the remaining 9.6% is contributed by the manufacturing sector. This advantaged the country to have a steadily increasing aggregate labor productivity since 1991. Figure 3 and figure 4 show structural change and within labor productivity change at sectoral level.

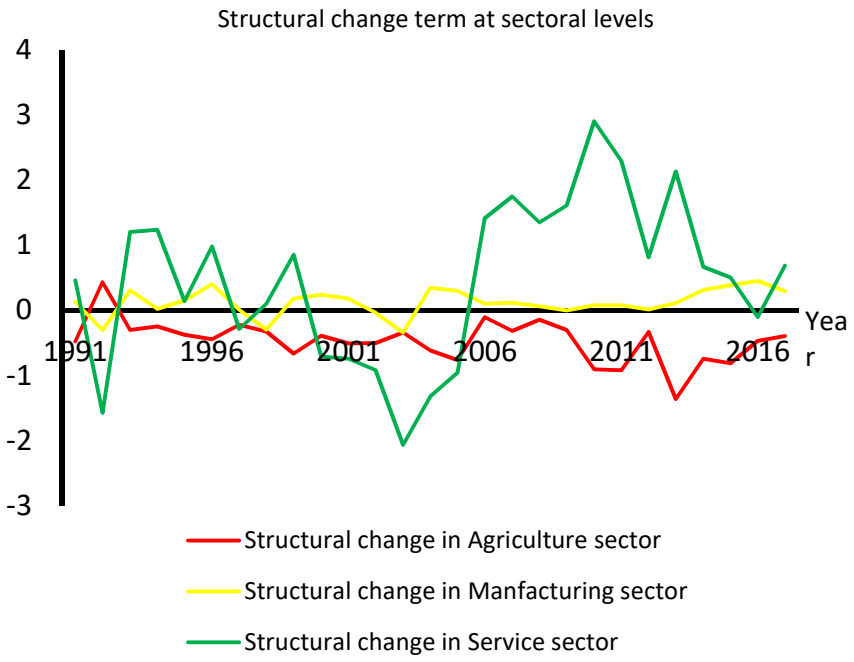

Figure 3: Structural change at the sectoral level

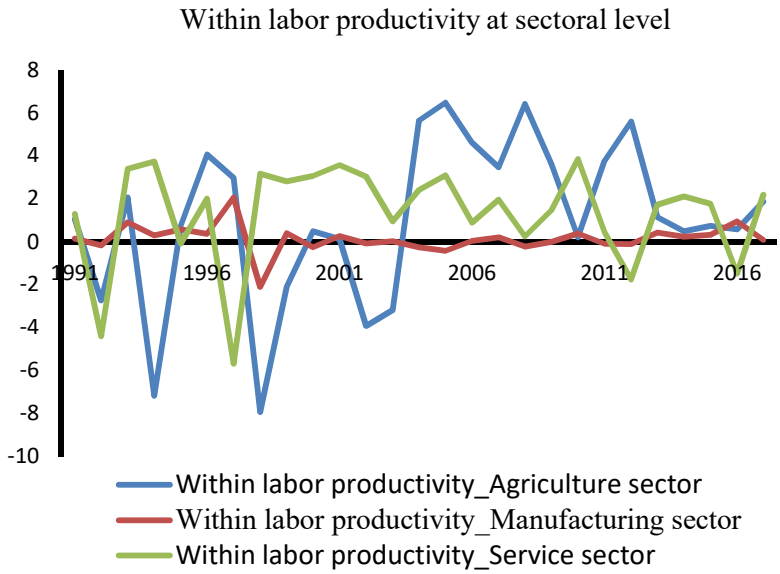

Figure 4. Sector specific within sector labor productivity change in Ethiopia

5.2 ARDL Regression results

A scatter plot is used to decide on the mathematical specification of the model that shows the relationship between structural change and economic growth.

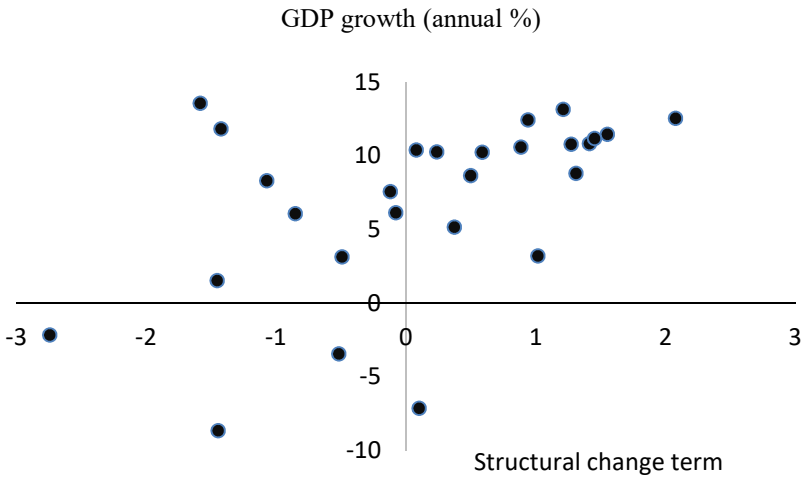

Fig 5. Scatter plot of GDP growth rate with structural change term

Based on figure 5, the model can have either a linear positive relationship or a U-shaped-quadratic mathematical form. But the quadratic form of structural

change term is tested, and it is found to be insignificant at 5% significance level. Therefore, the mathematical specification of the model is destined to be linear.

I. Stationary tests

Checking the stationarity of variables is the first step to choose a method of analysis from time series models. These models that are used to estimate stationary variables cannot be used for non-stationary variables. According to Shrestha and Bhatta (2018), ordinary least square (OLS) and vector autoregressive (VAR) models result in unbiased estimates only when all variables are stationary. On the other hand, Johansen co-integration test and ARDL can be used if all variables are non-stationary, while ARDL is the only estimation technique available for a model with a mixture of stationary and non-stationary variables. As a result, keeping this in mind, the Dickey-Fuller unit root test is used to check the stationarity of variables. And four of the variables mentioned on the following table with no sign of "D" are found to be stationary at level form. But those variables with "D" are non-stationary at level but at first difference.

Table 5: Unit root test based on Dickey-Fuller

Dickey-Fuller test for unit root			Number of obs = 26		
	Test Statistic	1% critical value	5% critical value	10% critical value	P-value
TFPGR	-3.425	-3.743	-2.997	-2.629	0.0101
Openness (D.)	-4.196	-3.750	-3.000	-2.630	0.0007
Structural Change (D.)	-6.597	-3.750	-3.000	-2.630	0.0000
Employment rate	-2.963	-3.750	-3.000	-2.630	0.0385
GDP growth rate	-4.081	-3.743	-2.997	-2.629	0.0010
Structural change in the manufacturing sector	-7.370	-3.750	-3.000	-2.630	0.000

Hence, the variables listed in the table above are a mixture of stationary and non-stationary variables. Therefore, our choice of time series model is narrowed down towards the ARDL model. This model is an ordinary least square (OLS) based model that is most widely used for the time series with mixed order integration (Nkoro and Uko, 2016). It also provides the short-run and long-run coefficients so that we can easily interpret the results accordingly.

II. Choice of appropriate lag length

In choosing the optimal lag length, the number of explanatory variables will be decided.

Table 6: VAR lag order selection criteria

Selection-order criteria					Number of observations = 24			
Sample: 1994-2017								
Lag	LL	LR	df	P	FPE	AIC	HQIC	SBIC
0	18.748				8.9e-10	-.979	-.888	-.635
1	194.31	351.12	49	0.000	2.8e-14	-11.53	-10.79	-8.777
2	292.27	195.93*	49	0.000	1.8e-15*	-15.6*	-14.2*	-10.45*
Endogenous: GDPgr, employment rate, structural change, human capital index, openness, TFPGR								
Exogenous: _Cons								

Based on table 6, the optimal lag length is 2 which is determined based on most of the criteria mentioned in the table (LR, FPE, AIC, HQIC and SBIC).

III. ARDL model estimation results (Short-run and long-run coefficients)

Given the optimal lag length is 2, ARDL estimation result and post estimation diagnosis tests are given as follows.

Table 7. ARDL model estimation for short-run scenario

ARDL regression: selected based on the above criteria	
Explanatory variables	Dependent Variables
	GDP growth rate
L. GDP growth rate	-0.737***(0.172)
L2. GDP growth rate	-0.697***(0.124)
Rate of employment	1,915***(239.5)
L. growth rate of employment	2,438***(278.7)
L2. Growth rate of employment	558.9*(260.4)
Structural change term	5.202***(0.411)
L. Structural change term	3.254**(0.889)
L2. Structural change term	0.831(0.473)
Human capital index	-1,012***(159.1)
L. Human capital index	751.9**(282.4)

L2. Human capital index	392.2*(196.0)
Openness index	6.836*(2.971)
L. Openness index	9.706**(2.880)
L2. Openness index	-14.21***(2.390)
Total factor productivity index	0.614***(0.139)
L. Total factor productivity index	0.592**(0.212)
L2. Total factor productivity index	0.640***(0.132)
Constant	-297.7***(34.41)
Observations	24
R-squared	0.990
Sample	1994 – 2017
F (17, 6)	33.61
Prob > F	0.000
Adj R-squared	0.9602
Root MSE	0.9175

Note: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Source: Author's estimation by using STATA

Table 8: Diagnostic tests for the ARDL model estimated above

	Null hypothesis	chi2(1)	Prob>chi2
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity	Constant variance	1.43	0.2324
Breusch-Godfrey LM test for autocorrelation	No serial correlation	0.684	0.7103
Skewness/Kurtosis tests for Normality	Normally distributed	4.09	0.1294
Ramsey RESET test using powers of the fitted values of GDP growth rate	The model has no omitted variables	F (3, 17) = 1.01	0.4123

Source: Author's estimation by using STATA

The post estimation diagnostic tests which are presented in table 8 shows that there are no problems of heteroskedasticity and serial correlation. Also, the

Ramsey RESET test proved the appropriateness of the mathematical model while normality test based on Skewness/Kurtosis proved the normality of the distribution of the error term. Therefore, ARDL model is used for interpretation. Similarly, the long run coefficient that determine the effect of structural change is given as follows.

Table 9: ARDL regression for long-run scenario

Explanatory variables	Dependent Variable: GDP growth rate	
	ADJ	Long run
L.GDP growth rate	-2.434*** (0.259)	
Rate of employment		2,018*** (129.2)
Human capital Index		54.23*** (2.271)
Openness index		0.957(0.866)
Structural change term		3.817*** (0.252)
TFP growth rate		0.759***(0.107)
Observations	24	24
R-squared	0.993	0.993
Adj R-squared		0.9729
Log-likelihood		-15.351311
Root MSE		0.9175

Note: Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1
Source: Author's estimation by using STATA

As can be seen from table 9, taking R-square and F-test as measures of goodness of fit, the model explains the relationship very well. 99.3% of the variation in the dependent variable is explained by the variations in the independent variables. The co-integration coefficient is negative and significant which formalizes the long-run model. Also, post estimation diagnosis tests presented

in Table 8 confirmed that all the Gauss-Markov assumptions are met, and the problem of endogeneity is less of our concern due to the nature of the ARDL model. The error terms in this model are assumed to be correlation free.

IV. ARDL Bound test

The ARDL bound test is conducted to check whether the variables are co-integrated in the long run therefore the long-run coefficients can be used for interpretation.

Table 10. Pesaran/ Shin/ Smith (2001) ARDL bounds test

Pesaran/Shin/Smith (2001) ARDL Bounds Test
H0: no levels relationship F = **15.552**
t = **-9.408**

Critical Values (0.1-0.01), **F-statistic**, Case 3

	[I_0] L_1	[I_1] L_1	[I_0] L_05	[I_1] L_05	[I_0] L_025	[I_1] L_025	[I_0] L_01	[I_1] L_01
k_5	**2.26**	**3.35**	**2.62**	**3.79**	**2.96**	**4.18**	**3.41**	**4.68**

accept if F < critical value for I(0) regressors
reject if F > critical value for I(1) regressors

Critical Values (0.1-0.01), **t-statistic**, Case 3

	[I_0] L_1	[I_1] L_1	[I_0] L_05	[I_1] L_05	[I_0] L_025	[I_1] L_025	[I_0] L_01	[I_1] L_01
k_5	**-2.57**	**-3.86**	**-2.86**	**-4.19**	**-3.13**	**-4.46**	**-3.43**	**-4.79**

accept if t > critical value for I(0) regressors
reject if t < critical value for I(1) regressors

As it is indicated in table 10, the F-statistics is higher than the critical values. As a result, the null hypothesis of no levels relationship is rejected and proved the existence of cointegration between variables. Therefore, the long-run model estimation which is presented in table 9 is legitimized once again.

V. Stability test

Once the long run coefficients are estimated, their stability can be checked by using recursive cumulative estimation of CUSUM and CUSUM square tests. The test results are illustrated by the following figures.

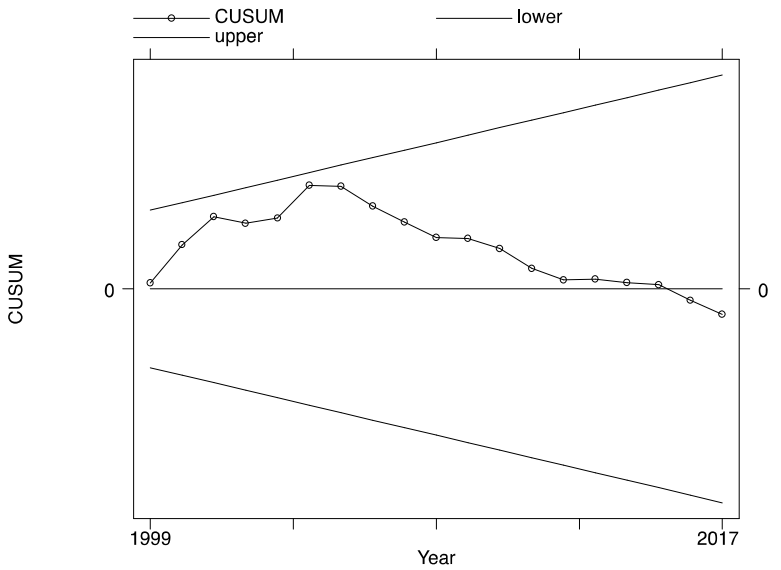

Figure 6. A plot of the cumulative sum of recursive residuals

Source: Author

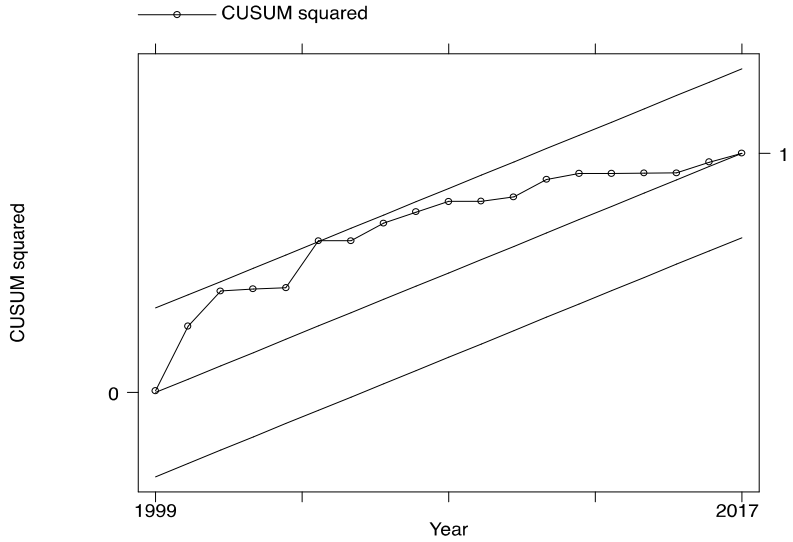

Figure 7. A plot of the cumulative sum of square of recursive residuals

Source: Author

Figure 6 and 7 show that CUSUM and CUSUM squared graphs lay between the 95% confidence bands for the period mentioned on the graph which guarantees the stability of the parameter estimates. The coefficients of our ARDL estimates are stable and can be used over time. As a result, there is no structural break in the residual and both the short-run and long-run estimates are used for interpretation as follows.

A. The effect of structural change on GDP growth rate in the short run

Based on Table 7, the gain in labor productivity due to relocation of labor affects the growth rate of GDP of the country positively. A 1% increase in labor productivity due to relocation of labor between sectors increases the GDP growth rate of the country by 5.2% for the same year and 3.3% for the next year. Hence, the effect of structural change in terms of labor relocation between sectors cause the growth rate the economy in two consecutive years. This is because the relocation of labor in Ethiopia has been mainly from low productive agricultural and manufacturing sectors to high productive service sector. Therefore, it is likely to boost aggregate labor productivity and by implication GDP growth rate.

This result confirms Lin (2011) and McMillan and Rodrik (2011). These studies claim that the nature and speed of structural change determine its role in achieving and sustaining economic growth. The structural change in Ethiopia is mainly characterized by the movement of labor from both the agriculture and manufacturing sectors to the service sector. The average labor productivity in the service sector is almost four times higher than labor productivity in agriculture and 3.5 times higher than labor productivities in the manufacturing sector for 1991 - 2017. Therefore, the movement of labor towards the service sector happens to be the only channel that can result high level of labor productivity and economic growth. The relocation of labor from agriculture to the manufacturing sector didn't result in an increased labor productivity and growth rate of GDP. Even if the share of employment in the manufacturing sector has increased from 6% to 11.4%, the relocation of labor towards the manufacturing sector has reduced aggregate labor productivity for 2008 - 2016.

Furthermore, openness, total factor productivity and growth rate of employment have a positive and significant effect on the growth rate of GDP at 5% significance level. On the other hand, the level value of the human capital index and lagged values of GDP growth rate are affecting GDP growth rate negatively in the short run.

B. The effect of structural change on GDP growth in the long run

In addition to the short-run relationship, the long-run relationship is also estimated and presented in table 9. Based on the estimation result, structural change term is found to affect the GDP growth rate in the long run positively at 1% significance level. A 1% increase in labor productivity due to relocation of labor from one sector to the other, long-run growth rate of the country increases by 3.8%. This has a huge implication for economic policy. On an average basis, as long as the relocation of labor contributes to the increase in labor productivity, the growth rate of GDP will increase both in the long run and short run. This result is consistent with Zulkhibri et al. (2015) where they came up with similar results for Malaysia, Nigeria, Turkey, and Indonesia over 1960-2010 and Nguyen (2018) for Vietnam between 1990 and 2013.

6. CONCLUSION

In this study, ARDL model is employed to determine the effect of structural change on the GDP growth rate of the Ethiopian economy by recognizing both investment fundamentals from the Solow growth model and structural change from Lewis' duality model. Structural change term and within sector labor productivity are extracted from aggregate labor productivity and sectoral share of employment by using a shift-share decomposition technique. Other variables used in the analysis are taken from World development indicators (WDI) for 1991-2017.

The structure of Ethiopian economy has shown drastic change over 1991-2017 both in terms of sectoral share of total employment and GDP. For example, the contribution of the agriculture sector to GDP by the year 1991 was 58.7% but it has declined to 33.8% by the year 2017 which is a 24.9% decline over 26 years. The share of employment in this sector has also been declined from 90.1% to 68.22% during the same period. On the contrary, the share of the service sector has been increasing both in terms of share of total employment

and its contribution to GDP. By 1991, the service sector was accounted for 29.67% of the total GDP and 15.92% of total employment. But by the year 2017, its share of GDP has increased to 36.92% while its share to the total employment became 21.48%. As a result, the service sector becomes the dominant sector in the economy in terms of its contribution to GDP. It is also the fastest growing sector in the economy in terms of its contribution to the total employment.

To determine the effect of structural change on GDP growth rate both in the long run and short run, the Autoregressive distributive lag (ARDL) estimation technique is used because it can handle a mixture of stationary and non-stationary variables together. Also, this technique estimates parameters for both short-run and long-run scenarios. As a result, the gain in labor productivity due to relocation of labor from low productive to high productive sectors increases the GDP growth rate of the economy both in the long run and short run. This may include the relocation of labor from agriculture and manufacturing sectors to the service sector in the short run and relocation of labor from agriculture to modern sectors in the long run. Therefore, the country shall promote the relocation of labor from agriculture to modern sectors so that it can achieve a high level of growth rate of GDP both in the short run and long run.

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