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DEVELOPMENT ECONOMICS | RESEARCH ARTICLE

Decomposition analysis of economic growth in Afar region, Ethiopia

Getachew Wollie Asmare^{1*}

Abstract: This paper is aimed to decompose, the economic growth of the Afar national regional state of Ethiopia in to labor productivity, employment rate and working age population and to verify whether the positive economic growth registered earlier on the region was a job creation growth or not. To do so, annual time series data ranging from 2010 to 2018 were used and per capita value added as a measure of economic growth was decomposed by using Shapley decomposition analysis technique. The result reveals that changes in output per worker accounted the highest proportion (74.33%) followed by changes in working age population (32.85%) and employment rate (−7.17%) for the total change in per capita value added during the entire period of time. The negative growth changes registered in employment rate implied that the economic growth registered on the Afar national regional state was a jobless growth. The economic growth patterns of Afar region does not favor the agriculture sector where the poor are found. The within-sector takes the lion share contributing (72.67%) to aggregate change in output per worker growth followed by structural change (13.21%) and interaction of within sectors and structural change (14.11%). Finally, these findings navigated us to suggest for policymakers, to amend their sector-wise economic policies and strategies focused to enhance employment generation and labor productivity of the Afar region.

Subjects: Economics; Macroeconomics; Development Economics



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Getachew Wollie Asmare has MSc degree in Agricultural Economics and working as a lecturer of economics at Samara University, Ethiopia. He has imparted various undergraduate courses for Business and Economics students. Some of his area of interest focused in conducting a research on estimation of Regional Gross Domestic Product (RGDP), measuring economic growth and inflation, measuring efficiency, economic valuation of tourism, poverty analysis and measuring food security status using time-series, cross-sectional and panel data.

PUBLIC INTEREST STATEMENT

Nations in the world has used Gross Domestic Product (GDP) as a gauge of economic growth. GDP tells us the nation's total income and/or the total expenditure on its output of goods and services. GDP is often considered the best measure of how well the economy is performing. Afar region is one of the eleven regional states in Ethiopia that had registered a higher economic growth during 2010 to 2018. But, having a positive economic growth may not be a guarantee to say that there is poverty reduction in one's nation or region. Because, the impact of economic growth on poverty reduction can be displayed through the extent that the economic growth generates employment opportunity and also its contribution for the productivity of workers. Then in this paper, the researcher has verified that, whether the positive economic growth registered on the region during the last decade was create job opportunities or not by supporting with empirical evidence.

Keywords: Value added; structural change; decomposition analysis; Ethiopia

1. Introduction

Ethiopia has adopted different economic policies and strategies to galvanize its economic growth. Since 1991, Ethiopia has pursued a policy of Agricultural Development Led Industrialization (ADLI) aimed to increase agricultural productivity by assuming it help to facilitate demand for industrial commodities and used as inputs for industrialization (World Bank [WB], 2016). Plan for Accelerated and Sustained Development to End Poverty (PASDEP) was also implemented as a 5-year plan (from 2005 to 2010) focused on, boosting agricultural production via intensification and yield growth and also an industrial and export earnings strategy based around industries with linkages to agriculture. Then, the first and second growth and transformation plan (GTP-I from 2010 to 2015) and (GTP-II from 2015 to 2020) were also implemented by giving strong emphasis on light manufacturing in key sectors where the country has a perceived comparative advantage, industrialization, urbanization, and export promotion (Ministry of Finance and Economic Development [MoFED], 2006; Ministry of Finance and Economic Development [MoFED], 2010; National Planning Commission [NPC], 2016). The main aim of those policies was to sustain the rapid, broad-based and inclusive economic growth and used them as a spring board to become a low-middle-income country by 2025. Following their hierarchy power from the federal state, the Afar national regional state also adopt the above policies by setting a correspondence institution to galvanize its own regional-state economic growth and improve food security status of the pastoralists.

By implementing the above policies, Ethiopia has experienced solid progress in key economic and social indicators and is one of Africa's fastest-growing economies (Tadele & Shiferaw, 2015). The Ethiopian economy recorded 8.2% average growth rate per annum during the GTP II period (2015/16-2019/20), which was 2.8% point lower than the average growth target set for the plan period. For the year 2019/20, Ethiopia has a real GDP of 1990 billion birr (or \$70.82 billion¹) at constant basic price with a growth rate of 9% (National Bank of Ethiopia [NBE], 2020). During 2018/19, the Afar regional state also has a GDP of 15.94 billion birr (\$0.567 billion) at a constant market price and in between 2012 and 2018 the region registered an average growth rate of 8.10% (Afar Bureau of Finance and Economic Development [ABoFED], 2020).

The pace of long-run economic growth is of fundamental importance to living standards. Economic growth is an irreplaceable mechanism for lifting people out of poverty. But, lifting people out of poverty by boosting economic growth does not necessarily imply that the gap between the rich and poor will lessen (Gill & Kharas, 2007). Recently, researchers and policymakers have given emphasis to study and understand whether the economic growth of a nation is job creating growth or not. Because in most developing nations, the poor derive most of their income/consumption from work: as employees or as self-employed in subsistence activities like agriculture. Thus, the impact of growth on poverty is seen as depending on the extent to which growth generates employment and good earning opportunities of the working poor in addition to unemployed peoples (World Bank [WB], 2012). Afar region is one of the eleven regional states in Ethiopia that had registered a higher economic growth during the last decade. But, having a positive economic growth may not be a guarantee to say that there is poverty reduction in one's nation or region. Because, the impact of economic growth on poverty reduction can be displayed through the extent that the economic growth generates employment opportunity and also its contribution for the productivity of workers. So, it is needed to undertake a research and verify whether the positive economic growth registered on the region during the last decade was simultaneously contributed for creating job opportunities or not and support it with empirical evidence. Hence, there are some researchers conducted their study at national level (Pedro, 2018; Tadele & Shiferaw, 2015; Zelalem, 2017) but, no one is undertaken on the study area. So, studying the decomposition of economic growth in a particular region has its own role to provide plenty of information for policymakers to amend and cross-check their ongoing economic policies. Then, this

paper was conducted on Afar region by having an aim to fill the above literature gap and the following specific objectives.

- To decompose the contribution of economic growth of Afar region in to labor productivity, employment creation, and working age population;
- To assess the role of within sector and structural changes for economic growth of Afar region; and
- To examine which sector contributes more for employment generation and for output per worker in the Afar region.

2. Literature review

In the history of macroeconomics, economic growth has many theories and models which starts from the debate of the Keynesian school of thought and the Orthodox or Neoclassical school of thought about its cause (Waller, 2000). Even after the Second World War, there are four major theories: the linear-stages-of-growth model, patterns of structural change theory, international dependence revolution theory and the neoclassical free-market counterrevolution theory having their own critiques and support (Todaro & Smith, 2012). Among them, the structuralist economics of the post WW-II period has revived in the development economics literature of this time, and it came to be known as the “New Structural Economics” (Lin, 2012). It emphasizes that growth has a poverty-reducing effect if it ensures that a country’s labor force and other resources are directed to the productive activities. The structural change theory focused on the mechanisms by which developing economies transform their economic structures from the dominant traditional subsistence agriculture to the modern manufacturing and service economy. The proponent of this theory used modern economic theory and statistical analysis to identify the process of structural change to a sustainable rapid economic growth of developing economies. The well-known examples of this model are the “two-sector surplus labor” theoretical model of Arthur Lewis (Lewis, 1954). The Lewis model focused on the transformation of the economic structure of countries from agriculture, which has low productivity of labor, towards an industry that has a high productivity of labor (Todaro & Smith, 2012).

On the literature of decomposing economic growth to employment generation and productivity growth, there are two methods that most researchers have adopted. The first method is Employment Elasticity approach also known as the traditional approach, and the second method is the Job Generation and Growth Decomposition tool (JoGGD) also known as the Shapley’s Decomposition Analysis approach.

Employment elasticity is a measure of the percentage change in employment associated with one percentage point change in GDP. It indicates the ability of an economy to generate employment opportunities for its population during its growth and development process (Elangbam, 2019). Padalino and Vivarelli (1997), Ewald (1999), Islam and Nazara (2000), and Bhattacharya and Sakthivel (2003) has applied this approach to put empirical evidence on the economic growth of a nation is employment driven and/or productivity driven.

On the other hand, researchers hav applied shift share decomposition method that originating from (Fabricant, 1942) to describe how growth is reflected in the sectoral pattern of growth and employment generation. But, this traditional shift share method has criticized by its assumption that productivity growth within each sector is not affected by structural change. So to tackle this problem, the modified shift-share analysis method is introduced by splitting the within- and between-effects in the standard decomposition based on the assumption that marginal and average labor productivity in a sector are equal, or put otherwise, that labor productivity growth is independent of the changes in employment (Timmer & de Vries, 2009). As a general, this methodology (Shapley decomposition) is used to describe how growth is linked to change in employment at the aggregate level and sector wise. It is also a simple additive method that links changes in a particular component to changes in total per capita value added, by taking into account the relative size of the sector or component, as

well as the magnitude of the change (Fagerberg, 2000; Timmer & Szirmai, 2000; Van Ark & Timmer, 2003). Then in this paper, both approaches were employed as a result of these methods helps to figure out the relationship between economic growth and employment scenario and also the quality of jobs being created across the sectors (Elangbam, 2019; Gutierrez et al., 2007; Pedro, 2018; WB, 2012).

Tadele and Shiferaw (2015) have investigated the evolution of macroeconomic policies in Ethiopia and their outcome in terms of output growth as, productivity changes and employment structure both at aggregate and sectoral level. They remarked that the various reforms undertaken in Ethiopia since the 1990s seem to have positively impacted economic performance. Although the sectoral composition of the Ethiopian economy has changed from agriculture to services, changes in the composition of employment have lagged behind. Economy-wide labor productivity growth has been accompanied by employment growth, but the former has been strong, outpaced the growth of employment. According to these authors, structural change has also played an important role for enhancing labor productivity growth in the country.

Zelalem has conducted a study in Ethiopia, to identify the contributions of service sector to per capita GDP and employment growth during two periods of (1999–2005) and (2005–2013) using a Shapley decomposition method. His research result shows that the service sector has the highest contribution in productivity but a negative contribution in employment change during the (1999–2005) growth periods. However, during the high growth period of (2005–2013) the growth in per capita GDP is due to productivity growth, which emanates from the service sectors specifically from the distributive service sector. The service sector has witnessed high growth and has contributed to the growth in output and employment during the recent growth periods (Zelalem, 2017).

Pedro (2018) investigates the pace and pattern of structural change in Ethiopia tracking 10 economic sectors data between 1999 and 2013. His analysis suggests that the structure of production has changed considerably but that shifts in the composition of employment have lagged behind. Output per capita growth has been strong and mainly driven by within-sector productivity improvements. However, the contribution of structural change has increased over time, which is encouraging.

3. Methodologies

3.1. Descriptive of the study area

The Afar National Regional State is one of the eleven regional states of Ethiopia and is the homeland of the Afar people. Formerly known as Region 2, its new capital as of 2007 is the recently constructed city of Samara, which lies on the Addis Ababa– Assab highway. The Afar Triangle, the northern part of which is the Danakil depression, is part of the Great Rift Valley of Ethiopia, and is located in the north of the region. It has the lowest point in Ethiopia and one of the lowest in Africa. The southern part of the region consists of the valley of the Awash River, which empties into a string of lakes along the Ethiopian-Djibouti border. Other notable landmarks include the Awash and Yangudi National parks.

Afar Regional State is the region of most amazing natural attracted areas including the Afar depression, which is a plate tectonic triple junction, it also has major minerals including potash, sulfur, salt, bentonite, and gypsum. Besides, there are also promising geothermal energy sources and hot springs in different areas of the region. Afar region is also a home to peculiar wild life, which notably include the African wild ass, Grevy's Zebra, Wild fox, Wild cat, Cheetah, and Ostrich. These wild animals are found in the region's national parks.

Based on the 2007 Census conducted by the Central Statistical Agency of Ethiopia (CSA), the Afar Regional State has a population of 1,390,273, consisting of 775,117 men and 615,156 women; urban inhabitants number 185,135 or 13.32% of the population, a further 409,123 or 29.43% were pastoralists. With an estimated area of 96,707 square kilometers, the region has an estimated

density of 14.38 people per square kilometer. Based on the 2017 projections by the Central Statistical Agency of Ethiopia, the Afar Regional State has a population of 1,812,002, consisting of 991,000 men and 821,002 women; urban inhabitants number 346,000 of the population, a further 1,466,000 were pastoralists (Central Statistical Agency [CSA], 2013).

3.2. Nature and source of data

Ethiopia also recorded its national economic data since starts from 1960s and estimate its Gross Domestic Product following the basic concepts, methodologies and practices of system of national accounting that most institutions and nations like IMF, European commission, World Bank and United Nations has used. But, Afar national regional state as a region has recorded its own Regional Gross Domestic Product (RGDP) data since starts from 2010.

As a result of unavailability of data, this paper incorporates a time series data only almost a decade (from the period of 2010 to 2018) on 15 major economic activities of the region. Data on the output of each economic activities in terms of value added was obtained from the Afar national regional state Bureau of Finance and Economic Development (BoFED) and also from the national Plan and Development Commission (PDC). Data on employment and working age population were taken from the national labor force survey as well as the urban employment unemployment survey of Central Statistical Agency (CSA) conducted on 2005, 2010, and 2018. Besides, data on population were obtained from midyear population projection of CSA.

3.3. Method of data analysis

Employment Elasticity is the percentage change of employment for every 1% change of GDP at a period of time. It is given by:

$$\varepsilon = \frac{\Delta E/E}{\Delta Y/Y} \quad (1)$$

where ε stands for the employment elasticity, E stands for employment while Y denotes value added of Afar economy. The numerator as shown above can be interpreted as the percentage change of employment, while the denominator represents to the percent change in the growth rate of value added. The elasticity approach here is based on arc elasticity and not point elasticity.

The Shapley decomposition method also adopted to decompose growth of the regional economy because of its advantage to be additive but effective method that links changes in a particular component to changes in per capita value added by taking into account the relative size of the sector. It also gives the necessary details pertaining to the quality of job created and whether there is increase in productivity (Elangbam, 2019). According to the user's guide developed by World Bank (WB, 2012), the Shapley decomposition method has six steps but, due to unavailability of data, only the first three steps were adopted in this paper. Hence steps 1, 2, and 3 can be performed independently of other steps and these steps are adequate to achieve the research objective.

The first step is to decompose per capita value-added growth into growth associated with changes in output per worker, growth associated with changes in employment rates and growth associated with changes in the size of the working age population.

$$y = \omega * e * \alpha \quad (2)$$

where y is per capita value added (Y/N), ω is total output per worker (Y/E), e is employment rate (E/A), α is labor force or working age population (A/N), and the symbol (*) represents the interaction (multiplication).

The total change in per capita value added will be the sum of the growth attributed to each of its components ω , e , and α . Thus if we let ϖ , \bar{e} , and $\bar{\alpha}$ denote the fraction of growth linked to each component, then the total growth of an economy can be expressed as:

$$\Delta y = \varpi * \Delta y + \bar{e} * \Delta y + \bar{\alpha} * \Delta y \quad (3)$$

where $\varpi * \Delta y$ will reflect the amount of per capita growth linked to output per worker in which the employment rate e , and the share of working age population a had “stayed constant” and the other components will be interpreted as the same fashion.

In the second step, the total growth in employment (Δe) can be decomposed into employment generation by each sector aimed to know the contribution of each sector for employment generation and for total per capita growth.

$$\Delta e = \sum_{i=1}^s \Delta e_i \quad (4)$$

where Δe is the total growth in employment and $\Delta e_i = \Delta \frac{E_i}{A}$ is just the change in employment in sector i as a share of total working age population.

In the third step, the Shapley approach also helps to know the contribution of output per worker for economic growth by decomposing output per worker into sectoral employment shifts, changes in output per worker within sectors and their interaction effect. That is, average output per worker will increase either if there is an increase in output per worker within a sector or when there is shifting of workers across sectors from lower productivity to higher productivity sectors.

$$\omega = \sum_{i=1}^s \omega_i S_i \quad (5)$$

where ω is total output per worker (Y/E), $\omega_i = \frac{Y_i}{E_i}$ denotes output per worker in sector i and $S_i = \frac{E_i}{E}$ is the share of sector i in total employment.

The Shapley approach also helps to decomposed changes in aggregate output per worker ($\Delta \omega$) as:

$$\Delta \omega = \Delta \omega_w + \Delta \omega_B + \Delta \omega_I \quad (6)$$

where $\Delta \omega_w = \sum_{i=1}^s \Delta \omega_i * \left(\frac{S_{i,t=0} + S_{i,t=1}}{2} \right)$ corresponds to the change in output per worker due to changes in output per worker in sector s which is also referred to as the “within component” and $\Delta \omega_B = \sum_{i=1}^s \Delta S_i * \left(\frac{\omega_{i,t=0} + \omega_{i,t=1}}{2} \right)$ which can be interpreted as the change in output per worker due to inter-sectoral employment changes (structural change) and ΔS_i is the share of sector i in total employment.

$\Delta \omega_I = \sum_{i=1}^s \Delta S_i * \Delta \omega_i$ represents the interaction effects of change in within effect and structural change.

The symbol $+$ and $*$ represents addition and multiplication, respectively.

4. Data analysis

4.1. Economic growth rate of Afar region

In Afar national regional state, total output in gross value added has been increased nearly by twofold from 8.9 billion birr in 2010 to 15.9 billion birr in 2018 representing a 78.09% increment over the entire period of time (Table 1). The region also registered a growth rate of 23.74% in the mid-year population, 39.39% in working age population, and 35.83% in the number of employed

Table 1. Output, population, employment, and productivity, Afar 2010–2018

	2010	2018	% change
Gross value added	8,950,211,277.07	15,939,413,699.05	78.09
Population	1,483,000.00	1,835,000.00	23.74
Working age population	305,323.30	425,603.34	39.39
Employed persons	249,840.22	339,358.19	35.83
Per-capita value added	6,035.21	8,686.33	43.93
output per worker	35,823.74	46,969.29	31.11
employment rate	0.82	0.80	–2.56
Working age population	0.21	0.23	12.65

persons. On the same study period, the region also have a growth rate of 43.93% in per capital value added. This growth was recorded as a cumulative of decreases in employment rate by 2.56%, increases in both output per worker by 31.11% and the share of working age population by 12.65%. However, the employment rate has experienced a decline growth (–2.56%) may be as a result of young people’s staying longer time in education which delays their entry in the labor market. Pedro (2018) also confirmed that employment rate in Ethiopia has a decline after 2005.

4.2. Aggregate decomposition of GVA Per capita growth, Afar (2010–2018)

Table 2 below presents decomposition of aggregate gross value added into output per worker, employment rate and demographic structures to understand how much each of these components was important. Changes in output per worker accounted for a higher proportion (74.33%) for the total change in per capita value added. That means, if working age population and employment rate had stayed constant, the higher rate of productivity would increase observed growth in per capita value added of the period by 74.33%. In other word, from 2010 to 2018 per capita value added grew by 43.93% (Table 1). Although output per worker growth contributes more (74.33%) for this incremental growth of per capita value added.

The results from Table 2 also suggested that the 32.85% of change in per capita value added can be linked to changes in the structure of the population based on the correlation analysis derived from the Shapley decomposition method. That means, *ceteris paribus* the sole change in the age structure of the population would have generated a growth equivalent to 32.85% of the total growth of working age for the period (12.65%). Because this result disclosed that there were less dependents (children’s and elderly) per each working age adult. Hence, a small change in the share of working age population has a 32.85% effect on total growth of per capita value added.

Unfortunately, changes in employment were registered in negative direction. Having the effect of labor productivity and working age population as constant, the higher rate of employment would decrease the actual growth of per capita value added by 7.17%. So, it clearly implied that the positive economic growth of registered on Afar region during the study period was jobless growth. Because, a fall in employment rate implies that many people have been discouraged and left out the labor force during that period. The study made by Elangbam (2019) also reaffirm that growth in India and the states in North Eastern Region has been largely jobless growth.

4.3. Sectoral decomposition of employment rate

To know the contribution of different sectors to the overall employment growth, we decompose aggregate employment growth into employment rate in each sector and presented on Table 3 below. Agriculture is the largest sector to absorb high number of employee (161 thousand) in the region, followed by manufacturing (87 thousand) and trade (23 thousand). But, the employment share of agriculture sector to the total working age population has declined from its 0.47 in 2010 to 0.38 in 2018 that is the contribution of agriculture for employment generation is negative (–19.01%). This

Table 2. Decomposition of growth in per capita value added, Afar 2010–2018

Decomposition of growth in per capita value added	Ethiopian Birr (ETB)	Percentage of total change in per capita value added
Total Growth in per capita value added (Δy)	2,651.12	100
Growth linked to changes in output per worker ($\Delta \omega$)	1,970.46	74.33
Growth linked to changes in employment rate (Δe)	−190.11	−7.17
Growth linked to changes in working age population ($\Delta \alpha$)	870.77	32.85

mean that, the probability of each person to get employed in agriculture sector is decreased by 19.01% as the share of working population or the share of labor force has raised. The employment elasticity agriculture sector also shows that for a 1% increase in value added will increase employment in agriculture by 0.34%, which is less than the other sectors employment elasticity. Therefore, it disclosed that the economic growth patterns of Afar region does not favor the agriculture sector where the poor are found. Between 2010 and 2018, financial intermediaries (1989.5%), other community service (324.09%), and transportation (149.54%) should take a line share for employment generation on the Afar region's economy. Employment elasticity shows that the ability and capacity of an economy to create job opportunities for its population. During periods of positive economic growth, employment elasticities have a value between 0 and 1 that indicates there is both productivity growth and employment growth (Kapsos, 2005). High elasticities in this range suggest employment-intensive growth, while low elasticities indicate low employment growth and higher labor productivity growth. The recent decline in the economy-wide employment elasticity reflects a combination of faster economic growth and slower employment growth (Pedro, 2018). For instance, financial intermediaries, electricity, mining, other community services, and transport sectors of the economy have high employment elasticity indicated that those sectors have a good performance in absorbing new workers in the economy of Afar region.

Table 3 above also revealed that total employment grew approximately by 35.83%, but as a result of the simultaneous growth in the working age population, the employment rate decreased by 2.56%. In line with this, the average employment elasticity of all sectors during the study period on the study area was equal to 0.46%, which shows employment elasticity is inelastic and less responsive to generate employment opportunity for every 1% increment in value added. Except public administration, all other sectors registered absolute growth in the number of employed persons. Table 3 also shows that, as a share of working age population agriculture, public administration, education-related activities, health and social work activities and private households with employed persons registered a negative growth.

4.4. Contribution of employment changes to overall change in employment rate

Table 4 above shows how the 2.09% points of decline in the growth of employment rate was distributed among the 15 different sectors of the economy. In between 2010 and 2018, if the growth in which the demographic change, total output per worker, and employment in all sectors except the agriculture sector remain unchanged, employment in agriculture had negative growth with −8.88% point. However, the agriculture sector has absorbed a large number of employed persons, but its contribution for employment generation as a share of working age population is negative and decreased by 8.88% point. That means during the study period, the agriculture sector accounts the highest share (424.36%) of the reduction in the growth of employment rate. On the other side, manufacturing, other community service, and transport sector contribute positively for employment generation for the region by 2.93, 1.19, and 0.92 percentage point, respectively.

Table 3. Employment by sectors of 15 major economic activities, Afar 2010–2018

Sectors	Employment			Employment per working age population			Employment elasticity
	2010	2018	% change	2010	2018	% change	
Agriculture	142,643.05	161,047.29	12.90	0.47	0.38	-19.01	0.34
Mining	740.07	2,217.64	199.65	0.00	0.01	114.97	2.14
Manufacturing	53,596.02	87,186.53	62.67	0.18	0.20	16.70	0.13
Electricity and water	773.50	2,348.84	203.66	0.00	0.01	117.84	2.27
Construction	3,481.29	8,726.33	150.66	0.01	0.02	79.82	1.22
Trade	15,013.90	23,822.87	58.67	0.05	0.06	13.83	0.65
Hotels and restaurants	5,806.88	10,475.18	80.39	0.02	0.02	29.41	0.56
Transport & communications	1,871.29	6,509.22	247.85	0.01	0.02	149.54	1.46
Financial intermediation	112.17	3,267.16	2,812.64	0.00	0.01	1,989.50	4.32
Real estate activities	394.53	- ²	-	0.00	-	-	-
Public administration	8,197.32	7,076.35	-13.67	0.03	0.02	-338.07	-0.04
Education	8,871.31	10,629.29	19.82	0.03	0.02	-14.04	0.23
Health and social work	4,218.57	5,517.76	30.80	0.01	0.01	-6.17	0.13
Other community services	1,121.49	6,629.81	491.16	0.00	0.02	324.09	2.08
Private households	2,998.83	3,903.92	30.18	0.01	0.01	-6.61	0.15
Total	249,840.22	339,358.19	35.83	0.82	0.80	-2.56	0.46

Table 4. Contribution of employment changes to overall change in employment rate, Afar 2010–2018

Sectors	Change in total employment rate (percentage points)	Contribution of the sector to total employment rate growth (%)
Agriculture, hunting and forestry	–8.88	424.36
Mining and quarrying	0.28	–13.32
Manufacturing	2.93	–140.11
Electricity and water	0.30	–14.27
Construction	0.91	–43.50
Whole sale and retail trade	0.68	–32.50
Hotels and restaurants	0.56	–26.73
Transport and communications	0.92	–43.80
Financial intermediation	0.73	–34.93
Real estate activities	-	-
Public administration and defense	–1.02	48.85
Education	–0.41	19.50
Health and social work	–0.09	4.07
Other community, social and personal services	1.19	–56.90
Private households with employed persons	–0.06	3.10
Total	–2.09	100.00

Public administration and defense (48.85%), education (19.5%), real estate activities (6.18%), health related activities (4.07%), and private households (3.1%) in its rank also aggravates for most of the decrement in the growth of employment rate. On the contrary, manufacturing, other community services, transport and construction are the most important sectors to increase changes in the overall employment growth.

4.5. Contribution of sectoral employment changes to overall change in per capita value added

Tables 5 shows the contribution of sectoral employment changes to growth in total per capita output. The negative growth of employment generation in agriculture sector would have decreased total per capita value added by 806.76 Ethiopian Birr (ETB). This indicates the fact that the negative growth of employment in agriculture sector has decreased 30.43% of the total change in per capita value added growth.

In addition to agriculture, the public administration, education, health service, and private household sectors have reduced the per capita value added growth by 92.87, 37.08, 11.74, 7.74, and 5.9 Ethiopian birr, respectively. However, the manufacturing sector, other community service sector and transportation and communication sector have increased the per capita value added growth by 266.37, 108.17, and 83.28 ETB, respectively. Unfortunately the positive and high contribution of these sectors has less weight to offset those sectors that have negative contribution on per capita growth. As a result, the growth of per capita value added growth linked to employment rate was –190.11 ETB.

4.6. Output per worker (Labor productivity)

Table 6 shows the output per worker and their percentage growth of the 15 major economic sectors of Afar region's economy over the period of 2010 to 2018. Aggregate labor productivity measured by gross value added per worker has been increased in real terms from 35.8 thousand birr in 2010 to 46.9

Table 5. Contribution of sectoral employment changes to overall change in per capita value added

Sectors	Contribution to change in per capita value added In (ETB)	Percent of total change in per capita value added (%)
Agriculture, hunting and forestry	−806.76	−30.43
Mining and quarrying	25.32	0.96
Manufacturing	266.37	10.05
Electricity and water	27.13	1.02
Construction	82.70	3.12
Whole sale and retail trade	61.79	2.33
Hotels and restaurants	50.83	1.92
Transport and communications	83.28	3.14
Financial intermediation	66.41	2.51
Real estate, renting and business activities	-	-
Public administration and defense	−92.87	−3.50
Education	−37.08	−1.40
Health and social work	−7.74	−0.29
Other community, social & personal services	108.17	4.08
Private households with employed persons	−5.90	−0.22
Total	−190.11	−7.17

thousand birr in 2018. The table also shows that on average, mining, construction, transport, and financial intermediation are the most important sectors who have high labor productivity while manufacturing, private household services, and trade activities have less labor productivity. From 2010 to 2018 financial intermediation, other community services, electricity, and mining show loud decrement in output per worker by 74.24%, 43.22%, 37.58%, and 35.58%, respectively. However, manufacturing, public administration, and health and social works could increase output per worker by a higher proportion. Finally, all of the 15 economic activities can have an average productivity of 41,396.52 birr with a growth rate of 31.11% in between 2010 and 2018.

4.7. Decomposition of output per worker into within sector and inter-sectoral shifts

The within-sector takes the lion share contributing (72.67%) to aggregate change in output per worker growth (Table 7). However, this solid contribution comes from the largest share of agriculture, public administration, and manufacturing sectors. Jointly, these three sectors accounted the highest share (9674.8 ETB) for the growth of aggregate output per worker. In other words, agriculture, public administration, and manufacturing in its order accounted for 44.45%, 33.16%, and 9.19% of the total increase in output per worker, while mining, financial intermediation, transport, construction, other community service, and electricity all together decrease output per worker by 2979.83 birr.

Besides to within sectoral contribution, inter-sectoral or structural change has its own role to increase the change in output per worker by 1,472.92 ETB (13.21%). The positive contribution of inter-sectoral shifts indicates that on average labor moved from lower productivity sectors to higher productivity sectors. So far Table 6 shows that mining, construction, and transportation sectors are the most important sectors that have higher labor productivity. Thus, it shows that an important share of growth in output per worker was due to movements of the labor force into those sectors who have higher productivity from less productive sectors (like manufacturing and private household sectors). The region's structural change also accounted for 0.63%³ points of

Table 6. Changes in output per worker by sectors, Afar 2010–2018

	Sectors	2010	2018	Change	Average productivity (ETB)
1	Agriculture, hunting and forestry	43,045.09	52,522.08	22.02	47,783.58
2	Mining and quarrying	579,676.20	373,691.24	-35.53	476,683.72
3	Manufacturing	1,681.59	6,028.67	258.51	3,855.13
4	Electricity and water	58,295.63	36,387.10	-37.58	47,341.37
5	Construction	197,966.62	176,678.22	-10.75	187,322.42
6	Whole sale and retail trade	15,067.03	18,003.32	19.49	16,535.17
7	Hotels and restaurants	26,400.94	35,661.62	35.08	31,031.28
8	Transport and communications	145,320.25	112,832.65	-22.36	129,076.45
9	Financial intermediation	192,813.70	49,674.99	-74.24	121,244.34
10	Real estate, renting and business activities	748,913.21	-	-	-
11	Public administration and defense	32,293.55	170,043.75	426.56	101,168.65
12	Education	16,688.87	25,964.99	55.58	21,326.93
13	Health and social work	23,065.04	59,408.61	157.57	41,236.83
14	Other community, social & personal services	60,786.80	34,517.34	-43.22	47,652.07
15	Private households with employed persons	3,309.33	7,628.46	130.51	5,468.90
	Total	35,823.74	46,969.29	31.11	41,396.52

Table 7. Contribution to the total output per worker growth

Sectors	The contribution of within sectors to changes in total output per worker (in ETB)	Contribution to change in total output per worker (%)
Agriculture, hunting and forestry	4,954.10	44.45
Mining and quarrying	−978.12	−8.78
Manufacturing	1,024.69	9.19
Electricity and water	−109.73	−0.98
Construction	−422.02	−3.79
Whole sale and retail trade	191.29	1.72
Hotels and restaurants	250.55	2.25
Transport and communications	−433.24	−3.89
Financial intermediation	−721.16	−6.47
Real estate activities	−	−
Public administration and defense	3,696.00	33.16
Education	309.96	2.78
Health and social work	602.29	5.40
Other community services	−315.56	−2.83
Private households	50.76	0.46
Sub-total of within effect	8,099.81	72.67
Between sectors	1,472.93	13.22
Interaction effect	1,572.82	14.11
Total	11,145.55	100.00

gross value added per capita during the entire period of time which is less than the national figure (0.9 percentage points) recorded by (Pedro, 2018) during 1999 to 2013.

The interaction effect as a combination of changes in within effect and structural change has positively contributed (14.11%) for the change in total output per worker. It reflects the capacity of the region to shift labor towards rapidly growing sectors in terms of productivity.

5. Conclusion and recommendation

In Afar national regional state, total output in gross value added has been increased nearly by twofold from 8.9 billion birr in 2010 to 15.9 billion birr in 2018 representing a 78.09% increment over the entire period of time. Changes in output per worker accounted for a higher proportion (74.33%) followed by changes in working age population (32.85%) and employment rate (−7.17%) for the total change in per capita value added. This negative growth changes registered in employment rate implied that the growth of Afar region was a jobless growth. Because, as employment rate is falling many people have been discouraged and left out the labor force during that period.

During the study period, total employment grew approximately by 35.83%, but as a result of the simultaneous growth in the working age population, the employment rate decreased by 2.56%. Agriculture is the largest sector to absorb high number of employee in the region, followed by manufacturing and trade. But, as a share of total working age population, the contribution of agriculture for employment generation is negative and decreased by 8.88%. The economic growth patterns of Afar region does not favor the agriculture sector where the poor are found. Other than agriculture, manufacturing, other community service and transportation sector should take a line share for employment generation on the region's economy. Aggregate labor productivity measured by gross value added per worker has been increased in real terms from 35.8 thousand birr in 2010 to 46.9 thousand birr in 2018. The within-sector takes the lion share contributing (72.67%) to aggregate change in output per worker

growth followed by structural change (13.21%) and interaction of within sectors and structural change (14.11%).

Finally these findings on economic growth decomposition of Afar region navigated us to suggest for policy makers that, to amend their economic policies and strategies focused to enhance sector wise employment generation and labor productivity in the region. Further researches will be needed to analyze the determinants of economic growth and its impact on poverty reduction on the study area by including data on Total Factor Productivity (TFP) growth using the six steps of Shapley decomposition analysis methodology.

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Notes

1. On the year 2018/19, the average exchange rate is \$1 = 28.10 ETB (National Bank of Ethiopia (NBE), 2020).
2. Hence employment data of real estate, renting and business activities for the year 2018 is not available.
3. The value is obtained by multiplying the annual compound gross value added per capita growth rate 4.73% by the contribution share of structural change (13.22%).

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