



FDRE Policy Studies Institute



Ethiopia Productivity Report

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Outline

- Chapter 1: Introduction
- Chapter 2: Literature review
- Chapter 3: Economy-wide labor productivity in Ethiopia
- Chapter 4: Productivity in Ethiopia: Zooming in the manufacturing sector

Introduction

- ❑ Ethiopia has designed and implemented several strategies and development plans which include PASDEP, GTP I and GTP II.
- ❑ As a result, Ethiopia has exhibited double digit growth over the last decade and a half.
 - ❑ PASDEP period average growth = 10.1%
 - ❑ GTP I period average growth = 10.2%
 - ❑ GTP II (3-year average growth) = 8.8
- ❑ Growth was concentrated in **services and agriculture on the supply side**, and, **private consumption and investment on the demand side**.
 - In recent years the service sector has overtaken the agricultural sector

Introduction

- According to NBE report, the Ethiopian economy recorded 7.7% growth in 2017/18 fiscal year
 - Share in GDP: Agriculture =34.9%, Industry =27%, Services =39.2
- Despite the high economic growth achieved **Ethiopia's** productivity remains well below the productivity in developing countries
 - The high level of economic growth was largely driven by substantial public investment on physical infrastructure and a strong performance of the service sector
 - Ethiopia stands out for having registered very rapid infrastructure development.

Introduction

- Productivity improvement is an important source of sustainable economic growth and hence crucial for policymaking (Conway, 2016).
 - **It is considered as the world's chief source of real economic growth, social progress and better standard of living.**
- Understanding this, the pursuit of quality, productivity **and competitiveness has become Ethiopia's key policy direction in GTP II.**
 - Enhancing the productivity of agriculture and manufacturing sectors is one of the major focus areas of GTP II.
 - However, concrete policy measures to enhance productivity remain unclear

Introduction

- ❑ In order to concretize productivity policies, a comprehensive and detail study on productivity is needed
- ❑ Thus, the objective of this report is to examine the evolution of productivity in Ethiopia, with particular emphasis on the manufacturing sector and produce *Ethiopia Productivity Report*.
 - Useful for policymakers to have shared information and deeper understanding on the concept and practice of productivity.
 - Formulation of a clear policy on productivity.
- ❑ The analysis is divided into two main parts:
 - Economy-wide productivity
 - Manufacturing sector productivity

Chapter 2: Literature review

- Concept and measurements of productivity
- Decomposing labor productivity
- The importance of productivity in general and **Ethiopia's context**

Concepts and measurements

- Productivity is defined as the link between outputs resulting from a production process or service system and the input used to generate this output
 - It reveals how well resources are combined and utilized to achieve the desired and expected results
- Productivity can be discussed at three levels:
 - International
 - National
 - Enterprise levels

Concepts and measurements

Measuring productivity:

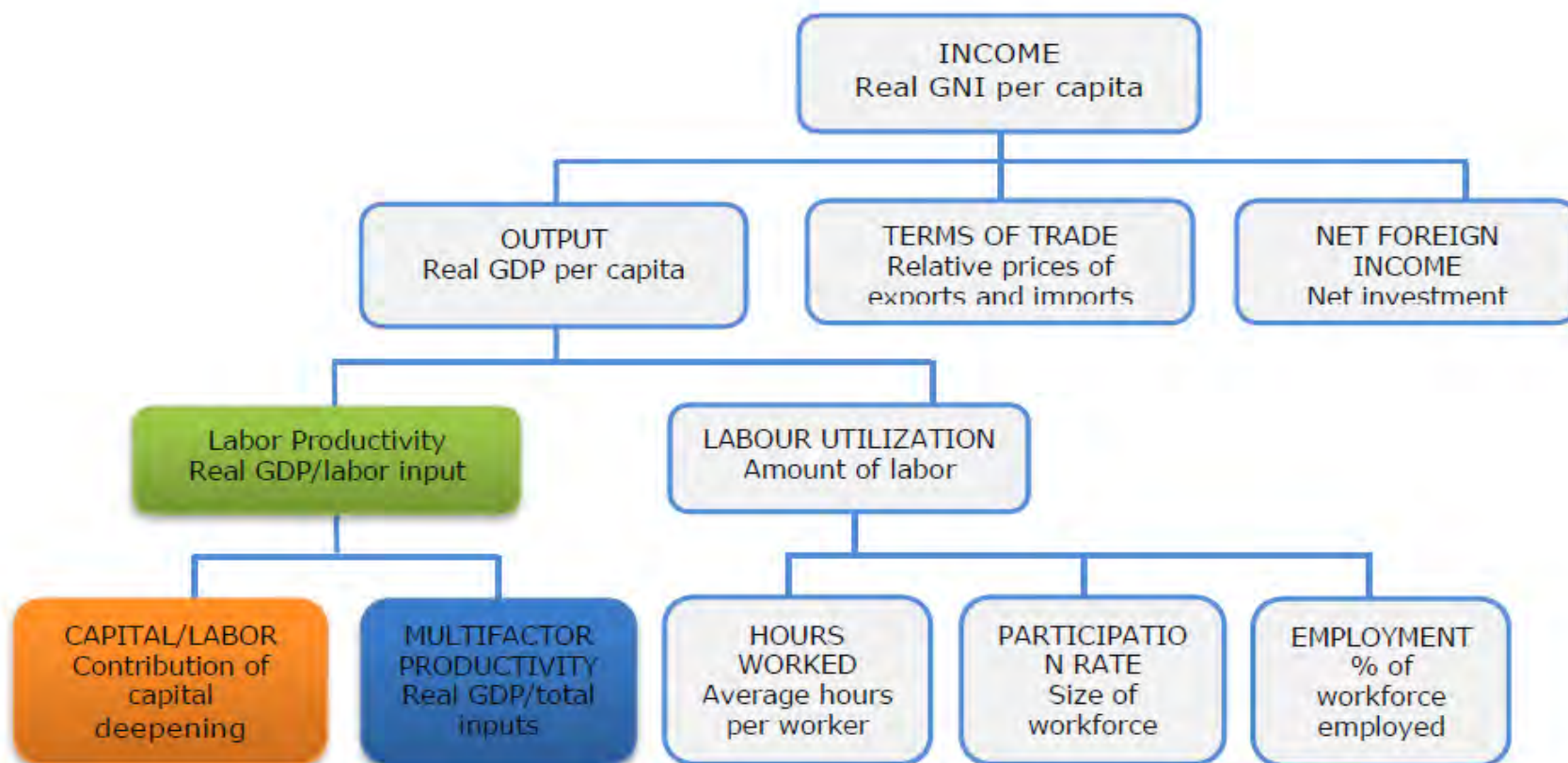
- Labor productivity: Labor productivity is defined as the amount of output (or value added) produced divided by the amount of labor used to produce that output.
- TFP: is measured as the output produced from a bundle of inputs
 - It is the portion of output that is not explained by the amount of inputs utilized
 - It is improvement in knowledge, organizational structure, human resources management, skills attainment, information technology and efficient use of factors of production.
 - It more accurately measures how efficiently an economy utilizes its factor inputs.

Decomposing labor productivity

- Labor productivity can be decomposed in a variety of ways. The most common ones are:
 - **Capital deepening**: the amount of capital available to each unit of labor
 - It is related with labor productivity improvements as workers have more capital to use in the production process.
 - It is the utilization of capital among the workforce
 - **TFP**: brings about technological dynamism

Decomposing labor productivity

Macro level labor productivity decomposition



The importance of productivity in general and Ethiopia's context

Ethiopia's GTP II

- ❑ Quality, productivity and competitiveness has become **Ethiopia's key policy direction**
- ❑ Enhancing the productivity of agriculture and manufacturing sectors is one of the major focus areas of GTP II
- ❑ **Ethiopia's industries are labor intensive with very limited capital except light machines.**
 - Competitiveness cannot be assured if it is not complemented with enhanced labor productivity.

Chapter 3: Economy-wide labor productivity in Ethiopia

- Situation analysis of economy-wide labor productivity in Ethiopia
- **Ethiopia's economy**-wide labor productivity compared with peer countries
- Economy-wide labor productivity growth decomposition in Ethiopia

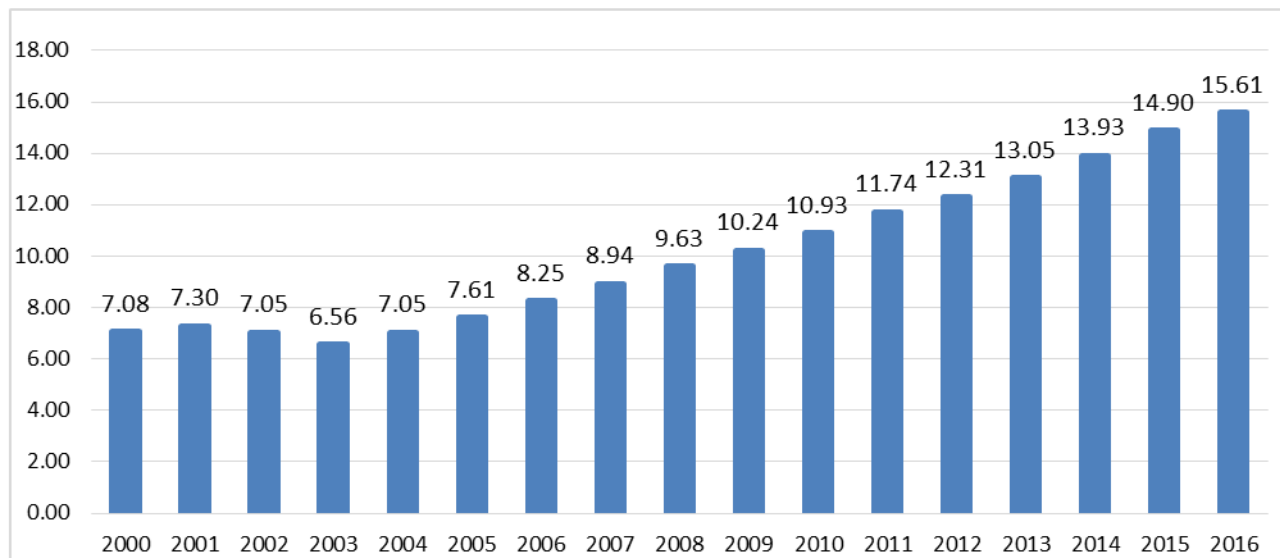
Situation analysis of economy-wide labor productivity in Ethiopia

- Data source
 - NPC: National accounts
 - Employment data from the World Bank's WDI
- Economy-wide labor productivity is measured as the ratio of output (value added) produced in a year to the total number of labor used.

$$\text{Labor Productivity} = \frac{\text{GDP}}{\text{Total Number of Employed Persons}}$$

Situation analysis of economy-wide labor productivity in Ethiopia

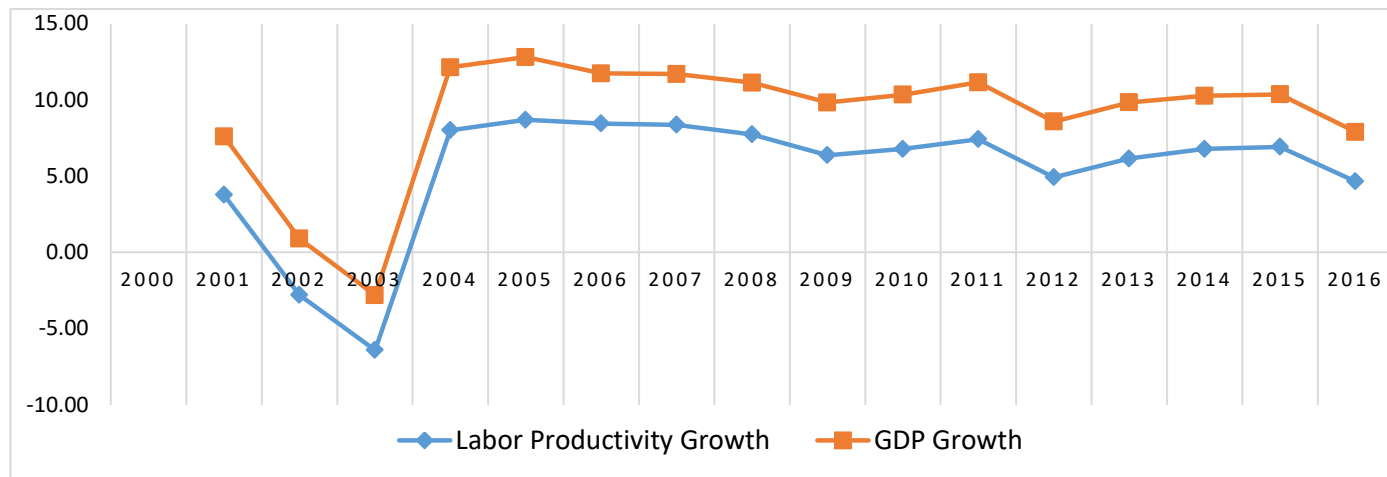
Figure 3.1: Economy-wide labor productivity in Ethiopia ('000 Birr)



- Economy-wide labor productivity increased from 7, 000 birr per worker in 2000 to about 16, 000 birr per worker in 2016

Situation analysis of economy-wide labor productivity in Ethiopia

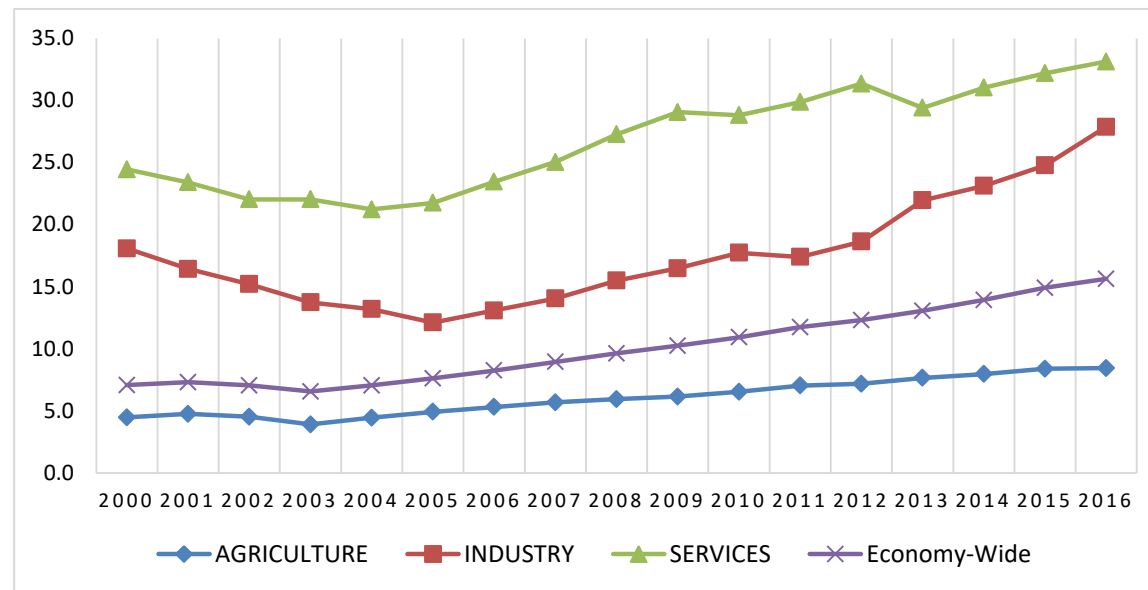
Figure 3.2: GDP growth and labor Productivity Growth, 2000-2016



- Annual average labor productivity growth = 4.94 %.
- Overall labor productivity growth trend was fairly stable with slight declines in 2009, 2012 and 2016.
- Labor productivity growth was negative for the years 2002 and 2003
 - Can be explained by the drought in the 2002/3 period
- Labor productivity growth follows GDP growth
- Ferede and Kebede (2015) found a 5.1% annual LP growth (2005-2013)

Situation analysis of economy-wide labor productivity in Ethiopia

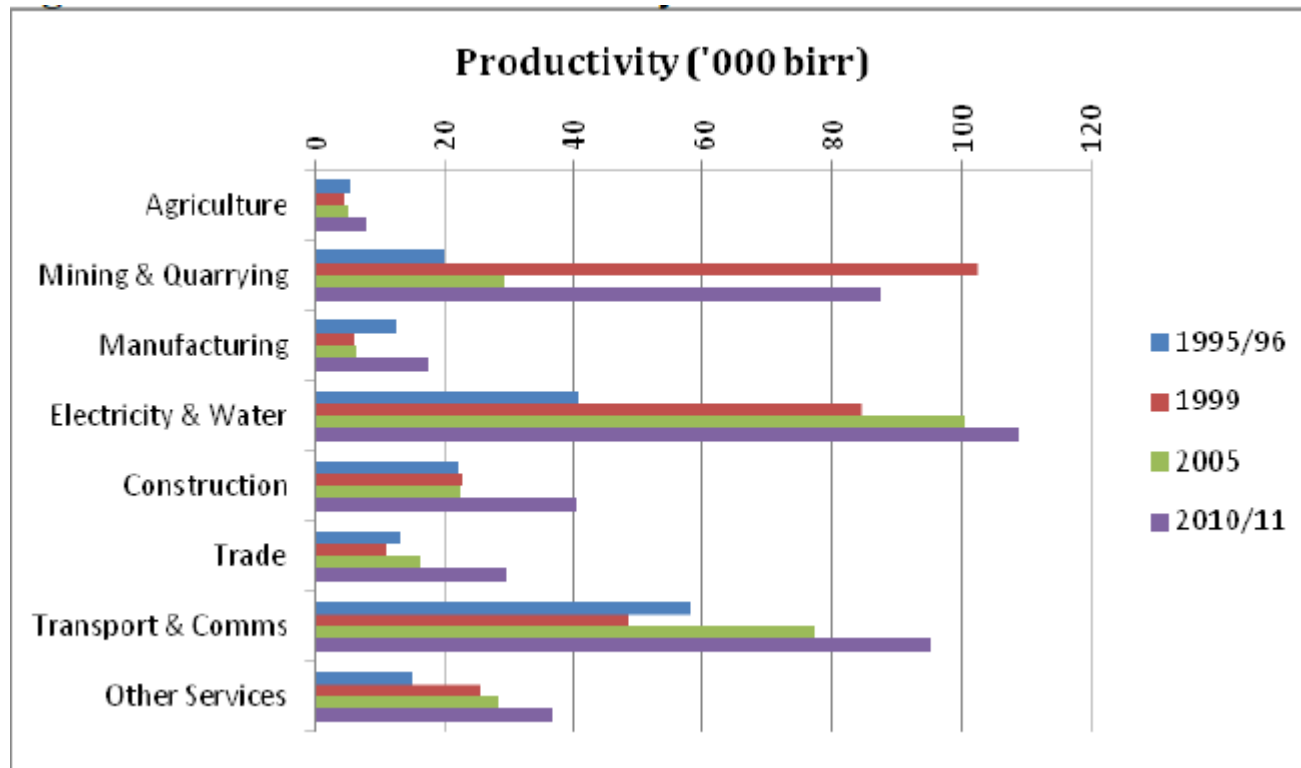
Figure 3.3: Ethiopia's labor productivity by major sectors ('000 Birr, 2003 prices)



- The service sector stands out in terms of labor productivity
- In 2016, labor productivity in the services sector and industrial sector were 3.9 and 3.3 times more than that of agriculture

Situation analysis of economy-wide labor productivity in Ethiopia

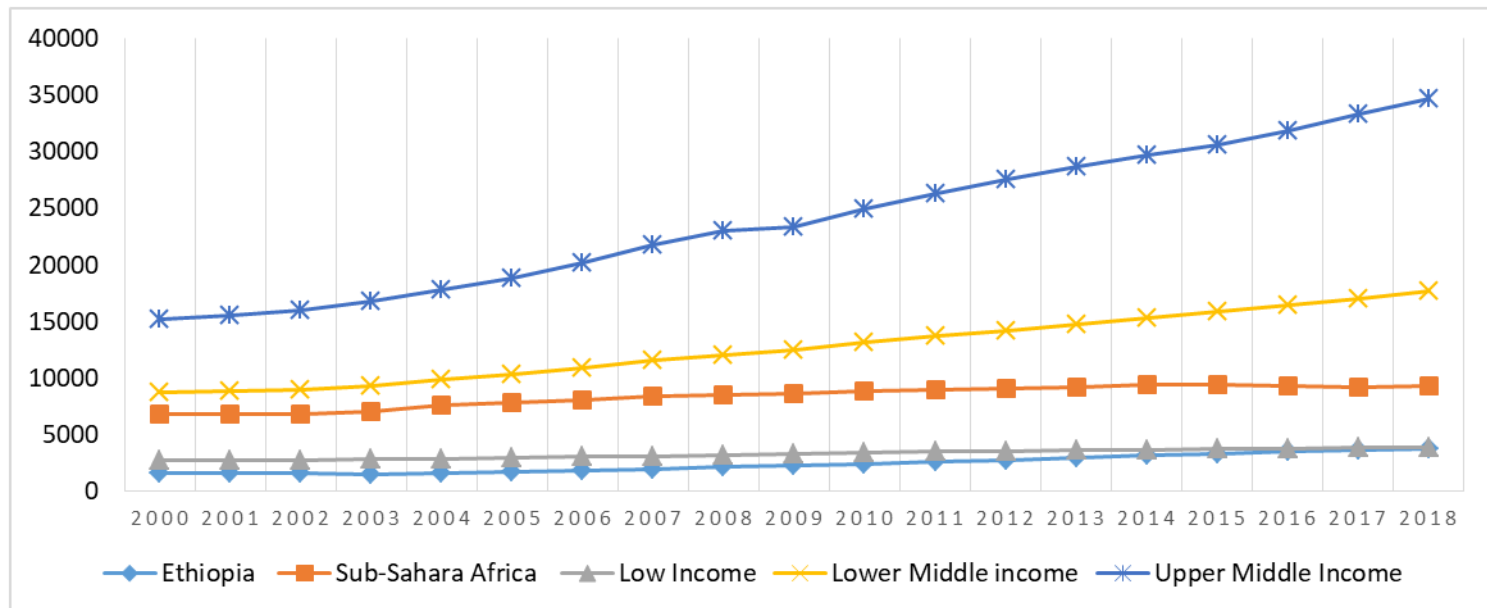
Further disaggregation of economy-wide labor productivity



Source: Martins, 2014

Comparison by income categories

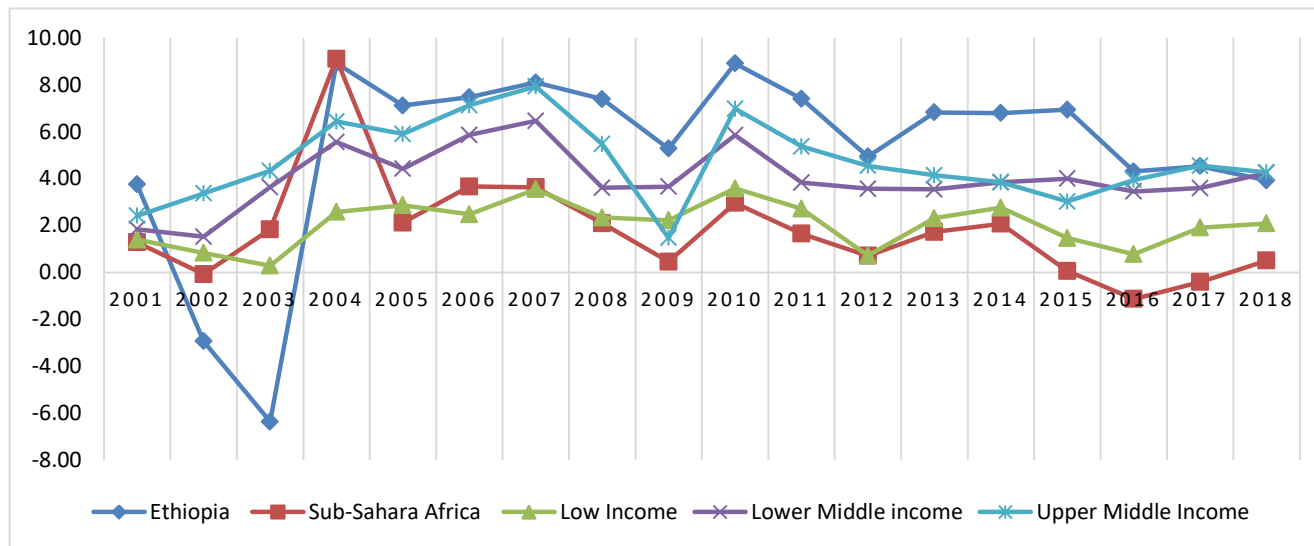
Figure 3.4: Ethiopia's labor productivity: comparison by income categories (Output per worker (GDP constant 2011 international \$ in PPP)



- In 2018 labor productivity in Ethiopia was 40% of the average for Sub-Saharan Africa, a quarter of the average for lower–middle income countries and 10% of the average for upper middle income countries.

Comparison by income categories

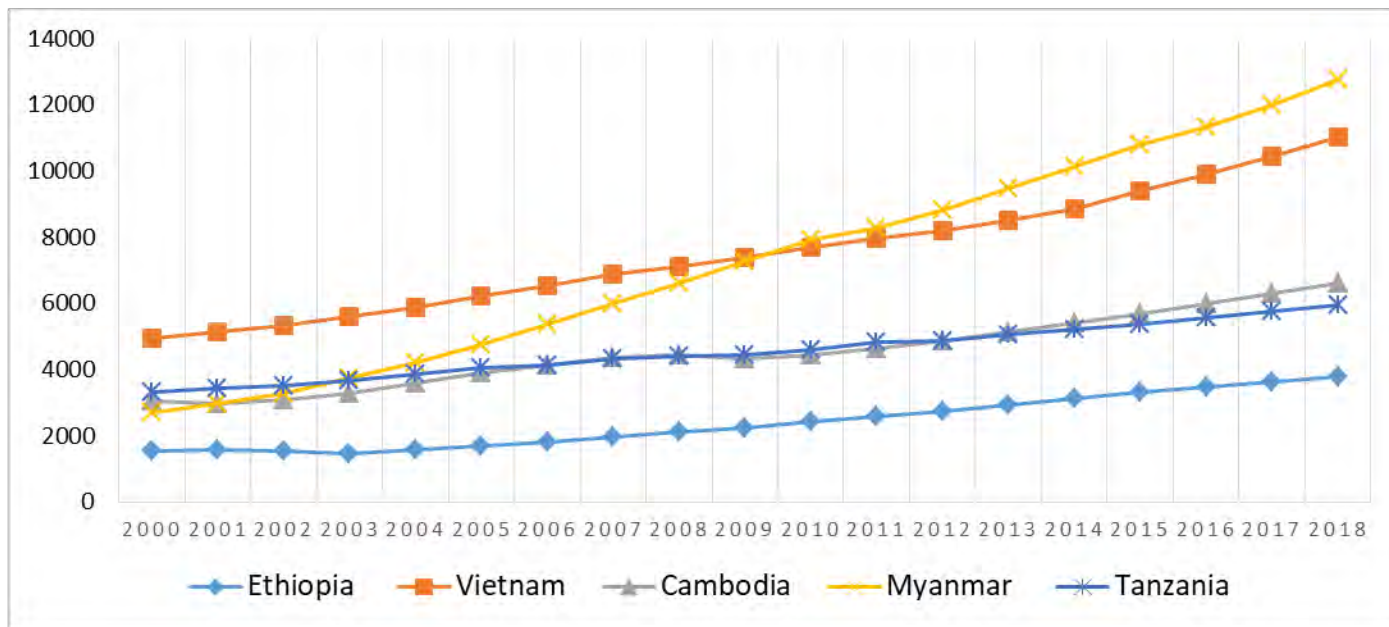
Figure 3.5: Ethiopia's labor productivity growth in comparison to peer countries by income categories



- In terms growth, Ethiopia's labor productivity growth is slightly higher than the comparison group.

Comparison with peer countries

Figure 3.6: Ethiopia's labor productivity in comparison to selected peer countries categories (Output per worker (GDP constant 2011 international \$ in PPP)



- Ethiopia's labor productivity is lower than the comparator countries
- For example, in 2018, Ethiopia's labor productivity has been nearly 3, 3, 2, and 2 times lower than that of Myanmar, Vietnam, Cambodia, and Tanzania respectively.

Economy-wide labor productivity growth decomposition in Ethiopia

- In this section, we partly focus on the period 2000-2014 due to unavailability of data on capital stock for the period after 2014.
- The economy-wide labor productivity grew on average by about 4.8% between 2000 and 2014.
- We analyze the sources of this growth in labor productivity using the *Growth Accounting* and *Shift-Share Analysis* methods

Economy-wide labor productivity growth decomposition: Growth accounting method

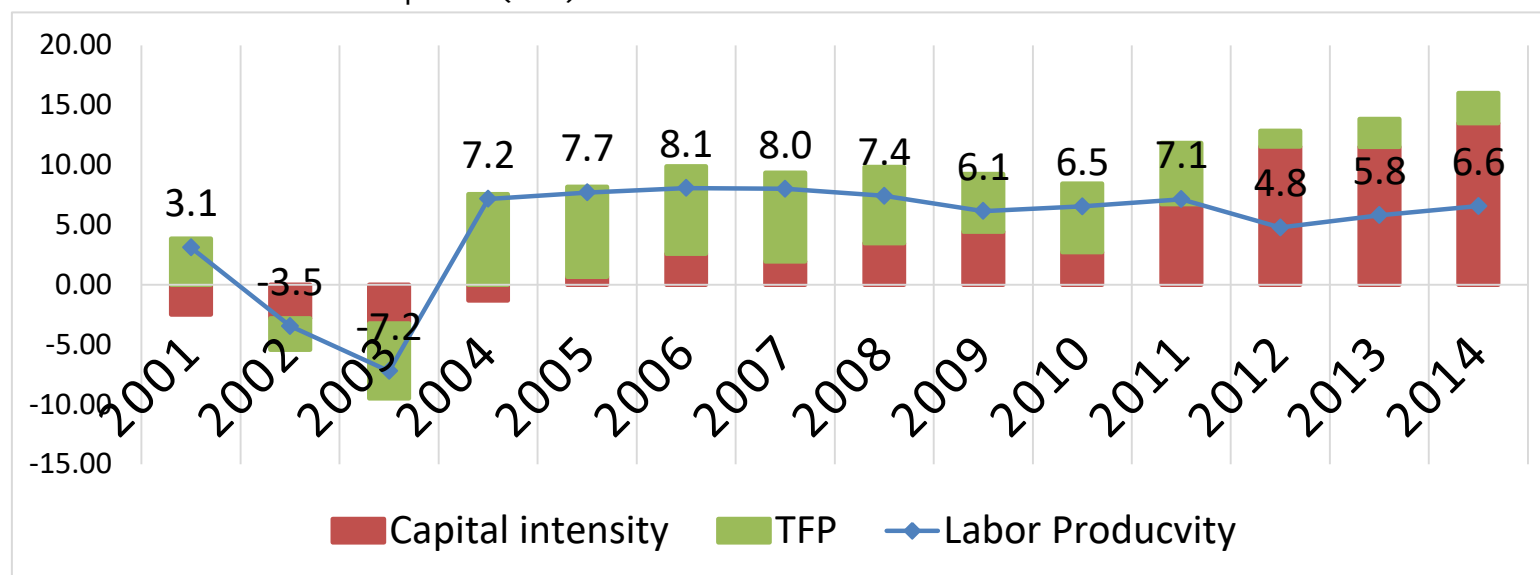
- *Growth accounting theory* suggests that the variation in the growth of labor productivity can be explained by the change in capital deepening, labor quality, and TFP growth
- In the absence of data on labor quality, we decompose growth in labor productivity into *capital depending* and *TFP growth*
 - Thanh et al. (2018) for Vietnam, Asia productivity Organization (APO) (2017) for Asian countries used the same method but the later classifies capital input into two *IT-capital* and *non-IT capital*.

Economy-wide labor productivity growth decomposition: Growth accounting method

- ▣ The decomposition is derived from a Cobb-Douglas type production function
- ▣ We use capital stock data for Ethiopia from Penn Tables
- ▣ Following the 2015/16 Input-Output and Social Accounting Matrix for Ethiopia (Andualem et al. (2018), we adopt a capital share, α , of 0.3.
 - 30% of the value added goes to physical capital (machinery, buildings, trucks etc) while the remaining 70% goes to labor
 - Collins et al. (1996) and Thanh et al. 2018 assume, $\alpha = 0.35$ for East Asia and Vietnam respectively).

Economy-wide labor productivity growth decomposition: Growth accounting method

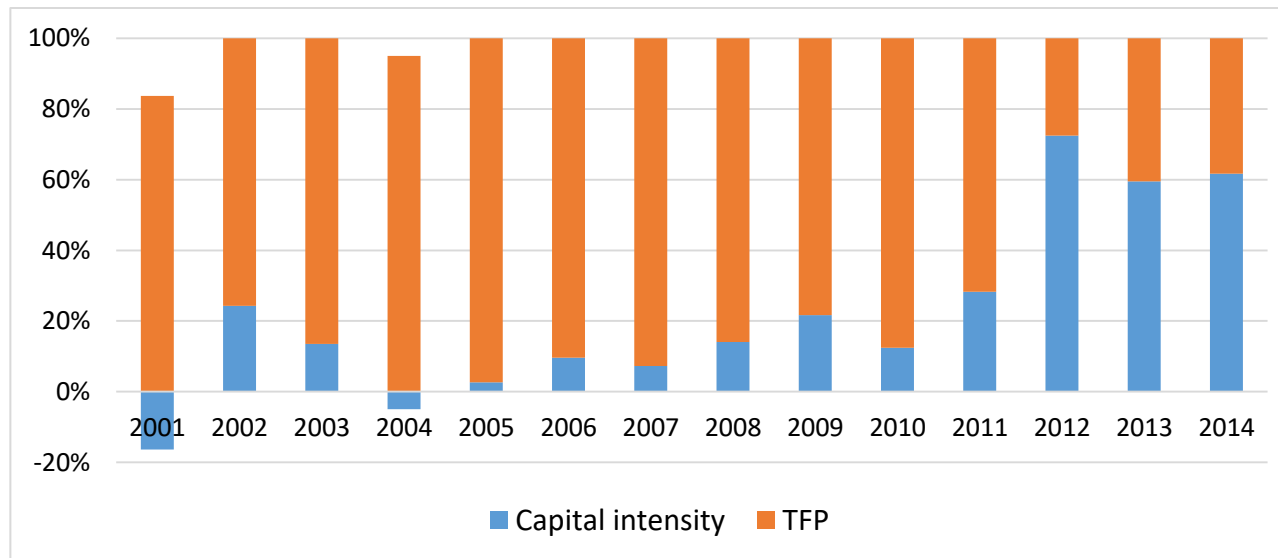
- Figure 3.7: Growth rate of labor productivity, capital intensity, and TFP in Ethiopia (%)



- Capital intensity appears to be generally increasing from the year 2004.
- Labor productivity growth follows similar trend as TFP growth.
 - So, the decrease in TFP is the cause in the decrease in labor productivity (in some of the years).
 - This indicates there was an inefficient use of capital by labor

Economy-wide labor productivity growth decomposition: Growth accounting method

Figure 3.8: Contribution shares of capital intensity and TFP to Ethiopia's labor productivity



- The contribution of TFP growth for labor productivity growth was more than 70% for most of the years
- Capital intensity contributed strongly to labor productivity growth in recent years
 - This came about as investment and capital accumulation were quite strong in since GTP I.

Economy-wide labor productivity growth decomposition: Growth accounting method

APO reports labor productivity growth for Asian countries annually.

- It shows that TFP has been a main driver to enhance labor productivity in Cambodia, India, Sri Lanka, and Pakistan for the period 1970-2015.
- Vietnam: Labor productivity growth was driven
 - 1970-1995 = by TFP
 - 1996-2015 = by capital deepening
- South Asia: Labor productivity growth was driven by
 - 1970-1980 = Capital deepening
 - 1980 -2005 = by TFP
 - 2005-2015 = capital deepening

Decomposing labor productivity growth using *shift-share* analysis

- In this section, we decompose the sources of labor productivity in terms of labor mobility intra or inter sectors using the shift-share method
- The method decomposes labor productivity growth into three factors, namely
 - *(i) within effect*
 - *(ii) shift effect*
 - *(iii) interaction effect.*

Decomposing labor productivity growth using *shift-share* analysis

Table 3.2: Decomposition of labor productivity growth using shift-share analysis method

Period	Productivity Growth	Sources of Labor Productivity Growth			Contribution Shares to Labor Productivity Growth (%)		
		Within effect	Shift Effect	Interaction Effect	Within effect	Shift Effect	Interaction Effect
2004-2007	7.9	21.7	4.6	0.5	81.0	17.0	2.0
2008-2011	6.6	14.2	7.2	0.5	64.7	32.9	2.4
2012-2016	6.0	15.7	9.9	1.3	58.3	36.9	4.8
2000-2016	6.6	66.2	42.6	12.0	54.8	35.3	9.9

- Labor productivity growth has been mainly driven by both within-effect and shift effect.
 - Productive firms within each sector were expanding
 - There has been evidence of a shift across sectors from less productive to more productive sectors.
- The large share of *within effect* combined with increasing share of *shift-effect* signifies that Ethiopia is at an initial stage of structural transformation.

Decomposing labor productivity growth using *shift-share* analysis

Our findings are consistent with previous studies

- ▣ World Bank (2016): More than 70% of **Ethiopia's** growth is attributed to within-sector labor productivity gains for the period 1999–2013
- ▣ Timmer and de Vries (2009) concluded that growth accelerations in Asia and Latin America are mostly explained by within-sector productivity rather than labor reallocation
- ▣ **Ethiopia's labor productivity growth has been mainly driven** by within-sector productivity improvements for the period 1996-2011 (Martins, 2014)
- ▣ Within-sector productivity growth accounts for much of the aggregate labor productivity growth in Ethiopia (Ferede and Kebede, 2015)

Summary of main findings (Economy-wide productivity)

- ❑ Economy-wide labor productivity has seen an increasing trend in Ethiopia (~5% annual growth)
 - However, this growth is low even by developing countries standard
- ❑ Labor productivity growth mainly came from TFP
 - This has changed to capital deepening in recent years.
- ❑ Labor productivity growth has been mainly driven by within-sector productivity improvements followed by shift-effect.
 - This signifies that Ethiopia is at an initial stage of structural transformation.

Chapter 4: Productivity in Ethiopia: Zooming in the manufacturing sector

- ❑ Description of the manufacturing survey data and the sector
- ❑ Productivity in the Manufacturing Sector in time-series and by sector (based on CSA LMSI survey 1996-2016)
- ❑ Labor productivity in the manufacturing sector: Comparing Ethiopia with selected countries (based on UNIDO industry database)
- ❑ Wage-productivity nexus in the Ethiopian manufacturing sector

Description of the CSA manufacturing survey data: Sources and limitations

Data source:

- ❑ CSA of Ethiopia Large and Medium Scale Manufacturing Industries (LMSMI) employing 10 or more people
 - The survey dataset covers the period 1996 – 2016.
- ❑ We have attempted to meticulously provide a reasonably workable dataset for 21 years from 1996 to 2016.
- ❑ The final panel dataset has
 - 3,378 establishments (end year 2016)
 - 30,609 observations (over the whole period).
- ❑ The structure of the panel data is unbalanced as new firms enter the industries every year.

Description of the CSA manufacturing survey data: Sources and limitations

Limitations

- The data suffers from quality problems
 - variables often vary (in terms of structure, code, name,) across years)
 - Change in the establishment number for data starting from 2012 and onwards
 - Outliers which could have been a result of entry, unit, and variable name errors
- Despite a painstaking effort to get an accurate picture of the manufacturing sector, we cannot claim that the dataset to be completely free of errors

Description of the CSA manufacturing survey data: Sources and limitations

- We use two measures of productivity
 - **Labour productivity** as the ratio of real-value added of production to the labor force

$$\text{Labor Productivity}_i^t = \frac{\text{Value Added}_i^t}{\text{Employment}_i^t}$$

- **Total Factor Productivity (TFP)** is the portion of output not explained by traditionally measured inputs of labour and capital used in production
 - A residual from the estimation of Cobb-Douglas production function

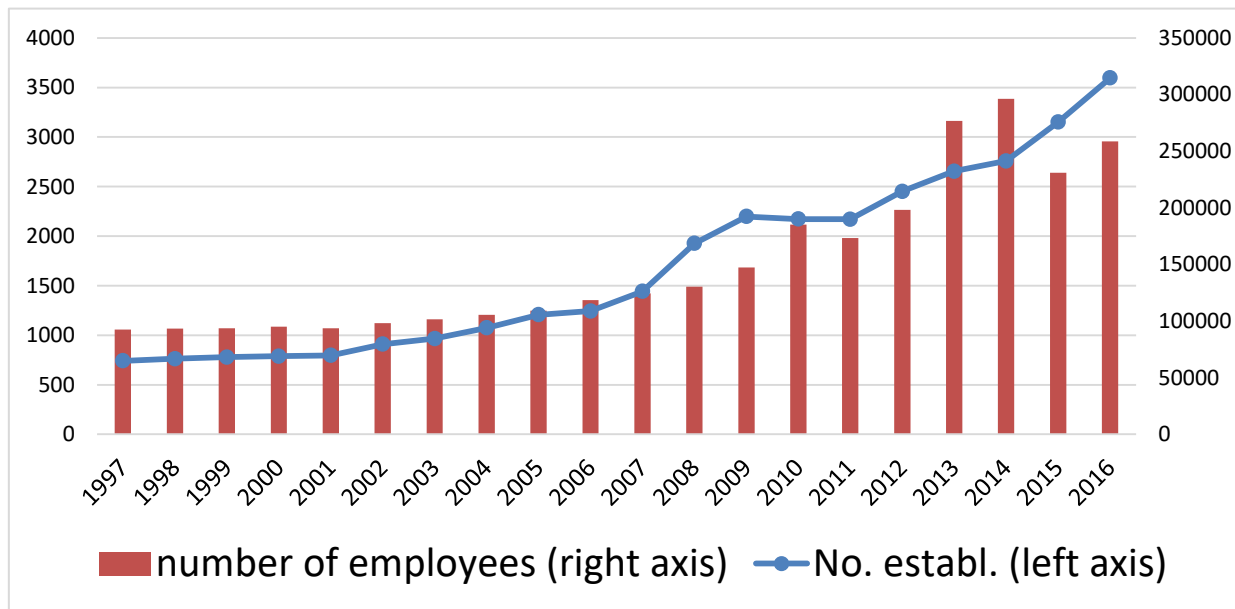
Description of the survey data: Sources and limitations

Definition of variables

- ❑ **Value Added:** is the difference between the gross value of production and industrial costs (IC) and non-industrial costs (NIC).
- ❑ **Labor input:** Number of employees engaged computed as the sum of paid employees, working proprietors, active partners, and unpaid family workers. Temporary workers are adjusted give equivalent of full-time workers.
- ❑ **Capital input:** total book value of the fixed assets at end of the year as provided by the respondents in the survey
- ❑ Prices deflator: variables are adjusted for price changes

General characteristics of the manufacturing sector

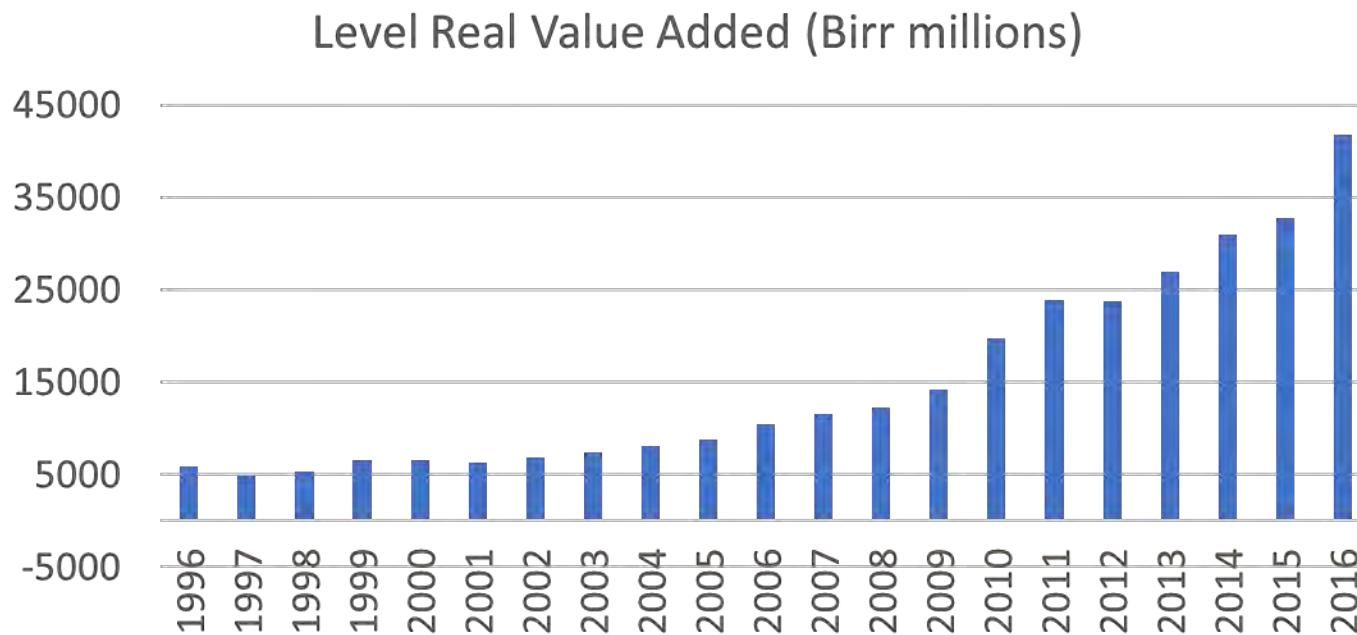
Figure 4.1: Trends in number of establishments and employment



- The number establishments increased from 741 in 1997 to 3,596 in 2016 (nearly 5 fold increase).
- Employment also increased from 92,365 to 258,599 over the same period (nearly 3 fold increase)

General characteristics of the manufacturing sector

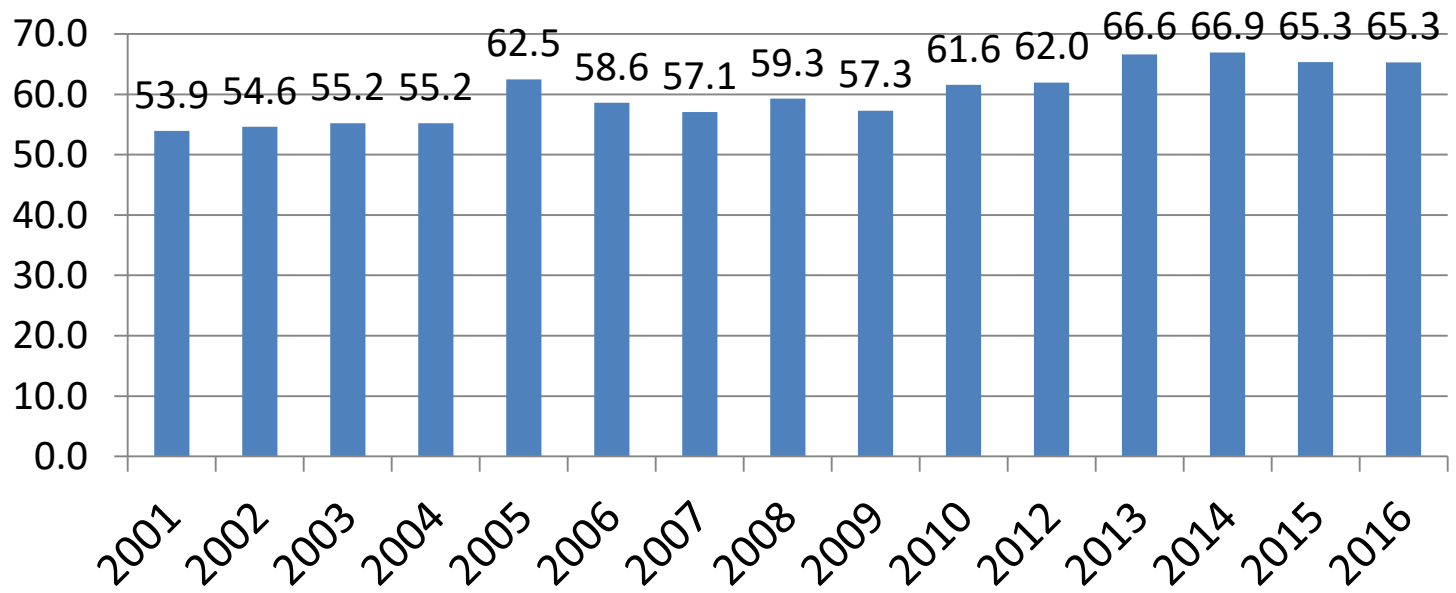
Figure 4.2: Trends Real Value Added



- Real value added increased from 5.89 billion birr in 1996 to 41.8 billion birr in 2016 (about 7-fold increase).
- Sharp rise since 2010 – GTP I period

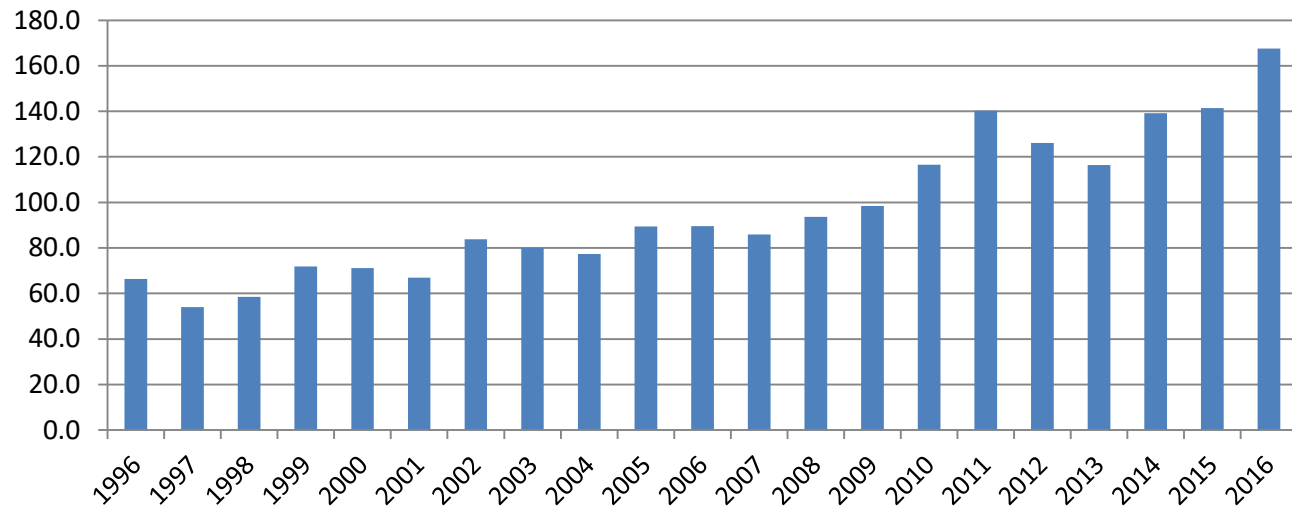
General characteristics of the manufacturing sector

Figure 4.3: Average capacity utilization rate (%) in the manufacturing sector by year



Manufacturing productivity in time series

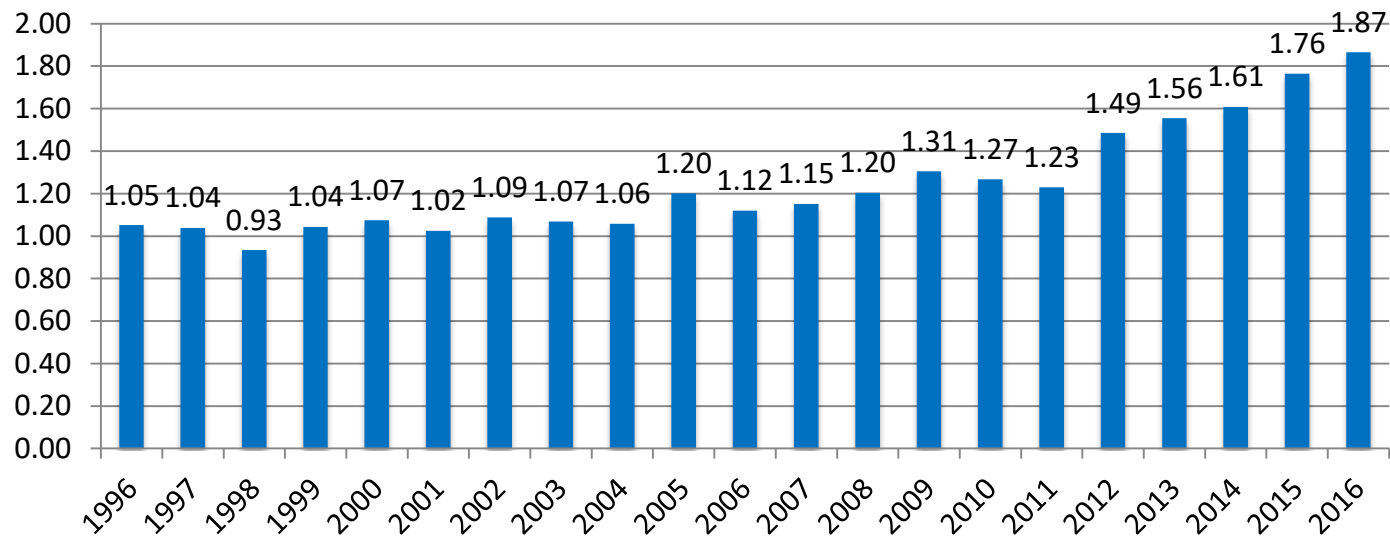
Figure 4.4: Labor productivity in the manufacturing sector (in 000's birr per employee)



- Labor productivity has generally shown improvement over time
- It increased from about 66.4 thousand birr per employee in 1996 to 167.6 thousand birr per employee in 2016
- **Average annual growth 4.6%**
- But the growth was volatile

Manufacturing productivity in time series

Figure 4.6: Ethiopia manufacturing sector TFP in level



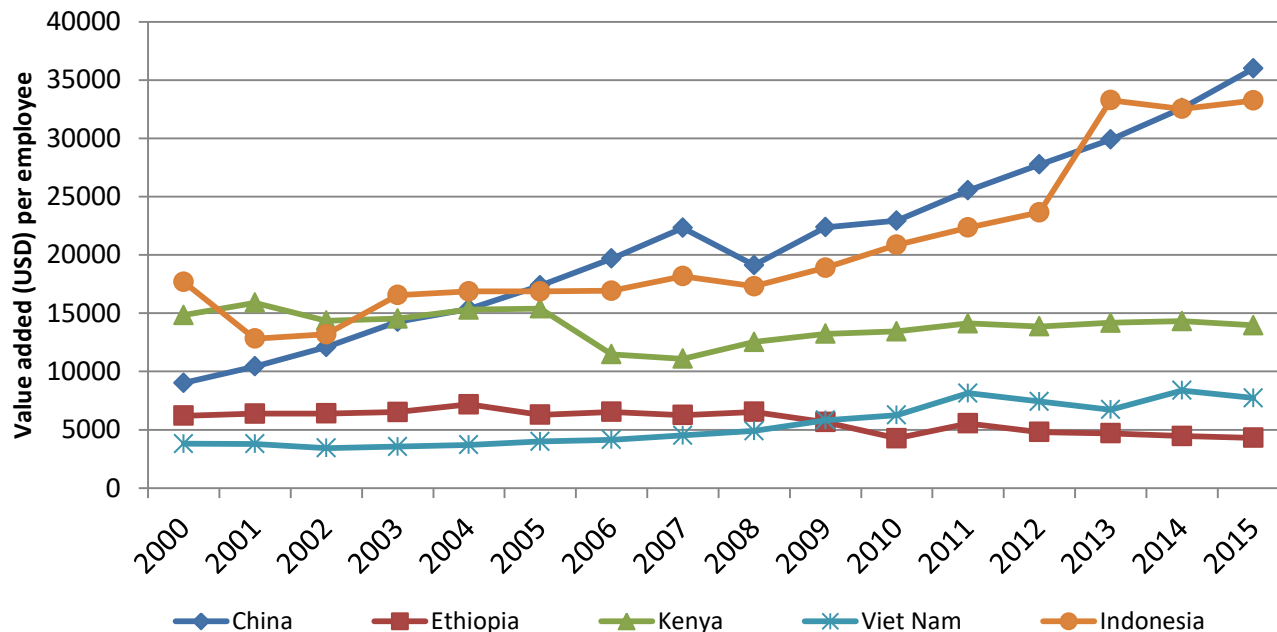
- Annual average growth rate of TFP over the period is 2.86%.
- TFP growth in recent years is higher
 - Period (1996-2005) = 1.5%.
 - Period (2006 – 2016) = 4%

Labor productivity in the manufacturing sector: Ethiopia and selected countries

- ❑ This section compares Ethiopia's manufacturing sector labor productivity with selected countries in Asia and Africa.
- ❑ Labor productivity = the ratio of value added to number of employed persons in the sector.
- ❑ The value added is measured in USD and constant at 2010.
- ❑ Data source: UNIDO (INDSTAT 2 2018, ISIC Revision 3).

Labor productivity in the manufacturing sector: Ethiopia and selected countries

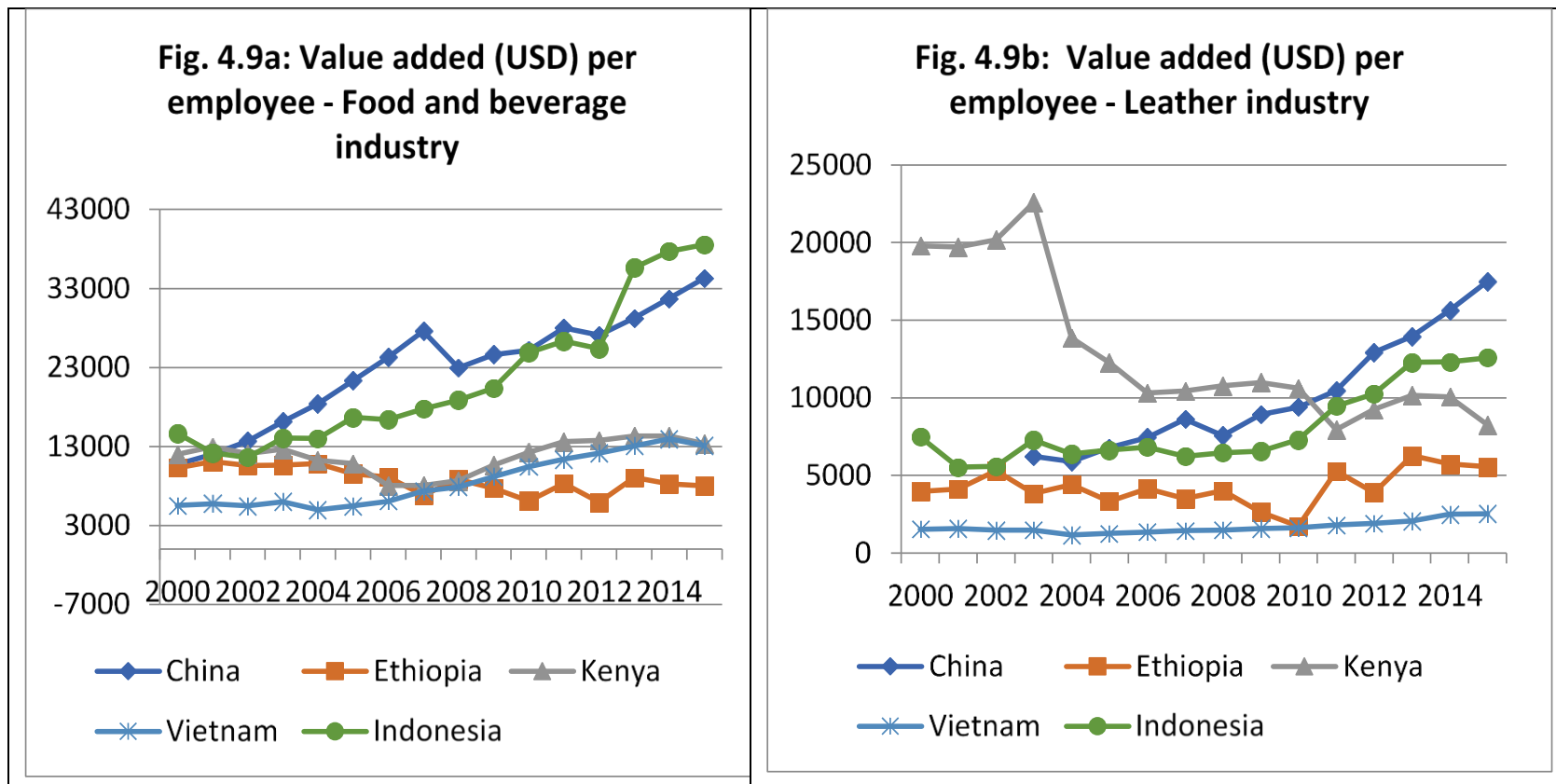
Figure 4.8: Manufacturing sector labor productivity: selected countries



- Ethiopia ranked at the bottom of all the countries in the group by the end of the sample period.
- In 2000, Ethiopia's labor productivity was about 94% that of China. This became only 13% of China's productivity in 2015.
- Even Kenya's labor productivity is 3 to 4 times higher than that of Ethiopia
- Viet Nam overtook Ethiopia since 2010

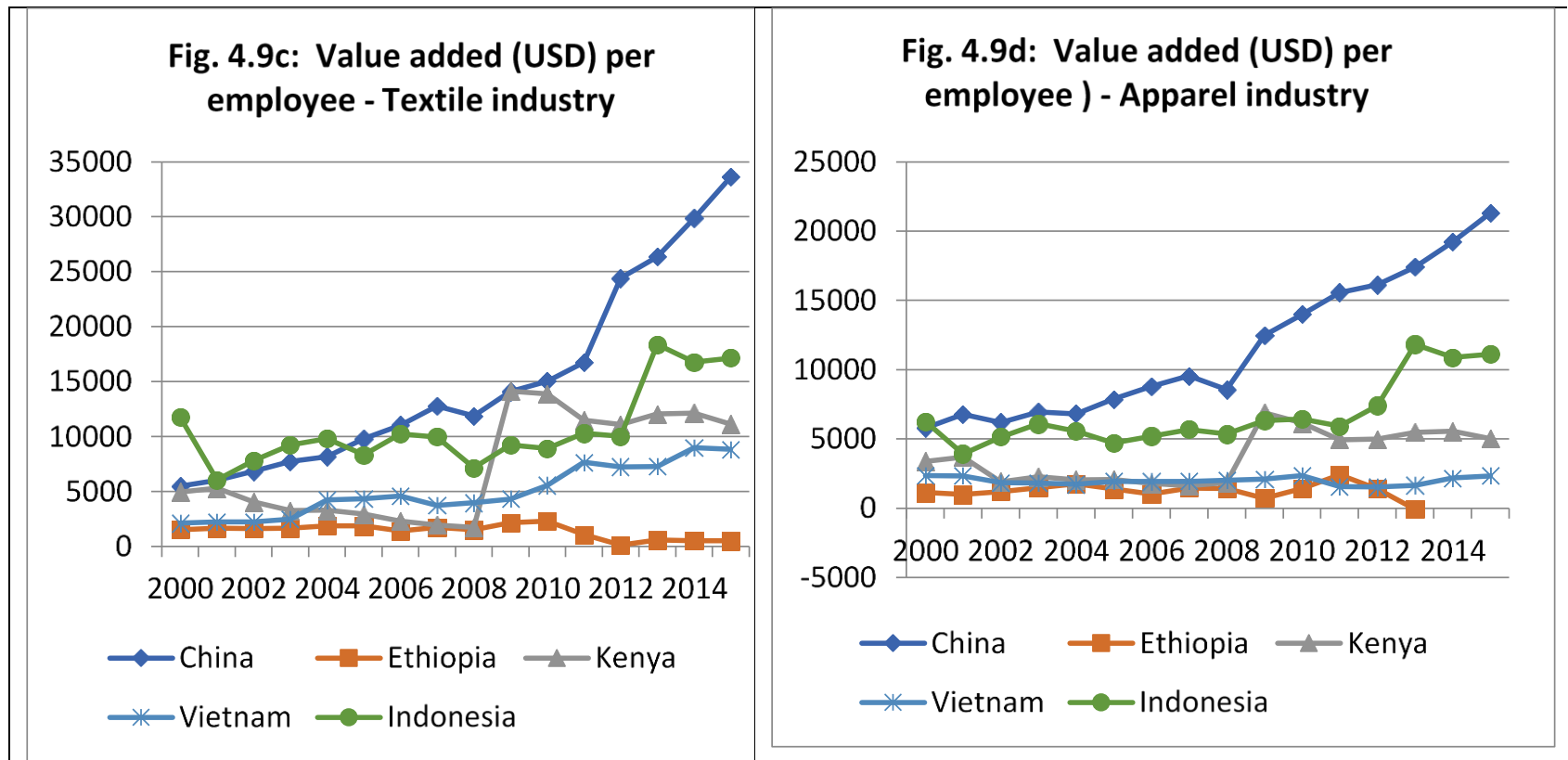
Labor productivity in selected labor incentive sectors

Figure 4.9: Value added (USD) per employee for selected sectors



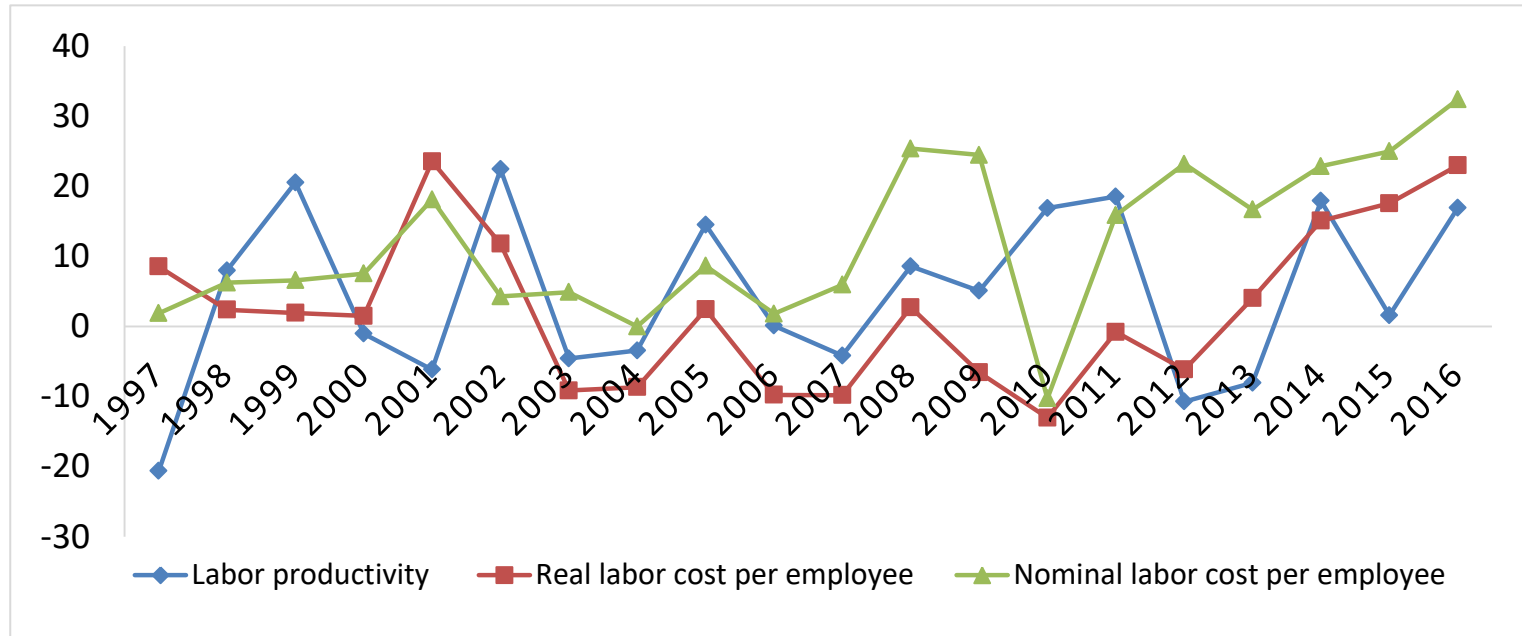
Labor productivity in selected labor incentive sectors

Figure 4.9: Value added (USD) per employee for selected sectors



The wage-productivity nexus

Figure 4.14: Labor productivity and labor cost growth rate (%)



- Comparing growth (1996 – 2016)
 - Nominal labor cost per employee = 12.1%
 - Real labor cost per employee = 2.5%
 - Labor productivity = 4.6%

Main findings of the manufacturing sector productivity

- Based on the CSA database (1996-2016) we find that Ethiopia's manufacturing sector;
 - labor productivity has shown a moderate growth rate (nearly 5% annual average growth)
 - However, TFP over the sample period (2.86% annual growth)
- We also find a large heterogeneity in productivity among sectors
 - Some sectors such as motor vehicle, basic metal, fabricated metal, and food and beverage show higher labor productivity level.
 - In contrast, the garment, wood, textile, furniture and leather sectors exhibited a low level of labor productivity.
- The labor productivity comparison with peer and benchmark countries (China, Indonesia, Kenya, and Viet Nam) shows us that
 - Ethiopia's labor productivity in the manufacturing sector (even at the subsector level of the selected industries) has remained stagnant and in some cases declining trend → **the gap with the other countries in the sample increasingly widened**
- Wage-productivity nexus: Labor productivity on average grew by 4.6% (1996-2016).
 - This growth is lower than the nominal labor cost per employee (12.1%) but faster than the real labor cost per employee growth (2.5%)

Thank you!