REPUBLIC OF TÜRKIYE
NECMETTİN ERBAKAN UNIVERSITY
SOCIAL SCIENCES INSTITUTE
DEPARTMENT OF ECONOMICS

INDUSTRIAL PRODUCTION, MULTI-FACTOR PRODUCTIVITY, AND DEVELOPMENT OF INDUSTRIAL POLICIES IN ETHIOPIA: THE CASE OF MANUFACTURING SECTOR

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PhD THESIS

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KONYA - 2022

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SOSYAL BİLİMLER ENSTİTÜSÜ
İKTİSAT ANABİLİM DALI

ETİYOPYA'DA SANAYİ ÜRETİMİ, ÇOKLU - FAKTÖR VERİMLİLİĞİ VE SANAYİ POLİTİKALARININ GELİŞİMİ: İMALAT SEKTÖRÜ ÖRNEĞİ

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ABSTRACT

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	Title of the Thesis/ Dissertation	*Industrial Production, Multifactor Productivity, and Development of Industrial Policies in Ethiopia: The Case of The Manufacturing Sector*		

Ethiopia began industrial development almost a century ago, even though this longtime industrialization experience is still dismal. The industrial and manufacturing sectors are undeveloped by all indicators, including poorer productivity and export, lower technical competence and technology, lower backward and forward connections, and lower in everything, even today. Besides, the manufacturing sector is one of the least productive subsectors.

Although Ethiopia's manufacturing sector began in the 1950s; firm-level studies have received little attention, and few studies have examined Ethiopian firm-level TFP; using recent balanced panel datasets, calculating TFP using the Value-added approach, fully measuring the Value-added variable by including stock difference values, and using four estimators makes the thesis unique. Besides, the thesis emphasizes manufacturing because of the government's policy of prioritizing the sector. Thus, the thesis examines industrial production, multi-factor productivity, and industrial policy development in Ethiopia's manufacturing sectors. Using the Ethiopian central statistical agency (CSA) reconstructed balanced panel datasets from 2011/12-2019/20, the level, growth, and determinants of TFP were measured for 570 sampled firms in the general manufacturing panel and Growth and Transformation Plan (GTP) priority, export-oriented and import substitution sub-sectors. The thesis uses four methods to estimate Ethiopian manufacturing TFP: Arellano and Bond, 1991; Arellano and Bover, 1995; Blundell and Bond, 1998; LSDVC.

All diagnostic estimation tests are satisfactory and significant, appropriate to the analysis result. Besides, the lag of log TFP (L. ln _TFP) shows a positive sign. It is

statistically significant in all four GMM estimators examined and panel estimation in the thesis. At the same time, the results of labor skill(lnskill), export status (iexpstuts), and firm age (lnage) are positive and significant in all four estimators in the general manufacturing sector. Similarly, the major results of the textile garment and leather subsectors revealed that labor skill (lnskill) is positive and significant across all four estimators. And also, the export status (iexpstuts) and age of the firm (lnage) are significant and exhibit positive signs in Arellano and Bond's (1991) and Blundell and Bond's (1998) estimations.

Furthermore, labor skill (lnskill) and age of firm (lnage) coefficients have a positive sign and are significant in all four food and beverage subsector estimators; all four estimators have negative firm size (ifirmsize) coefficients in the subsector. Similarly, labor skill values are positive and significant in the chemical and non-metallic mineral sub-sectors of four GMM estimators. In all GMM and LSDVC estimators, the firm age coefficient is positive and significant. However, in LSDVC estimators, firm size coefficients are only significant and negative. Moreover, In the basic and fabricated metal subsectors, lnskill and lnage are positive and significant in all four estimators. Similarly, the ownership coefficient is significant in all estimators except system GMM, while the material (lnrm) coefficient is only positive and significant in LSDVC estimation. Finally, the legal form of business ownership (ilgfbo) coefficient has a positive sign and is statistically significant only in this subsector.

The study results revealed that public incentives and policies to improve Ethiopian manufacturing firm's productivity should focus on skilled labor, export promotion, a special support scheme for SMFs, and firm experience (firm age). Besides, the respective government bodies should periodically evaluate and revise existing industrial policies to fit the situation; the industrial and trade policy should not be put separately, and trade should be mainstreamed in every economic sector. Moreover, along with the above policies and strategies, the government should set productivity goals that can be measured and managed for the primary industries and manufacturing subsectors and create strong and transformative institutions for implementation.

Keywords: *Industrial Production, Manufacturing, Industrial Policies, Productivity, Multi-factor productivity, Panel Data Models, Ethiopia.*
JEL codes: L25, L52, L60, D22, D24, C33

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Etiyopya, bu uzun süreli endüstriyel gelişme deneyimi hala iç karartıcı olsa da, neredeyse bir asır önce endüstriyel bir başlangıç yaptı. Sanayi ve imalat sektörleri, daha düşük verimlilik ve ihracat, düşük teknik kapasite, düşük teknoloji, hem geri hem de ileri ağlar ile zayıf bağlantılar ve bugüne kadar bile her şeyde daha düşük dahil olmak üzere tüm göstergeler tarafından gelişmemiştir. Ayrıca, imalat sektörü ise verimli en düşük alt sektörlerden biridir.

Etiyopya'nın imalat sektörü 1950'lerde başlamış olsa da, firma düzeyinde araştırmalar çok az ilgi görmüştür ve Etiyopya firma düzeyinde TFV'yi inceleyen az sayıda çalışma vardır; Güncel dengeli panel veri setlerinin kullanılması, Katma Değer yaklaşımı kullanılarak TFV'nin hesaplanması, Katma Değer değişkeninin stok farkı değerleri dahil edilerek tam olarak ölçülmesi ve dört tahmin edicinin kullanılması tezi benzersiz kılmaktadır. Ayrıca, hükümetin sektöre öncelik verme politikası nedeniyle tez, imalata vurgu yapmaktadır. Bu nedenle, tez Etiyopya'nın imalat sektörlerinde endüstriyel üretim, çok faktörlü verimlilik ve sanayi politikası gelişimini incelemektedir. 2011/12-2019/20 yılları arasında Etiyopya'nın merkezi istatistik kurumu (CSA) tarafından yeniden yapılandırılmış dengeli panel veri setleri kullanılarak, imalat paneli ve büyüme ve dönüşüm planı (GTP) öncelikli ihracata yönelik ve ithal ikamesi alt sektörlerinde örneklenen 570 firma için TFV'nin düzeyi, büyümesi ve belirleyicileri ölçülmüştür. Tez, Etiyopya imalat TFP'sini tahmin etmek için dört yöntem kullanır: Arellano ve Bond, 1991; Arellano ve Bover, 1995; Blundell ve Bond, 1998; LSDVC.

Tüm tanısal tahmin testleri, analiz sonucuna göre tatmin edici ve anlamlıdır. Ayrıca log TFP (L.ln _TFP) gecikmesi de pozitif bir işaret gösteriyor. Tezde incelenen dört GMM tahmin edicisinin tamamında ve panel tahmininde istatistiksel olarak

anlamlıdır.Aynı zamanda, genel imalat sektöründeki dört tahmin edicinin hepsinde işgücü becerisi, ihracat durumu ve firma yaşı sonuçları pozitif ve anlamlıdır. Benzer şekilde, tekstil hazır giyim ve deri alt sektörlerinin ana sonuçları, işgücü becerisinin dört tahmin edicinin tamamında da pozitif ve anlamlı olduğunu ortaya koydu. Ayrıca Arellano ve Bond'un (1991) ve Blundell ve Bond'un (1998) tahminlerinde de ihracat durumu (iexpstuts) ve firmanın yaşı (lnage) önemlidir ve pozitif işaretler sergilemektedir. Bundan başka, işgücü becerisi (beceri) ve firma yaşı katsayıları pozitif bir işarete sahiptir ve dört yiyecek ve içecek alt sektörü tahmin edicisinin tamamında anlamlıdır; dört tahmin edicinin de alt sektörde negatif firma büyüklüğü (ifirmsize) katsayıları vardır.

Benzer şekilde, dört GMM tahmincisinin kimyasal ve metalik olmayan mineral alt sektörlerinde de işçilik becerisi değerleri pozitif ve anlamlıdır. Tüm GMM ve LSDVC tahmin edicilerinde firma yaş katsayısı pozitif ve anlamlıdır. Ancak, LSDVC tahmin edicilerinde firma büyüklüğü katsayıları sadece anlamlı ve negatiftir. Ayrıca, temel ve fabrikasyon metal alt sektörlerinde, işgücü becerisi ve firma yaşı dört tahmin edicinin hepsinde pozitif ve anlamlıdır. Ayrıca, sistem GMM dışındaki tüm tahmin edicilerde sahiplik katsayısı anlamlı iken, malzeme (lnrm) katsayısı LSDVC tahmininde sadece pozitif ve anlamlıdır. Son olarak, işletme sahipliğinin yasal şekli (ilgfbo) katsayısı pozitif bir işarete sahiptir ve sadece bu alt sektörde istatistiksel olarak anlamlıdır.

Çalışmanın sonucuna göre, Etiyopya imalat işletmelerinin verimliliğini artırmaya yönelik kamu teşvikleri ve politikalarının, nitelikli işgücü, ihracat teşvik, küçük ve orta ölçekli firmalar özel bir destek programları ve firma deneyimine odaklanmalıdır. Ayrıca, ilgili hükümet organları mevcut sanayi politikalarını duruma göre zamanında değerlendirmeli ve revize etmelidir; sanayi ve ticaret politikası birbirinden ayrı tutulmamalı ve ticaret her ekonomik sektörde ana akım haline getirilmelidir. Bundan başka, yukarıdaki politika ve stratejilerle birlikte hükümet, ana sanayiler ve imalat alt sektörleri için ölçülebilen ve yönetilebilen verimlilik hedefleri belirlemeli ve uygulama için güçlü ve dönüştürücü kurumlar oluşturmalıdır.

***Anahtar kelimeler**: Sanayi Üretimi, İmalat, Sanayi Politikaları, Verimlilik, Çok faktörlü verimlilik, Panel Veri Modelleri, Etiyopya.*
***JEL kodları:** L25, L52, L60, D22, D24, C33*

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Bu tezin hazırlanmasında bilimsel etiğe ve akademik kurallara özenle riayet edildiğini, tez içindeki bütün bilgilerin etik davranış ve akademik kurallar çerçevesinde elde edilerek sunulduğunu, ayrıca tez yazım kurallarına uygun olarak hazırlanan bu çalışmada başkalarının eserlerinden yararlanılması durumunda bilimsel kurallara uygun olarak atıf yapıldığını bildiririm.

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Yukarıda adı geçen öğrenci tarafından hazırlanan Etiyopya'da Sanayi Üretimi, Çoklu-Faktör Verimliliği ve Sanayi Politikalarinin Gelişimi: İmalat Sektörü Örneği başlıklı bu çalışma 06/07/2022 tarihinde yapılan savunma sınavı sonucunda oybirliği/oyçokluğu ile başarılı bulunarak jürimiz tarafından Doktora Tezi olarak kabul edilmiştir.

Sıra No	**Danışman ve Üyeler**		
	Unvanı	**Adı ve Soyadı**	**İmza**
1	Prof. Dr	Abdulkadir BULUŞ	
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ABBREVIATIONS AND ACRONYMS

AACCSA Addis Ababa Chamber of Commerce and Sectoral Associations
ADLI Agricultural Development Led Industrialization
CD-PF Cobb-Douglas production function
CGE Computable general equilibrium
CPI Consumer Price Index
CSA Central Statistical Agency
DEA Data Envelopment Analysis
EDRI Ethiopian Development Research Institute
EEA Ethiopian Economic Association
EIC Ethiopian Investment Commission
EKI Ethiopian Kaizen Institute
EPRDF Ethiopian people's revolutionary democratic front
EPU Economic Planning Unit
ESCI Ethiopian standard Industrial classification
ETB Ethiopian Birr
FDI Foreign Direct Investment
FDRE Federal Democratic Republic of Ethiopia
FFYP First Five-year Plan
GDP Gross Domestic Product
GNI Gross National Income
GTP Growth and Transformation Plan
IEG Imperial Ethiopian Government
ILO International Labor Organization
ISIC International Standard for Industrial Classification
LIDI Leather Industry Development Institute
LMSMI Large and Medium Scale Manufacturing Industries
L-P Levishom-Petrin
MIDI Metal Industry Development Institute
MLE Medium and large-scale industries
MLSM Medium and large-scale manufacturing enterprises
MoFED Ministry of Finance and Economic Development
MPD Ministry of planning and development
MSE Micro and Small Enterprise
NPC National Planning Commission
NBER National Bureau of Economic Research
OECD Organization for Economic Co-operation and Development

PASDEP Plan for Accelerated and Sustained Development to End Poverty
PF Production Function
PCA Principal Component Analysis
PDC Planning and Development Commission
PPP Purchasing power parity
PPP Purchasing Power Parity
PSI Policy Studies Institute
PSIC Pakistan's Standard Industrial Classification
R&D Research and Development
SAM Social Accounting Matrix
SAP Structural adjustment program
SFYP Second Five-Year Plan
SME Small and Medium Enterprises
SMF Small and Medium Firms
SSA Sub-Saharan Africa
TFP Total Factor Productivity
TFYP Third Five-Year Plan
TIDI Textile and Industry Development Institution (Ethiopian)
TVET Technical and Vocational Education and Training
UNCTAD United Nations Conference on Trade and Development
UNDP United Nations Development Program
UNIDO United Nations Industrial Development Organization
USD United States Dollar
VA Value -Added
WBES World Bank Enterprise Survey
WDI World Development Indicator
WWII World War Second

ACKNOWLEDGMENTS

This thesis would not have been finished without the tremendous assistance I got over the previous years from so many individuals. First, I would like to express my profound thanks to my supervisor, **Prof. Dr. Abdulkadir Buluş**, for his unending support in guidance, supervision, eternal assistance, and hospitality. Moreover, he always encourages me to do better work in my PhD studies and in life in general; he is a great advisor and motivator. His guidance helped me in all the time of research and writing of this thesis. Besides my advisor, I also appreciate the special insightful comments and encouragement of the doctoral thesis committee (TIK) members, Prof. Dr. Fatih Mehmet Öcal and Prof. Dr. Önder Kutlu.

Furthermore, I would like to thank Asst. Prof. Dr. Mustafa Gömleksiz and Assoc. prof. Dr. Serife Özsahin for their valuable support and encouragement during the research. My special thanks go to Dr. Amin Abdella, my fellow friend, and colleague, Dr. Esubalew Ayalew, for their tireless support on the subject and encouragement during the research. Similarly, I would like to thank Dr. Tsegay Gebrekidan for his kind support on the topic. Additionally, a special thank is given to all the members of the Economics Department at Necmettin Erbakan University.

Moreover, I would like to thank the Turkish Government Scholarships (YTB) for providing me with a full scholarship and financial support to complete this PhD Program. Besides, I would like to thank the Ethiopian central statistics agency (CSA) for assisting me with LMSMIS data.

Besides, I am eternally grateful to my darling wife, Ibsitu Abadiga; your presence is always with me in these busy times. Without your immense love, understanding, and encouragement, it would be impossible for me to complete my study.

Last but not least, my deepest gratitude goes to all my families, especially my mother, Alewiya Jamal, and my friends, for their tremendous support and hope they gave me and for supporting me spiritually throughout writing this thesis and my life in general.

Finally, I know that many people have assisted me during my studies, but they are not named here. I am indebted to all of them and will honor their assistance by extending it to others.

INTRODUCTION

Nowadays, world countries' social and economic structures have been profoundly altered due to industrial development; it is often regarded as the single event responsible for the most significant degree of this alteration. Industrialization is not just the means to sustainably supply people's fundamental requirements but also generate wealth in the world nations. Consequently, the relevance of industrialization resides in its potential to contribute to the transformation of all economic sectors, and the same conditions happened in many industrialized economies throughout their industrialization periods (EEA, 2005).

The relocation of industry from high-income nations to low-income and developing nations has been one of the most momentous transformations that have taken place in the global economy over the last four decades. Accordingly, the industrial development process in Africa has resulted in displeasing outcomes throughout this same period of industrialization (Newman et al., 2016). However, according to recent UNICTAD industrial development reports (UNICTAD, 2013, 2015, 2017, 2019), the performance of African countries, particularly SSA countries, the industry in general, and the manufacturing sector performance and share in all measures of the economy is below the world's low-income country average. Thus, it was clear from these reports that African countries are trailing behind and undeveloped in the industrialization phases compared to developed and newly industrialized emerging nations.

In Ethiopia, the industrialization process and industry in the contemporary sense appears as an economic unit at the start of the twentieth century (Gebreeyesus, 2016a). At the same time, manufacturing started to gain pace in the 1950s, after a short period of interruption during WWII. As a result, various new industries were founded during this time, and these sectors significantly contributed to the improvement of the national economy (Shiferaw, 1995). It is also possible to notice the emergence of specific government plans and strategies to promote and lead the nation's economic and industrial success throughout this period, which is a noteworthy development during this period.

Furthermore, Ethiopian industrialization and industrial development periods can have been divided into three periods (regimes) over the last eighty years, which include the Imperial regime (1950- 1974), the Dergue regime (1974 – 1991), and the EPRDF regimes (1991 - 2019). All régimes are characterized by different economic systems and the emergence of various industrial policies and strategies (Gebreeyesus, 2013, 2016b).

Value addition is the distinguishing feature of the industrial sector compared to other economic sectors, particularly the manufacturing sector. Still, the trends in industrial value-added (including construction) in Ethiopia throughout 2008 show a slight increase (World Bank, 2020). Besides, reports indicate that the manufacturing sector showed relatively minimum contribution to the percentage of GDP and share in all measures of the economy in the sub-sector exhibits Ethiopia's infant manufacturing activities. It implies an early stage and low level of industrialization in the country. Among the reasons for low industrialization and manufacturing activities, the main reason was that the manufacturing sector was not a concern (priority) sector until recently in Ethiopia. Similarly, this low contribution of the manufacturing sector to the GDP is a common feature of most developing countries, especially in Sub-Saharan African countries (G. Chen, Geiger, & Fu, 2015; World Bank, 2015).

Ethiopia began its industrialization about a century ago, as mentioned before. Even though this long-term experience is still its dismal standing compared with developed and developing neighboring countries, the sector is, by all measures, highly badly gloomy and among one of the world's least industrialized economies (EEA, 2005). So far, the sector's share at the national level in each assessment available and share in the economy has an insignificant performance (Altenburg, T., 2010; Melaku, n.d.; Mitiku & Raju .S, 2015a). However, Ethiopia has set itself the goal of transforming the country into an industrial economy and improving the per capita income of its citizens to the "*middle-income level by 2025*"[1]. To this end, the government has introduced consecutive plans and strategies

[1] Ethiopia's Growth and Transformation Plan II ((FDRE, 2016) "*aims to spur economic structural transformation and sustain accelerated growth towards the realization of the national vision to become a low middle-income country by 2025"*.

with a particular emphasis on the manufacturing sector. Specifically, as of 2017, it aims to increase the industrial sector's proportion of GDP from 16.7% in 2017 to 27% by 2025 and the manufacturing sector's share of GDP from 5.4 percent in 2017 to 17% by 2025 (EEA, 2017).

According to the World Bank (2015) and Subramanian & Matthijs (2007), the Ethiopian manufacturing sector's low labor and total factor productivity were the primary reasons for its low competitiveness. However, the government and foreign organizations regard it as a crucial strategic sector, but still, the sector has not recorded encouraging results. Besides, according to (Alemu & Zerihun, 2005), Ethiopia's manufacturing firms are "*inefficient in productivity and resource allocation*." Furthermore, according to various authors, the industrial sector is considered "*substandard by every assessment,"* one of the least developed globally, and lower in every measure until recently. For instance, among the available measurements, the sector is characterized by lower productivity (Zerihun, 2008) and lower export capability (Bigsten & Gebreeyesus, 2009a). Furthermore, according to (EEA, 2005), manufacturing has the lowest level of development in terms of output volume, product quality, technical status, labor skill, and export capability.

On the other hand, various studies also recommended that the primary reason for the industrial sector's detrimental, distorted, and irregular status would be the lack of sound industrial policy (Mitiku & Raju .S, 2015b). Similarly, Ethiopia has developed and executed several national development plans and strategies since the early 2000s; the industry sector in general and the manufacturing sector, in particular, have been given national importance following the formulation of the national industrial policy in 2003 by the FDRE. Furthermore, the formation of favorable conditions for the industry is among the cornerstones of the previous two development plans called GTP (I and II) strategies.

For instance, the GTP- I (2010/11-2014/15) industrialization plan focused on building a competitive manufacturing sector; the GTP-II (2015/16-2019/20), aiming to deepen structural transformation, is built on the GTP-I lessons acquired specifically concerned on the manufacturing sector (NPC, 2016). Furthermore, recently Ethiopia implemented a home-grown plan development plan called Ethiopia 2030, the pathway to prosperity from 2020 to 2030, with the primary strategic pill of assuring quality growth, boosting productivity, and competitiveness of the sectors. However, despite several sectoral policies, strategies, and plans being implemented, the manufacturing industry's contribution to the overall economy has been reduced.

Productivity is a "*fundamental concept in economic analysis, the efficiency of converting inputs into outputs*." Similarly, productivity is usually defined as the ratio of output volume to the volume of input usage (OECD, 2001). In another way, TFP is the rate at which total input is transformed into total output (W. E. Diewert & Nakamura, 2007). In economics, the concept of productivity has been the subject of various theoretical and empirical investigations. The idea of productivity was first incorporated into the growth model by Solow (1956) as a "*measure of technological progress and was regarded as an external mechanism*." Solow (1957) noticed that output increased due to factor accumulation and increasing productivity.

According to Van Biesebroeck (2007), the primary goal of productivity measurement is to discover output disparities that differences in input cannot explain. The most commonly used productivity measures are labor, capital, multi-factor productivity, or TFP measures (OECD, 2001). Nowadays, most productivity studies are centered on total factor productivity (TFP), a comprehensive aggregate measure of output that provides the most accurate picture of the economy. TFP is often regarded as the most comprehensive indicator of productivity and efficiency in utilizing productive resources. In addition to the substantial literature on the subject of studies for more comprehensive measurement issues, some of the studies were undertaken by (Blundell & Bond, 2000;

Griliches, 1998; Levinsohn & Petrin, 2003; Olley & Pakes, 1996). However, there has been no approach for predicting TFP entirely free of constraints.

In particular, the studies of productivity at a firm's level often assume that output (typically measured as value-added or as a proxy using the deflated sales value) is a function of the inputs used by the firm and its productivity. Accordingly, the residual TFP measure evaluates the impact of numerous policy measures following the functional relationship (Landi & Niederreiter, 2017). Therefore, this thesis focuses on estimating multi-factor productivity (TFP) at the firm level based on the value-added approach in general; since it is a critical measure of manufacturing performance and a key indicator for policymakers at the macro, industrial, and firm levels. Besides, labor productivity is measured using value-added per labor.

There is a substantial body of work on productivity determinants empirically and theoretically at the aggregate, industry, and firm levels. These include studies by (D. Jorgenson, 1995b, 1995a, 2005) extensive productivity and productivity-related various volumes of research works and Griliches (1998) and his collaborators' work on different productivity and NBKR productivity-related subjects, two of the most critical pioneering fields of productivity. In addition, several governments and non-governmental organizations throughout the world have made substantial contributions to the field's early development. Another recent study, published by (Botrić, Božić, & Broz, 2017; Cieślik, Michałek, & Szczygielski, 2019; Du & Temouri, 2015) confirms various variables that impact firm-level productivity across nations and sectors. However, they also agree that there is significant and persistent heterogeneity in firm-level productivity across countries and industries. Thus, to construct applicable industrial and innovation policies that promote long-term, sustainable growth, it is imperative that the determinant of a firm's productivity variability be studied from both a microeconomic and macroeconomic policy viewpoint (Dvouletý & Blažková, 2020; Storey & Potter, 2020).

However, the firm-level study of manufacturing industries, which focuses on production performance and total factor productivity analysis using recent survey panel data of manufacturing firms across developing nations, has received very little attention in the literature. As a result, it is critical to concentrate efforts on areas that can provide more up-to-date information because productivity is another important indicator of profitability performance. Moreover, there is very little information about the total factor productivity (TFP) of manufacturing establishments in Ethiopia at the firm level using up-to-date, balanced panel datasets. Also, the Ethiopian government's first and second growth and transformation plans have been completed during this period, which is significant from a policy standpoint. Besides, it is necessary to evaluate the GTP (I and II) period to ensure that policy intervention for the subsequent plans is successful. Furthermore, the thesis primarily emphasizes that the manufacturing sector is consistent with the government's policy of prioritizing the sectors. Therefore, it focuses on the firm-level analysis because firm-level statistics allow us to understand the factors that contribute to the large discrepancy in productivity between establishments.

Moreover, the researcher believes this is the initial effort to give a comprehensive insight into firm-level TFP determinants based on a larger balanced panel dataset covering the whole manufacturing industry over an extended period in Ethiopia and displays the country's economic activity structure. Thus, the thesis is unique from previous studies in the field because it first used the recent reconstructed balanced micro panel datasets from 2011/12 to 2019/20. Secondly, the thesis calculated the TFP of each subsector as a residual of the CD production function (CD- PF) using the Value-added (VA) approach. Thirdly- while previous related studies used a proxy variable as VA, this thesis measured the VA variable by fully considering and including the stock difference values. The Fourth – while previous studies used only the known three GMM estimators, this study used four estimators by having the updated LSDVC estimators as a fourth estimator for comparison with the existing GMM estimators.

Similarly, this study is an attempt to fill in the gaps in the literature. Accordingly, the study focuses on small, medium, and large manufacturing firms rather than the overall industry at the national level. Therefore, the level, growth, and determinants of TFP were measured for 570 firms in all general manufacturing sectors in the first place. Then for the GTP priority subsectors, export-oriented and import substitution sub-sectors in the manufacturing panel using CSA reconstructed balanced panel datasets including 15 main industrial categories in manufacturing sectors covering the period 2011/12 - 2019/20.

The thesis's general objective is to examine the industrial production, multifactor productivity, and development of industrial policies in Ethiopia in the case of the manufacturing sector by using reconstructed balanced panel datasets. The sub-objectives considered to address and answer the overall objective of this thesis are as follows: Firstly, the sub-objective of the study is to examine the review of the Ethiopian economy in general and industrial production performance in particular. Secondly, the sub-objective of the study is to review and assess the development of industrial and manufacturing policies and institutions enacted to promote the industry in Ethiopia and to review the main investment incentives and regulations. Thirdly, the sub-objective of the study is to measure the level and growth of TFP and labor productivity (value added per employee) at the firm level and examines the TFP determinant in the manufacturing sector in Ethiopia, in general, GTP priority, export-oriented, and import-substituting sub-sectors in particular.

The paper was organized into four chapters, each focusing on a different aspect of the thesis's main goal. The remaining sections of the paper are structured as follows. The first chapter provides a theoretical framework that discusses the concepts and definitions of industry in general as well as manufacturing and industrial policy in the context of Ethiopia. Also covered are some theoretical issues such as industrial development history, classification of industrial sectors, investment incentives and regulations at the national level, and industrial development policies and institutions in Ethiopia. Chapter two examines the overview of the Ethiopian economy and industrial sectors' contribution; it discusses the macroeconomic performance, the economic contribution and performance of Ethiopia's major industries in general, and the manufacturing sector in particular.

Chapter three discusses the literature review covering the concept, significance, empirical facts, and measurement of productivity and the multi-factor productivity in manufacturing firms in Ethiopia. Also, it targeted reviewing the main determinants of TFP in manufacturing firms in general and in the context of Ethiopia. Chapter four focuses on methodology and discusses the description of the data and sector, and data analysis methods covering descriptive statistics and econometric models are provided and discussed. Finally, in the latter part of the fourth chapter, the findings and interpretation of descriptive statistics and econometric analysis results are identified and discussed in-depth and eventually report a policy recommendation for enhancing Ethiopian industrial productivity in general and in the context of the manufacturing sector.

CHAPTER ONE

1. THEORETICAL BACKGROUND

It is required to define and adequately characterize the notion of industries and manufacturing in general and subsectors in particular for information regarding the research topic to be accurate and useful. As a result, the description of concepts, definitions, theories, and related phrases is a prerequisite in most cases and a common approach to producing a thesis or an academic paper. In this section, the researcher briefly discusses the ideas and definitions of industry, industrial output, manufacturing, and industrial policy in general and in the context of Ethiopia. It also identifies and reviews some theoretical issues of industrial development history, classification of industries, investment incentives and regulations in Ethiopia, and finally, industrial development policies in and institutions in Ethiopia.

1.1. Concept and Definition

As stated in Encyclopedia Britannica (2011), the industry is defined as" *a group of productive enterprises or organizations that produce or supply goods, services, or sources of income. In economics, industries are customarily classified as primary, secondary, and tertiary, and the secondary industries are further classified as heavy and light"*.

Additionally, it is defined as *"manufacturing activity as a whole*, *the nation's industry" and "distinct groups of productive or profit-making enterprises within the banking industry"* (Encyclopedia Britannica, 2011). *It is also defined as "a department or branch of a craft, art, business, or manufacture that employs significant personnel and capital, particularly manufacturing*."

According to OECD (2022), "*Industrial production refers to the output of industrial establishments and covers sectors such as mining, manufacturing, electricity, gas and steam and air-conditioning*. *This indicator is measured in an index based on a reference period that expresses a change in the volume of production output"*.

Thus, this thesis follows the definition stated above, emphasizing industrial production of the general manufacturing sectors, specifically those that employ more than ten employees in Ethiopia.

According to the United Nations (2004) International Standard Industrial Classification (ISIC Revision-3.1), manufacturing is "the *physical or chemical transformation of materials or components into new products. Whether the work is done by power-driven machines or by hand, whether it is done in a factory or the worker's home, and whether the products are sold at wholesale or retail. The assembly of manufactured products' parts is also considered a manufacturing activity*" (United Nations (2004).

Manufacturing is defined by the Ethiopian central statistics agency (CSA) as "*the physical or chemical transformation of materials or components into new products, regardless of whether the work is performed by power-driven machines or by hand, regardless of whether the work is performed in a factory or at the worker's home, and regardless of whether the products are sold wholesale or retail. Furthermore, assembly of product component pieces is also considered a manufacturing activity* " (CSA, 2018). This term is defined in accordance with the International Standard Industrial Classification (ISIC Revision-3.1). Additionally, the CSA defines large and medium-scale manufacturing as all firms that employ ten or more people and rely on electricity to operate.

Additionally, manufacturing includes establishments participating in mechanical, physical, or chemical transformation of raw materials, substances, or components to create new goods. Additionally, manufacturing consists of the assembling of components of manufactured products. However, the survey's scope of manufacturing industries is confined to establishments employing ten or more people and using power-driven machinery and governmental and private industries in all country regions with establishments included in the study.

In general, the working definition for this thesis is based on the above-stated Ethiopian central statistics agency (CSA) definition, which follows the International Standard Industrial Classification (ISIC Revision-3.1).

On the other hand, Industrial policy interpretation and application have varied significantly throughout history and worldwide. The following definition will explain what makes an industrial policy, which policy instruments it uses, and how it is adopted, representing the views of pioneering researchers in industrial policy. Thus, Industrial policy is not defined consensually, examining this notion's controversies. However, according to Warwick (2013), industrial policy is defined as "*any type of intervention or government policy that attempts to improve the business environment." In other words," to alter the structure of economic activity toward sectors, technologies or tasks that are expected to offer better prospects for economic growth or societal welfare than would occur in the absence of such intervention*."

Moreover, various other authors such as (Landesmann, 1992; Lin & Chang, 2009; Pack & Saggi, 2006) furnish narrower definitions of industrial policy. For instance, (Pack & Saggi, 2006) defined industrial policy *as "any form of selective intervention."* In other words,*" government policy that seeks to shift the production structure toward sectors that are expected to provide greater economic development possibilities than would occur in the absence of such intervention, that is in market equilibrium."* Finally, assuming the meaning is clear, this paper will adhere to the older definition.

1.2. History of Industrial Development in Ethiopia

As mentioned in the introduction section, the Ethiopian industrialization process and industry in the present-day sense appeared as an economic unit at the start of the twentieth century. At the same time, the demand for imported manufactured commodities increased because of the emergence of a strong central government, the rise of cities related to the construction of railways, and the improvement of internal relations in the country. Accordingly, the beginning of import–substitution factories at home and, consequently, modern manufacturing enterprises began appearing in the 1920s. Since 1927, about 25 factories were started in a few major cities, most owned by foreign nationals. In addition, between 1928 and 1941, immigrants from Armenia and Greece constructed no less than ten new factories in Ethiopia. These factories were used for manufacturing goods (Gebreeyesus, 2013).

Moreover, manufacturing started to gain pace in the 1950s, after a short period of interruption during WWII. As a result, various new industries were founded during this time, and these sectors contributed momentous contributions to the improvement of the national economy (Shiferaw, 1995). Among the leading manufacturing plants established, such as - the Wonji sugar plant, a joint venture between the government and a Dutch company, three leather and shoe processing industries, textile factories, and two wood processing plants are among some of them. It is also possible to notice the emergence of specific government plans and strategies to promote and lead the nation's economic and industrial success throughout this period, which is a noteworthy development during this period.

Furthermore, when discussing the history of industrialization in Ethiopia, it is helpful to divide the country's governments into three distinct regimes. These regimes can be distinguished from one another based on the different policy orientations, types of governmental systems, and implementation of various plans and strategies they enacted during their time in power. Accordingly, the Ethiopian industrialization and industrial development periods can have been divided into three regimes (periods) over the last eighty years, which include the Imperial regime (1950- 1974), the Dergue regime (1974 – 1991), and the EPRDF regimes (1991- 2019). Although, as stated before, all régimes are characterized by different economic systems and the emergence of various industrial policies and strategies, at the same time, those Industrial policies and strategies have unique characteristics regarding guiding vision and plan, business focus, and organizational structure. Therefore, they generally can be classified as private sector-led, and import substitution from early 1950 to 1974, known as the -Imperial regime; import substitution and state-led, with no or little room for the private sector to operate from 1974 to 1991 is known as the Dergue regime. Finally, a market-oriented economy, the private sector-led and export-oriented from 1991 to 2019, is called the EPRDF regime (Gebreeyesus, 2016a)**.**

The so-called imperial period (regime) starts from 1930 to 1974 in the history of Ethiopia. The imperial government that pursued an economic strategy based on market principles was known as the Hailesilasse regime. It also prioritized the dominance of foreign-held industries and was a privately-run regime. Moreover, even as early as the 1940s, Ethiopia attempted industrialization by devising a 10-year plan to establish a foundation for manufacturing capability in the country. However, during the period of Ethiopia's First Five Year Development Plan (FFYP), which was announced in 1957, there were trends of entrepreneurial activity toward features of the manufacturing industry (UNDP, 2017).

In the mid-1950s, a deliberate push to promote industrial growth started creating the FFYP from 1958 to 1962 (IEG, 1957). The plan proposed that light industries that produced consumer products for the local market would be developed to import-substitute for heavy industries to accomplish industrial growth. According to the FFYP, a major role in funding the investment capital necessary for the industry was envisaged in the strategy, with foreign direct private investment expected to play the primary role. Accordingly, numerous policy initiatives were implemented to promote manufacturing investment, including safeguarding the domestic industry by high tariffs and banning imports, tax inducements, and credit allocation. In general, some other roles and responsibilities for the government in promoting industrial development were envisaged in the plan in detail (IEG, 1957). Similarly, the subsequent additional two five-year plans, the SFYP and the TFYP were released between 1963 and 1973 (IEG, 1962, 1968). Throughout this period, the government widened its inducements to attract business and improve its economic sectors by directly investing in production (EEA, 2005; Gebreeyesus, 2013; IEG, 1968).

Finally, the foreign investors and the industrial sector in Ethiopia were boosted due to the adoption of these strategies. But the country's total industrial capacity stayed weak by the end of the plan period and did not perform as planned before. Besides, it was defined by a double structure, a traditional tiny-scale and handicraft sub-sector and a larger medium-scale sub-sector, respectively adding approximately half of the value-added of manufacturing (World Bank, 1985).

After the imperial monarchy, which was previously in control, Ethiopia was toppled by a military coup, which allowed the Dergue regime to ascend to power. In Ethiopian history, the so-called "*Dergue Regime*" dates from 1974 to 1991. The military regime adhered to a centralized economic structure, which meant that the state was the ultimate decision-maker for all of the nation's economic endeavors. However, through the preparations for the country's fourth five-year growth plan, the Ethiopian Revolution erupted in 1974. At the same time, most MLSM enterprises in the country were subsequently restructured under government corporations and nationalized by the military regime. Moreover, the state announced a "socialist economic policy" (PMAC, 1975) and imposed considerable limitations on the private sector and the market system (Gebreeyesus, 2013; Oqubay, 2015).

Furthermore, constraints were placed on the private ownership of money and the engagement in various commercial activities. Besides, among the main restrictions in the period, the imports were prone to quantitative controls, and the state introduced higher tax rates. Also, during this time, the business owners may only partake in one firm, and private investment was restricted to a maximum of half a million birrs in value. Besides, in this regime, the national currency of Ethiopia (Birr or ETB) was designated a fixed exchange rate system. It was set at about 2.07 ETB and was exchanged in one U.S Dollar throughout the military government's tenure from 1974 to 1991. In addition to this measure, other restrictive measures such as price controls have been started, covering various product lines and a highly controlled labor market (Balema, 2014; Gebreeyesus, 2016b; Tekeste, 2014).

On the other hand, in this regime under discussion, the performance and activities of industries in general and their subsectors declined; industrial production's dramatic output declined during the first few years after the revolution. This decline was primarily caused by nationalization, which resulted in the subsequent departure of foreigners who owned and managed the enterprises and the escalation of the conflict in Eritrea, particularly in Asmara, which at the time possessed roughly one-third of the country's industrial capacity (World Bank, 1985). During the same period, the state launched a consecutive production campaign, the so-called locally known as "*zemecha*," to boost productivity, primarily by boosting capacity utilization and partially altering the declining trend from 1977 to 1978. However, until the mid-1980s, the state had no industrial policy per sector, a central planning body was set up in 1984, and a Ten-Year Perspective Plan (TYPP) was developed. The TYYP includes a macroeconomic structure, a plan for public investment, a descriptive set of projects, and output goals for 1984/85-1993/94. Throughout this period, the critical emphasis of the industrial development policy was to support import substitution and labor-intensive industries. Consequently, a critical aspect of industrialization is considered an investment in the country's public sector (Oqubay, 2015; World Bank, 1985).

At the same time, the government became the only sensitive body to have and control the MLSM operations. Despite this, the industrial sector remained dominant until 1991, when the Dergue system ended (EEA, 2005). Although its most significant share in the market, the government's private monetary position was steadily weak and had to depend on state financial support and overdraft facilities to fulfill its labor capital requirements; among the main problems encountered by the manufacturing firms during the period, such as the shortages of working capital, raw materials, and foreign exchanges and other related problems severely restricted manufacturing plants in the country. As a result of these and other related issues, the majority of enterprises were forced to operate far below their production capacity, unable to fulfill prospective demand, and could not compete on the world market due to the poor quality of their goods (UNIDO, 1991).

Finally, Ethiopia's economy suffered a severe downturn during the latter years of the Dergue period; the instability impacted the manufacturing sector and declined added Value. Besides, the establishment number of MLSM decreased, accompanied by a decrease in employment. Among the causes some of the leading causes of this reduction were hostile policies against the private sector, significant inefficiencies in the public sector, and the intensification of the country's conflict. Despite the government implementing a mixed economic policy to change the country from a command economy in March 1990, this endeavor was too late and fruitless since the government changed in May 1991 (Balema, 2014; Gebreeyesus, 2013; Tekeste, 2014).

Moreover, an armed battle spearheaded by the EPRDF resulted in the overthrow of the Derge administration in 1991. Accordingly, the so-called EPRDF Regime in Ethiopian history spans the years 1991 to 2019; it is the period that followed the military regime's overthrow. Shortly after that, there was a significant shift in economic policy. The country began to adopt a market orientation with a private-run but strong state role in the economy, which paved the path for establishing private firms. Besides, in the early transitional government's tenure, the EPRDF-led transitional administration proclaimed that it would pursue an economic strategy based on free-market principles and implemented different programs, measures, and development plans shortly after capturing power. Accordingly, the IMF imposed SAP as a pre-condition for access to loans, similar to the many other African and neighboring nations. As part of the structural adjustment program (SAP), several reforms were implemented throughout the first decade of the EPRDF administration (1991-1999) to reverse the command economic system by encouraging competition, opening up the economy, and boosting private enterprise. During this period, the government launched three rounds of reform programs supported by the IMF and the WB; between 1992/93 and 1994/95, which indicates the first phase of the SAP was implemented (Ibid[2]; Gebreeyesus, 2016b; MOFED, 2006).

[2] Ibid: *cited from the same source as a previous citation*

Furthermore, among the primary measures undertaken during this period were foreign exchange market liberalization measures, beginning with a significant devaluation of the Ethiopian Birr (ETB) by approximately 150 percent in 1992, which were implemented. Moreover, rationalization of public expenditure, including adopting a new investment code and labor laws, was implemented. Similarly, public enterprise laws, eliminating subsidies, export tax rebates, and price liberalization was also implemented. Besides, the second phase of the economic reformation program (1994/95-1996/97) sought to reduce the state's role in economic activity while encouraging the increased engagement of private capital. As a result, the country moved into a three-year Enhanced Structural Adjustment Facility (ESAF) agreement with the IMF in 1996. At the same time, the government started the third phase of the reforms program in 1996/97 to1998/99. In general, it is reported that the favorable policy climate has revitalized the manufacturing industry and the economy through economic reforms and macroeconomic stability (MOFED, 2006; MoFED, 2010; NPC, 2016).

Moreover, the government introduced an export promotion strategy to identify the lack of progress in the diversification of exports in 1998. However, although this strategy had a broad application, the breadth of its applications was limited. In contrast, to the previous policy regimes, industry in the general and manufacturing sector was given national importance following the formulation and introduction of the detailed national industrial policy in 2003 by the FDRE. Furthermore, in the same regime under discussion, the specific sub-sectoral policies and subsequent development plans like that of the SDPRP (2002/03-2004/05), PASDEP (2005/06-2009/10), and the two five years GTP (I and II) from 2010/11-2019/20 have made industrial policy more practical (EEA, 2005; MOFED, 2006; NPC, 2016).

Despite several sectoral policies, strategies, and plans being implemented, the manufacturing industry's contribution to the overall economy has been reduced. The introduction of GTP in 2010-11 realized that the high growth episode experienced during PASDEP could never be sustained, notwithstanding the structural change, which requires a transfer in economic activity to the manufacturing sector (MoFED, 2010). However, the rate of structural change, on the other hand, has failed to demonstrate any sign of significant advancement. Historically, the economy has been based on two sectors: services and agriculture. However, as some have predicted, labor has not shifted from lower-productivity to higher-productivity industries. As a result, over the last two decades, the proportion of manufacturing in GDP has remained steady or unchanging (World Bank, 2015).

The EPRDF prioritized agriculture and rural development under ADLI while paying less importance to the manufacturing sector. The manufacturing sector's share of GDP in 2004 was 4.2%, and even after PASDEP, the manufacturing sector's GDP share was only 4 % (MOFED, 2006). The introduction of GTP-I in 2010/11 realized that the high growth episode experienced during PASDEP could never be sustained, notwithstanding the structural change, which requires a transfer in economic activity to the manufacturing sector (MoFED, 2010; NPC, 2016).

In general, the formation of favorable conditions for the industry is among the cornerstones of the previous two development plans called GTP (I and II) strategies. For instance, the first GTP, an industrialization plan focused on building a competitive manufacturing sector; the second GTP, aiming to deepen structural transformation, is built on the GTP-I lessons acquired specifically concerning the manufacturing sector. Furthermore, a detail about the current development plan that replaces the previous GTP was that Ethiopia implemented a home-grown development plan called Ethiopia 2030. Consequently, the pathway to prosperity from 2020 to 2030 is discussed in detail in the subsequent industrial policy sections. Chapter two of this thesis will also discuss the performance of GTP (I and II) plans using descriptive statistics concerning major macroeconomic indicators, industry, and the manufacturing sector.

1.3. Classification of the manufacturing industry in Ethiopia

In the economic literature, a different measure of firm size is used for the classification, starting with the employment count as a measure of firm size (Gibrat, R., 1931). The other dimensions used for classification include - the "sales amount" of the firm as firm size measured by (Cefis, Ciccarelli, & Orsenigo, 2002) and "assets" of the firm as a measure of firm size as stated by (Serrasqueiro, Nunes, Leitão, & Armada, 2010). Similarly, the firm's "revenue" is used as a measure of firm size by (Tang, 2015); likewise, the "output and value-added" of the firm is used as a measure of firm size by (Harris & Trainor, 2005). However, numerous investigations using diverse data sets show that the size definition does not affect the outcome (Axtell, 2001; Daunfeldt & Elert, 2013; Tang, 2015).

Additionally, the size of firms will decide competitiveness, particularly for manufacturing companies exporting, because this implies a quantity of output and hence economies of scale and lower unit cost. Ethiopia's manufacturing sectors include large and medium-scale manufacturing, small-scale manufacturing, and cottage and Handicraft manufacturing (Wodajo & Senbet, 2013). According to an Ethiopian central statistics agency (2015) report on the LMS manufacturing industries survey, "*the manufacturing industries employing 10-19 people and utilizing power-driven machinery are classified as small firms. On the other hand, those employing 20-49 people are classified as medium-scale manufacturing industries, and those employing more than 50 people are classified as large manufacturing enterprises using power-driven machinery. Besides, the Micro Manufacturing Industries categorized those hiring less than ten workers*"(CSA, 2015). Thus, the firm size is also defined as the total number of employments in this study. The methodology section of this thesis explains the detailed classification of manufacturing firms for the econometric analysis.

According to the Ethiopian economics association report on the Ethiopian economy (2017), among the overall LMSMI, about 38.8 percent, 27.2 percent, and 34 percent were those employing 10-19 people, 20-49 people, and 50 and above, respectively in 2009/10, it implies the concentration for manufacturing industries employing under 50 people in companies. If one only discusses permanent workers, the rate is worse because the number of workers is usually lower than the number of persons engaged. Unlike the target in GTP I, in 2013 - 2014, the concentration of manufacturing industries employing less than 50 workers increased slightly, reaching 67 %, indicating that more medium-sized industries entered the market in the first four GTP-implementation years. Relative to the base case (2009/10), the concentration of industries with fewer than 50 workers has decreased, remaining the same, and expanded consumer goods, intermediate goods, and sub-sectors producing capital goods in 2013/14, respectively (EEA, 2017), See the appendix table A6.

On the other hand, in the World Bank (2009b), the enterprise surveys and indicator surveys are divided and classified firms according to three criteria*: ''sector of activity, firm size, and geographic location''*. "*Stratification by firm size divides the firm's population into three strata: small firms (5-19 employees), medium-sized firms (20-99 employees), and large firms (100 or more employees)"*; It was based on the ISIC (World Bank, 2009b).

Moreover, the Ethiopian standard industrial classification (ESIC), having 982 categories, was published in January 2010, according to Article 30(2) of Commercial Registration and Business Licensing Proclamation 686/2010. However, in 2013 it was revised and called the First Revised Ethiopian Industrial Standard. (AACCSA, 2017a; Addis Fortune, 2018). However, doing business in Ethiopia is challenging and among the lowest globally. The World Bank's 2018 business index ranks Ethiopia 161st out of 190 economies, comparing its business regulations to other economies or regions (World Bank, 2017). In comparison with recent years, in 2020, it was 159 out of 190 countries in the world (World Bank, 2020a). Despite this, the Ministry of Trade of Ethiopia (MoT) has started to seek to update the Ethiopian Standard Industrial Classification, a system used by a five-digit Code to classify industries (Addis Fortune, 2018).

In general, the manufacturing industries' classification using employment size is explained in detail in the methodology portion of this thesis for this study, which is based on the classifications presented in this section and diverse existing reviewed literature.

1.4. Investment Incentives and Regulations

Nowadays, a good economic policy in legislation, licensing of business, and taxes is a fundamental element of a favorable business environment; registered businesses pay taxes and are expected to comply with the regulations and benefit from the government incentives while discharging their duties. Therefore, one of the most important pillars of GTP initiatives, as stated before, is the creation of favorable circumstances for the sector.

However, the industrial sector's narrow base is an obstacle with a significant implication for the country's potential to obtain foreign exchange and creation job possibilities for its growing workforce. Therefore, the government's policy would also further focus on empowering SMEs during the plan period since they form and intensify MLEs. In addition to creating job opportunities and stimulating urbanization, this would take a role in the agricultural sector's growth. As stated explicitly in the government's industrial development policy, the value-added private sector is the driving force behind the expansion of the various sectors in the country. As such, the state would continue to execute each endeavor to facilitate and encourage the achievement of the growth objectives of the industry sector's development plans (MoFED, 2010).

Moreover, in 2025, Ethiopia anticipates becoming a middle-income nation and a significant manufacturing center in Africa. Although the goal is more profound than a quantitative goal, it requires effective poverty reduction and developments in agriculture, employment, and the environment. Among the presented goals, the three primary cornerstones for achieving that goal are economic development (for instance, by focusing on light production, such as textiles, leather, garments, agro-processing, chemicals, metal, and other priority sectors in the industrial policy), social development, and environmental development (EIC, 2017).

Although the proper focus provided in the government growth plans on the LMSMI - the success reported so far is unsatisfying, indicating the pressing need to analyze the growth limiting factors in the sector that hinder it from playing a leading role in the country. In order to accomplish the plan objectives mentioned above, the state provides competitive incentives for investment incentives for the manufacturing sector in the country to achieve its leading role in the industry. For instance, the "*Investment Proclamation 768/2012*" identified duty drawbacks, vouchers, bonded export factories, manufacturing warehouses, and bonded input supply initiatives as essential tools for supporting manufacturing and export. On the other hand, the government tax law provides duty-free imports of raw materials and machinery and equipment for manufacturers in Ethiopia. Moreover, as predicted, substantial investment in the business has not flowed mainly due to the presence of other advantageous companies towards longer payback times for investment in the industry (AACCSA, 2019b).

The change from a state-controlled to a market-oriented economy began in 1991 after the previous EPRDF government assumed power from the former socialist and military dictatorship. Since the EPRDF regime assumed power from the dergue regime, a range of changes has been amended to the national investment code; no separate policy governs FDI in the prior periods. Nevertheless, the existing foreign direct investment (FDI) regulatory system is a component of the national investment rules. As a result, foreign investors are allowed to engage in all sectors of the economy, except for a few areas reserved for domestic companies and the government. Additionally, it is stated in the Ethiopian Government Regulation *"Investment Incentives and Investment Areas Reserved for Domestic Investor's council of minister's regulation no.270/2012"* for detailed analysis of the incentives in the sector and areas under discussion (EIC, 2017).

Currently, the government is pushing to privatize some of the largest state-owned enterprises (SOEs) to allow local and foreign investors to buy shares, which is a significant reversal because of the state's aversion to capitalism. Therefore, the government will bring up for sale minority shares in Ethiopian Airlines, Ethio-telecom, Ethiopian electric power, and the Ethiopian Shipping and logistics services enterprise. Besides, the government will pursue partial or complete selling of railway projects, hotels, sugar, and other manufacturing industries, which are now exclusively restricted to the government (VOA, 2019)

In general, the achievement in the new liberalization process is good so far in the telecom sector, which has already sold some of its shares to the so-called Safaricom Ethiopia consortium of foreign telecom companies and started its service in Ethiopia. However, the other remaining sectors are under the planning of the bidding process.

1.5. Reviews of Industrial Policies Development in Ethiopia

As discussed in detail in the industrial development section, the institutional structure within which the industrial sector existed before 1974 was a free enterprise system with an open policy, which indicated the firms and their activities were not subject to the minimum requirement. Besides, the governments attract potential investors from inside and outside the country to commit resources to industrial development. As a result, several specific tasks were assigned principally to industrial policies, and plans were published in proclamations and orders to implement them. The overarching goal of such economic strategies and plans was to increase the size of the industrial sector to integrate it into the global capitalist economy system (Befekadu, 1986).

The former EPRDF government emphasizes the importance of supporting the development of the private sector as a driver of economic growth and productivity improvement in the country's economy. Accordingly, it is committed to improving industrialization and other high-value activities. The regime describes itself as a developmental and revolutionary-democratic government. It can be defined as "*developmental*" - throughout the context; the urge to lay the groundwork for long-term economic development strongly drives its mindset and practices (Altenburg, T., 2010; Oqubay, 2015).

Although government engagement in industrial policies has been beneficial in several nations, industrial policy has failed many other countries. For instance, Ethiopia may fall into the first category for its industrial policy that has not improved its performance over the three regimes under discussion. Despite the differences in economic systems, policies, and strategies used by the Imperial, the Dergue, and the EPRDF governments, the industrial sector's contributions to GDP and job creation remain unsatisfying; it is concluded that all the three have been of equal magnitude (Mitiku & Raju .S, 2015a).

As discussed before, the Imperial regime followed an economic policy-based market from 1930 to 1974 in Ethiopian history. During these systems, the effort was made to change the country by expanding modern healthcare facilities and schools by enacting a constitution as a sign of stability to attract investment, build infrastructure, and begin FYP, called medium-term plans. Besides, the economic development plan and the industrial sub-section were both pro-private and encouraging. As a result, GDP growth reached 4 percent in the final stage (1960-1974), and the average per capita growth was approximately 1.5 percent (Geda, 2005).

The ideology and national policy of the successor Dergue regime (1974-1991) has selected a socialist economic system in which market forces have been deliberately repressed, and socialization of the production and distribution processes has been forcefully pursued. Which has resulted in the full and utter destruction of the private sector. As a result, growth decelerated to 2.3% - 0.4% per capita. Despite the regime's dependence on the agricultural sector, the sector is prone to nature's vagaries; growth was also highly abnormal. Besides, the regime is marked by intensive conflict, highlighting the dismal growth performance (Geda et al., 2004).

The EPRDF, with the market-oriented guiding policy, embraced typical market liberalization SAP with the help of the Bretton Woods institutions. However, these changes defied Dergue regulatory syndrome (Mitiku & Raju .S, 2015b). Over the past few years, industrial policy development in Ethiopia has made substantial progress. In particular, the structural changes in the Civil Service Transformation Program are changing the industrial policy structure in the right direction. Moreover, industrial policies in Ethiopia have not yet been consistently and independently assessed, and there are no comprehensive assessments of critical institutions and programs available. Despite specific reporting requirements, reports include information on operations rather than effects and are usually compiled by the implementing agencies rather than third parties (Altenburg, T., 2010).

Generally, as discussed before, Ethiopia's policy regimes have seen repetitive growth over the last four decades. Therefore, it can be said that the growth environment evolved from moderately market-oriented to tightly controlled before becoming liberalized in the third period. This gradual policy was related to the growth cycle, which was good in the first and third phases and very weak in the second phase was in the Dergue regime. Moreover, with the implementation of the FDRE's national industrial policy in 2003, the industry in general and the manufacturing sector, particularly, received due attention to national importance, as discussed in detail. The policy was formulated in the sense of the global environment and free-market economy philosophy under the preceding principles: recognize private capitalists as a transformer of an industrial development plan, following the path of Agriculture-led Industrialization, following the export-led Industrialization, and focus on labor intensive industries and using coordinated foreign and domestic investment, strong state control and mobilizing the whole society for industrial development (NPC, 2016). Finally, according to Gebreeyesus (2013), the critical elements of the abovementioned three regimes' industrial policies and their main experiences are briefly examined and summarized in Appendix Table A9.

1.6. The Review of the March 2018 Ethiopian Government Reformation

In this thesis, a government reform conducted following the EPRDF rule by the so-called present Ethiopian Prosperity Party (EPP) as the EPRDF's successor is referred to as the March 2018 reform. Besides, the current regime is characterized by a recently implemented home-grown development Plan called Ethiopia 2030: The pathway to prosperity from 2020 to 2030, which is the immediate successor of the previous two GTP (I and II), with the primary strategic pill of assuring quality growth, boosting productivity, and competitiveness of the sectors. According to the MOFED and NBE's various years of official statistics, Ethiopia has had significant and continuous growth over the last few years. The aggregate demand side of the economy is primarily responsible for this growth. These are mainly due to the government's enormous expense of infrastructure development over the previous few years, contributing to the current situation. However, this government spending is somewhat offset by several loans and grants. Inflation has been documented for years due to how government expenditure has been administered and the growth rate. Furthermore, development has not resulted in the creation of long-term and stable employment opportunities. Therefore, alternative sources of growth and government expenditure and loans have been influential in recent years (FDRE, 2019).

The current government is conducting various reform initiatives to sustain economic development, create a stable macroeconomic environment, generate long-term and secure employment, and establish strong implementing institutions, among other things. Furthermore, the anticipation of its side benefit leads to increased international and national acceptability, solid relationships, and a more competitive economy on the world stage. In particular, the preparation of the Prime Minister's "*medemer*" or "*synergy philosophy,"* the ten-year development plan 2020-2030, home-grown economic reform programs, and the expected new industrial policy, as well as other ongoing political and institutional reform measures, are among the main different reform activities undertaken by Ethiopian Government Reformation from March 2018 onward (MPD, 2021).

Ethiopia's ten-year perspective development plan (2021–2020) is titled "Ethiopia 2030: The Pathway to Prosperity," while the country's Vision 2030 is titled "Ethiopia: An African Beacon of Prosperity." The primary strategic pillars of the development plan (2021–2030) are to assure quality growth, boost productivity and competitiveness, undertake institutional reform, guarantee the private sector's economic leadership, promote equal involvement of women and children, and develop a climate-resilient green economy. Moreover, economic growth should ensure that all people are involved and that the benefits of growth are distributed fairly, resulting in a greater quality of life for all citizens—reduced poverty all over the indicators and inflation and unemployment. In addition, increased aggregate supply should result from economic expansion. Modern agriculture, industry, and mining are the focal points. The emphasis is on structural transformation to utilize the development sources (MPD, 2021).

Similarly, the development plan's second strategic pillar and the primary focus area are boosting output and productivity, which involves growing export earnings and replacing imports by lowering manufacturing costs. In addition, having access to high-quality infrastructure (which consists of connecting infrastructural development to development corridors), creating high-quality human resources, and others. Also, the following areas are discussed as primary focus areas; firstly, prioritizing new manufacturing systems and producing sufficient and high-quality human resources; Secondly, the linkage of Incentives to export income and job creation performance; Thirdly, modernizing and improving the logistics system, and developing the technical skills required for long-term expansion (FDRE, 2019; Wazza, 2022).

Generally, Economic reform is represented in market policy changes aimed at increasing market-based supply, with the primary goal and emphasis being to improve the productivity and competitiveness of the private sector to convert it into a privately-owned economy, as described above. In addition, it will help to decrease unemployment. These enhancements involve macroeconomics but are differentiated by sub-economy and structural adjustment.

1.7. Industrial Policies and Institutions Enacted to Promote Industry in Ethiopia

Ethiopia's industrial policy-making process is characterized by greater flexibility and potential for policy learning than other neighboring African countries (Oqubay, 2015). As discussed in the previous section of the thesis, the government developed and implemented different developmental and industrial policies and strategies during the last government regimes in different periods in the country. Besides, the comprehensive plans and policies emphasized the priority of industrial and manufacturing sectors, particularly with a package of available incentives for industries under discussion. Additionally, the government has broadened the range of policy instruments available to boost the designated industry over time. The government has also increased the number of policy tools available to assist the selected sector over time, which is an encouraging development (Gebreeyesus, 2016b; Oqubay, 2015).

Generally, the performance has been varied, and manufacturing exports have not been satisfying. Recent studies show that inadequate trade logistics and a lack of quality inputs in the local market are limiting Ethiopia's textile and leather sectors' worldwide competitiveness. Thus, the government has made several initiatives to resolve these issues: It modernized the public service, especially the customs administration, and invested in infrastructure to lower operating costs. However, inadequate trade logistics and low-quality materials hamper export industries (Ahmad, 2016; Oqubay, 2018a).

Furthermore, the benchmarking, institutional twinning, and kaizen were all additional assistance initiative programs implemented by the government to assist Ethiopia's industrial sector in improving their products and services' quality, productivity, and international competitiveness. Therefore, this section looks at Ethiopia's three policies for boosting the industrial sector productivity in Ethiopia. Among the implemented assistance program to boost the industrial sector productivity, the first was the so-called *"Benchmarking*[3]*."* As a result of UNIDO funding, the government initiated a benchmarking initiative in 2005, with the leather industry as its primary objective. Accordingly, several internationally-known enterprises and experts provided direct assistance to selected garment and leather firms. Besides, the program had a minimal influence on the performance of the factories involved in its implementation. The program's goal was to improve technology and increase the capacity of priority industries

[3] Benchmarking is the systematic comparison of current reality with target countries and/or companies, and the setting of clear numerical improvement goals.

to increase their worldwide competitiveness. However, benchmarking did not resolve specific problems or attain pre-established objectives (Hailu et al., 2020; Ahmad,2016).

The second assistance program implemented to boost industrial sector productivity was the so-called "Twinning" program. It mainly aims to partner with a domestic institution and a similar foreign institution to increase domestic capacity via training, visits, and institution-building and experience exchange. Besides, the twinning program benefited several Ethiopian organizations, most notably the LIDI, which received financing from India's central Leather Research Institute from 2011 to 2014. The twinning agreement increased the LIDI's institutional capability in different business areas and related subjects: for instance, specifically in research, product development, and industrial consultancy are among the primary areas of institutional capacity development. As a result, LIDI's beneficiaries saw increased production and LIDI's drive to engage in new product development. Inspired by the LIDI initiative, the TIDI and the MIDI partnered together in 2014. However, difficulties with complementarity have been discovered in the scheme's implementation (Ahmad, 2016; Hailu et al., 2020).

Among the implemented programs, the third assistance program to boost industrial sector productivity was the so-called "*Kaizen"* program. It is a cross-sector initiative program launched in Ethiopia in 2009 in cooperation with Japan as a two-year trial project with thirty chosen enterprises in Addis Ababa and its surroundings. Accordingly, it is a Japanese management concept that emphasizes the need for gradual and ongoing development. Encouraged by the results obtained in the chosen enterprises regarding higher productivity and better quality, the government intends to expand the program's implementation to more businesses. Ethiopian Kaizen Institute (EKI), created in October 2011 by legislation, has developed into a strong implementation agency with an expanding area of operation. Ethiopian Kaizen Consultants are now capable of teaching fundamental kaizen without the assistance of the Japanese. In addition, EKI assists national, regional, city-wide, and institutional kaizen movements. It has resulted in great qualitative and quantitative successes wherever properly adopted (Hailu et al., 2020; Oqubay, 2015; UNDP, 2017).

However, the kaizen has experienced several obstacles - among the primary obstacles are the enterprises' unwillingness to implement kaizen, employees' reluctance to engage, frequent turnover of managers and kaizen leaders, and a lack of understanding of the concept limits associated with rapid learning and inadequate information management. Moreover, kaizen is still considered an instrument for forced efficiency rather than a spiritual awakening in Ethiopia. As a result, Kaizen has not yet established itself as a real national productivity movement in Ethiopia (Ahmad, 2016; Hailu et al., 2020).

CHAPTER TWO

2. OVERVIEW OF ETHIOPIAN ECONOMY AND THE CONTRIBUTION OF MANUFACTURING SECTORS

Before delving into this thesis's micro-level analysis of productivity at a firm level, it is vital to look at the main national economic indicators since economic activity at all levels is inseparably linked in the world countries. For instance, the micro, middle or meso, and macro-level activities are connected to the economic growth of any country globally. Moreover, enterprises' profitability, growth, innovation, efficiency, and productivity impact the performance of the industries or manufacturing they belong to at the micro-level. Besides, the individual firms would optimize their potential capabilities for increased performance at the micro and middle levels if appropriate resources were allocated across industries or sectors (i.e., at the middle level). In turn, increased sectoral productivity leads to an increase in a country's aggregate productivity and, as a result, to the rise in national income and other related government income accounts in general (Ahmad, 2016). Thus, there is a high degree of connectivity across various sectors and levels of economic activity, contributing to the country's overall economic growth.

Furthermore, the more robust macroeconomic performance creates advantageous operating conditions for individual firms and stimulates the market on both the demand and supply sides. Therefore, it is vital to analyze these relationships while providing a comprehensive picture of the important national economic indicators and growth processes. This chapter is devoted to this attempt; however, it is limited to macroeconomic and meso-economic parts deemed necessary for justifying and helping better comprehend the microeconomic analysis at the center of this thesis rather than the entire dissertation. In particular, it rationalizes and supports understanding the empirical analysis section of the thesis, which uses micro panel data at the firm level.

Moreover, this thesis chapter is concerned with national and sectoral features based on accessible primary surveys and secondary data from domestic and foreign sources. For instance, this chapter uses domestic sources such as NBE, CSA, and MPD and foreign sources such as World Bank, WDI, and other related sources for descriptive national and sector analysis. Additionally, as the specific objectives, this chapter is primarily intended to assist readers in gaining a basic understanding of the current state of the Ethiopian economy in general and sectoral features in particular. Besides, it supports the previous chapter's theoretical background section and the empirical microeconomic analysis at the center of this thesis. Specifically, the performance and contribution of industries and manufacturing sectors and previous development plans and policies were examined to justify this study.

2.1. Overview: Ethiopian Macroeconomic Performance

This section of the thesis discusses aggregate indicators, for instance, various national account metrics such as gross domestic product (GDP), gross national income (GNI), and per capita GDP; employment; economic stability; development funding; human development; status in international trade; and structural changes, among others.

Ethiopia is a landlocked nation in East Africa and the second-most populated country in Africa after Nigeria, with an estimated 115 million residents in 2020. It is a member and the African Union headquarters seat in the capital Addis Ababa, Ethiopia. Besides, Ethiopia has the fastest expanding economy in the continent and region, with the real GDP increasing by 6.1% in 2019/20. Furthermore, Ethiopia aspires to become - *a lower-middle-income country globally in 2025*. However, with a per capita gross national income of $890, it is among one of the world's poorest African countries (World Bank, 2020b).

Nevertheless, Ethiopia has been one of the world's fastest-growing economies (at an average of 10% per year) in the past decade and a half. Moreover, the country's capital accumulation, mainly through public infrastructure projects, was the driving force behind development in the past and current periods (World Bank, 2021). The above statistics demonstrate that the nation has a promising future for new company establishments, the products market, and low-wage labor for businesses, all of which are crucial for industrial development and economic progress.

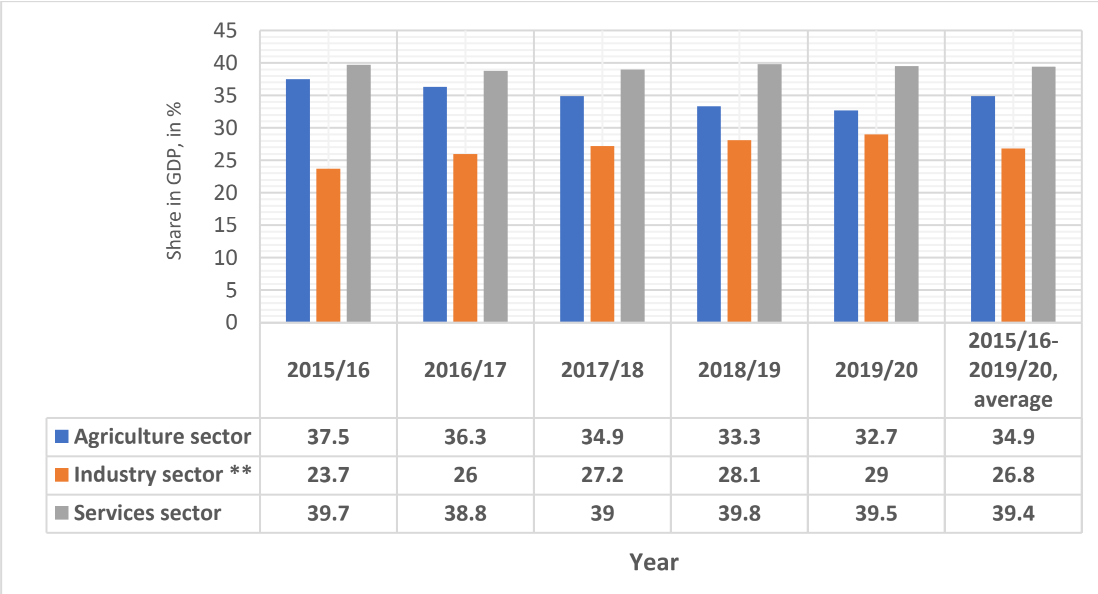
The World Bank (2021) reported that Ethiopia's real gross domestic product (GDP) Growth slowed in 2019/20 and even more so in 2020/21 due to the COVID-19 pandemic, with growth in industry and services dropping into the single digits. In contrast, since agriculture is the primary income source for more than 70% of the Ethiopian population, the country was not seriously affected by the COVID-19 outbreak. Therefore, compared to the previous year, its contribution to growth somewhat increased in 2019/20.

The sectoral contribution of Ethiopia's exceptional economic growth during the previous decade and a half indicates the country's structural change. In recent years, the service sector has surpassed the agriculture sector as the most significant contributor to GDP, with a close 39.5 percent in 2019/20, compared to 32.7 percent by the agriculture sector in the same fiscal year (NBE, 2020). Ethiopia's agriculture sector is an essential component of the country's economy. It accounts for over 33% of the country's gross domestic product (GDP), employs over 70% of the population in the country, earns approximately 80% of the total export revenues, and supplies around 70% of its raw materials to secondary sectors in the country. Because of this, agriculture has been highlighted as the primary engine of economic growth in Ethiopia's first GTP I (2010/11-2015) and the second GTP II (2016-2020) and the current successor development plan (2021-2030).

Specifically, a shift to a greater degree of agricultural expansion coupled with agro-processing industries and productivity is anticipated to ensure the productivity required to satisfy the country's food security demands and related manufacturing sector's productivity in the current development plan. Furthermore, as previously noted in the industrial policy and strategies section, the manufacturing sector received particular focus throughout Ethiopia's two development plans, GTP I and GTP II (2010/11–2019/20). In addition, the industries and sub-sectors indicated above have been designated as the primary government emphasis and priority areas in Ethiopia's new ten-year development plan, which will be implemented in 2021–2030.

The industrial sector has registered the highest shares of about 29 percent of GDP in the same period, 2019/20, which increased compared to the GTP II first implementation year, 2015/16, which is 23.7 percent of GDP; even though it has registered significant growth since 2013 after a stagnant share in the decade before 2013. Moreover, in the same year, 2019/20, the manufacturing sector accounted for around 6.8 percent of GDP, which is lower than the 8 percent goal in the GTP-II implementation end period in 2019/20, while certain industrial parks started to be populated and functional in recent years. However, the manufacturing industry's contribution to GDP (industrial sector excluding construction, mining and quarrying, and electricity and water) remained less than 5 percent until 2012/13 and also less than 7 percent until 2019/20, which is extremely low even by the African average of 10 percent.

The corresponding sectoral shares of agriculture and service were 32.7 percent and 39.5 percent, respectively. Compared to the previous year, 2017/18, there is a minor shift in both sectors, with agriculture accounting for 34.9 percent of GDP and service accounting for 39.2 percent (see figure 2.1 below). As a result, the service and sub-construction industries have experienced the most rapid expansion in recent decades. However, a structural change occurs at a much slower rate regarding employment. That is one of the reasons why the agricultural sector employs most people, with few job opportunities available outside the sector.



	2015/16	2016/17	2017/18	2018/19	2019/20	2015/16-2019/20, average
Agriculture sector	37.5	36.3	34.9	33.3	32.7	34.9
Industry sector **	23.7	26	27.2	28.1	29	26.8
Services sector	39.7	38.8	39	39.8	39.5	39.4

[4]

Figure 2.1. The major sector's share of GDP in percent in Ethiopia

Source: PDC, NBE, 2020

Similarly, Ethiopia has encouraged labor-intensive businesses to provide good employment, improve linkages with the agricultural sector, and increase export competitiveness since its industrial development strategy was developed in 2002 (FDRE, 2002). In contrast, the Growth and Transformation Plan (GTP)–I (2010/11–2014/15) and the recent Growth and Transformation Plan (GTP)–II (2015/16–2019/20) incorporated an active industrial policy aimed at transforming the structure of the economy, particularly from agriculture to industry and higher value services sector. As recalled, the Ethiopian government policy background in general and the industrial; sector were discussed briefly in background chapter one under the industrial development and policies review section, starting from the imperial regime up to the current EPRDF regime.

[4]** *The industry sector includes the mining and quarrying, manufacturing, electricity and water and the construction sectors. For instance, in 2019/2020, the industrial sector accounted for 29 percent of the total GDP, with the construction industry accounting for 72.2 percent of industrial output and playing a major role in the development of roads, trains, dams, and residential housing. In addition, the manufacturing subsector contributes 23.9 percent to the total industrial output. In 2019/20, the electricity and water and Mining and quarrying industry subsectors recorded the remaining values of industrial output contribution (NBE, 2020).*

2.1.1. Economic Growth

The Ethiopian government is focused on two primary goals of increasing GDP development and reducing poverty long ago. The government has committed to attaining the ambitious goal of transforming the country into a middle-income country by 2025. According to the most recent World Development Indicator statistics (2021), Ethiopians are classified as low-income, with a gross national income (GNI) of USD 102.6 (276.9 in PPP) and a GNI per capita of USD 890 (2410 USD in PPP) in 2020, respectively (see Figure 2.2 and 2.3 below). In contrast to the previous year, the GNI in 2019 was 94.9 billion USD (257.9 in PPP), and the GNI per capita was 850 USD (2300 USD in PPP), which were higher than in 2018. As a result, GDP and GDP per capita had increased significantly compared to the GTP II implementation phase in 2016, when GDP was 68.9 billion USD (194 USD in PPP) and GDP per capita was 670 USD (1870 USD in PPP).

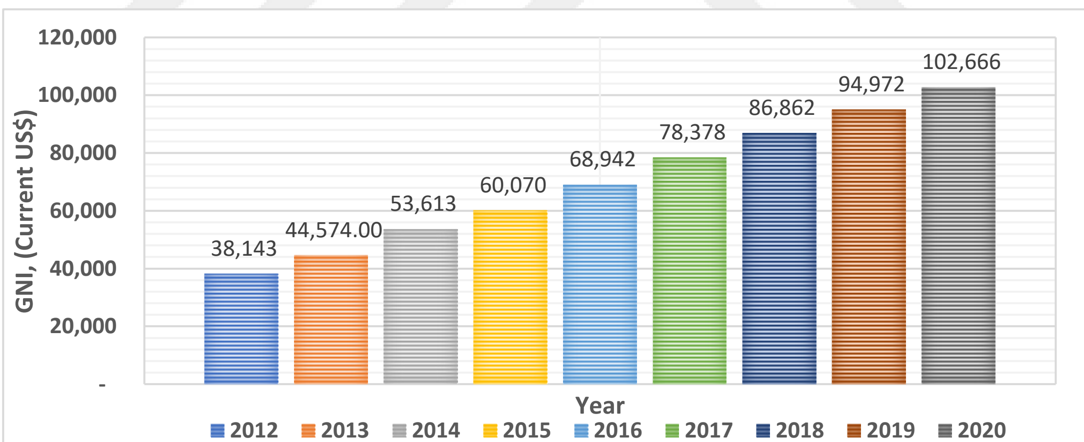


Figure 2.2. GNI (current US$) by years

Source: Authors calculation based on WDI data, (2021).

Figure 2.3. GNI per capita (current US$) by years

Source: Authors calculation based on WDI data, (2021)

Figure 2.4 below shows a considerable decline in the GNI per capita growth in recent years compared with the previous period. The largest GNI per capita growth was registered relatively in 2013 and 2016, it was 7.50 and 7.25 percent, respectively, and the lowest growth rate was 3.39 percent. In recent years, the GNI per capita growth was 4.18 and 3.39 percent in 2019 and 2020, respectively.

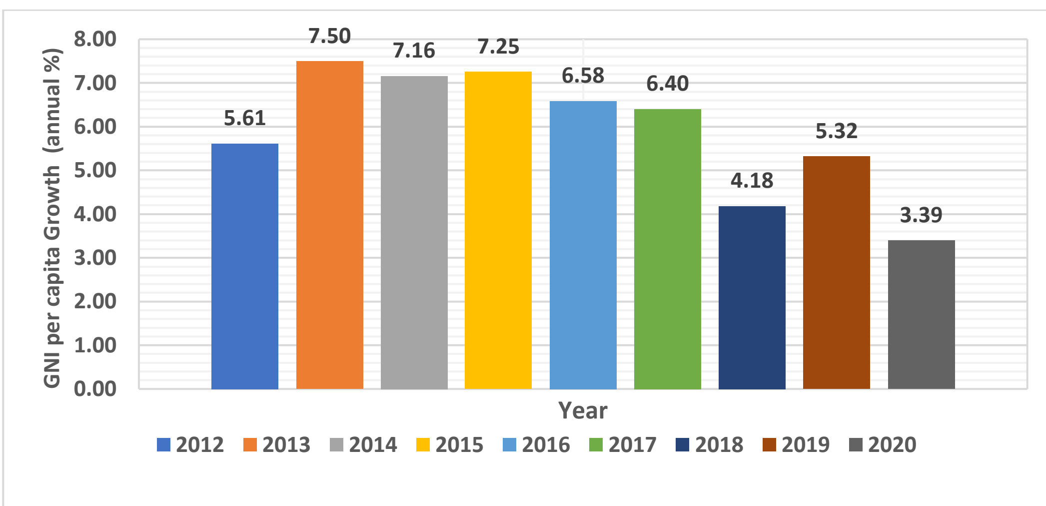


Figure 2.4. GNI per capita, growth in percent (annual) by years

Source: Authors calculation based on WDI data, (2021)

The trends in GDP per capita and gross national income (GNI) per capita throughout the 2012–2020 period, on the other hand, show a constant increase in both across the period (see Figure 2.5 only for GDP per capita current USD and figure 2.6 for GDP and GNI per capita current USD below). For instance, in 2012, the GDP per capita and the GNI per capita were around 467.1 and 410, respectively, in current US dollars. By the end of 2020, these statistics were increased to 936.3 and 890 US dollars, respectively.

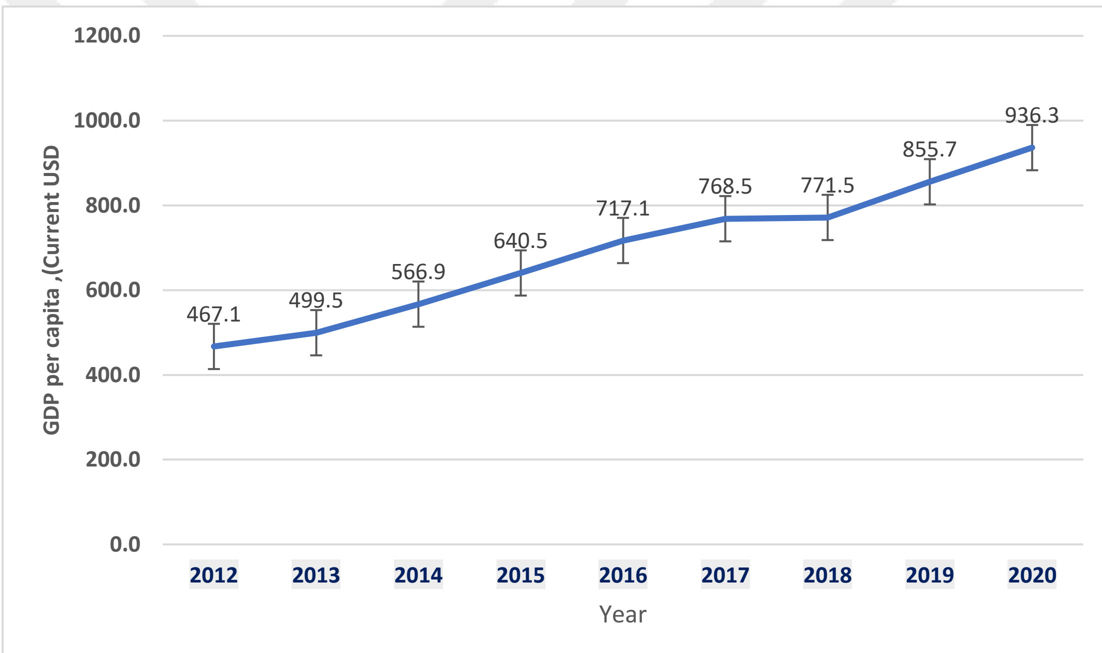


Figure 2.5 GDP per capital (current US$) by year

Source: Authors calculation based on WDI data, (2021)

Furthermore, there was considerable growth in GDP per capita and GNI per capita during the GTP I and II implementation end periods. For instance, the GTP I implementation ended in 2015; the GDP per capita and GNI per capita were 640.5 USD and 600 USD, respectively. Besides, the GDP per capita and GNI per capita were 936.3 USD and 890 USD in the GTP II implementation end period in 2020, respectively. This is seen in the figure below (Figure 2.6).

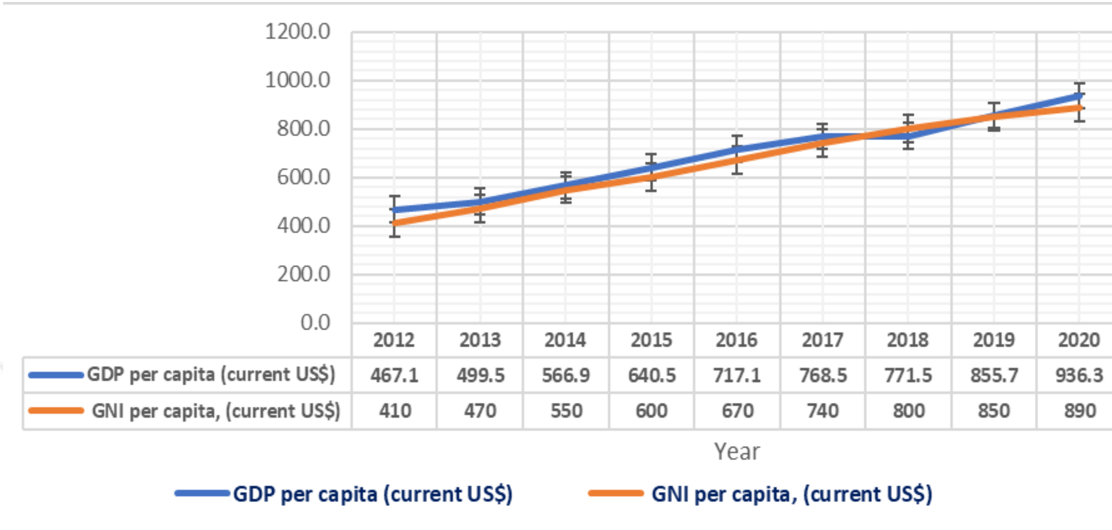
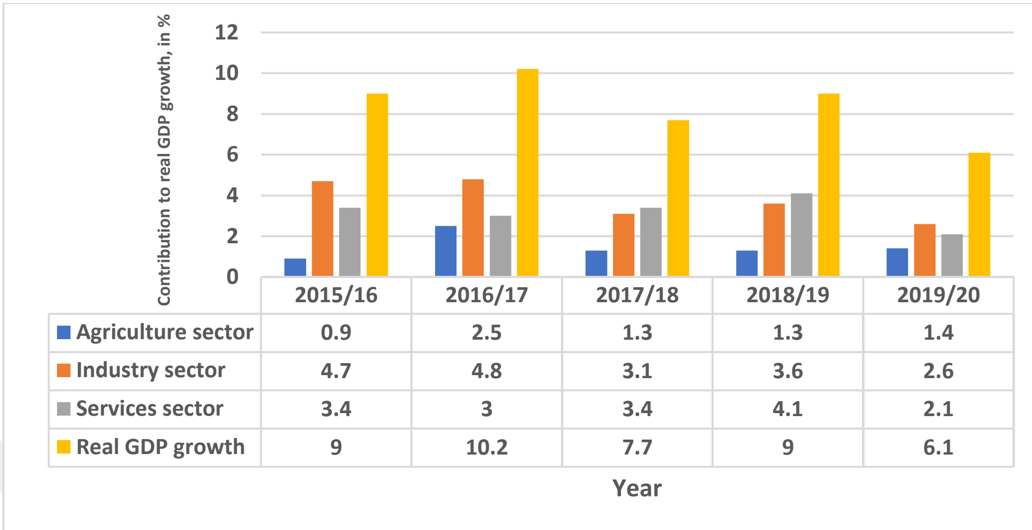


Figure 2.6 GDP and GNI per capita by (Current US$)

Source: Authors calculation based on WDI data, (2021)

According to the world economic Outlook (2019) report, Ethiopian economic growth was robust and showed considerable rise even as the world suffered severe macroeconomic and social conditions due to the COVID-19 pandemic. As a result, as of the 2019/20 fiscal year, real GDP increased by 6.1 percent, above the average growth of 3.5 percent predicted for Sub-Saharan Africa during this period (WEO, 2019). However, the real GDP growth rate is lower than the real GDP growth rates of the two previous years, which were 7.7 and 9 percent in 2017/18 and 2018/19, respectively. As a result, the industry's proportion of GDP rose to 29% in 2019/20 from 28% in 2018/19, while the service sector's share decreased slightly to 39.5% from 39.8 %. In comparison, agriculture's contribution to GDP decreased to 32.7 % from about 33.3% over the same time (NBE, 2020). Also, see figure 2.7 below for sectoral contribution to real GDP growth,2015/16-2019/20.



	2015/16	2016/17	2017/18	2018/19	2019/20
Agriculture sector	0.9	2.5	1.3	1.3	1.4
Industry sector	4.7	4.8	3.1	3.6	2.6
Services sector	3.4	3	3.4	4.1	2.1
Real GDP growth	9	10.2	7.7	9	6.1

Figure 2.7. Sectoral contribution to real GDP growth by major sectors

Source: ***Authors calculation based on MPD data, (2020)***

Figure 2.8 below shows the share of GDP sectoral average from 2015/16-2019/20 was the service sector, agriculture sector, and industry sector were 39.4 %, 35%, and 26%, respectively.

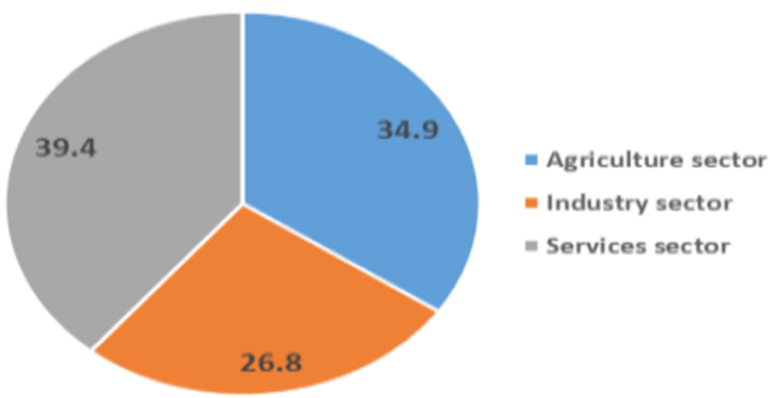


Figure 2. 8. Sectoral share GDP by major sectors from 2015/16-2019/20 average in Percent

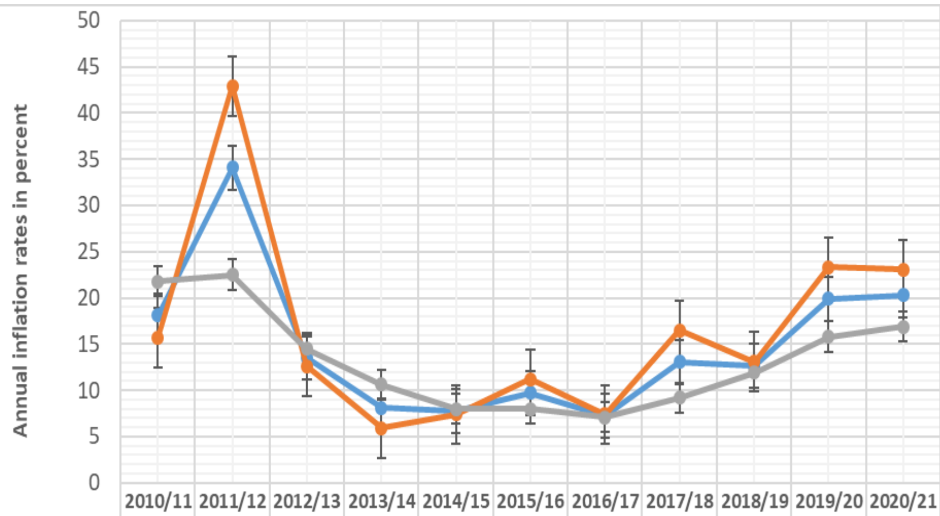
Source: ***Authors calculation based on MPD data, (2020)***

According to the NBE (2020) report, the slow but continuous transition in the economy's structure reflects the government's strategic goal of strengthening manufacturing and supporting export-led growth while modernizing the agriculture sector, which has long been the country's economic backbone. As a result, the Ethiopian economy generally grew at an average annual rate of 8.2 percent over the GTP II period (2015/16-2019/20), which was 2.8 percentage points below the plan period's average growth target (NBE, 2020). As a result, Ethiopia's economy is expected to expand by 8.4 percent in 2020/21, compared to the global economy's 5.4 percent and Sub-Saharan Africa's 3.4 percent growth forecasts, respectively (WEO, 2019).

2.1.2. Inflation (Price development)

As one of its primaries, the Ethiopian GTP aims to maintain macroeconomic stability. Ethiopia's government is also committed to keeping inflation at or below a single-digit level in the previous GTP implementation periods. Despite substantial supply shocks caused by drought in 2015/16, macroeconomic policy measures aimed at controlling the pace of increased money supply helped keep inflation in the single digits until 2015/16. Although there have been instances of significant inflation rates throughout the previous decade, this has not been the standard. Besides, when Ethiopia experienced remarkable double-digit economic growth, inflation reached record levels (NBE, 2020).

Moreover, the annual average headline inflation rate increased to 20.3 percent in 2020/21 from 19.9 percent in the previous year. This was primarily due to an increase in food and non-alcoholic beverage inflation from 13.1 percent to 23.3 percent and a 3.9 percent increase in non-food inflation from 11.9 percent to 15.8 percent, respectively (see figure 2.9 below). Similarly, the headline inflation increased to 19.9 percent annually in 2019/20, up from 12.6 percent in the previous year. Again, this was due to a 10.2% increase in food and non-alcoholic beverage inflation from 13.1 to 23.3 percent and a 3.9 percent increase in non-food inflation from 11.9 to 15.8 percent (NBE, 2020).



	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
General	18.1	34.1	13.5	8.1	7.7	9.7	7.2	13.1	12.6	19.9	20.3
Food & Non-alcoholic beverages	15.7	42.9	12.6	5.9	7.4	11.2	7.4	16.5	13.1	23.3	23.1
Non-Food	21.8	22.5	14.5	10.6	8	8	7.1	9.2	11.9	15.8	16.9

Figure 2.9. Trends in Annual inflation rates in percent (2011/12-2020/21)

Source: (NBE, 2020).

2.1.3. International Trade (Merchandise export and import)

Trade has been well noted to impact an economy's success of a country significantly in the world. Similarly, since the advent of globalization, all nations worldwide have been interconnected in international trade and investment. Accordingly, the importation of capital goods by less-developed nations, such as Ethiopia, is critical to transforming their conventional economic sectors into more competitive and facilitating the country's industrialization process. However, they provide only a tiny contribution to the international trade sector. Moreover, due to their reliance on exporting primary commodities, they are at risk of being negatively affected by changes in commodity prices and unfair trade agreements (Ahmad, 2016; IMF, 2018). As mentioned in table 2.1 below, Ethiopia's principal export goods are coffee, oilseeds, leather and leather products, pulses, flowers, khat, gold, and electricity (see table 2.1). As shown in Table 2.1 below, there are variations in the contribution of export commodities over time in Ethiopia.

Table 2.1. Values of Major Export Items (In millions of USD)

Particulars	2017/18		2018/19		2019/20	
	Values	%Share	Values	%Share	Values	% Share
Coffee	839.0	29.6	764.1	28.7	855.9	28.6
Oilseeds	423.5	14.9	387.8	14.5	345.0	11.5
Leather and Leather Products	132.4	4.7	117.4	4.4	72.0	2.4
Pulses	269.5	9.5	272.3	10.2	234.8	7.9
Meat & Meat Products	101.7	3.6	88.6	3.3	67.4	2.3
Fruits & Vegetables	61.4	2.2	60.9	2.3	58.8	2.0
Textile & Textile Products	103.8	3.7	152.9	5.7	168.9	5.7
Live Animals	61.1	2.2	45.8	1.7	54.1	1.8
Chat	263.2	9.3	303.6	11.4	324.4	10.9
Gold	100.2	3.5	27.9	1.0	196.5	6.6
Flower	228.6	8.1	256.6	9.6	422.3	14.1
Electricity	80.5	2.8	55.7	2.1	66.4	2.2
Others	171.2	6.0	132.9	5.0	121.1	4.1
Total Export	**2,836.1**	**100.0**	**2,666.5**	**100.0**	**2,987.7**	**100.0**

Source: **(NBE, 2020)**

According to the NBE (2020) report, the contribution of the total merchandise export earnings increased by 12.0 percent yearly due to higher export earnings from coffee (12.0 percent). Besides, the contribution of flowers (64.6 percent), gold (604.5 percent), live animals (18.1 percent), chat (6.9 percent), textile & textile products (10.5 percent), and electricity (which contributed 19.3 percent), respectively. For instance, despite a 4.6 percent decline in the worldwide price of coffee, the export earnings from coffee increased by 12.0 percent, owing to a 17.4 percent increase in the volume of coffee exported. Therefore, compared to the previous year, coffee represented 28.6 percent of total merchandise exports, a tiny decrease from the last year's figure of 28.7 percent. Likewise, export earnings from flowers climbed by 64.6 percent as both export volume and international prices increased by 63.2 percent and 0.9 percent, respectively.

Consequently, the proportion of flower export sales rose to 14.1 percent in 2019/20, compared to 9.6 percent in the previous year, 2018/19. Additionally, despite a 2.2 percent fall in price, revenue from the sale of live animals increased by 18.1 percent as the number of live animals exported increased by 20.7 percent. These resulted in a minor rise in the proportion of live animals in overall merchandise export revenues, which climbed to 1.8% from 1.78% one year earlier (see figures 2.11 and 2.12 for foreign exchange earnings from selected export items and the export share of selected export item).

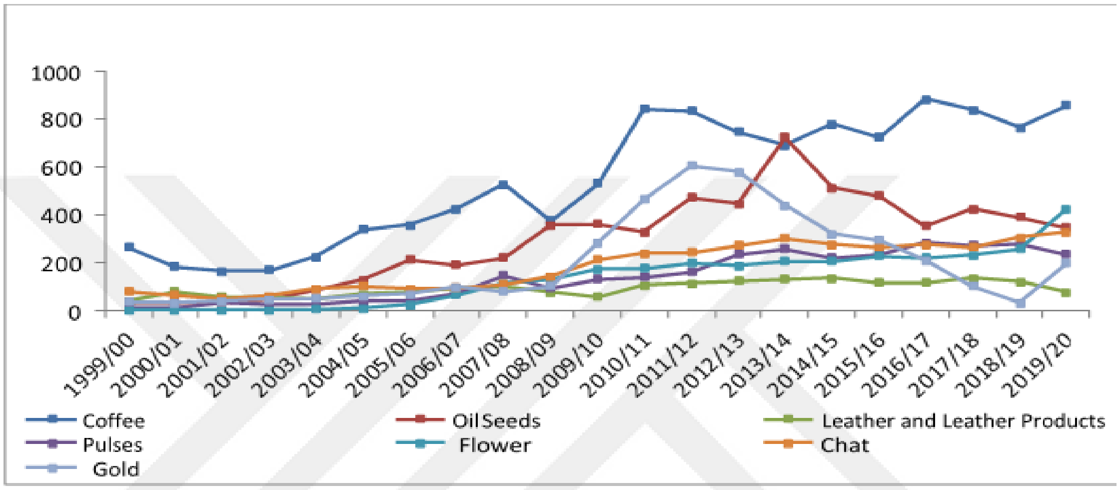


Figure 2.10. Foreign exchange earnings from selected export items

Source NBE, (2020).

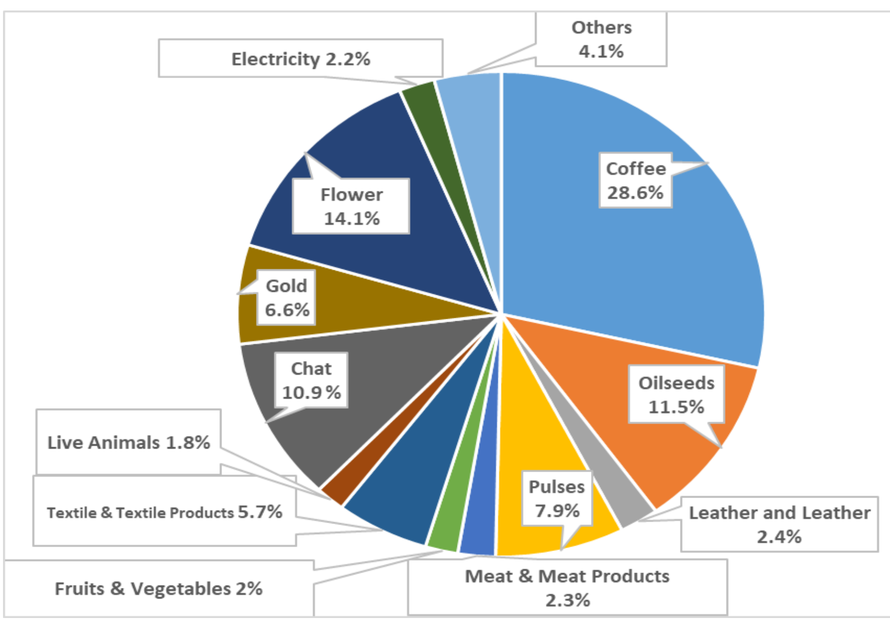


Figure 2.11. The export share of selected export items

Source: Authors calculation based on NBE data, (2020)

According to the GTP, Ethiopia aimed to transform the export sector responsible for the country's main foreign exchange earnings. Consistent with what is stated in the development plan, to make this goal a reality, it was intended to increase the inflow of foreign currency from international trade activities, mainly the export of merchandise, from 2.2 billion USD in 2009/10 to 6.5 billion USD in 2014/15 in GTP-I planning period. However, the actual result fell short of the goal, and the average accomplishment in terms of export revenues from goods exports was about USD 3 billion each year during the plan period. At the same time, the GTP- II was planned to change the export sector to keep the fast-economic development going and lay the groundwork for a structural transformation in the economy. Because of this, the transformation of the merchandise export sector has been placed at the core of the GTP- II development plan document (NPC, 2016). However, the total export of goods (merchandises) and services was USD 7.7 billion in 2019/20, of which the export of goods values was USD 2.99 billion in 2019/20 (NBE, 2020).

Moreover, according to the NBE (2020) annual report, Asia, Europe, and Africa were the most popular destinations for Ethiopian product export. Ethiopia's total exports were dominated by Asia, which accounted for 36.4 percent of overall exports; Europe contributed 33.6 percent of total export earnings, with the Netherlands accounting for 30.8 percent. Similarly, Africa accounted for around 18.9 percent of Ethiopia's total export revenue (see Appendix, Table A8. export to and import from Africa for detail). Furthermore, the United States accounted for 10.6 percent of Ethiopia's overall export earnings in 2010 (NBE, 2020).

Similarly, since 2019, the Netherlands has ranked first among export destinations and export partners; previously, in 2018, the United States ranked first among export destinations; earlier, from 2010 to 2017, China ranked first among export destinations and partners. Besides, Germany, the United States, Belgium, and Saudi Arabia took the successor positions respectively during the same years. However, as shown in Table 2.2, Ethiopia's export trade has variations in the share of significant export destination countries over time. (See Table 2.3 below, which shows the direction of trade in terms of export value).

Table 2.2. Export value by direction of Trade in 2011/12-2019/20 (in 000 Birr)

Countries	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
Netherlands	3.722.699	3.029.773	3.733.608	3.590.928	3.705.136	4.177.990	5.001.314	*5.843.402*	*9.670.553*
USA	1.533.048	2.055.430	2.528.811	3.516.787	3.284.623	4.317.231	*6.649.832*	5.358.010	6.784.201
Saudi A.	3.551.459	2.754.806	3.516.771	4.039.152	3.642.647	4.400.225	4.971.483	5.072.646	6.484.675
Germany	5.321.133	4.200.734	3.578.888	4.206.156	3.374.501	3.943.247	4.729.676	3.117.964	5.026.821
UAE	1.327.262	1.434.080	1.505.223	1.968.395	1.663.203	2.694.756	2.890.041	3.660.308	3.936.157
Djibouti	1.459.098	2.237.359	3.657.884	1.594.047	2.205.921	2.283.065	3.312.768	3.572.337	3.702.736
Japan	796.091	1.617.076	1.304.904	1.965.575	1.212.783	2.233.317	2.377.677	3.385.579	3.566.011
China	*5.669.068*	*4.660.202*	*7.588.195*	*7.378.001*	*6.430.788*	*5.111.010*	6.301.807	4.035.157	2.635.421
Sudan	3.012.327	1.675.097	1.550.096	1.649.715	1.333.608	983.314	2.690.710	1.945.939	2.168.104
Kenya	176.617	190.938	383.110	586.440	618.827	1.186.102	1.057.669	566.102	439.609
ROW	27.925.965	32.268.063	32.895.509	29.365.185	32.253.716	32.355.487	32.730.018	37.016.783	49.826.193
Total	54.494.767	56.123.558	62.242.999	59.860.381	59.725.753	63.685.744	72.712.995	73.574.227	94.240.481

Source: ***Authors calculation based on MPD data, (2020)***

On the other hand, according to the same data from NBE for 2019/20, Asia accounted for 60.6 percent of Ethiopia's total imports. As demonstrated in Table 2.3 below, most imports from Asia were from China (42.9 percent), India (12.9 percent), and other countries. Similarly, European countries accounted for 21.8 percent of Ethiopia's imports, with Turkey (20.2 percent) and Ukraine (11.2 percent).) the country's two most important trade partners. Furthermore, America supplied around 9.3% of Ethiopia's imports, with 82.7% coming from the US, 5.9% from Canada, and the remaining 0.3% from other countries. Furthermore, African countries provide about 8.1 percent of Ethiopia's total item imports, with Morocco (37.6%) and Egypt (25.9%), among others, accounting for the majority of contributions. (See Table 2.3. Ethiopian import origin (direction) for further details).

Table 2.3. Import value by direction of trade in 2011/12-2019/20 (in 000Birr)

Countries	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
China	31.790.965	44.773.247	72.643.511	126.572.346	117.251.124	114.932.246	100.864.789	109.790.427	112.353.466
USA	7.831.544	7.082.276	13.436.708	15.043.777	26.691.945	22.894.078	31.244.388	38.161.945	33.114.720
UAE	4.072.607	6.225.994	13.411.898	9.493.860	9.676.620	8.283.685	14.283.918	15.436.919	17.282.833
S. Arabia	26.664.514	20.459.836	21.229.838	16.717.802	7.964.805	10.728.631	9.089.127	6.854.464	14.250.181
UK	1.769.438	1.479.938	2.785.358	4.386.801	4.277.115	3.750.299	5.981.833	9.114.792	9.216.315
Germany	3.130.180	3.635.738	6.647.651	6.916.081	7.849.773	5.711.671	7.256.006	9.018.931	9.208.171
France	2.572.641	3.382.183	2.476.004	3.416.216	4.176.288	4.505.121	4.756.805	4.355.548	8.257.770
Italy	6.782.256	8.869.965	9.435.122	10.188.233	13.340.823	15.518.260	13.370.602	9.585.489	8.191.163
Djibouti	4.194	14.656	6.060	13.765	25,5	54,6	7.506	269.451	1.226.326
Kenya	652.128	571.875	670.751	775.309	704.623,9	775.026,6	883.937	1.139.054	2.682.249
Sudan	1.899.249	175.036	3.372.556	2.782.296	885.021,3	2.697.548,6	2.500.770	2.303.863	2.295.903
ROW	104.417.423	100.200.272	115.721.901	134.487.747	160.195.693	164.474.514	206.875.788	217.363.269	214.110.255
Total import	191.587.139	196.871.016	261.837.358	330.794.233	353.013.856	354.271.135	397.115.468	423.394.151	432.189.352

Source: Authors calculation based on MPD data, (2020)

Besides, According to (NBE, 2020) statistics, since 2011/12, China has ranked first among import origins, and the highest import values of Ethiopia come from there. In 2011/12, it was around 31.791 billion ETB and substantially increased, reaching 112.335 billion ETB in 2020. Since 2017/18, the USA and UAE have the following china as Ethiopia's second and third import origin. However, as shown in Table 2.4 above, Ethiopia's import trade has variations in the share of significant import-origin countries over time. (See Table 2.3 above, which shows the import value by direction of the trade from 2011/12-2019/20). Furthermore, details about the end-users significant value of import items are shown in Appendix A5.

2.1.4. Population and Unemployment

The Ethiopian government created several policies and strategies to prepare the private sector to generate employment and reduce unemployment significantly in the country's previous and current development plans and strategies. Specifically, Ethiopia has encouraged labor-intensive businesses to provide suitable employment, improve linkages with the agricultural sector, and increase export competitiveness since its industrial development strategy was developed in 2002 (FDRE, 2002).

As previously discussed, Ethiopia is the second-most populous country in Africa after Nigeria, with around 115 million inhabitants in 2020; it increased with respect to the previous year's statistics in 2016 and 2018 by 103.6 and 109.2 million, respectively (World Bank, 2021). Besides, more than 80 different ethnic groups in the country, making it the most populous in East Africa. Figure 2.12 below shows the Ethiopian population and labor force from 2016 to 2020, which shows that about 78.3 % of the population resides in rural areas. In previous years, the data shows 80.13 and 79.23 in 2016 and 2018, respectively. Moreover, the labor force statistics reveal 52.8 million people in 2020, which is an increase over the previous years' 48.23 and 49.79 million in 2016 and 2017, respectively.

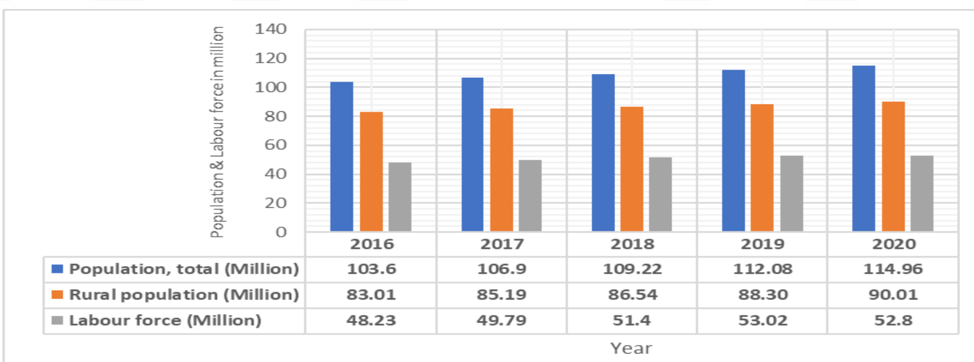


Figure 2.12. Ethiopian population and labor force from 2016 to 2020 in million

Source: Authors calculation based on WDI data, (2021), (modeled ILO estimate)

The age distribution in figure 2.13 below demonstrates that Ethiopia is equipped with a high labor input and a large pool of potential labor market entrants. Ethiopia's working-age population (15–64 years) accounts for about 56.54 % in 2020, as indicated in figure 2.13. On the other hand, in 2016 and 2018, it was 54.8 percent and 55.71 percent of the overall population, respectively.

Similarly, around 39.91 % of Ethiopia's population comprises children aged 0–14 years, slightly less than in 2016 and 2020, when children aged 0–14 years accounted for 42.17 % and 40.78 %, respectively. Similarly, the 2020 statistics show that the older population aged 65 and above accounted for around 3.54 percent of the Ethiopian population. This figure is nearly identical to the figure from 2016 to 2019. (See figure 2.13 below Ethiopian population from 2016 to 2020 by age group).

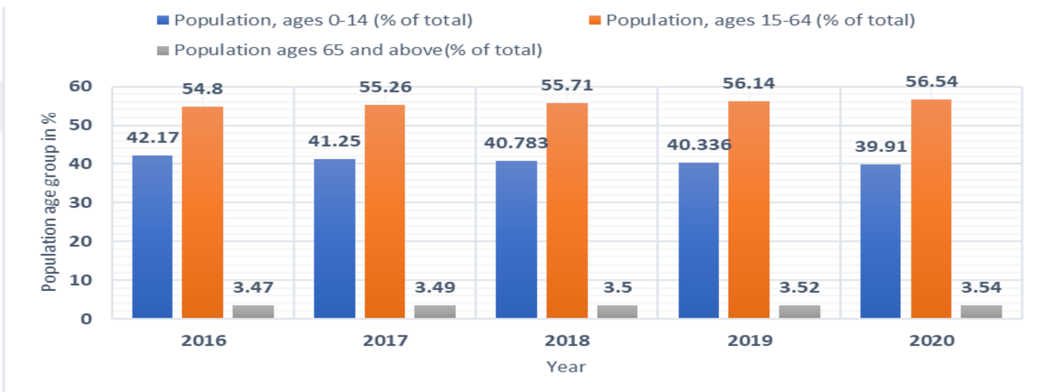


Figure 2. 13. Ethiopian population from 2016 to 2020 by age group

Source: Authors calculation based on WDI data, (2021), (modeled ILO estimate)

Furthermore, a country's economy may be gauged by the conditions in the labor market, which is one of the most critical indicators of the economy. The employment and unemployment rates, as the primary indicators, reflect the economy's ability to generate new jobs. Besides, those indicators are among the main macroeconomic indicator variables and most discussed issues in politics and policymakers try to manage in every country. For instance, Ethiopia's robust investment-led economic growth has improved urban employment circumstances (IMF, 2018).

Figure 2.14 below shows the trends in the unemployment rate in the 2012 to 2020 periods. The world bank development indicator statistic (2021) depicts that the unemployment rate in the year 2020 was 2.79 %. Compared with previous years, it increased by 20.4 % and 2.07% in 2019 and 2018. Between 2012 and 2020, the lowest unemployment rate was 2.04%, which appears in 2019. Also, the unemployed rate during the GTP II implementation time in 2016 was 2.17%, which was lower than the GTP II end period 2020 rate of 2.79%.

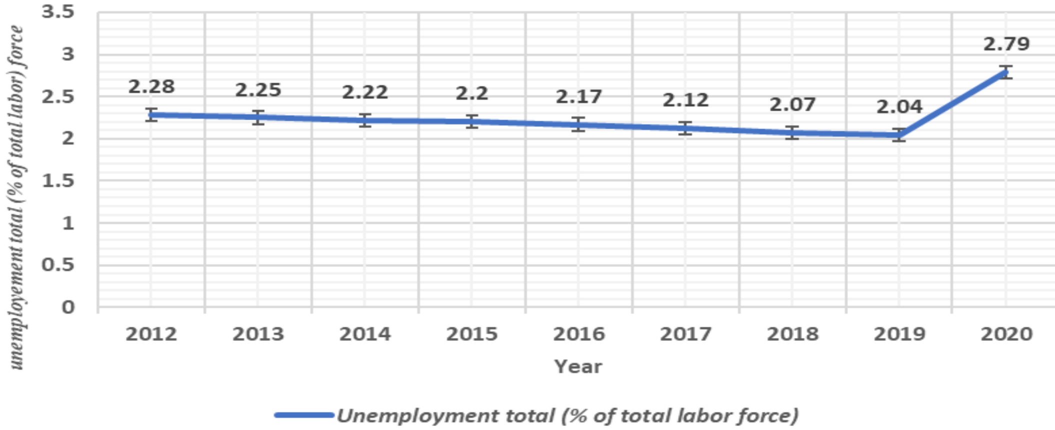


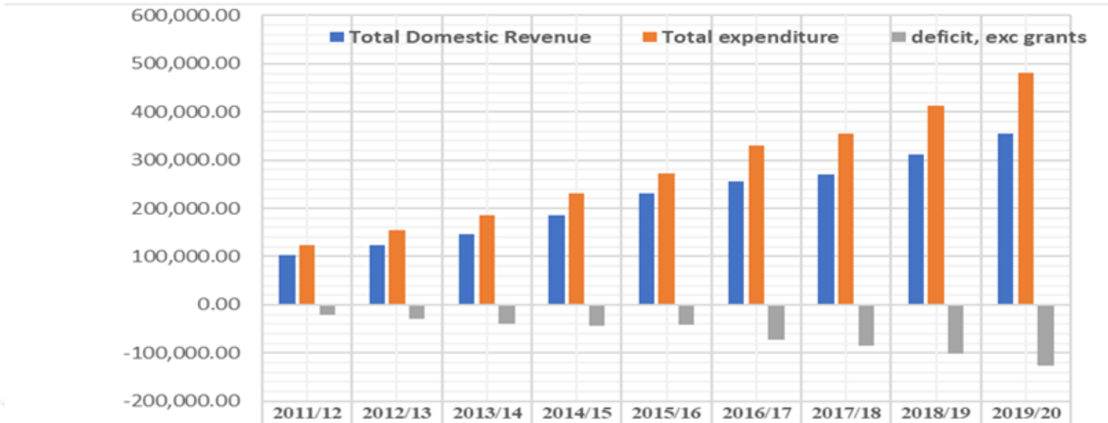
Figure 2.14. Unemployment rate (total unemployment % of the total labor force) (2012-2020

Source: Authors calculation based on WDI data, (2021), (modeled ILO estimate)

2.1.5. The overall government finances

As discussed in the policy and development plan section, Ethiopia's government pursues an ambitious development plan with a fiscal strategy emphasizing domestic income mobilization and pro-poor expenditure. As a result, the government has increased domestic revenue to reduce the budget deficit. However, the general government's budgetary performance revealed a more significant total fiscal deficit (excluding grants) in 2019/20, reaching Birr 125.83 billion, increasing from Birr 101.7 billion in 2018/19 and Birr 84.5 billion in 2017/18. Conversely, according to the NBE report (2020), the primary deficit percentage of GDP has decreased from 3.0 % to 2.50 %.

Moreover, general government expenditure reached Birr 480.1 billion in 2019/20, which was Birr 413.1 billion in the last year 2018/19; it increased by 16.2 percent higher than last year as both current and capital expenditures increased (Figure 2.15 below shows overall government revenue).



	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
Total Domestic Revenue	102,863.6	124,077.4	146,172.8	186,618.7	230,657.3	256,629.0	269,648.2	311,317.4	354,312.8
Total expenditure	124,416.7	153,928.7	185,471.7	230,521.1	272,930.1	329,286.8	354,205.3	413,105.7	480,143.2
deficit, exc grants	-21,553	-29,851	-39,299	-43,902	-42,273	-72,658	-84,557	-101,788	-125,830

Figure 2.15. Overall Government Revenue

Source: ***Authors calculation based on NBE data (2020***

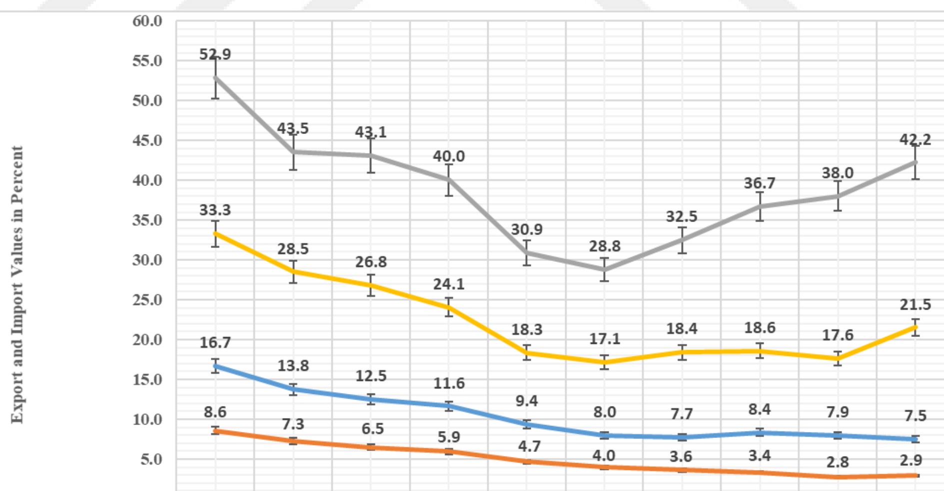
The overall government revenue (excluding grants) increased by 13.0 percent, reaching Birr 354.31 billion in 2019/20 and Birr 331.31 billion in 2018/19, respectively, while its share of GDP reached 11.5 percent, which was lower than the previous fiscal year. A similar increase of 16.6 percent was seen in general government expenditure. As a result, it had a 15.3 percent share of the national economy's gross domestic product (see figure. 2.15 for detail).

2.1.6. The balance of payments in general

Despite improvements in product trade and net service payments deficits, the overall balance of payments deteriorated in 2019/20, recording a US$1.2 billion deficit versus a US$941.6 million deficit the previous year. These were due to a decline in net private transfers, official transfers, and capital account balances. The deficit in net services was USD 213.5 million in 2019/20, down from USD 550.7 million in the previous year in 2018/19, while the product trade deficit improved by 12.5 percent. Due to the decreases in net private and official transfers, the current account deficit (including official transfers) decreased to USD 4.4 billion in 2019/20 from USD 4.9 billion a year before 2018/19 (NBE,2020). As a result, the current account deficit as a gross domestic product (GDP) percentage was 4.1 percent (NBE, 2020).

On the other hand, Figure 2.16 below shows the overall government revenue, including total export per GDP, merchandise export percentage of GDP, total export percentage of total import, and merchandise export percentage of merchandise import. (see figure. 2.16. overall government revenue for detail).

As discussed in the international trade sub-section, the export of goods (merchandises) and the total export of goods and services were USD 2.99 and 7.7 billion, respectively, in 2019/20. Moreover, figure 2.16 shows that in 2019/20, the merchandise export to the percentage of GDP amounted to 2.9 percent, which is lower than the GTP II implementation period goal of 11.8 in 2019/20. At the same time, the total export percentage of GDP was 7.5 percent in 2019/20. Besides, the total export percentage of total import is 42.2 percent, whereas the merchandise export percentage of merchandise import was 21.5 percent in 2019/20.



	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
Total Export /GDP	16.7	13.8	12.5	11.6	9.4	8.0	7.7	8.4	7.9	7.5
Merchandise Export/GDP	8.6	7.3	6.5	5.9	4.7	4.0	3.6	3.4	2.8	2.9
Total Export/ Total Import	52.9	43.5	43.1	40.0	30.9	28.8	32.5	36.7	38.0	42.2
Merchandise Export/Merchandize Import	33.3	28.5	26.8	24.1	18.3	17.1	18.4	18.6	17.6	21.5

Figure 2.16. Overall Government Revenue

Source: ***Authors calculation based on NBE data, (2020)***

2.2. The Economic Contribution and Performance of the Industrial and Manufacturing sector in Ethiopia

2.2.1. Industrial Vale-added and contribution to GDP

As discussed before, Ethiopia's industrial sector comprises mining and quarrying, manufacturing, construction, electric power, and water sectors. Moreover, as compared to other economic sectors, value addition is the distinguishing feature of the industrial, particularly the manufacturing sector but the trends in industrial value-added (including construction) in Ethiopia throughout the 2010–2020 period show a constant increase across the period (World Bank, 2020b). (see table 2.4 and figure 2.17 below for detail). For instance, in 2010, the industrial value-added was around 4,395 in constant US dollars. However, in contrast to the end of 2020, these statistics were increased to 21,886 million US dollars.

Furthermore, there was considerable growth in industrial value-added during the GTP I and II implementation end periods, with 10,527 million USD in the GTP I implementation end period in 2015 and 21,886 million USD in the GTP II implementation end period in 2020, respectively (WDI, 2022). This is shown in the graph below (Figure 2.13). Although the manufacturing sector showed relatively high growth, the minimum contribution to the percentage of GDP in the sub-sector exhibits Ethiopia's infant manufacturing activities. It implies an early stage and low level of industrialization in the country. Among the reasons for low industrialization and manufacturing activities, the main reason was that the manufacturing sector was not a concern (priority) sector until recently in Ethiopia. Moreover, this low contribution of the manufacturing sector to the GDP is a common feature of most developing countries, especially in Sub-Saharan African countries (World bank 2015).

Table 2.4. The industrial value-added in Ethiopia (2010-2020)

Variable name	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Industry VA (constant 2015 US$)	4,395	5,054	6,047	7,505	8,783	10,527	13,047	15,731	17,735	19,962	21,886
Industry VA (% of GDP)	9.435	9.665	9.476	10.945	13.471	16.298	21.933	23.582	27.306	24.822	23.105
Industry VA (annual % growth)	10.82	15.011	19.638	24.103	17.042	19.846	23.944	20.572	12.740	12.556	9.635

Source: ***Authors calculation based on NBE data, (2020)***
***** All values are in a million US$***

According to the world bank WDI database (2022) on the industrial value-added, the Ethiopian industrial sector, including construction, contributed 23.1 % of GDP in 2020, which shows a significant increase in GDP contribution compared with previous years under discussion. In 2010, the industrial value-added contribution to GDP was 9.44 percent. However, by the end of 2020, these statistics increased significantly to 23.1 percent. The same significant increment is shown at the GTP I and II implementation end periods, with 16.3 percent in the GTP I implementation end period in 2015 and 23.105 percent in the GTP II implementation end period in 2020, respectively. However, the industrial Value-Added annual growth rate shows a decline in the recent years in 2018-2020 in Ethiopia compared with the previous years throughout the 2010–2017 period, showing a slight increase across the period (see Table 2.4 and Figure 2.17 below for detail).

In contrast, following the Ethiopian Economics Association report on the Ethiopian economy (2018), the industrial sector contributed 25.3% of GDP compared to the previous year 2016/17 contribution of the sector, which was 16.7 % of GDP. Furthermore, in 2015/16, the sector showed better output as value-added increased by 20.7% compared to 2016/17. Another major part of the industrial sector is that the construction subsector substantially dominates the sector's value-added volume and growth rate (EEA, 2018). Therefore, despite some restrictions on main infrastructural problems like energy, a lack of foreign exchange earnings to import raw materials and capital resources, and low technological and institutional efficiency, the recent rapid growth in the manufacturing sector is promising (EEA, 2018).

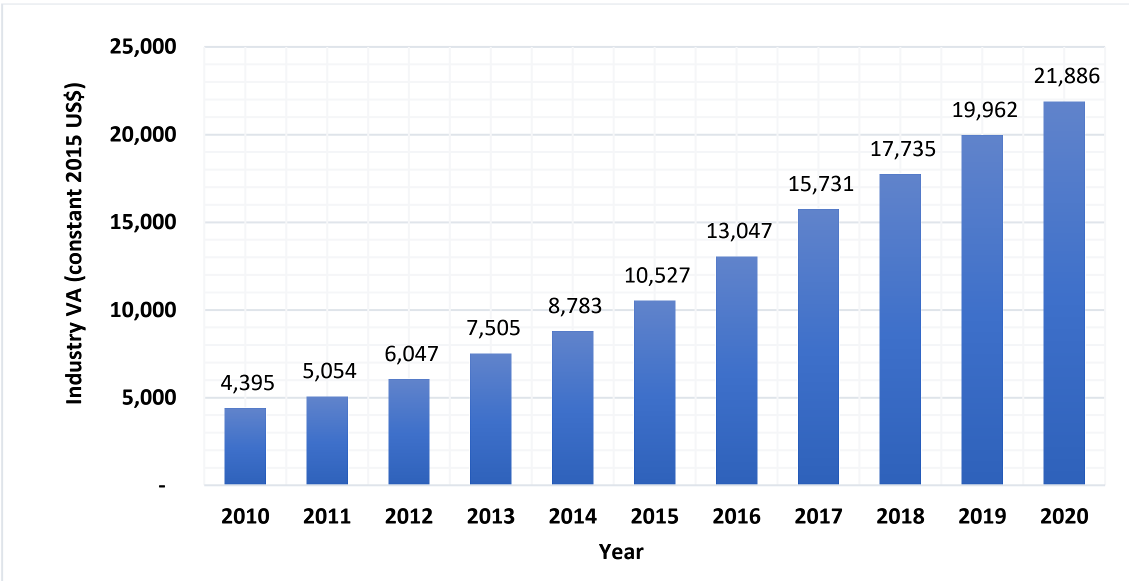
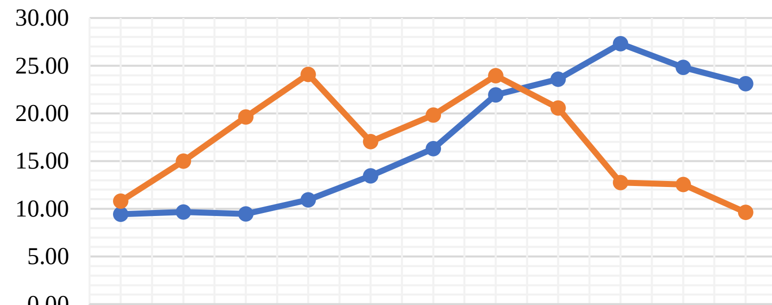


Figure 2.17. The industrial value-added in constant 2015 US$ in Ethiopia (2010-2020)

Source: Authors calculation based on WDI data, (2021)

Figure 2.18 below shows the industrial value-added percentage of GDP and annual percentage growth in Ethiopia's industrial sectors from 2010 to 2020. As reported in the figure below, there was a significant increase in industrial value-added % GDP from 2010 to 2018. However, in recent years, in 2019 and 2020, a relatively slight decrease in industrial value-added % GDP is reported in the figure below. Besides, the industrial value-added percentage of GDP annual growth rate statistics show a slightly significant increase in the previous years. For instance, the highest growth rate was registered in 2013 and 2016, 24.10 and 23.94, respectively. In contrast, the lowest rate is recorded in 2020 and 2010, 9.64 % and 10.82%, respectively. (See figure 2.18 below for detail).



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Industry VA (% of GDP)	9.44	9.66	9.48	10.94	13.47	16.30	21.93	23.58	27.31	24.82	23.11
Industry VA (annual % growth)	10.82	15.011	19.64	24.10	17.04	19.85	23.94	20.57	12.74	12.56	9.64

Year

Figure 2.18. The industrial value-added % GDP and annual % growth in Ethiopia (2010-2020).

Source: Authors calculation based on WDI data, (2021)

2.2.2. Manufacturing value-added and contribution to GDP

According to the FDRE, GTP II (FDRE, 2016), building up a nation's technical capacity and industrial competence and creating work opportunities for a wide range of people and rising average incomes is impossible without the expansion of the manufacturing sector. Furthermore, the growth plan stated that the growth of the manufacturing sector contributes to an improvement in both the TFP and the competitiveness of the whole economy. According to NPC (2016), on average, about 41.5 percent, 12.7 percent, and 45.8 percent of agriculture, industry, and services contributed to GDP in the GTP I period. However, the share of the agriculture sector has decreased relative to the base case (2009/10), whereas the industry has increased, and the service sector has stayed more or less the same. Following the planning and execution of the industrial development Strategy in 2002, the 2005 PASDEP, and the 2010 GTP, with due emphasis on the manufacturing industry, the sector has not recorded encouraging results (NPC, 2016).

The manufacturing sector value-added includes the large and medium-scale and small and cottage industries. On average, the overall manufacturing industries, LMSMI, and small and cottage industry share during GTP I was around 4.4%, 3.1%, and 1.2% of GDP, respectively. However, the share of the total manufacturing and LMSM industries increased slightly relative to the base year at the end of the plan period. Also, the small-scale and cottage industry share showed a slight decrease compared to the expected small-scale, medium-scale agricultural industries providing opportunities for employment or the enormous unemployed urban workforce and linking themselves with the other sectors (FDRE, 2016).

According to the Ethiopian Economic report (EEA, 2017), the manufacturing industry includes two main components: large and medium-sized manufacturing, comprising 80.65 % of value-added in the manufacturing sub-sector, and small-scale and cottage manufacturing, which has a 19.35 percent share in manufacturing output. Output at a large and medium scale has increased by 22.9%, primarily because of the development of industrial parks in various country regions, which is significantly improved (EEA, 2017). Additionally, Ethiopia's infant manufacturing activities or early industrialization stage are reflected in the manufacturing sector's small percentage contribution to GDP. However, in most developing nations, particularly in Sub-Saharan African countries, this low contribution of the manufacturing sector to the GDP is a common feature. Thus, the proportion of manufacturing value added (MVA) is a useful metric for comparing how well the sector performs relative to other countries' performances. The Ethiopian manufacturing sector's manufacturing value added (MVA) performance is presented in Table 2.8 at a constant 2015 price from 2010-to 2020. However, despite the strong expansion in the manufacturing sector, the subsector's contribution to GDP remained relatively small. It was 5.3 percent of GDP in this sector by 2020. One the reason was the manufacturing sector was not a concern (priority) sector until recently in Ethiopia. Besides, many sectoral policies, strategies, and plans were established and implemented to elevate the manufacturing industry's importance in the overall economy. However, in recent years, the sector's contribution to the economy has risen due to economic reforms and objectives assigned to the sector (MoFED, 2010).

As a result, the trends in manufacturing value-added in Ethiopia throughout the 2010–2020 period show a constant increase across the period (see Table 2.5 and Figure 2.19 below). For instance, in 2010, the MVA was around 1444.6 in constant US dollars. However, by the end of 2020, these statistics were increased to 5,390.80 million US dollars. Furthermore, there was considerable growth in industrial value-added during the GTP I and II implementation end periods, with 2,844.90 million USD in the GTP I implementation end period in 2015 and 5,390.80 million USD in the GTP II implementation end period in 2020, respectively (World Bank, 2022). This is seen in the graph below (Figure 2.19 for detail).

Table 2.5. The manufacturing value-added in Ethiopia (2010 to 2020)

Variable	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Mfg., VA (current US$)	1189.5	1,176.70	1,481.30	1,764.00	2,219.70	2,844.90	4,228.50	5,058.80	4,910.90	5,365.70	5,709.40
Mfg., VA (constant 2015 US$)	1444.6	1,578.10	1,764.40	2,063.20	2,406.40	2,844.90	3,496.40	4,358.50	4,655.80	5,014.10	5,390.80
Mfg., VA (% of GDP)	4	3.7	3.4	3.7	4	4.4	5.7	6.2	5.8	5.6	5.3
Mfg., VA (annual % growth)	9.2	9.2	11.8	16.9	16.6	18.2	22.9	24.7	6.8	7.7	7.5

Source WDI (2020)
***** All values are in a million US$***

The share of MVA in GDP for Ethiopia is very low and even less than other African LDCs. The annual growth rate in total manufacturing value added (MVA) and MVA yearly growth rate in percent. For instance, the MVA percentage contribution to GDP for Ethiopia has slightly increased by 4 and 5.3, respectively, between 2010 and 2020. the highest MVA percentage of GDP contribution was registered in 2017, 6.2 percent, compared with other periods under discussion in the study. Also, at the end of GTP II, targets are planned to be 22% for annual growth rate and 8% for GDP contribution (EEA, 2017, 2018).

Similarly, the MVA of Ethiopia's economy has achieved a growth rate of 9.2 and 7.5, respectively, between 2010 and 2020. However, the highest growth rate was registered in 2017, 24.7 percent, and the lowest was 6.8 percent in 2018, compared with other periods under discussion in the study. The results show its performance is poor as compared to other economies. However, the recent year's MVA growth rate was low relative to the previous years, for instance, 7.7 and 7.5 percent in 2019 and 2020, respectively.

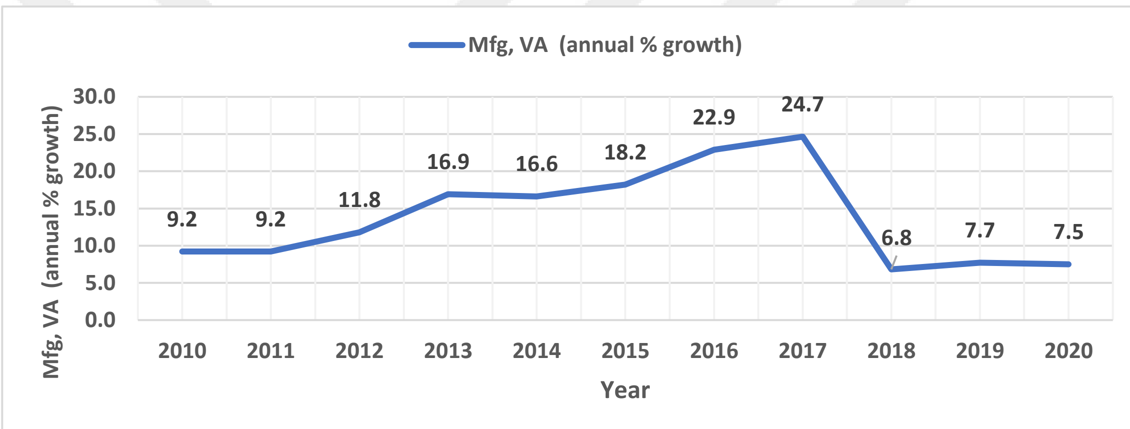


Figure 2.19. Manufacturing, value added (annual % growth)

Sources: Authors calculation based on WDI data, (2021)

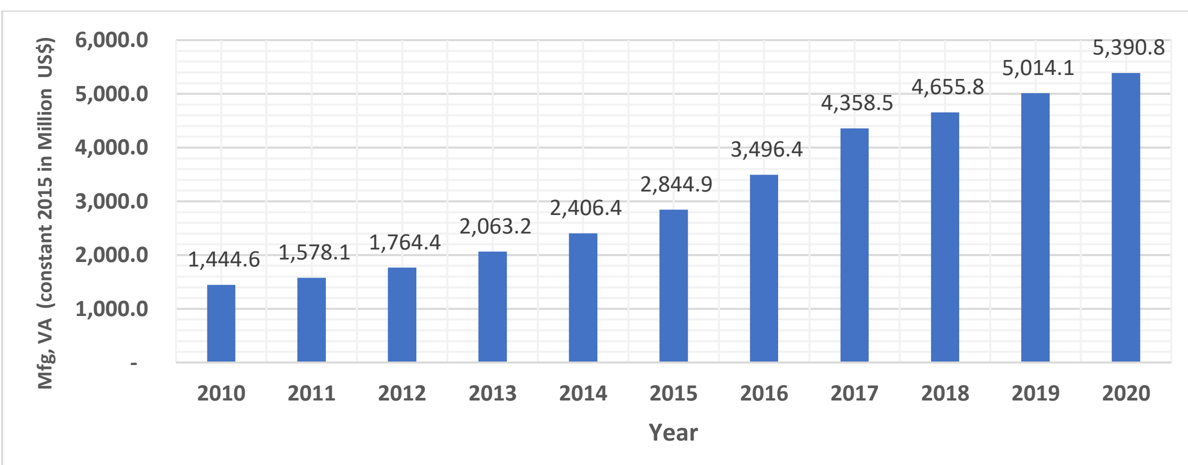


Figure 2.20 Manufacturing, value-added in Ethiopia (2010-2020) (constant 2015 US$)

Sources: Authors calculation based on WDI data, (2021)

The MVA constant USD 2015 was shown in the above figure 2.20. It shows that there is an increasing MVA in the year 2010-2020. The figure shows that the highest value is registered in the year 2020, while the lowest value was recorded in 2010.

Figure 2.21 shows the Manufacturing value-added as a percentage of GDP for 2010-2020. The MVA percentage of GDP shows that it was 4.0 % in 2010 and 5.3% in 2020. The figure shows that the highest value MVA percentage of GDP was registered in the year 2017, which was 6.2 percent, while the lowest value was reported in 2012, which was 3.4 percent. However, the recent year's MVA percentage of GDP achieved was slightly lower than the previous three years (2016-2018), for instance, 5.6 and 5.3 percent in 2019 and 2020, respectively.

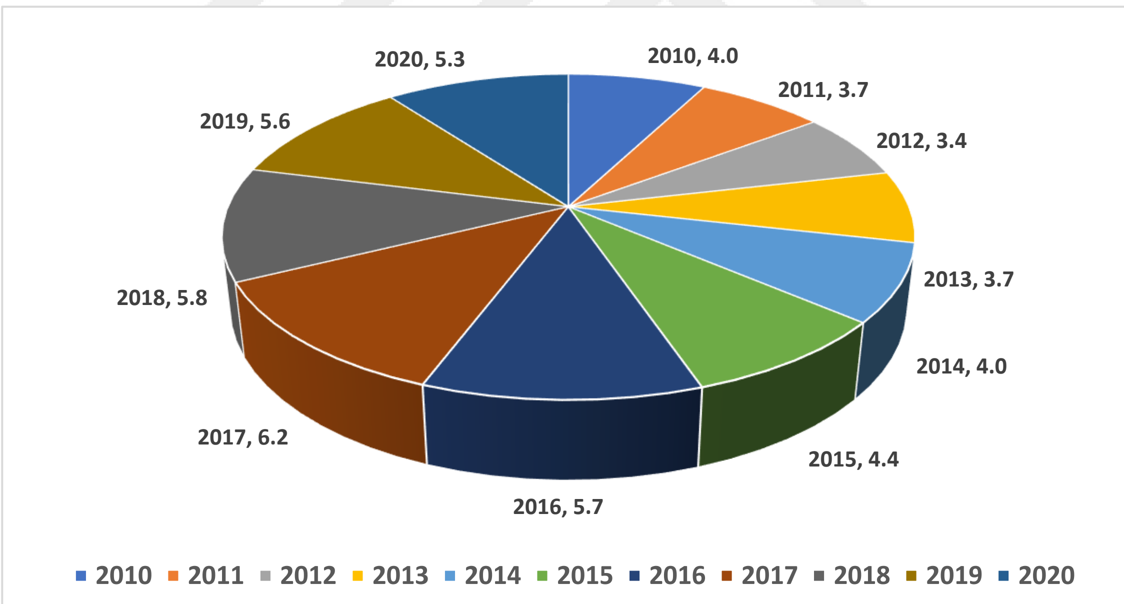


Figure 2.21. Manufacturing value-added as % of GDP

Sources: Authors calculation based on WDI data, (2021)

2.2.3. Contribution of the manufacturing sector to employment

A glance at the share of employment in the major sectors of the economy (that is, agriculture, industry, and service) can tell the country's development stage. For instance, the larger share of agriculture in the economy means the infancy of that country's development stage. Ethiopia's manufacturing industry employed around 300,000 people between 2012/13 and 2016/17, as shown in Table 2.6 below. Table 2.6 shows that the overall number of people employed by the different manufacturing industries was more than 293,058 in 2016/17. Over the preceding five years, the number of people working in all industries has shown a consistent upward trend, as shown in the table. During the survey year, the food and beverage manufacturing industry employed more than 21% of the workforce. The rubber and plastic manufacturing industry worked for more than 14% of the workforce. The textile manufacturing industry employed more than 12% of the workforce (CSA, 2016). (See table 2.6 below the trends in the number of employees in the manufacturing sector for details).

Moreover, the number of employees has not increased as planned during the GTP-I implementation period. Across most subsectors, the number of workers in 2014/15 was greater than in the base scenario (2009/10), although it was lower than in the previous year. In the consumer products manufacturing sub-sectors, there has been a decrease in the number of employees. As a result, the consumer goods-producing sub-sector, which includes food and beverage, textile and garment, and leather, had a significant fall in the majority of priority exporting sub-sectors. Although it is just a small piece of the attention and incentives provided to the sub-sectors, there is an expectation that the sub-sector would spearhead the transformation of the manufacturing sector and other sectors of the economy (EEA, 2018).

Table 2.6. Trends in the number of employees in the Manufacturing Sector

Industrial Group	2012/13	2013/14	2014/15	2015/16	2016/17	Growth rate 2012/13-2016/17) in %
Manufacture of food products and beverages.	52,441	55,970	63,790	59,152	61,760	17.77
manufacture of tobacco products	431	431	2,246	564	549	27.38
manufacture of textiles	34,483	56,386	30,540	27,699	35,590	3.21
Manufacture of wearing apparel, except fur apparel.	8,016	6,746	6,106	13,029	15,419	92.35
Manufacture of leather (tanning and dressing; footwear, luggage, and handbags	18,311	18,690	17,122	15,055	13,958	-23.77
Manufacture of wood and products of wood and	5,577	3,189	3,642	21,159	2,504	-55.10
Manufacture of paper, paper products, and printing	9,720	13,245	9,536	9,468	9,788	0.70
Manufacture of chemicals and chemical products	15,293	15,250	16,604	16,021	17,830	16.59
Manufacture of rubber and plastic products	63,527	17,868	19,662	21,355	42,900	-32.47
Manufacture of other non-Metallic mineral products	37,172	28,609	28,198	36,421	35,407	-4.75
Manufacture of basic iron and steel	3,754	3,487	8,130	5,451	6,371	69.71
Manufacture of fabricated metal products	13,396	61,550	9,290	10,770	12,500	-6.69
Manufacture of machinery and equipment N.E.C.	379	1,967	1,821	2,832	2,490	556.99
Manufacture of motor vehicles, trailers & semi-trailers	5,168	4,500	4,581	6,719	6,847	32.49
Manufacture of furniture; manufacturing N.E.C.	9,186	8,467	9,824	12,904	29,145	217.28
TOTAL	**276,854**	**296,355**	**231,092**	**258,599**	**293,058**	**5.85**

Source: CSA, Various issues

2.2.4. Contribution to productivity

Although productivity is another significant performance indicator, the proportion of real value added to the total number of permanent employees is measured as labor productivity. Due to Ethiopia's poor labor productivity and total factor productivity, the industrial sector has not competed effectively internationally (World Bank, 2009a). As defined broadly as any development of new products or processes and any modest improvement in product, process, or work organization, innovation is the primary source of productivity disparity across enterprises. Furthermore, Ethiopia's poor productivity in manufacturing is the single most crucial issue contributing to the country's low competitiveness in the world market (Subramanian & Matthijs, 2007; World Bank, 2004, 2009a, 2015). According to the World Bank (2009), low productivity is caused by a combination of structural and economic variables that render the economy less responsive to economic incentives (2009).

In addition, low productivity is attributed to various issues, including a lack of expertise and knowledge, a scarcity of raw materials, financial constraints, and a shortage of investment prospects (World Bank, 2009a, 2015). According to (Ramachandran, Gelb, & Meyer, 2014), Ethiopia's manufacturing firms are inefficient in terms of productivity and resource allocation among firms. It is partly due to policy factors shield incumbent firms from the competition (World Bank, 2009a), which is characteristic of manufacturing firms in Africa.

According to the World Bank (2015), productivity increases are crucial for long-term economic growth and improving living standards in developing countries. Thus, these are essential areas where Ethiopia must restructure its economy to fulfill the GTP goals of poverty reduction and become a middle-income nation within ten years. As a result, the government emphasized the significance of greater industrial efficiency and competitiveness to generate employment as fast and permanently as possible, as mentioned in the GTP pillar three. As previously indicated, the government's efforts are directed toward building a competitive manufacturing sector that will result in the required structural transformation by utilizing the country's resources and inexpensive labor potential. As a result, Ethiopian enterprises are more competitive than firms in more productive SSA nations for the reasons mentioned above (World Bank, 2015).

As measured by proxy variables like value-added per labor or per wage bill, productivity has increased significantly in practically all industries since 2008, in contrast to patterns observed in previous decades. According to Ethiopian Economic Report (2017), LMSMI's overall productivity trends have increased during the entire GTP I implementation period. Had productivity been computed depending on the number of people employed, productivity may have taken on different patterns instead of permanent employees. Generally, the sector's productivity, primarily intermediate goods producing was on average greater than capital and consumer goods-producing sub-sectors. While the productivity of both intermediate goods and capital goods-producing sectors stood above the entire industry, the sector producing consumer goods manifested below it, showing the relative labor intensity of the sectors producing consumer goods (EEA, 2017, 2018).

2.2.5. Contribution to export revenue

Globalization necessitates the existence of international commerce for nations throughout the globe to flourish and progress economically. Specifically, international trade is an essential component of the growth and development of nations in this period of globalization, and it is becoming more so. The developing nations, in particular, must reap the benefits of this effort. Consider, for instance, how firms and businesses might increase and diversify their export operations to take advantage of the increase in foreign currency. Because of this, it is used in their industrialization process by acquiring imported capital goods, meeting industrial raw material requirements for future export, supporting import substitution programs and other aims in the development plan and industrial policies, among other things.

Moreover, in Ethiopia, the main objective of GTP concerning the manufacturing sector was to raise the revenue of manufactured exports, primarily by increasing the volume of its exports and changing from primary commodities to value-added exports, in particular in the key sub-sectors such as textiles and leather, and food processing. Moreover, the result recorded so far has fallen short of meeting the goal set by the plan. The rise in export earnings during the first two years of implementation of the GTP I has been encouraging since then, though the rise in export earnings has diminished. In 2013/14, almost all priority exporting sub-sectors of manufacturing recorded comparatively lower performance (17.2% decrease) than the earlier year. As regards the structure, almost all export revenue was due to sub-sectors that produce consumer goods (an annual average of 95.9 percent). The food and beverage, textile, and leather sub-sector together account for about 89.3% of overall export revenues for the same period (FDRE, 2016; Oqubay, 2018b). (see Appendix Table A3 in the appendix section). Moreover, as discussed, descriptive result shows that the volume and diversity of export products have not changed as planned, and manufactured exports, which account for about 15 percent of total merchandise export, have remained small and stagnant.

Generally, the performance has been varied, and manufacturing exports have not been satisfying. As discussed, most of the export items are primary agricultural products, and manufacturing merchandise export performance is minimal compared with other countries and the previous development plan targets in the sector. As a result, export diversification and other activities that support the export orientation aims, priority areas, and activities must be carried out at all levels, beginning with the firm level and progressing to the national level. Besides, recent studies show that inadequate trade logistics and a lack of quality inputs in the local market are limiting Ethiopia's textile and leather sectors' worldwide competitiveness. The government has made several initiatives to resolve these issues: It modernized the public service, especially the customs administration, and invested in infrastructure to lower operating costs. However, inadequate trade logistics and low-quality materials hamper export industries.

2.2.6. Contribution to the balance of trade (Net-Export)

Following up on what has been discussed so far, it is necessary to carry out parallel initiatives in the international trade areas, particularly in the export sector, for the respective balance of trade-related components, for the area under discussion to benefit from a balanced growth contribution. As a result, examining export revenue in separation simply tells us one side of a story. The whole picture can be acquired if one presents the net-export revenues of the sector, that is, the export revenues of exporting industries less than their import bill. To this end, the scope in which LMSMI's export revenue covers its import bill is attempted. On average, the total export revenue covered only about 25% of its import bill for its raw materials during the first four years of achievement of the GTP. Indeed, it was greater than the base case of 12 percent. Although significant changes have been insured contrasted to the start point, the target set in GTP-I, the sector has not been able to satisfy its foreign currency requirement through its export revenue. It implies that export revenues from other sectors of the economy remain to finance the import bill of manufacturing industries (MOFED, 2014).

Furthermore, export to import coverage differs from sector to sector. During the first four GTP implementation periods, food and beverage, textile, and leather subsectors reported export revenues to import bill ratios of approximately 30%, 60.2%, and 204.9%. The three sub-sectors reported improved performance of 16.3 percent, 47.3 percent, and 172.9 percent in contrast to their respective shares in their base year (2009/10) (see figure 2.22 below for detail) (MOFED, 2014). Similarly, in the recent year 2019/20 the total export percentage of total import is 42.2 percent, whereas the merchandise export percentage of merchandise import was 21.5 percent.

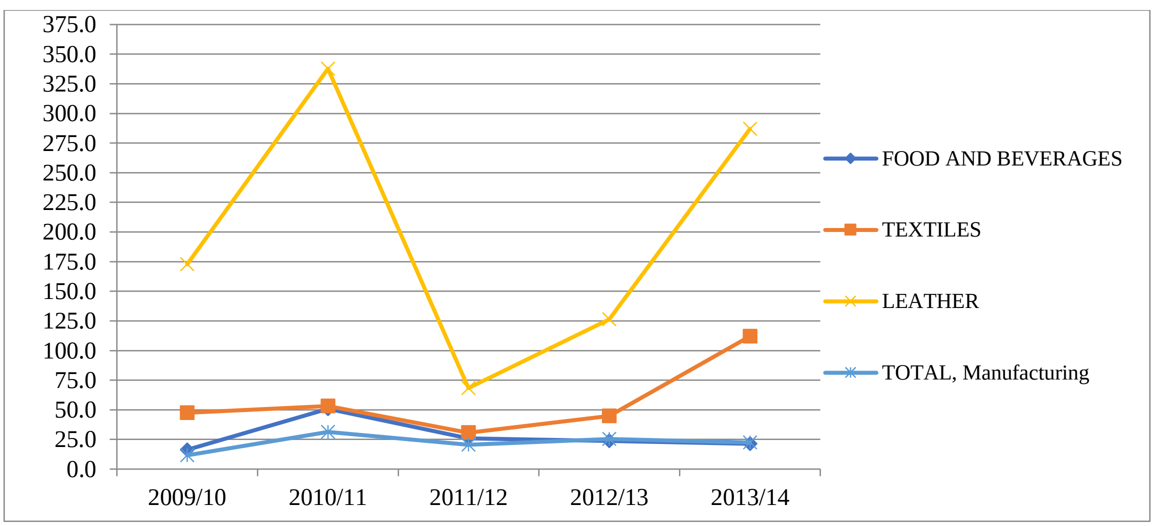


Figure 2.22 Export revenue to import ratio in percent

Source: CSA, (Various issues)

2.2.7. Manufacturing and Foreign Direct Investment (FDI)

The manufacturing industry plays a critical role in economic transformation, primarily because the sector develops technology and manufactures machinery that may be used to increase the productivity of its sector and the productivity of other sectors of the economy. Besides intending to move the country's structure away from its agricultural economy's dominance and toward manufacturing industries, Ethiopia began an economic reform program in 2010. According to UNCTAD (2018), FDI has historically been a critical source of funding on a worldwide scale. It provides finance for 39% of emerging nations' financial requirements. Additionally, it is expected to impact economic growth through technology transfer, increased global competitiveness, and job creation. Thus, the FDI inflows were 1.43 trillion USD globally in 2017. Accordingly, the developing economies garnered 47% of global FDI, or around USD 671 billion. Africa received 2.9 percent of worldwide FDI, amounting to 42 billion USD in 2017 (UNICTAD, 2018). Also, Ethiopia received anticipated FDI flows of 4 billion USD in 2016 and 3.6 billion USD in 2017. These equate to 0.25 percent of world FDI, 8.6 percent of FDI volume in Africa, and 47% of FDI in Eastern Africa (UNICTAD, 2018).

According to (EEA, 2018; NBE, 2018), Ethiopia has received a significant amount of FDI in recent years by African and even other developing country standards. Ethiopia had the sixth most significant influx of FDI in 2015, after Angola, Egypt, Mozambique, Ghana, and Morocco. Except for Egypt, all four nations with higher FDI than Ethiopia rely on natural resources, particularly oil. Ethiopia was Africa's fourth-largest recipient of FDI in 2016, after Angola, Egypt, and Nigeria. In terms of FDI inflow (3.6 billion USD) in 2017, the country rose to the second position in Africa behind Egypt, which garnered 7.4 billion USD. In the 2018 report, Ethiopia's revenue for 2014, 2015, and 2017 was amended to USD 1.9 billion, 2.6 billion, and 4.0 billion, respectively. Moreover, Ethiopia's progress has been significantly aided by FDI. In 2017, FDI outperformed merchandise export profits in terms of foreign exchange by 43%. Exports of products and non-factor services accounted for 67% of the total foreign exchange profits, while private and government transfers accounted for 44% (EEA, 2018; NBE, 2018).

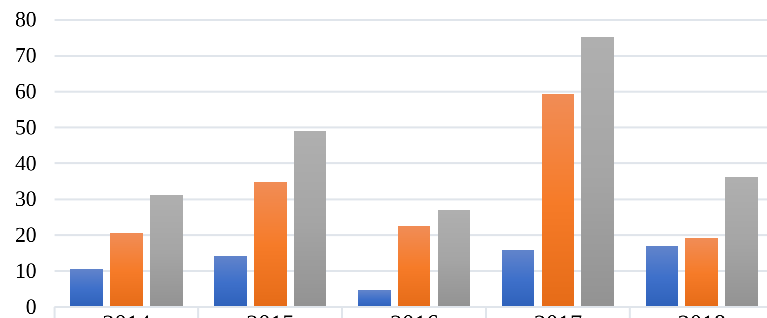
According to the Ethiopian investment commission report (EIC, 2019), FDI inflows began to increase as Ethiopia prepared to implement its first Growth and Transformation Plan (GTP I) (2010-2015), which coincided with an increased inflow of foreign investment from the South (mainly Turkey, China, and India). Also, the establishment and inauguration of Ethiopia's first industrial park, the Eastern Industrial Zone (EIZ), was built by a Chinese private company. As a result, the government's choice to develop publicly owned industrial parks as policy instruments to attract export-oriented (or efficiency-seeking) FDI and increase exports of value-added commodities was influenced by the building and operation of the EIZ[5]. As a result of this decision, Ethiopia's industrial policy and export-led industrialization plan took a significant stride forward (EIC, 2019).

Furthermore, as stated in the EIC report (EIC, 2019), Ethiopia has seen a dramatic increase in foreign direct investment (FDI) since 2012, primarily due to the government's determination to create state-of-the-art industrial parks that include all the essential services and infrastructure for investment. So far, the industrial parks have acted as powerful magnets, drawing FDI to the country at a rate never seen. In addition, they have been vital in igniting new FDI trends in the nation. Moreover, The FDI trends in the manufacturing sector into chosen export-oriented priority sectors like Textile and clothing, leather goods, agro-processing, pharmaceuticals, and ICT were selected to optimize Ethiopia's comparative advantages (EIC, 2019).

At the same time, Ethiopia's FDI is currently concentrated on manufacturing, which is unusual for a low-income, agrarian-based African economy. FDI dominates most developing nations' extractive, agricultural, and service sectors. Besides, the EIC report (2019) revealed that approximately 60% of FDI flows to Ethiopia are directed toward

[5] EIZ stands for Eastern Industrial Zone

manufacturing. Figure 2.23 below shows the FDI Trend in Ethiopia from 2014 to 2018. The FDI amount in the manufacturing sector was 20.45 and 19.14 billion USD in 2014 and 2018, respectively. As shown in figure 2.23 below, the highest Total FDI flow of USD 59.24 billion was registered in manufacturing in 2017. Ethiopia is one of only a few African nations where the manufacturing sector receives the majority of FDI stock, owing primarily to investment drawn to industrial parks. It demonstrates the government's ultimate growth goal through structural transformation and sustainable development by promoting investment flows into productive industries (EIC, 2019; NBE, 2020).



	2014	2015	2016	2017	2018
FDI flow to the other sectors	10.5	14.14	4.6	15.76	16.86
FDI flow to the Mfg. sector	20.45	34.86	22.4	59.24	19.14
Total FDI flow	31	49	27	75	36

Year

Figure 2.23. FDI in Ethiopia in Billion USD

Source: EIC, (2019)

According to the world bank, WDI statistics (2022) on the FDI net inflow in Ethiopia, Ethiopian FDI net inflow was US 288 million and 2.396 in billion current US$ in 2010 and 2020, respectively. The recent FDI figure in 2020 decreased compared with the previous consecutive years, 2015-2019. At the same time, the most significant net FDI inflows into Ethiopia were recorded in 2016 and 2017, with 4.143 and 4.017 billion current US dollars, respectively. (see figure 2. 24 below for detail).

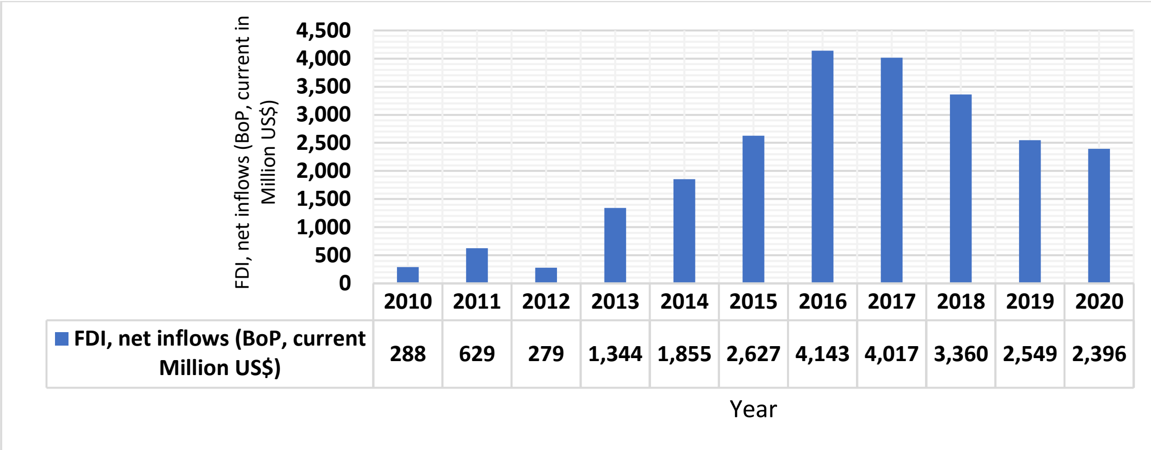


Figure 2.24. FDI inflow in manufacturing (in Billion USD)

Sources: Authors calculation based on WDI data, (2021)

Besides, using the same statistics from the world development indicator (World Bank, 2022), FDI net inflow in the percentage of GDP was 2.2 % in 2020 and 1 % in 2010. It shows a slight increase in GDP contribution compared with previous years under discussion. The significant increment in percentage contribution for GDP was shown at the GTP-I implantation end period with 4.1 % and GTP-II implementation periods in 2016, 2017, and 2018 with 5.6 %, 4.9%, and 4%, respectively. (see Figure 2. 25 below for detail).

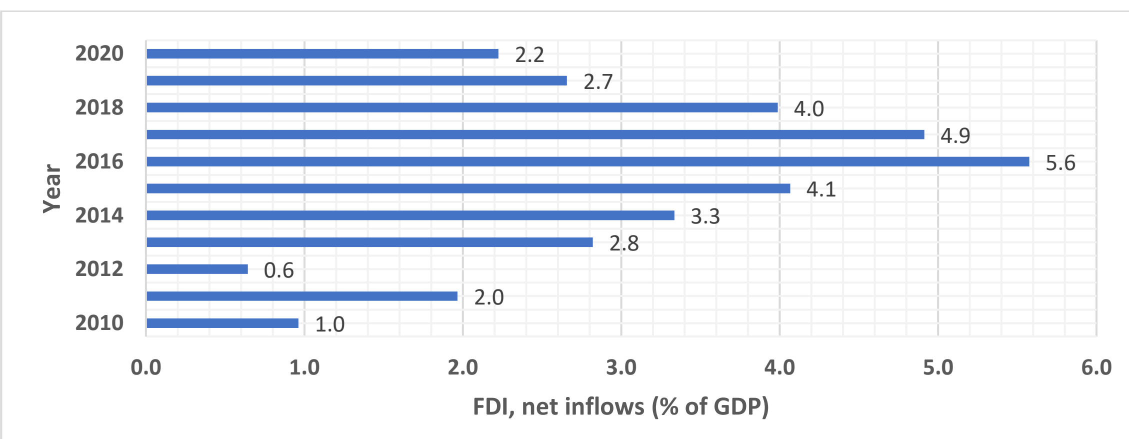


Figure 2.25. FDI net inflow in % of GDP

Sources: Authors calculation (WDI) data, (2021)

CHAPTER THREE

3. LITERATURE REVIEW

Productivity is a worldwide concern in today's ever-changing and globalized society, and boosting productivity is often seen as a solution to a wide range of social and economic issues. For instance, business leaders and management see it as a realistic approach to increasing global competitiveness. Additionally, it raises the quality while simultaneously cutting expenses through enhanced efficiency and effectiveness. Similarly, productivity, or the more productive use of economic inputs, has been described as a valuable resource to raise income and well-being. In this instance, it is reasonable to say those disparities in productivity are the primary cause of inequalities in inter-country income and economic progress (Hall & Jones, 1999).

In economics, the concept of productivity has been the focus of numerous theoretical and empirical studies. The idea of productivity was first incorporated into the growth model by (Solow, 1957a) as a measure of technological progress and was regarded as an external mechanism. Accordingly, Solow (1957) noticed that output increased due to "*factor accumulation and increasing productivity*." According to this view, output increases associated with the use of a fixed factor input combination such as labor, capital, or natural resources occur due to technological advancements; In other words, productivity gains despite the importance attributed to the concept of productivity, also known as "*Solow residual*," in the literature. Because economic growth did not fully explain productivity sources, the concept remained closed at the time. However, recent research shows that this "*residual*" term, total factor productivity or multi-factor productivity[6], is getting more attention.

Moreover, there is a substantial body of work on productivity determinants both empirically and theoretically at the aggregate, industry, and firm levels. These include

[6] Total factor productivity is another name for multi-factor productivity. "*Multifactor productivity denotes the inclusion of numerous elements as inputs, but not necessarily all of them. Total factor productivity denotes that all potential factors are taken into account"* (OECD, 2001). This is rarely the case in practice.

studies by (Jorgenson,1995b, 1995a, 2005) extensive productivity and productivity-related various volumes of research works and (Griliches, 1998) and his collaborators' work on different productivity and NBER productivity-related subjects, two of the most critical pioneering fields of productivity. In addition, several governments and non-governmental organizations worldwide have made substantial contributions to the field's early development, such as productivity measurement issues (OECD, 2001). Another recent study (Botrić et al., 2017; Cieślik et al., 2019; Du & Temouri, 2015) confirms various variables that impact firm-level productivity across nations and sectors. In addition to that, they agree that there is significant and persistent heterogeneity in firm-level productivity across countries and industries.

Furthermore, when the measurement of productivity is investigated to achieve a balance between productivity theory and practice, it is possible that a greater understanding of the relevance of productivity will be achieved. Additionally, studies undertaken by (Caves, Christensen, & Diewert, 1982; DW, 1982) provide a more in-depth analysis of the notion of productivity indexes and measurements in detail. In addition to the substantial theoretical and empirical literature on the subject, different researchers have undertaken and studied more comprehensive, advanced, and detailed productivity measurement issues in recent years. For instance, the studies on productivity measurement were studied in detail by (Blundell & Bond, 2000; Griliches, 1998; Olley & Pakes, 1996).

Thus, the main aim of this chapter is to attempt a review of the theoretical and empirical literature on the concept of productivity through an in-depth examination of what productivity is and is not, measuring what is quantifiable, and counting what is to be measured. Finally, it examines the determinant of TFP and reviews related empirical literature and practical concerns in general and Ethiopia in particular. Besides, it reviews the growth theories' perspective on productivity and the Ethiopian industrial policies towards increased productivity and productivity improvement.

3.1. Productıvıty: Concept, Measurement, Theorıes, Sıgnıficance and Empırıcal Facts

3.1.1. Concept and definition of productivity

As discussed before, the concept of productivity is a crucial notion in economic analysis. It is an essential indicator of economic efficiency because it reveals how well resources are integrated and deployed to accomplish the intended and anticipated results. Moreover, productivity creates value from existing resources, including raw materials, labor, skills, capital equipment, land, intellectual property, management aptitude, and financial capital for countries. As a result, more output, better value, and higher income may be achieved for every hour spent if the appropriate decisions are made following the plans and policies in place. Thus, simply productivity is defined as the ratio of output to input as follows:

$$\text{Productivity} = \frac{\text{Output}}{\text{Input}} \qquad (1)$$

Despite the formula's simplicity, there is no unique way of measuring productivity in the real world. For instance, in line with (Krugman, 1994), "*productivity is almost everything in the long run*." Besides, productivity can be studied at three different levels: global, national, and enterprise. Accordingly, from the global level viewpoint, productivity indicates the competitiveness between nations to achieve high-tech goods, high-quality services, and lower cost of production. Besides, from the national level point of view, productivity uses the resources available to optimize overall return, boost employment and boost citizens' living standards. Finally, productivity at an enterprise level is linked to the best use of corporate resources for more excellent business performance (Hailu et al., 2020).

Different studies and organizations define and debate productivity in a variety of ways, yet with notions that are quite similar; for example, (ILO & ADB, 2015; Prokopenko, 1987) defined Productivity as a relationship between the output of a manufacturing process or a service system and the inputs that produce that output. In short, it displays the quantity of output per unit of input in this case. Similarly, other studies stated that a productivity-improving society selectively mobilizes new ideas, technological improvements, and competitive business models to produce more excellent value by maximizing a country's resources (Conway, 2017; Cusolito, Dautovic, & McKenzie., 2018; Hsieh, 2015; OECD, 2001).

In conclusion, productivity is" *the combination and use of production elements or resources to generate desired and intended outputs*." According to the OECD productivity measurement manual, at the same time, productivity may be viewed from each component of production - "*labor productivity*" from the viewpoint of labor and "*capital productivity" -* from the "*capital*." In addition, "*Total Factor Productivity*" (TFP) is an index that measures how much output is generated from all input production components (OECD, 2001).

3.1.2. Types of productivity measurements

As previously noted, the word productivity is a crucial notion in economics. It is defined basically as "*the efficiency of converting inputs into outputs."* Hence, the productivity levels and growth measurements represent important economic performance indicators. *Furthermore, productivity is usually defined "as the ratio of output volume to the volume of input usage*." Although there is no debate on this general point, a quick examination of the productivity literature and its various implementations shows no unique reason or a single measure of productivity (OECD, 2001). According to the OECD (2001), "*technology, efficiency gains, benchmarking production processes, real cost-saving, and living standards. "*are the primary objectives of productivity measurement.

Accordingly, among the main objectives of productivity measurement based on the OECD (2001), one objective is "*Technology*," which is based on tracing technical change as a commonly stated goal of analyzing productivity growth. Similarly, Technology has been defined as "*the currently known way of converting resources into outputs desired by the economy*" (Griliches, 1987), as referenced in the OECD manual (2001). However, it either manifests itself in its *disembodied, which includes (new* *blueprints, scientific discoveries, and organizational approaches) or embodied (design and quality improvements in new capital goods and intermediate inputs)*. Besides, the connection is unclear despite the common linkage of productivity indicators with technical advancement.

Furthermore, as mentioned before, one of the second objectives is *"Efficiency gains."* Hence an Internal efficiency of a business is a crucial factor in its economic viability - efficiency in terms of input usage, given technology (i.e., technical efficiency), and efficiency in combining inputs, given technology, and market pricing (i.e., allocative or price efficiency) (Hill & Kalirajan, 1993). However, there is a conceptual difference between the search for efficiency changes and the search for technological changes. From an engineering perspective, "*total efficiency indicates that a manufacturing process has produced the highest quantity of physically possible output*" with current technology and given a fixed number of inputs (Diewert & Lawrence, 1999), as referenced in the OECD manual (2001). Thus, advances in technical efficiency constitute a step toward "best practice," or removing technological and organizational inefficiencies. However, not all forms of technical efficiency make economic sense, which is reflected by the concept of allocative efficiency. Thus, it suggests profit-maximizing behavior on the firm's side. When measuring productivity at the industry level, efficiency improvements may be attributed to either better efficiency in single firms representing the industry or a shift in production towards more effective firms (OECD, 2001).

The third objective is "*Benchmarking production processes."* It is possible to identify inefficiencies and other problems in the field of business economics and other related fields by comparing productivity metrics for specific manufacturing processes. However, the relevant productivity measurements are often represented in physical units (for instance, automobiles per day, passenger miles per person) and are extremely precise (OECD, 2001). These serve the objective of factory-to-factory comparisons, but the resulting productivity indicators are difficult to integrate or aggregate; for instance, as referenced in the OECD productivity guide (2001), for detail see Baily (1993), who discussed such approaches. On the other hand, the additional goal of productivity metrics, the *"Real cost savings,"* is a practical way of expressing the essence of measured productivity change. It is theoretically possible to distinguish between various efficiency changes, technical changes, and economies of scale, but it is challenging in practice. As a result, productivity is usually quantified as a *"residual,"* including the above components and changes in capacity utilization, learning-by-doing, and various measurement mistakes (OECD, 2001). Besides, as cited in the OECD productivity guide (2001), (Harberger, 1998) reiterated the idea that there are a wide variety of causes for productivity increases and referred to this phenomenon as the " *real cost savings*." In this context, productivity assessment in practice may be seen as an investigation into the location of real cost savings in production.

At the same time, as stated in the (OECD 2001), the other main objective of productivity measurement is *"Living standards."* Accordingly, productivity measurement is essential in determining the national living standards of every nation in the world. For instance, the basic is per capita income, which is likely the most widely used indicator of living standards: income per person in an economy changes directly with one measure of labor productivity, value-added per hour worked. In this regard, assessing labor productivity contributes to a better understanding of the development of living standards in the economy. Moreover, other instances might be the long-term trend in MFP (OECD, 2001; Pilat, 1996).

In simple terms, productivity measurement quantifies a productive system's output and input resources. The productivity measurement aims to improve productivity by increasing effectiveness and using existing resources better. The veil to be lifted from output measurement is the challenge of aggregating different items that do not have consistent quality or features. On the input measurement side, the challenge of aggregating multiple types of inputs into a well-defined composite unit remains crucial. It is possible to argue that measuring productivity is merely theoretically straightforward. On the other hand, the economic theory of measuring productivity may be traced back to Jan Tinbergen's (1942), as mentioned in the OECD productivity guide (OECD, 2001).

Robert Solow's (1957) articles on productivity, the measure of technical advancement, and an external process known as the "*Solow residual*," as previously stated, were among the most important contributions to productivity studies. They created productivity measurements that are useful for assessing economic development in the context of a production method. Since then, the research on the subject has advanced significantly, and productivity issues have grown familiar in today's worldwide society (Solow, 1957b).

Additionally, there are several productivity measurements available in the literature. However, the selection between both relies on the objective and data availability in many cases. Broadly, productivity measures can be classified as "*single-factor productivity measures (tying output measurements to a single input measure) or multiple-factor productivity measures (tying output measurements to a collection of inputs)*." This distinction applies to the productivity analysis at both macro-level and industrial or firm-level. Another contrast, which is especially important at the industry or business level, is between productivity measurements that connect some measure of gross output to one or more inputs and those that employ a value-added notion to capture output fluctuations (Pilat & Schreyer, 2003).

Similarly, the most widely utilized productivity measurements among the productivity measures are labor, capital, and multi-factor productivity (MFP). Besides, they can be specified either in the form of "*capital-labor MFP, which is based on a value-added concept of output or in capital-labor-energy-materials MFP (KLEMS), which primarily focuses on a gross output concept.*" The most often computed productivity indicator is value-added-based labor productivity, preceded by KL- MFP, and KLEMS-MFP. However, those measurements of productivity are still not independent of one another. For instance, numerous contributing drivers behind labor productivity increase may be discovered, and one is the rate of MFP change. The economic theory of production may be used to establish this and many other linkages among productivity indicators (OECD, 2001; Pilat & Schreyer, 2003).

Consequently, according to the (OECD, 2001; Pilat & Schreyer, 2001), Labor productivity (LP) is defined as "*the amount of output produced divided by the labor amount expended to produce that output*." It reveals how efficiently labor is used to produce gross output or value-added". Thus, simply labor productivity is defined as the ratio of output (value-added) to the number of employees. Although labor productivity is the most potent and frequently recognized productivity measure nowadays, it has limits. LP is a partial measure of productivity that does not account for capital expansion or other necessary inputs to increase output. Thus, conclusions based only on labor productivity may be deceptive, excluding other variables that affect output. Also, the quality of data and input or output definitions may impact labor productivity figures (OECD, 2001). Because of the other key inputs develops, the analytical value of labor productivity may change over time and between sectors (Conway & Meehan, 2013). It's also challenging to measure how much work is being done (labor itself), and only a small percentage of employees have the education, credentials, abilities, and experience that should be considered for calculating LP. Additionally, several data sources with distinct ideas and meanings make international comparisons difficult (Hailu et al., 2020).

Although the TFP is a better proxy than the other two productivity metrics, it captures the amount of output that is not yet represented by labor and capital input in the production function. However, the (World Bank, 2009a) found that TFP also has severe drawbacks. Its fundamental weakness is that since different researchers utilize different data and technical assumptions to arrive at their conclusions, TFP is impractical for policymakers. Besides, TFP is contaminated by variables other than strictly technological change, such as increased returns to scale, markups owing to imperfect competition, or profits through sectoral reallocations. Finlay, TFP predictions need much more data than LP estimations, which is not an exaggeration (EPU, 2017).

In contrast, some authors have suggested that they solve output and input aggregation problems; those inputs should be added together to get *'constant price'* money values; the same should be said for output. The problem with this technique is that the final productivity index will be lower than economic productivity (David, 1972; Iyaniwura & Osoba, 1983). On the other hand, the productivity levels of the single factor are likely to be influenced by the intensity of the factor inputs omitted to use. For example, two firms with the same manufacturing technologies may likely have different labor productivity because one uses capital even more intensively than the other because of variations in factor prices (Syverson, 2011). In light of this, researchers usually employ TFP unaffected by the intensity of observable inputs.

Besides, a commonly known productivity measurement or index of the total output is divided by the quantity of one input, discovered to become the oldest method of measuring production. The early productivity estimates centered around the value of output per person-hour of labor input despite the difficulties of quantifying labor input. Currently, productivity research focuses mainly on TFP, which are complete aggregates of output. The analysis of the variables that explain the variations in output levels is based on production theory (OECD, 2001; Pilat & Schreyer, 2003). Besides, the contribution of input change and the overall productivity factor to output growth may be separated from one other. Accordingly, the contribution of additional inputs to output increases is represented by the production function (PF). TFP change is attributed to the residual, often known as "*multi-factor productivity growth*" or "*Solow residual* " (Solow, 1956).

Although the TFP measurements have been the subject of recent productivity debates, there are numerous approaches to empirically implementing productivity measures once they have been formulated based on economic theory. Among the available methods, the parametric techniques can be differentiated from non-parametric ones from a comprehensive methodological perspective. In the first scenario, econometric methods are used to estimate PF variables and provide direct measurements of the increase in productivity. In the second situation, empirical measures that offer a reasonable estimate of the unknown "*true*" and economically defined index number are identified using features of a PF and results from the economic theory of production. For instance, the classic example of non-parametric methodologies is the growth accounting method for productivity measuring. Besides, (Antle & Capalbo, 1988) recognized two key ways to measure TFP: growth accounting (index number) and econometrics methods of productivity measurements.

Among the studies undertaken on the productivity indexes, studies by (Caves et al., 1982) provide a more in-depth study of the notion of productivity indexes. In addition to the substantial theoretical and empirical literature on the subject, various researchers have undertaken and studied more comprehensive, advanced, and detailed productivity measurement issues in recent years. For instance, the studies on productivity measurement were studied in detail by (Blundell & Bond, 2000; Griliches, 1998; Levinsohn & Petrin, 2003; Olley & Pakes, 1996). Furthermore, different authors studied econometric tools, for instance, studies by (Ackerberg, Benkard, Berry, & Pakes, 2007). Finally, to review the many methods for total factor productivity assessments that have been published in the productivity literature so far that were adapted from (Dhehibi, 2015) and elaboration from Mahadevan (2004) (see Figure 3.1 below).

As shown in figure 3.1 below, Among the available approaches to measuring TFP, the non-frontier method includes non-parametric index numbers and the parametric method. According to (Dhehibi, 2015), TFP index numbers or non-parametric index numbers are distinguished because the empirical estimate of various TFP indexes is based on various weighting methods for the input and output variables. As a result, among the available index of TFP measurements, the Divisia, Solow, and Tornqvist indices are extensively employed in empirical investigations, and those indexes are particularly popular in recent studies.

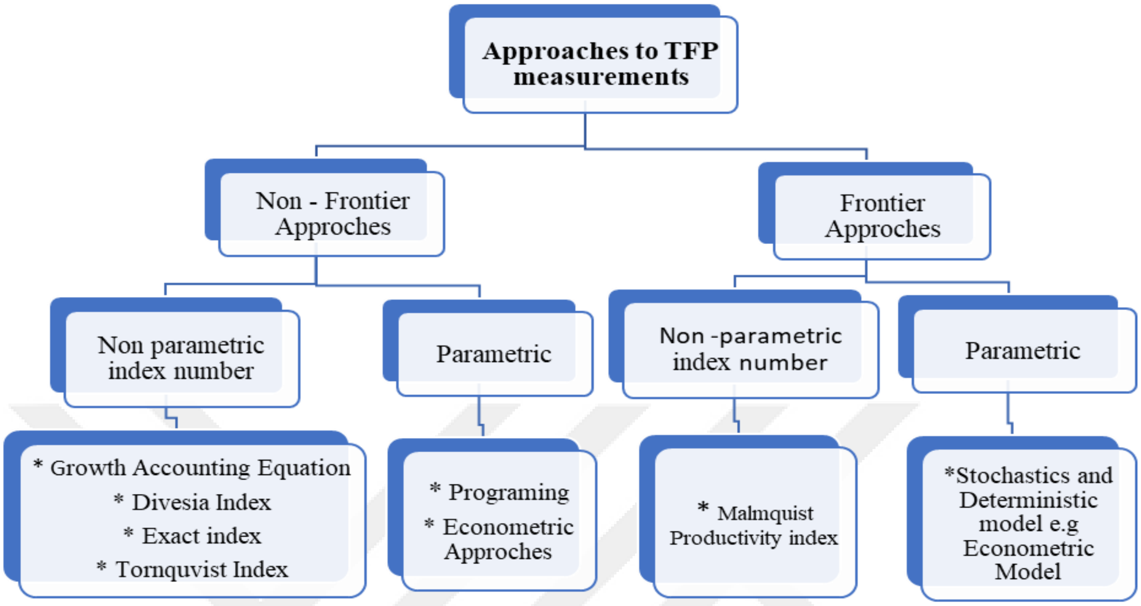


Figure 3.1. The Different approaches to TFP measurements

Source: Adapted from (Dhehibi, 2015), elaboration from Mahadevan (2004)

The *"Slow index,"* which (Solow, 1956) employed, uses a CD-PF to calculate the TFP growth. Among the assumptions used in his analysis were the continuous return to scale, autonomous Hick's neutral technological change, and the fact that the factor payments are equal to their marginal products. He makes all assumptions in estimating this production function. The following is the structure of the production function (PF) used:

$$Q = A(t)F\ (K, L) \qquad (2)$$

In equation (2) above, the Q, K, and L are the output, capital, and labor, respectively. When the production function shifts between two time periods, A(t) is a multiplicative factor that accounts for the change in the PF (at given levels of capital or labor). Following this, Solow handled the central challenge of calculating A(t) by employing an index number technique through a logarithmic differential of PF is utilized to discover a solution to this problem.

Moreover, as previously discussed, the frontier and non-frontier techniques can be further subdivided into parametric and non-parametric approaches based on their approach (see figure 3.1). The production function (PF) approach (also known as the parametric approach) and the growth accounting approach (also called the non-parametric index number method) are the two primary methodologies used in non-frontier methods for predicting growth in TFP. It is from the production function that the parametric and non-parametric approaches to the non-frontier methodology are derived (Dhehibi, 2015).

As mentioned before, growth accounting (GA) is one of the non-parametric index number methods of the TFP measurements. It is a way of evaluating the impact of numerous variables on economic growth. Besides, GA is a method for assessing the influence of various factors on economic growth. It divides output growth into the growth of labor, land, capital, education, technical knowledge, and other sources with the support of the aid of marginal productivity theory. The growth accounting technique for TFP measurement is characterized via calculating the difference between output growth and the weighted sum of all inputs to generate output growth related to what (Solow, 1957b) refers to as technical change or residuals. Therefore, index numbers are fundamental in aggregating inputs and outputs (Gboyega, 2003). Besides, the production theory is used to develop the standard framework for estimating productivity change. For example, consider the production function below, which has one output and two inputs.

$$Y(t)= A(t)f\,[K(t), L(t)] \qquad (3)$$

In equation (3), Y(t) represents total production (output) at time t, K(t) represents the flow of capital services at time t, and L(t) represents the flow of labor services utilized at time t. Also, A(t) represents an efficiency parameter that allows for variations in the production function. The production function, defined by the level of technical knowledge and resource abundance, A, determines the highest output attainable with the given amount of inputs, L(t) and K(t) total production (output). Various factors can increase it, including current businesses expanding their input utilization, new firms entering the industry, technology improvements, and resource availability increase, creating shifts in the aggregate production function. For instance, Figure 3.1 below provides insight into the definition of productivity using the representation by a production function.

In equation (3), two levels of the production function are shown: $Yo(t) = Ao(t)f$ [K(t), L(t)] and $Y_1(t) = A_1(t)f$ [K(t), L(t)], where $Y_1(t) > Yo(t)$. In the figure below, the vertical axis represents different units of output level, where Y' > Y. Also, the horizontal axis represents various levels of an aggregate input index, X, where X'> X. When the level of technical knowledge and availability of resources both remain constant. However, more inputs are used for the manufacturing of products, X' > X, and companies will move to the actual production function, $Yo(t) = Ao(t)f$ [K(t), L(t)], from B to C.

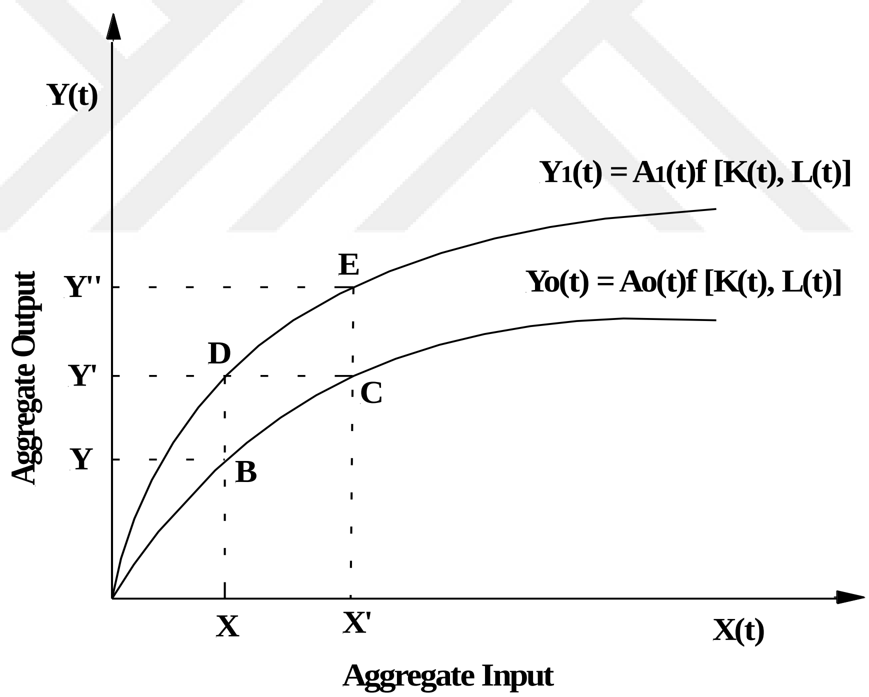


Figure 3.2. TFP representation by a production function

Source: Adapted from Saikia, Dilip (2009), elaboration from Kalirajan and Shand (1997).

At the same time, the firms use more capital and labor to generate more output, and total output (production) rises from Y (t) to Y' (t). Besides, the total production units can also grow when a firm adopts technological innovations (technical improvements), while the same quantity of input is employed and resource abundance remains unchanged.

The state-of-technology index increases from Ao to A_1' in this instance, and the production function shifts from Yo(t) = Ao(t)*f* [K(t), L(t)] and Y_1(t) = A_1(t)*f* [K(t), L(t)].

Besides, the shift upwards of the PF at a constant input bundle X is indicated by moving from point B to point D, while output units rise from Y to Y'. Finally, Firms may now produce more output, Y', while using the same amount of input, X. According to economists, the company is now more productive. The fundamental problem of productivity analysis is to use data on the prices and quantities of inputs and outputs to allocate the growth of Yt among the growth rates of K(t), L(t), and A(t). If the growth-accounting framework is used non parametrically, it begins by taking the logarithms of equation (3) and then logarithmically differentiating the equation with respect to time. The logarithmic differential may be expressed as follows:

$$\begin{aligned} dlnY(t)/dt &= (dY/dt)\,(1/Y) \qquad\qquad (4)\\ &= [\partial lnY(t)/\partial lnK(t)]\quad [dlnK(t)/dt]\\ &+ [\partial\, lnY(t)/\partial\, lnL(t)]\quad [dlnL(t)/dt]\\ &+ [\partial\, lnY(t)/\partial\, lnA(t)]\quad [dlnA(t)/dt] \end{aligned}$$

The GA approach entails accumulating thorough records of inputs and outputs, combining them into input and output indexes, and using them in the TFP index, as mentioned before. At the same time, the various index numbers methods describe intertemporal changes in numerous and different ways. Among the index number available, the three examples of indexes are Laspeyres exact index, Tornqvist, and exact geometric index. In the literature on the theory of index numbers, it has been demonstrated that the Törnqvist index of inputs possesses several desirable characteristics. For instance, one of the significant works by (W. Diewert, 1976) established that the Törnqvist index is an exact index for and hence consistent with a "*translog*" production structure. Besides, it is developed in the 1930s at the Bank of Finland; the Törnqvist index makes use of logarithms to compare two entities, such as two countries or two companies, or to compare a variable belonging to the same entity at two different times in time (Törnqvist, 1936). Even though the Laspeyres index has been widely used, the Tornqvist index is becoming more popular and the most often studied, and it is applied changing-weight index. This departure is because the index offers different estimations. Therefore, the exact implications of a change in these indexes cannot be predicted (Allen & Horn, 1975).

The Laspeyres exact index is thought to be exact for, or imply, a linear production function in which all inputs are perfect substitutions in the manufacturing process. Laspeyres are the most widely utilized indexes, and these indices use prices or quantities to weigh individual outputs or inputs while building aggregates (L. G. Allen & Horn, 1975). For a given amount of inputs or outputs, the Laspeyres index can be represented as:

$$Q_L = \frac{\sum \boldsymbol{P_i^0 X_i^I}}{\sum \boldsymbol{P_i^0 X_i^0}} \quad (5)$$

In equation (5), Pi and Xi denote the price and quantity of good I at time t. Assuming prices are maintained constant at their base time-period levels, the Laspeyres index illustrates how much of the change in total quantity value is due to pure quantity changes. A Laspeyres price index can be established similarly, with the quantities used as weights remaining constant at their base time-period levels (Allen. (1975).

On the other hand, the Tornqvist provides more precise change approximations than Laspeyres indices because of intermediate substitution options. There should not be either ideal or non-substituted for the individual components of the aggregate but intermediate alternatives. Due to the prices or quantities in comparison between the two time periods, enter the index to reflect potential changes in the index mix (Diewert, 1976). Similarly, The Tornqvist index is a discrete approximation of the broader Divisia index, implying a homogenous translog production function. Therefore, the Tornqvist quantity index can be stated in the following way:

$$Q_T = \ II_i \left[\frac{X_i^I}{X_i^0}\right] 0.5(S_{iI} + S_{i0}) \quad (6)$$

In equation (6), Xi^k is the value of the i^{th} price or quantity in time k, S i^k is the proportion of total income (cost) of output (input) I in time k, it represents the natural logarithm, and Π_i is the product operator. As weights, revenue, or cost shares are applied to compute aggregate output and input indices; technological change must be neutral. Furthermore, the underlying transformation function must be detachable in outputs and inputs.

Furthermore, various previous studies demonstrated a correlation between Divisia indices and theoretical productivity indicators (C. R. Hulten, 1973; D. W. Jorgenson & Griliches, 1967; Solow, 1957b). They noted that the Divisia index is a continuous index form, whereas the Törnqvist index is its discrete equivalent. At the same time, according to (W. Diewert, 1992), "*Unfortunately, these Divisia indexes necessitate the collection of price and quantity data on a continuous-time basis, which is unachievable empirically*." Thus, since then, the Törnqvist index has likely become more widely employed to quantify multifactor (TFP) productivity (Pilat, 1996). However, according to (W. Diewert, 1976), the evident drawback of TFP measurement is the difficulty separating technological improvements from the impacts of scale economies and input substitution.

To conclude, the geometric index exacts the CD-PF. Furthermore, the term *'exact'* refers to calculating the percentage change in variable costs at time t that cannot be explained by changes in inputs, outputs, or variable input prices. Almost all indices are based on cost and revenue shares in constrained production functions. In contrast, the Superlative indexes are those that are accurate even with a variable unit cost function or production function (Allen & Diewert, 1981). Thus, this section briefly mentions and reviews all three forms of output indexes to experimentally examine the differences between the Laspeyres, Tornqvist, and Geometric index formulas.

On the other hand, as mentioned before, the econometric approach is one of the parametric index number methods of the TFP measurements. The primary goal of measuring productivity using econometric techniques is to estimate an explicitly stated production function, primary or "*primal*" or the dual or "*cost or profit*" functions, to create a direct correlation between productivity growth and critical features or parameters of either of the function. Among the benefit of this approach, the most significant advantage of this technique is that its econometric application results in parameter estimates of the production technology that can be used to measure productivity advancement in the process (Berndt & Christensen, 1973).

In recent years, the econometric approach to measuring TFP has made a lot of progress due to the integration of discoveries in duality theory and flexible, functional forms with econometric theory. Among the methodology used in most investigations, they closely followed (Berndt & Christensen, 1973) essential publication on the translog production function. Besides, it is pointed out that a common econometric technique to measure the rise in productivity will consist of defining the function of technology as a PF, a cost or a profit function, and estimation of derivatives.

Hulten, (2001) points out that there is no reason why the econometric technique and the index number approach should be considered rivals; instead, he cites particularly fruitful cases of the working together of the two methods (synergism). There are synergies, mainly when econometric approaches are employed to explain the productivity residual further, thus lowering ignorance over the "*measure of our ignorance*. According to Hulten, (2001), the "*Economic techniques are best suited for academically oriented, single-study examinations of productivity growth."* Besides, because of their potential richness and testable setup complement the non-parametric - index number approaches that are the suggested tool for periodic productivity statistics.

Although much research has been conducted on the subject, the literature has not yet reached a consensus on the best approach to assessing TFP growth. Typically, TFP measurements are not always the best for all purposes, and there is no complete TFP measure for all instances that may be experienced in the real world (Mahadevan, 2003). Besides, as stated in the literature, estimating the aggregate PF confronts the researcher with numerous problems, including the potential endogeneity of capital and labor. These might have affected the elasticity estimates obtained and the TFP values obtained. Therefore, it is argued that researchers and readers need to keep these possible biases in mind when interpreting the findings. The critical productivity Measures are described and summarized in table 3.1 below, based on (Gál, 2013) study on assessing total factor productivity at the firm level.

Type of output measure	Type of input measure			
	Labour	**Capital**	**labor and Capital**	**Capital, labor, and intermediate inputs (energy, materials, services)**
Gross output	Labour productivity (based on gross output)	Capital productivity (based on gross output)	Capital-labour MFP (based on gross output)	KLEMS multifactor productivity
value-added	Labour productivity (based on value-added)	Capital productivity (based on value-added)	Capital-labour MFP (based on value-added)	
	Single-factor productivity measures		***Multifactor productivity (MFP) measures***	

Figure 3.3. Summary of the main Productivity Measures

Source: OECD 2001 and Gal (2013)

Specifically, the studies of productivity at a firm's level often assume that output (commonly measured as VA or deflated sales) is a function of the inputs used by the firm and its productivity (Katayama et al., 2005). Besides, following the functional connection, the "*residual TFP measure examines the effect of multiple policy actions*." Therefore, this thesis focuses on estimating multi-factor productivity (TFP) at the firm level based on the value-added approach in general; since it is a critical measure of manufacturing performance and a key indicator for policymakers at the macro, industrial, and firm levels. Besides, labor productivity measures are of particular importance because they often reflect levels of welfare and development (Heshmati & Rashidghalam, 2016).

3.1.3. Growth Theories perspective on Productivity

This section reviews the neoclassical and new growth theory's perspectives on productivity growth. First, it summarizes the relationship between investment and productivity from the perspectives of two different theories: the neoclassical and the new growth models, respectively. Although the models focus on distinct elements of productivity development, they both add to our knowledge of the growth process (Dale Weldeau Jorgenson & Jorgenson, 1996).

However, both theories emphasize the importance of investment, but the exact effect on productivity growth varies. Investment is broadly defined as spending on physical assets, education, training, and other forms of human capital accumulation and research and development. Additionally, the notion that broadly defined capital produces mainly internal and decreasing returns is a defining feature of neoclassical thought, instead of the new growth theory's emphasis on outward and constant or rising returns. This results in different viewpoints on the investment-productivity relationship and the possibility of long-run growth (Aghion et al., 1998; Sala-i-Martin & Barro, 1995).

The basic neoclassical growth model is among the widely known growth models in economics. The famous (Solow, 1956, 1957a)- article standardized the neoclassical model, combined theory with national account data, and laid the groundwork for many growth studies. Besides, the neoclassical framework's attractive simplicity and intuition have made it the backbone of practical productivity and economic development studies. According to (K. J. Stiroh, 1998), although popular, the typical neoclassical model has several drawbacks. First, early research ascribed much of the increase in labor productivity to external factors (Solow, 1957a). The neoclassical model failed to explain key US productivity patterns, including the post-1973 slowdown in the 1970s and 1980s. Second, since capital accumulation is susceptible to decreasing returns, a steady-state increase in per capita variables is inevitable. Furthermore, the worldwide data did not match the fundamental neoclassical model in terms of observed disparities in income, capital shares, and rates of return. As a result of these issues, more research on investment and productivity improvement has been conducted by (Mankiw, Phelps, & Romer, 1995).

Accordingly, one method was developed by (D. W. Jorgenson & Griliches, 1967) and reported by (Dale Weldeau Jorgenson, 1996) remained firmly rooted in the neoclassical paradigm and aimed to improve measurements of investment, capital, labor, and other omitted inputs to decrease the size of the unexplained residual in the analysis. This approach was not intended to explain the origins of technological development but rather to diminish its significance as an empirical explanation for growth studies.

Furthermore, the endogenous (new growth) theory was created to go beyond the neoclassical paradigm by proposing an endogenous mechanism for long-run productivity development, either by eliminating the declining returns to capital or explaining technological change as the consequence of particular activities (Segerstrom, 1998). Besides, endogenous growth models are defined by (Segerstrom, 1998) as those in which "*the rates of technological change and economic growth are endogenously determined based on the optimizing behavior of firms and consumers*." In addition, in his research, (C. Hulten & Schwab, 2000) cites noncompetitive markets, growing returns to scale, externalities, and endogenous innovation as major components of the new growth theory.

Moreover, among other things, one of the main motivations for creating endogenous growth models was the aim to avoid the neoclassical conclusion that only external technological development causes long-run productivity increase. Indeed, one may simply assume a constant marginal product of capital, as in the so-called "AK" models, in which output is a linear function of capital, with $Y_t = Ak_t$. Accordingly, long-run productivity growth may continue, and any change in the level of technology or savings rate results in a change in the pace of productivity increase over the long term. Consequently, (Romer, 1986), in a seminal article that served as the impetus for the new growth theory, - proposed a mechanism and accompanying economic explanation for why capital could not be subject to diminishing returns. The potential of external effects, wherein research and development activities of one firm spill over and influence the stock of knowledge accessible to all firms, was of special interest to Romer. These Firms are subject to constant returns to scale for all private inputs, but the degree of technology ‘A’ fluctuates depending on the aggregate stock of certain privately supplied inputs (Romer, 1986).

Therefore, despite the pioneering works done through neoclassical on growth theories in general and productivity in particular, the main difference between neoclassical and new growth theories is the joint returns to capital and their implications for long-run productivity growth. The capital (as broadly defined as all accumulated inputs) suffers from decreasing returns in the neoclassical paradigm, and productivity growth is ultimately decided by exogenous technological development. On the other hand, there are constant returns to capital in the case of endogenous growth, resulting in long-run growth in per capita variables. While both perspectives explain development, they concentrate on distinct elements and are not mutually exclusive. Moreover, the new growth theorists developed an advanced growth model to explain the evolution of technology due to *“economic agents' actions*.” In contrast, neoclassical economists developed advanced measurement tools to clearly assess technical progress by removing the “*transitory impact of input accumulation”* Finally, both significantly contributed to the areas of productivity studies, in particular (K. Stiroh, 2001).

The modifications of the neoclassical model (endogenous growth models or new growth theory) were devised to challenge the popular neoclassical notion that an exogenously driven change in technology could only explain a long-run gain in productivity. Furthermore, the endogenous growth literature, according to Scherer (1971) as mentioned in (Griliches, 1957, 1991), was developed in response to the naive assumption that technological development's advantages (also known as “*manna from heaven*”) were determined by "*outside the system*," as (Griliches, 1957) doctoral thesis and contemporaneous paper demonstrated. On the other hand, Griliches, (1957) looked at technical progress in economic factors, pointing out that hybrid corn seed penetration followed a logistic distribution. The dissemination of innovations and the ensuing technological revolution are similar to seed variation penetration in agricultural output.

In reality, various academics have uncovered countless examples of similar patterns, including (Mansfield, 1961), a productivity pioneer who treated technology development and imitation rate with equal foresight.

In the "*new growth theory*," the production frontier is shifted by endogenous factors to answer the question of the source of the spillover; accordingly, (Arrow K. J. 1962) emphasized the " *learning-by-doing*" (Romer, 1986) modeled the degree of technology 'A' as a function of the "*stock of research and development."* At the same time, (Lucas, 1988) as a function of the "*stock of human capital*," (D. Coe, Helpman, & Hoffmaister, 1997; D. T. Coe & Helpman, 1995) as a function of "*trade spillovers."* Additionally, they are assumed that the explanation for the spillover that endogenously dictates technological progress is a relaxing of limitations on its use. This is another way of expressing that the efficiency of current technology (including innovations) is a primary determinant of TFP growth. Besides, another observation concerning endogenous growth models and the necessity to address endogeneity constraints in productivity evaluations should be made at this point.

Even though there has been much research on the structural modeling of productivity models, it is beyond the scope of this study and this section to explore this large body of work in detail. Nevertheless, several researchers, most notably those linked with the NBER, have addressed these concerns, as evidenced by studies (Griliches, 1998; Griliches & Hausman, 1986; Stoker, Berndt, Ellerman, & Schennach, 2005), to mention a few.

3.1.3.1. The Schumpeterian model

As noted before, as the neoclassical paradigm serves as the primary reference point in growth economics, the Schumpeterian paradigm is the second branch of the new wave of endogenous growth models (Aghion & Howitt, 1992, 1998). This paradigm evolved out of contemporary industrial organization theory and positioned companies and entrepreneurs at the center of growth. The paradigm is based on three basic concepts: first, long-term growth necessitates innovation, which can take the form of process innovations (improving capital or labor productivity), product innovations (introducing new products), or organizational changes (to make the combination of production factors more efficient). Secondly, successful innovators earn monopoly rents from investments, including research and development (R&D), skills investments, and market expansion. The fact that invention produces positive knowledge spillovers (on future research and innovation activity) is an essential factor to consider when considering public involvement in the growth process. Hence the state's position as a co-investor in the knowledge economy. Thirdly, creative destruction, specifically, old innovations, technology, and abilities, is obsolete by new innovations (Aghion & Howitt, 1992, 1998).

Consequently, the progress includes a struggle between the old and the new, which innovators fight to change, making their work obsolete. Thus, innovation-led growth is associated with the increased company and labor turnover in OECD nations. As a result of this process of creative destruction, new innovators enter the market, and old inventors depart. Thus, a Schumpeterian growth theory prediction number one is: ‘*’Turnover is positively associated with productivity increase*’’. The model also implies that “*excessive innovation-led growth may be excessive under laissez-faire.”* The Schumpeterian theory, more precisely, begins with an industry-level production function as follows:

$$Y_{it} = A_{it}^{1-\alpha} K_{it}^{\alpha}, 0 < \alpha < 1 \qquad (7)$$

In equation (7), ‘A' refers to a productivity indicator associated with the industry i's most current technology at time t. K_{it} denotes the flow of a single intermediate product utilized in this sector, which is generated one-for-one by final output or, in the fullest form of the model by capital, Y_{it} is the aggregate of industry-specific outputs. Each intermediary product is solely created and marketed by the most recent inventor. Successful innovators in a sector i enhance the technological parameter ‘A_{it}’ and displace the prior product until the next innovator replaces it. Therefore, one implication of the Schumpeterian paradigm is that “*greater growth typically implies a higher company turnover rate*.” This process of creative destruction results in the entry of new innovators and the exit of previous innovators (Aghion & Howitt, 1998). According to (Aghion, Blundell, Griffith, Howitt, & Prantl, 2009), more flexible labor markets (which allow the process of creative destruction) promote greater productivity growth in advanced economies in the world.

3.1.4. The significance of productivity

This section examines the importance of productivity in general and the specific instance of Ethiopia. A strong emphasis on productivity is essential for economic growth and development in the world economies that we live in today, and it cannot be overstated. Productivity is critical for both economic growth and development. Similarly, numerous studies have been undertaken on the subject, specifically on the significance of productivity, and shown its importance from different perspectives. According to (Wen, 1993), there were three sources of growth; to show this created, a diagram. Accordingly, the first is providing growth in a traditional way, the second is providing growth through institutional innovation, and the third is providing growth via technical development.

Similarly, the MFP increases help and improves the economy and society in different ways. For instance, productivity gains result in increased output and revenue for various economic classes, and production growth directly adds to economic growth. Then the rise in real incomes helps to a better living standard. Moreover, according to economic theory, productivity gains in an industry or firm can impact profitability, pricing, and worker remuneration. Thus, more output can be generated with the same inputs if some inputs are of better quality or if production arrangements are changed.

In contrast, the same product can be generated with fewer resources (Apostolides, 2008). Furthermore, According to Oyeranti (2003), productivity was studied at all levels because of its strong correlation to people's living standards. For instance, on an individual basis, it is reasonable to claim that a man's living standard is determined by his ability to provide for himself and his family with the necessities for maintaining and enjoying life. The larger the number of products and services produced or imported into a given economy, the higher the average quality of living.

According to many development plans and strategies, boosting productivity is a significant concern in developing and developing nations' economies and is expected to benefit the economy. At the same time, (Wonnacott & Wonnacott, 1986) suggests that productivity improvement is a key to economic growth in global economies. Moreover, a rise in productivity can increase real earnings across different economy levels; for instance, In the case of a firm, more productivity means increased profit or income. Thus, the firm may use retained earnings to fund future investments, increasing productivity. Then it is believed that Increased dividends from the company would boost the income of the firm's shareholders. In the case of labor, a rise in labor pay might increase labor income. In the case of clients, a decrease in the price of service may result in an increase in the actual earnings of the clients. At the same time, productivity increases lead to increases in production (from the industry to the national level) and growing incomes in society, which leads to an improvement in living standards in the nations as a whole. As stated previously, the rise in revenue depends on what businesses do with higher earnings. Therefore, rising output and incomes contribute to the country's economic growth, which is the primary goal of the national economic policy of every country in the world. Thus, these are among the main reasons boosting productivity benefits the organization, industry, economy, and society as a whole (Apostolides, 2008; Pilat & Schreyer, 2003).

Furthermore (Scott 1983), as mentioned in (Gboyega, 2003), his model for a low-productivity trap validated this conjecture. The significance of productivity is that it has the potential to break the vicious cycle of poverty, the low-productivity trap, and unemployment. Among the most important relationships in economic analysis is the link between productivity and a country's overall well-being. Furthermore, the International Labor Organization (ILO & ADB, 2015) stated that productivity is the primary source of sustainable economic growth, social advancement, and a rising standard of living. Moreover, the only reason certain countries with very few resources can live a higher standard of living than others with sufficient resources seems to be their productivity level and growth. Therefore, increased productivity is beneficial to long-term economic growth and, as such, is an important policy consideration (Conway, 2016).

As discussed so far, in today's world economy, all the world leaders, policymakers, public officials, and politicians discuss productivity enhancement as a remedy for numerous societal problems. Thus, productivity has become a topic that everyone is concerned about, and it has become a real concern in today's globalized society. There are several strategies to increase productivity at work. In many sectors of society, economists see productivity as a significant source of economic growth and increasing real income. Industrial supervisors and engineers want to stay on top of production schedules, reduce the number of faults and rejections, achieve excellent quality, and save money by increasing productivity. Also, the company leaders and managers see it as a realistic solution to rising global competition, lowering production costs, and increasing profitability (Hailu et al., 2020; OECD, 2001; Pilat & Schreyer, 2003).

As mentioned in the industrial policy section of this thesis, Ethiopia aims to be Africa's light manufacturing hub by the year 2025. Thus, under the GTP-II, Ethiopia's primary policy promotes quality, productivity, and competitiveness. To accomplish this, the Ethiopian government has prioritized the growth of the manufacturing sector, with productivity enhancement in the manufacturing sector being a key policy pillar, as discussed before in detail. In particular, GTP II focused on structural transformation quickly, incorporating various activities from low to high productivity sectors, mainly the manufacturing sector (Hailu et al., 2020). It is believed that the sector has much room for expansion, and in this endeavor, manufacturers are expected to play a crucial role in the country's economy. Besides, the Ethiopian government's GTP intends to transform Ethiopia into a lower-middle-income nation by 2025 (Rao & Tesfahunegn, 2015).

Moreover, as it is known, Ethiopia's contemporary industrial processes are largely labor-intensive since the nation has a large workforce with many young people ready for work in industries. However, capital accumulation is limited in the industries, except for simple tools and light-duty machinery. Thus, industries can gain a competitive edge if a productive workforce pays low rates or minimum wage payments (Rao & Tesfahunegn, 2015). Moreover, the LP is an appropriate indication of a firm's productivity in a nation where labor is the main element in production(Bernolak, 1997). As a result, labor productivity assessment is particularly important in Ethiopia's industrial development process, specifically in the manufacturing sector.

Besides, for numerous reasons, LP is a significant policy emphasis in nearly all countries globally, not only those with labor-intensive industries. First, since the human aspect is regarded among essential production variables, LP should be the starting point for any productivity study. Second, it is a frequently used factor in determining living standards and economic growth. Third, LP is intuitively understandable; it is reasonably simple to measure with sufficient accuracy, and it is comparable internationally. Fourth, it is simpler to assess and discuss at all levels, such as federal, sectoral, and business levels (Gál, 2013; OECD, 2001).

Finally, the Ethiopian government is expected to benefit from a productivity increase. The importance of productivity will be expected to happen in Ethiopia if the available and appropriate industrial policies and development plans are implemented properly. Thus, among the productivity measures, this paper focuses on Ethiopia’s TFP, with labor Productivity also highlighted as a supplementary indicator of productivity.

3.1.5. Industrial policy and productivity in Ethiopia

This section focuses on the importance of Ethiopia's Industrial Policy in the country's efforts to increase productivity. As discussed before, several national development plans and strategies have been developed and executed in Ethiopia, dating back to the early 2000s; the industry sector in general and the manufacturing sector, in particular, have been given national importance following the formulation of the national industrial policy in 2003 by the FDRE. For instance, the PASDEP resulted in investments in social and economic infrastructure, agriculture, and urban development; Furthermore, the formation of favorable conditions for the industry is among the cornerstones of the previous two development plans called GTP (I and II) strategies. For instance, the GTP- I (2010/11-2014/15) industrialization plan focused on building a competitive manufacturing sector; the GTP-II (2015/16-2019/20), aiming to deepen structural transformation, is built on the GTP-I lessons acquired specifically concerned on the manufacturing sector. Furthermore, recently Ethiopia implemented a home-grown plan development Plan called Ethiopia 2030, the pathway to prosperity from 2020 to 2030. Therefore, it has a primary strategic pill of assuring quality growth, boosting productivity, and competitiveness of the economic sector; it was discussed in chapter one, the industrial policy section of this thesis (Ahmad, 2016; Gebreeyesus, 2016b).

However, despite several sectoral policies, strategies, and plans being implemented, the manufacturing industry's contribution to the overall economy has been reduced. The Ethiopian economy was relatively good during those previous plan periods, attaining rapid economic growth, raising citizens' per capita income and living standards, and reducing poverty rates. As a result, Ethiopia's growth was consistent and comprehensive, but it was also far greater than the regional average. Furthermore, the deepening structural transformation in which manufacturing industries dominate employment, consumption, and export has necessitated additional effort in creating institutions and technology preparedness. Moreover, the 2003 industrial development strategy is a first step toward enacting a stand-alone strategy. The strategy identifies important industrial sectors that deserve attention to build the platform for the industry to take its critical leading roles in the economy, such as textile and garment, meat, leather goods, agro-processing, and the construction industry (Demeke, Guta, & Ferede, 2006).

Furthermore, the policy was formulated in the sense of the global environment and free-market economy philosophy under the preceding principles: recognize private capitalists as a transformer of an industrial development plan, following the path of agriculture-led Industrialization, following the export-led industrialization, and focus on labor-intensive industries and using coordinated foreign and domestic investment, strong state control and mobilizing the whole society for industrial development (MoFED, 2010).

According to UNDP (2017), Ethiopia's manufacturing sector has remained underdeveloped despite attempts to expand it due to a lack of incentives, weak backward and forward links, and incentives to generate sectors that compete with imports. In addition, structural and institutional constraints are hindering productivity growth. While capital accounted for half of all growth between 2005 and 2017, productivity (TFP) had a minor contribution. It considers the possibility of increased inefficiency due to massive capital accumulation (UNDP, 2017).

Recently, Ethiopia's industrial policy has been rethought and revised following the country's 10-year Ethiopian home-grown plan (Ethiopia 2030: the pathway to prosperity), which runs from 2020 to 2030. The next ten-year plan's major reform agendas are inclusive and sustainable industrialization. They include the following - prioritize the growth of industrial sectors with a high level of local content, such as agro-processing and leather goods- "*encourage domestic manufacturing of primary and intermediate industrial inputs to strengthen the backward linkage of emerging manufacturing value chains.*" Besides, encourage the importation of competitive industries, utilizing the massive local market; create a framework for industrial relations. Similarly, the plan intends to keep the extraordinary economic development that the Growth and Transformation Plans have accomplished despite focusing more on the private industry. Therefore, Ethiopia's homegrown economic reform agenda is widely regarded as a well-coordinated response and roadmap for the country's economic development (FDRE, 2019).

In addition, Ethiopia's new horizon of hope action plan aims to enhance the investment climate, reduce unnecessary expenses, and promote investment, business creation, and productivity. The government also intends to strengthen the private sector's involvement through foreign investment and industrial parks. According to Ethiopia's Prime minister, the remaining domestic goal is to improve economic and social governance (FDRE, 2019).

3.1.6. Productivity improvement in Ethiopia

This section addresses what is being done and what is being planned to boost Ethiopia's overall productivity. Ethiopia stands out among its African neighbors for its fast-infrastructural development, but its overall economic efficiency has not increased at the same rate. This is concerning since productivity growth is essential to long-term economic growth and hence a necessary signal for policymakers (Conway, 2016). Besides, improved productivity performance is a critical component of industrial development (industrialization) markets and firm productivity in SSA (Esaku, 2021; Mitiku & Raju .S, 2015b). Recognizing this, Ethiopia made the pursuit of productivity a key policy objective during GTP II, with the improvement of agricultural and manufacturing productivity being one of the major priority areas. Furthermore, the new Ethiopian home-grown plan (2020-2030), or the so-called *"Ethiopia's homegrown Economic reform agenda*," sectoral reform focuses on increasing productivity, sustainability, and inclusive industrialization. Besides, "*to uncover the national development potential that will propel Ethiopia to become the African icon of prosperity by 2030*" (FDRE, 2019).

On the other hand, concrete policy initiatives intended to boost productivity remain unknown, and a comprehensive and detailed investigation of productivity is suggested to concretize productivity policies. Moreover, various academics and experts have proposed several policy directions expected to boost productivity. For example, in the Ethiopian Productivity Report (2020), the authors have recently pointed out that "*establishing a policy and an operational organization, advancing the collection and publication of data, and setting medium-term goals are the primary ways to develop policies to improve productivity across the nation*." In addition, they proposed and mentioned some policy areas include such as: "*adjusting investment policy for a proper pace and more private projects; speeding up structural transformation, maintaining wage competitiveness, and also deepening Kaizen into a national productivity movement, constructing an effective* *enterprise support system, especially for SMEs, and pursuing productivity and ethical goals simultaneously*" (Hailu et al., 2020).

3.2. Empirical Literature on Determinants of Productivity

A substantial body of work on productivity determinants empirically and theoretically at the aggregate, industry, and firm levels. Specifically, the literature on multi-factor productivity or TFP and the performance of firms has been growing in recent years. Besides, the literature on industrial productivity and manufacturing industries, in particular, are studied by different researchers in other parts of the world.

The second sub-objective of the study is to examine the multi-factor productivity in manufacturing firms in Ethiopia. Therefore, this section was explicitly targeted to assess and compare the drivers of productivity and review the main determinants of multi-factor productivity or TFP in general and in Ethiopia's context. Thus, the researcher briefly discusses an empirical examination of productivity-related (TFP) determinants in this section. Consequently, knowing the nature and most important productivity determining factors for firms may give insights to improve their contribution to the economy via indications of good program design.

Accordingly, the more recent study by Aneja & Arjun employed a non-parametric Malmquist productivity index to assess productivity growth and components in the Indian high-tech and middle high-tech industries from 2008 to 2018. They utilized the gross value added (GVA) at constant prices as the output variable. In addition, they used input variables such as labor and capital. Since it is more appropriate for measuring TFP, labor is categorized as the total number of people employed. They discovered that the productivity increases in both the high and medium high-tech industries are increasing. On the other hand, the breakdown of productivity growth reveals that high-tech industries are driven by technological progress (efficiency change is time-invariant). On the other hand, the medium- and high-tech sectors are driven by technological efficiency improvements (catching up effect). It seems from their results that the high-tech sector makes effective use of its resources and that the medium high-tech industry develops a strategic plan that is technologically orientated (Aneja & Arjun, 2021).

Another recent study by Kumar, Mallick, & Sen studies the impact of productivity growth on domestic savings across countries. They are decoupling the roles of trend and cycle using a panel of 47 economies with at least 40 years of continuous improvement time-series data and using a variety of approaches. They identified that higher productivity growth leads to higher savings and increasing investment. Moreover, the dynamics of such productivity shocks have been detached from the trend and cyclical shocks to show that cyclical productivity shocks appear to impact savings rates significantly positively. Moreover, they indicate that comparing two countries with different productivity levels (high and low) in a counter-actual study, this finding remains robust and confirms that significant drops in productivity shocks have been linked with a large decline in savings rates (Kumar, Mallick, & Sen, 2020).

Besides, Esaku, assessed the importance of export market destinations for productivity increase in SSA using matching and difference-in-differences methods. It was determined at the firm level using Levinsohn and Petrin's (L-P) (2003) approach of using intermediate inputs as a proxy for unobserved productivity shocks. They found that exports boost the productivity of exporters, with the most productive firms exporting to many markets. Furthermore, they found that businesses can sell more products in new markets with a productivity improvement. In addition, research reveals that exporting to several countries enhances firm productivity by 42.3% compared to exporting to a single market alone. According to their studies, productivity increases correlate with age, size, and ownership, but similar findings exist across countries and industries (Esaku, 2021).

Following, Onubedo K, & Yusuf, employing the stochastic trans-log frontier model, studied the impact of access to finance on labor productivity and total factor productivity (TFP) using cross-sectional firm-level data. The research also calculated a model of instrumental variable (GMM) to tackle potential bias in endogeneity among access to finance and productivity of firms. The study results indicated that firms' productivity had been negatively affected by the lack of access to finance, particularly overdraft facilities in Africa. Besides, the result shows small firms and sole proprietorships are mostly affected because they have less access to finance (Onubedo, K, & Yusuf, 2018).

Satpathy *et al.* (2017), investigated the relationship between total factor productivity (TFP) and firm-specific characteristics that influence the productivity of Indian manufacturing enterprises. They employed data from 616 companies from 1998/99 to 2012/13. TFP was computed using the L-P technique, and factors influencing TFP were discovered using the FMOLS method. Their studies demonstrated that embodied and disembodied technologies determine overall productivity in manufacturing and other sub-industries. Similarly, the size of enterprises and the intensity of raw material imports are crucial factors in determining productivity among sub-industries (Satpathy, Chatterjee, & Mahakud, 2017),

Sai Ding et al. (2016) studied TFP and its drivers in China's industrial businesses. GMM estimates for a large dataset and CD log-linear PF fixed effects were used to generate TFP. They rely on yearly accounting records from 1998 to 2007 from industrial firms. The determinant of TFP was also included in their production function model for calculating TFP. Finally, they employed the Haltiwanger approach to dissect measures of productivity growth into components that suggest resource reallocation across surviving businesses and the impact of company entrance and departure on productivity. The GMM estimate findings reveal that returns to scale are growing in the majority of sectors and a typically important upward trend signifying technological development. According to subsector decomposition, inter-firm resource reallocations occur more often between sectors than between provinces. The TFP of enterprises with state ownership is lower than that of businesses with no political affiliations or firms that are younger. Besides, depending on the industry, substantial political involvement and private ownership have varying effects on TFP. Also, exports and R&D are not considered vital TFP drivers in china. Finally, positive agglomeration spillovers are identified, and the importance of the firm's fixed costs and liquidity is established (Ding, Guariglia, & Harris, 2016).

The South African manufacturing TFP was estimated using firm-level data gathered between 2010 and 2013 by Newman et al. They looked at variances in the level and growth of productivity between manufacturing sub-sectors and variability in productivity levels within sectors to see whether there was any pattern. Following the work of Ackerberg et al. (2006), a modified version of Levinsohn and Petrin (2003) is employed. A two-step GMM estimator was used to estimate the model. According to the findings, productivity improved in almost all subsectors, although the pace of growth varied amongst subsectors. In addition, they find that the size of a corporation is inversely proportionate to its productivity and rate of expansion. They also uncover that participation in research and development and foreign commerce is associated with an increase in overall productivity (Newman et al., 2016).

Studies conducted by Richard Harris and John Moffat (2015) used British plant-level panel data gathered between 1997 and 2008 to study the factors affecting TFP and calculated production functions at a 4-digit SIC level. They looked at the elements that influence the TFP using the function of four plant characteristics: "internal and external knowledge; foreign ownership; multi-plant economies of scale and competitiveness; and spatial spillovers and 'place effects." They used system-GMM estimates, which allow for the inclusion of fixed effects and endogenous regressors in the model. They discovered that doing research and development is positively related to TFP and that the majority of foreign ownership groups have TFP that is greater than the national average. They also provide confirmation for a limited number of studies that have shown that plant age is negatively related to TFP. That vintage effects exceed the advantages of learning-by-doing in agriculture. They also discovered that knowledge generation is the most significant driver of TFP (particularly in manufacturing), with geographical location affecting overall productivity being the second most important determinant. Furthermore, they discovered that, despite its modest size, foreign ownership is considered to be the least relevant indicator of TFP (Harris & Moffat, 2015).

Goedhuys and Srholec used multi-level modeling to assess the impact of government institutions on the total factor productivity of 15,425 manufacturing firms from 32 developing countries. According to the findings, the technological infrastructure and educational system have a substantial impact and interact most strongly with firms' technical skills. Moreover, there are few justifications for governance steps conventionally regarded in the research (Goedhuys & Srholec, 2014).

Ayadi and Mattoussi (2014), using three firm-level datasets of 1323 Tunisian manufacturing firms from 2004 to 2006, explored the connection between company productivity and exports. The study evaluated both exporters and non-exporters. The findings indicate that fully exporting firms are more often self-selected to export markets and therefore have much less to benefit from exporting due to their possibly longer previous export experience. Besides, the study finds that in the longer run, fully exporting firms in sectors characterized by subcontracting regimes, such as the textile and electronics industries, are experiencing a distinct decrease in the export learning scope. Likewise, as in the agro-food industries, the export destination may also affect the scope of learning (Ayadi & Mattoussi, 2014).

Following this, Aiello F. et al. (2012) examined how the TFP of Italian manufacturing establishments is affected by internal company characteristics and geographical factors. They used a multi-level method that enables a clear difference between firm and regional-specific effects due to the hierarchical structure of their results. The first finding of their paper verifies that TFP firms are strongly affected by firm-specific characteristics; the findings apply to 2004-2006 and are shown as predicted. At the same time, it illustrates that position matters in describing the degree of the TFP of firms. Furthermore, they found that regional infrastructure endowments, local administration efficiency, and R&D investments positively impact firms' output.(Aiello Francesco, Valeria Pupo, & Fernanda Ricotta, 2012).

Schiffbauer & Ospina, (2010), using establishments-level data from the WBES database, presented empirical evidence of the influence of competition on FIRMS productivity. They have found a positive and robust deterministic relationship between competition proxies and productivity measures. They also observed that the countries that adopted product market reforms had a more marked rise in demand and consequently in productivity: the contribution to productivity growth due to competition driven by product market reforms was roughly 12-15%. At the same time, Poschke (2009) argued and evaluated the impact of a slight change in entry cost in the dynamic stochastic model of technology-choice heterogeneous enterprises. The study outcome explained one-third of the difference in TFP. It is also reported that the productivity difference occurs because the reduction in computation due to higher entry costs reduced the incentive to adopt more advanced technologies. Besides, the impact of entry costs on computation, firm diversity, and technology preference added to the findings relative to previous results; while the labor market is not competitive, entry costs are much higher (Schiffbauer & Ospina, 2010)

Another research by Li.Y. (2009) uses non-parametric (DEA) and parametric (SFA) to examine the efficiency and TFP of 22 mobile carriers from seven countries from 1995 to 2007. In addition, a second econometric data panel is also done to investigate the connection between regulatory reform. Based on the examination of the result of the study, efficacy indicators and adjustments in the TFP are reasonably sensitive to the choice of methodology. Besides, the findings of the second stage of the econometric analysis, on the other hand, show that changes in the mobile sector usually enhance a firm's productivity and TFP growth, with particularly strong contributions from the competition and independent industry regulators (Li, 2009)

Another Study by Goedhuys et al. (2008) investigated the determinants of productivity across manufacturing firms in Tanzania using cross-sectional firm-level data. The findings of their study show that only foreign ownership, ISO certification, and higher education management tend to affect productivity. The other technological factors, R&D and product and process innovation, technology licensing, and employee training, do not influence productivity. Their results also show there are significant influences from the wider business environment, but they appear to impact productivity and are robust to the different specifications of the model. Besides, they found that the credit restrictions, bureaucratic regulatory burdens, and a lack of business support services often hinder productivity, while higher productivity is correlated with a business association membership (Mohnen, Goedhuys, & Janz, 2008)

Similarly, the TFP of the Maghreb countries was investigated by Loko B. and Diouf M. (2009), who employed a PCA and a dynamic panel data model. Their findings demonstrate that reforms that seek to attract FDI and streamline the size of government, reallocate resources from low-productivity sectors to high-productivity ones, and encourage more women to enter the workforce might hasten TFP growth. Besides, reforms to enhance human capital, increase trade volume, and improve the business climate are equally significant. Again, their findings confirm the critical role of macroeconomic and structural influences, trade openness, and human capital in rising productivity growth (Loko & Diouf, 2009).

On the other hand, Akinlo (2005) examines the impact of macroeconomic factors on TFP in thirty-four SSA countries from 1980 to 2002. External debt is negatively and substantially associated with TFP in the study. In addition, agricultural VA as a proportion of GDP, interest rates on loans, and local price divergence from PPP are all factors that negatively influence the TFP. Conversely, their study shows that human resources, export–GDP ratio, private sector credit as a percentage of GDP, and foreign direct investment as a percentage of GDP has a significant positive impact on TFP. Besides, a strong positive effect on TFP was also discovered for manufacturing VA and liquid liabilities as a proportion of GDP (Akinlo, 2005).

Basti and Akin (2008) analyzed the productivity of Turkish and international firms. They selected non-financial enterprises between 2003 and 2007. Using the nonparametric DEA approach, the Malmquist Index was computed. In addition to productivity, Malmquist split productivity into efficiency and technological advancement. The study found no difference in productivity between domestic and foreign-owned businesses. However, except for 2006, the average productivity of both periods of enterprises declined every year (Basti & Akin, 2008)

In 2006, Kong and Tongzon analyzed the total factor productivity of Singapore's ten most important sectors from 1985 to 2000. For example, they used the DEA non-parametric frontier approach to generate the Malmquist Productivity Index (MPI) at the sectoral level. The study's analysis revealed best-practice sectors and laggards in inefficiency, technological, and total factor productivity changes. Additionally, these three productivity estimates considered the impact of inflation and economic cycles, resulting in more trustworthy figures for policymaking (Kong & Tongzon, 2006).

Mahmood et al. (2007) used the stochastic production frontier method to evaluate the efficiency of Pakistan's large-scale manufacturing industry. This frontier was calculated for 101 industries at the 5-digit PSIC between 1995/96 and 2000/01. Although the amount of the increase was modest, the findings of this research revealed that the efficiency of the large-scale manufacturing sector had improved. However, the outcomes were mixed at the disaggregated level, with most sectors improving in terms of technical efficiency and certain industries deteriorating in terms of efficiency (Mahmood, Ghani, & Din, 2006).

Fernandes and Ana Margarida (2006) examined the firm-level time-varying TFP indicators for 1999–2003 based on information gathered from a recent study of significant Bangladeshi manufacturing firms. Firm-specific deflators for output and input are used to compute TFP measurements, and unobserved simultaneity bias may be taken into consideration following Ackerberg et al. (2007). As a residual of a production function, TFP is calculated. Each industry's CD-PF is estimated using the logarithms of labor, capital, and a measure of the human capital of the workforce. Using OLS to estimate the PF coefficients implies exogenous input selections. Even after accounting for industry, area, and year fixed effects, they found an inverse correlation between firm size and TFP and an inverse-U-shaped correlation between firm age and TFP. In addition, they find that managerial quality and global integration are associated with company TFP. Eventually, they realize that power interruptions, bureaucratic barriers, and the incidence of criminality weaken firm TFP (Fernandes, Ana Margarida, 2006).

Fu (2005) conducted his research for a panel of Chinese manufacturers to determine TFP. In addition, the MPI assessed the TFP increase from 1990 to 1997. According to the findings, the study results revealed no evidence of substantial productivity increases at the industry level due to exports in a transition economy. Consequently, it has been suggested that a developed domestic market and a neutral outward-oriented policy are essential for exports to influence TFP development positively (Fu, 2005).

At the same time, various scholars have conducted several other empirical studies on productivity in Ethiopia. For instance, (Soderbom 2012; Bigsten and Gebreeyesus 2009; Bigsten and Gebreeyesus 2007; Bigsten et al. 2012; Melaku T. and Abegaz. 2013; Berhane. B 2013; Tekleselassie et al. 2018) are only a few examples of other researchers that have looked into productivity concerns relating to the Ethiopian manufacturing industry.

According to Soderbom (2012), big enterprises have a greater VA per worker than small ones. Therefore, he suggests that the country's value-added per person and GDP per capita may benefit from increasing the number of large firms (Soderbom, 2012). Furthermore, according to Bigsten and Gebreeyesus's findings, exporting firms were more productive than non-exporting firms (Bigsten & Gebreeyesus, 2009a). Moreover, as Bigsten and Gebreeyesus (2007) found, enterprises with better labor productivity develop more rapidly than those with lower labor productivity (Bigsten & Gebreeyesus, 2007).

Bigsten et al. (2012) investigated the relationships between business agglomeration, firm-level output prices, and physical productivity. They used census panel data for their econometric analysis. They discovered a statistically significant correlation between the agglomeration of establishments manufacturing a specific product in a given location and its price. Further, they found a positive and statistically significant relationship between the agglomeration of firms that produce a given product in a location and the physical productivity of firms in a similar location producing that product (Siba, Soderbom, Bigsten, & Gebreeyesus, 2012)

Saliola and Seker (2011), using micro-level data from manufacturing sectors in 80 developing nations, examine TFP performance at the firm level throughout the developing globe and across several regions. They used CD- PF to measure (TFP), which includes three components of production: “capital, labor, and intermediate goods.” In addition, they discovered that these nations had the greatest aggregate productivities over a wide range of regions (Eastern Europe and Central Asia; Latin America; Africa; and Asia) throughout the same period as the other countries. Also, according to the study, the greatest average productivities were found in Moldova, Nicaragua, Ethiopia, and Indonesia. Besides, Brazil has the most significant average productivity in the textile and chemical sectors (Saliola & Seker, 2011).

According to Berhane, (2013), the research investigates the influence of increasing the productivity of the manufacturing sector on the macroeconomics, sectoral output component and family income, and household welfare. The analysis used the recursive dynamic CGE model. Besides, the new version 2005/06 of the Social Accounting Matrix (SAM) model was used to calibrate the CGE model. The study thus demonstrated that the manufacturing sector is, in particular, the main driver of economic growth; the results indicate that the increase in productivity of agro-processing, non-agro-processing, and the overall manufacturing sector significantly increases real GDP and sectoral outputs (Berhane, 2013).

According to Getnet and Admit (2001), they found that Ethiopian experience in industrialization and competitiveness is poor and that the existing competitiveness capacity of the sector is not good. According to the government, manufacturing is a resource-based industry, but the data show this is not the case in practice. Besides, they found that all four-digit production operations in the clothing and leather sub-sectors are becoming uncompetitive even in the domestic market.(Getnet & Admit, 2006). Moreover, in a review article on the factors in determining size structure and productivity performance of manufacturing firms across developing countries, Tybout (2000) also cites ambiguity regarding government policies and demand situations, the weak rule of law, and corruption as significant factors that impede firms' operations (Tybout, 2000).

Moreover, various empirical studies and literature analyze the determinants and productivity of the manufacturing industry performance in Ethiopia. For instance, Lemi and Wright (2020), they conducted recent research that empirically explored the impact of exports and foreign ownership on Ethiopian and Kenyan firm-level efficiency, utilizing data from the WBES for Ethiopia (2006 and 2011) as well as Kenya Kenya (2007 and 2013). Empirical results from a typical CD-PF using Stochastic Frontier Analysis reveal that exporting allows firms in Ethiopia and Kenya to lower technical inefficiency. At the same time, a higher share of foreign ownership has the predicted sign but is not statistically significant. The findings further suggest that smaller firms and firms hiring temporary employees in both countries tend to be less productive over more extended periods. In addition, the expertise of a company's leadership helps Kenyan businesses minimize their technological inefficiencies. However, the effectiveness of innovation initiatives inside a company tends to rise with time. In contrast, the experience of managers for Ethiopian firms decreases productivity, although poorly, and innovation practices do not seem to influence firm productivity. Lastly, their analysis of the robustness of the nexus between export and productivity confirms that the one-size-fits-all causal relationship is not valid (Lemi & Wright, 2020).

Another recent study by Tekleselassie et al. (2018) examined productivity determinants using census data from medium and large companies in Ethiopia's textile and clothing industries. The research findings demonstrate that labor and material inputs are the primary drivers of firm-level outputs, whereas the relationship between production and capital input elasticity is minor. Possibly, this is related to the fact that the textile and garment industries are labor- and material-intensive. Besides, the study showed that human resources, agglomeration, and reward programs are the main drivers of productivity. The L-P endogeneity was estimated using two-year panel data constructed using 2015 recall data, which was utilized to estimate the simultaneous determination of productivity shocks and labor input. Cross-sectional and panel data estimators give comparable findings in their testing (Tekleselassie, Berhe, Getahun, Abebe, & Ageba, 2018).

Mitiku et al. (2015) examined the role of combined factor productivity (CFP) in four Ethiopian manufacturing sub-sectors in a recent study on Ethiopian manufacturing companies from 2006 to 2012. The researchers employed a panel data set with pooled OLS and fixed effects estimators to estimate CFP. The second CD-PF variant uses labor and capital as inputs, with no other inputs. They also use the value-added method as the dependent variable rather than gross output for the third method. Finally, the TFP variant is used for the typical primordial CD-PF. Besides CD -PF with four factors of production capital, labor, energy, and materials are is used to estimate CFP. They measure output by the firm's sales value and capital by machinery, vehicles, and equipment replacement value. Besides, they measure labor by the total number of hours worked. Finally, CFP is approximated as a residual term. Their results show that in pharmaceuticals, CFP levels range from 2.92 in leather to 8.01. The main determinants of manufacturing production are productivity and labor, while capital is statistically insignificant in determining output, especially in the KL model. Almost all sub-sectors had negative CFP growth post-GTP (Mitiku & Raju .S, 2015a).

Melaku and Abegaz evaluated the TFP growth and technical efficiency in the Ethiopian manufacturing sector at the firm level using unbalanced panel data gathered from the CSA's from 1996 to 2009. Besides, TFP growth is subdivided into technical change (progress), technical efficiency change, and scale impact. Their empiric results show the presence of significant inefficiencies, an inefficiency that explains at least 14 percent of the difference in performance between firms. Though TFP has improved during

2001/02, it is mostly attributable to shifting the production frontier. Moreover, the scale effect is zero or very slight since most industrial groups constantly return to scale (Abegaz, 2013).

Bigsten and Gebreeyesus (2009) used a 10-year firm-level panel dataset from Ethiopian manufacturing enterprises to study the causal relationship between exporting and productivity. They employed a system-GMM approach with a single step, with the export status instantly reflected in the PF. In addition, instrumental variables were employed to address endogeneity concerns, and a matching analysis was conducted to address selection bias. The researchers then evaluate exporters' pre- and post-export investment, employment, and sales behavior. Finally, they use a matching technique to control unobserved heterogeneity and selection bias (GMM). To quantify productivity, they developed input-output series. Gross production was reduced using deflators for each two-digit industrial classification. Lastly, they found considerable evidence of both self-selection and learning-by-exporting. They found prior exporters have altered the PF by between 15 and 32%, depending on the specification. In addition, exporters employed three times as many people and paid 1,6 times as much as non-exporters (Bigsten & Gebreeyesus, 2009b).

Biesebroeck (2005) examined how export increases productivity; as advocates of trade liberalization argued, exporting allows firms to achieve higher productivity levels. Moreover, a panel of manufacturing firms examines this hypothesis in nine low-income countries in sub-Saharan Africa and countries like Burundi, Cameroon, Cote d'Ivoire, Ethiopia, Ghana, Kenya, Tanzania, Zambia, and Zimbabwe. The results show that after joining the export market, exporters in these nations are more profitable and, more significantly, enhance their productivity advantage. Again, their findings are robust- when adjusting for unobserved variations in productivity and self-selection in the export market using various econometric techniques. Finally, they have shown that Scale economies are a significant channel for productivity advancement. At the same time, credit constraints and contract enforcement issues prevent firms that only generate economies on the domestic market from fully leveraging economies of scale (Van Biesebroeck, 2005).

In summary, even though there has been a lack of comprehensive research on TFP and industrial policies in Ethiopia's manufacturing sector in recent years. Thus, the reviewed empirical works indicate that inefficiencies and low productivity characterize the industry, and a low contribution of manufacturing to value-added and other economic contributions when compared with other developing countries in the world and neighboring countries in Africa. Because of this, it has a low level of competitiveness in the world market and makes a minimal contribution to export revenues. It also contributes little to employment and contributes a small percentage of GDP. The use of outdated methods (lack of new technologies), relative smallness (not being able to participate in exports), lack of competition, a lack of skilled labor, and a lack of R&D activities might all play a role in the lower productivity and efficiency. Other factors that prevent companies from performing up to potentially include a lack of availability of raw material (especially the imported raw materials), capital (finance), and demand.

Accordingly, this thesis will examine the industrial production, multi-factor productivity (TFP), and development of industrial policies in Ethiopia in the case of manufacturing sectors by using reconstructed balanced panel datasets in general. Besides, one of the sub-objectives will measure the growth and level of TFP and labor productivity (VA per employee) at the firm level and examines the TFP determinant in the manufacturing sector in Ethiopia; in general, a GTP priority, export-oriented and import substitution sub-sectors in particular.

CHAPTER FOUR

4. METHOD, RESULT AND DISCUSSION

4.1. Methods

This chapter is devoted to methods, results, and a general thesis discussion. Specifically, it focuses on methodology, including describing the data and sector, the study's variables and hypotheses, the panel data compilation process, and data analysis methods, including descriptive statistics and econometric models. In the final section of the fourth chapter, findings and interpretation of descriptive statistics and econometric analysis results are identified and thoroughly discussed. It focuses on the TFP level, growth estimation, and its determinants at the firm level. Consequently, it will provide policy recommendations for enhancing Ethiopian industrial productivity in general and within the context of the manufacturing sector.

4.1.1. Description of the Ethiopian Manufacturing Sector and Firms

It is known that various industrialized and emerging economies worldwide rely heavily on the manufacturing sector. At the same time, the manufacturing sector has been significantly and largely interconnected to other economic sectors. However, it is still in its infancy in terms of growth and economic impact in Ethiopia. Accordingly, a robust manufacturing sector is necessary for economic development, sustained economic growth, and resistance to negative influences. Therefore, it is believed that strengthening and expanding the sector would help reduce unemployment by creating more employment opportunities. It would also conserve foreign currency and improve the trade balance by generating foreign exchange and substituting imported goods. In addition, it is well-known that the sector's growth and consolidation contribute to a country's economic transformation and development by enhancing other industries.

The Ethiopian central static Agency (CSA) definition of manufacturing was used for this study, which defines manufacturing as follows:

> *"the physical or chemical transformation of materials or components into new products, whether the work is performed by power-driven machines or by hand, whether the work is done in a factory or the worker's home, and whether the products are sold at wholesale or retail. The assembly of component elements of manufactured items is likewise regarded as a manufacturing activity.*

It is based on the International Standard Industrial Classification (ISIC Revision-3.1) system. Besides, the CSA defines large and medium scale manufacturing industry as *"all manufacturing establishments that employ ten or more people and use electricity for their production processes" (CSA, 2018).*

Studies on the characteristics, productivity performance, and constraints (limitations) of manufacturing firms and sectors in the least developed nations (low-income countries) is frequently hampered by a shortage of data. Ethiopia's formal manufacturing statistics are extremely comprehensive compared to other African nations. Ethiopia's central statistical agency provides the majority of the available data (henceforth CSA). Specifically, the most comprehensive survey is the LMSMI (large and medium scale manufacturing industries) survey, which aims to include all manufacturing enterprises in the country employing ten or more people and utilizing power-driven machinery (See the section on data sources for details).

Furthermore, it is known that the availability of comprehensive, accurate, standardized, timely, and readily available survey data is crucial for measuring, monitoring, and analyzing the level and growth of productivity at the firm level and its determinants and variation throughout the sector. Consequently, it will demonstrate outcomes and evaluate the impact of development policies and plan objectives.

4.1.2. The source and description of the data

This thesis used micro and macro data sets to support its arguments—firm-level microdata was mainly used for the empirical chapters. In contrast, macro-level data were primarily used for the chapters and sections on the overview of the country's background, including the essential macroeconomic indicators descriptive analysis, general sector-specific characteristics, and other factors targeted at supporting the study objectives and shining a light on national-level technical capabilities.

The macro data was also utilized to deflate the nominal values of various variables employed in the firm-level studies. The data was gathered from various sources, including national and international agencies, and then used to meet objectives. In particular, the researcher collected data from national organizations such as the CSA, MPD, MoF, NBE and international institutions such as the World Bank, IMF, organizations under the UN and others. Besides, a wide range of related earlier publications and secondary materials were also extensively consulted. Finally, the data were evaluated qualitatively and quantitatively using descriptive statistics for the study.

Even though multiple survey data sets are available for productivity analysis globally, for instance, which is conducted by various international and national organizations, such as the WBES datasets, UNIDO database, and Ethiopian CSA survey of LMSMI datasets, there is still a lack of consistency and several other issues in the data. Thus, for this thesis's empirical parts, the researcher has relied on the complete firm-level data available for Ethiopia, which has been gathered by the country's Central Statistical Agency (CSA) through an annual survey of large and medium-scale manufacturing (LMM) enterprises.

In Ethiopia, LMSMI data on different indicators related to the firms is mainly obtained through annual CSA manufacturing industries survey data collection. The CSA survey data collection on manufacturing[7] firms yearly since the mid-1970s is intended to focus on the nature and sources of variations in all manufacturing industries, their competitiveness and attractiveness to FDI, and the characteristics and factors that influence the development of manufacturing industries. As a result, to obtain a comprehensive picture of these and other situations, the primary manufacturing items on which data is gathered include the following: the number and type of manufacturing establishments, the number of people employed, the wages and salaries paid by the establishments, paid-up capital, the gross value of production, the value-added, the volume of output and inputs, fixed assets, the value of stocks and investment, among other things.

The survey of Large and Medium-Scale Manufacturing Industries (LMSMI) conducted by the Central Static Agency (CSA) is the primary source of information for this study. Although the CSA has been running this survey annually since the mid-1970s, the most recent available data is from 1996 onward, with several issues. The primary difficulty with utilizing CSA and LMSMI data is that variables typically change their structure, code, and names over time due to added new variables, missing variables, and name changes. For instance, the change in the establishment number from 2012 onwards and the changes in the ISIC system from the "*ISIC Revision-3.1 to ISIC Rev. 4"* system from 2019 onwards. This may create a problem in the data compilation process (for instance, in the process of merging, matching, and balanced panel preparation). As a result, bringing the data together across this difference creates a different problem. The problems are addressed by systematically matching each establishment's characteristics and using the ISIC Revision 4 and Revision 3.1 correspondence tables[8].

Therefore, the CSA and LMSMI survey data covering 2011/12-2019/20 was used as the primary data source for this study. The establishments (firms) that are considered

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[7] Henceforth in the study manufacturing sector refers to Large and Medium Scale Manufacturing Industries (LMSMI)

[8] Correspondence tables between Revision 4 and Revision 3.1 of the International Standard Industrial Classification Activities (ISIC) for all economic sectors, United Nations Statistics Division, July 20th, 2007.

micro and small in scale are not included in this category or research.[9].The data sets are collected through proper survey design procedures and provide detailed structure data on some variables needed for analysis. An essential part of the survey, a census of medium and large manufacturing industries, gives a wealth of information about their inputs and outputs and other essential productivity measures. The other secondary data source will be a literature review, policy document review, and policy evaluation.

In addition, the year 2011/12 was chosen as the initial study period because it corresponds to the implementation of Ethiopia's first Transformation Plan, known as the GTP I phase (2010/11). Therefore, the study period also focuses on Ethiopia's first transformation plan, GTP I (2010/11-2014/15), and its second transformation plan, GTP II (2015/16-2019/20). Second, the manufacturing sector has become a priority sector in the economy of Ethiopia during the period under consideration. Thirdly, the industries mentioned above and sub-industries are prioritized as key focus or priority areas in the current Ethiopian growth plan for 2020–2030. Consequently, it is anticipated that this study will serve as an evaluation document for Ethiopia's prior Transformation Plan (GTP) and as a source of future policy recommendations for its current development plan (2020-2030). In addition, the CSA data based on ISIC version 3 can provide the most data on firm-specific characteristics during the period under consideration.

4.1.3. Sampling size and sampling method

The researcher selects a proportional number of sub-sectors, research periods, and geographic regions from the CSA dataset. In addition, all are chosen based on availability and data requirements for the study period. The subsector analysis is based on the two-digit and four-digit industrial categories of the International Standard Industrial Classification (ISIC) Revision-3.1 system to maintain consistency between various survey periods datasets.

[9] Appendix (4) contains a copy of Jimma University's cooperation letter for survey data request as well as a copy of the CSA's filled and signed form for requesting access to raw data.

Firstly, the sub-sectors included for the general LMMI panel data analysis are food & beverages, textiles, garments, leather, wood, paper, publishing and printing, chemicals, rubber and plastics, other non-metallic minerals, and basic metals, fabricated metals, and machinery and equipment. Finally, the balanced panel data sets cover 15 sub-sectors with 5,130 observations. Each survey period has a sample of 570 firms spanning nine years of restructured or reconstructed panel data from the CSA LMMIS survey. Moreover, the panel data used in this study has a balanced structure, as balanced panel datasets have equal observations for all groups (in this case, sub-sectors) across the study period.

As a result, the researcher believes that reconstructed balanced panel survey datasets from CSA and the LMMI survey over a reasonable period may assist in overcoming omitted variable bias resulting from unobserved firm-specific heterogeneity. Furthermore, correctly spanned panel data allows analyzing phenomena such as firm growth and productivity trends. Similarly, the entry and exit of firms have been handled in TFP estimations by building a balanced panel; that is, by removing any firms that join or exit the sample period within the time under consideration (Olley & Pakes, 1996).

Furthermore, the following vital sub-industrial sectors were given particular attention in Ethiopia's GTP I (2011–2015) medium and large industry development: Textile and garment industries, Sugar and sugar-related industries, cement, and cement-related industries, metal and engineering industries, chemical and pharmaceutical industries, and agro-processing industries.[10]. In addition to agro-industries, textiles, clothing, leather, and leather goods are Ethiopia's GTP II priority sectors. These industries

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[10] The agro-industry is divided into several divisions, including "*food and beverages, paper and wood products, textiles and garments, leather and leather products, rubber and tobacco products*" (CSA, 2018). In the second panel of data analysis about agro-industrial, the researcher is focused on the food and beverage industries and the textile, garment, and leather industries. It is expected that agro-processing goods will assist the country in upgrading its exports from low-value primary commodities subject to international price volatility to higher-value exports. Thus, it creates more and better-paying employment.

are projected to play a significant role in attracting foreign investment and increasing manufacturing exports. Secondly, eight manufacturing priority sub-sectors were included in the second-panel data productivity analysis of the manufacturing priority sub-sector in the GTP (I & II) period. The sub-sectors included for the second LMMI Panel data analysis are food & beverages, textiles, garments, leather, and non-metallic minerals chemicals, basic metal and fabricated metals. Finally, among the priority and key export and IS-oriented sub-sectors of the manufacturing industries, a third-panel data productivity analysis is conducted on the selected export-oriented and import substitution (IS) sub-sector.

Table 4.1. The Manufacturing sub-sectors included in the general panel data

ISIC 3.1 Code	Sub-Sector Manufacturing (Two-digit Industry)[11]	Number of Firms
	Consumer Goods	
15	Food & beverages	143
17	Textiles[12]	38
18	Garment (Wearing apparel)	21
19	Leather	31
20	Wood	31
21	Paper	18
22	Publishing & printing	37
25	Rubber & plastics	35
36	Furniture	46
	Intermediate Goods	
24	Chemicals	29
26	Non-metallic Minerals	70
	Capital Goods	
27	Basic metals	22
28	Fabricated metal	29

[11] Appendix Table 2. shows industry names and descriptions in detail.

[12] The textile and garment industry include the spinning, weaving, and finishing of textiles, the fabrication of cordage, rope, twine, and netting, the operation of knitting mills, and the production of wearable garments (CSA, 2018).

29	Machinery & equipment	12
34	Motor vehicles	8
Total Number of Firms		**570**

Source: **CSA Surveys various years**

Table 4.2. The GTP Manufacturing priority sub-sectors and export and import substitution (IS) sectors panel data analysis

ISIC Code	Sub-Sector Manufacturing (Two-digit Industry)	Remark
	Consumer Goods	
15	Food & beverages	Agro-processing industries, sugar, and sugar-related industries
17	Textiles	
18	Garment (Wearing apparel)	
19	Leather	
	Intermediate Goods	
24	Chemicals	Chemicals and minerals
26	Non-metallic Minerals	
	Capital Goods	
27	Basic metals	Metal and engineering industries
28	Fabricated metal	

Source: Authors compilation based on CSA survey

4.1.4. The scope of the study

As previously defined by the CSA, "*manufacturing establishments are those that engage in the mechanical, physical, or chemical transformation of materials, substances, or components into new products. Manufacturing includes the assembly of parts of manufactured products and the creation of new products*"(CSA, 2018). However, the scope of manufacturing industries in this study is limited to establishments that employ ten or more people, use power-driven machinery and cover both public and private industries in all country regions. Besides, the CSA LMMIS survey does not cover household business activities. The micro firms were left out of the study since it only included manufacturing companies with at least ten employees. Thus, the study covers all manufacturing establishments that employ ten or more people and use power for production, including public and private industries in all country regions where establishments within the scope of the census survey are found. Also, establishments (firms) with negative or zero inputs and outputs were eliminated from the analysis.

4.1.5. Panel data compiling procedure

This section describes the method of data collection by CSA and the procedure for data compilation used to produce the panel dataset. For instance, the researcher used Excel 2019, SPSS version 26, and STATA 15.0 to compile the data. In addition, the accessible sub-sector numbers, types, nature, and study periods were selected from the CSA database based on the available and required data for the study's panel data variables.

4.1.5.1. Data collection method used by the CSA

The productivity analysis research employed the CSA, LMMI dataset covering 2011/12 to 2019/20. The CSA yearly gathers the data from all manufacturing establishments (census survey) in the country that employ ten or more persons and utilize power for production. The dataset is acceptable for productivity analysis since it includes the relevant input and output variables. However, since the data is stored in a separate file throughout and across the years considered, it should be integrated into a panel data structure to serve the intended purpose. The data is gathered at the 4-digit level of the "*ISIC Revision-3.1*" for various survey periods and recently, since 2019, gathered using *"ISIC Rev. 4*". Besides, the data was acquired from enterprises by interviewing their managers and collecting the data to obtain the essential information. The information obtained was recorded on a set of forms and questionnaires prepared especially for this purpose (CSA, 2018).

4.1.5.2. The procedure of margining, matching, and balancing data

The CSA datasets have twelve (12) separate files for each year. These datasets need to be combined to create a firm-level dataset for each consecutive year. This requires cross-verification of the establishment's identities across multiple data sources and over different years to integrate the several rounds of LMSM establishment-level datasets into a single panel for analysis. When merging these datasets, it is necessary that all of the files have at least one variable in common and that the standard variable has the same name as the common variable in the other files. Each dataset is identified by a unique ID, establishment number, and ISIC, a mix of the firm's geographical information and other firm-specific common factors, all of which are unique to that dataset. In order to combine or merge separate 12 data files into one merged dataset for each year, these variables were employed (2011/12 to 2019/20 in this case). Even though minor adjustments were made to the questionnaire, the main variables remained unchanged. Besides, the merged datasets across the year utilizing the same standard variables are used to obtain the final balanced panel datasets. Observations that do not contain at least one of the significant production function variables (VA, labor, capital) are omitted from the sample. Additionally, because logarithms cannot be defined in circumstances of negative value-added, these observations are omitted.

Both techniques were based on manual, case-by-case matching procedures. The researcher attempted several different approaches to matching firms over LMSM rounds, but no one matching statistical method produced satisfactory results. Therefore, the researcher relied on a case-by-case evaluation of matches based on all available information. According to this approach, the data cleaning and preparation procedure were also carried out.

Finally, although Ethiopia's GTP began in 2010/11, 2011 was excluded from consideration when defining the study's final sample study period since CSAs began changing establishment numbers in 2012, merging, matching, and balancing the dataset was challenging for that period. As a result, the researcher eliminated the firm's datasets from the 2010/11 fiscal year because they did not have all of the information required for analysis, nor did they contain continuous data that could be used to generate the panel data sets. Because of this, it imposes considerable limits on the data-gathering technique and the choice of research periods. For the reasons stated above, the year 2012 was chosen as the starting period of the research since it marks Ethiopia's first transformation plan, known as the GTP I phase (2010/11-2015). Besides, firms with no recorded data on one of the variables utilized in the empirical research are excluded from the analysis. Accordingly, all variables have been modified (adjusted) for current market conditions, and as a result, all figures are real values.

4.1.6. The hypothesis of the study

The study of productivity analysis and its determinants vary in different market structures, geographic regions, and levels of development in urban or rural areas and other parts of the universe. However, according to numerous scholars, the technological advantage, the communication system, the size and experience of the establishment, the location of the establishment, and access to capital give the developed countries a chance to increase multifactor productivity and labor productivity. Therefore, the study's general objective is to explore industrial production, multifactor productivity, and the development of industrial policies in Ethiopia, specifically in the manufacturing sector, as stated before. The study is based on the following hypotheses and variables to investigate and achieve the sub-objective of analyzing the multifactor productivity (MFP) in Ethiopian manufacturing firms:

4.1.6.1. Manufacturing Output Variable Definitions

The two most fundamental measurements of output are value-added and gross output. The value-added measure excludes intermediate inputs (materials, energy, and services consumed during the manufacturing process), whereas the gross output measure includes such inputs. Labor productivity growth and MFP growth can be estimated using any output measures. The gross output measure of productivity is defined as "*the value of sales and new additions to inventories, however, allowing for purchases of intermediate inputs*." (OECD, 2001). Therefore, in line with the OECD (2001) definition, the value-added measure was obtained by deducting intermediate inputs from the gross output.

The MFP measurements based on value-added are assessed residually as the difference between the rate of change in real value-added and the weighted rates of change in principal inputs, labor, and capital, respectively. The MFP growth based on value-added will be positive - if volume value-added rises faster than - the sum of primary inputs. The value-added measures benefit from being a simple, weighted average of value-added growth in each industry, which is true for aggregate value-added growth and MFP growth measured in terms of value-added in individual sectors (OECD, 2001; Pilat & Schreyer, 2001).

The value-added measure is a measure that conceptually connects industry-level MFP growth to aggregate MFP growth in several ways. However, its estimations are sometimes inaccurate since it ignores intermediate inputs, making it easy to mis measure growth patterns (Cobbold, 2003). On the other hand, the gross output measure is preferred in productivity literature because it captures primary and intermediate inputs, proven to boost industrial productivity (Cobbold, 2003). Besides, Baily advises adopting the gross output measure for company-level data since there are no intra-industry sales at the firm level. Moreover, it gives a theoretical measure of production (Baily, 1986).

Baily (1986) further emphasizes that the VA technique has an advantage over the gross production approach due to the possibility of duplicate counting of inputs such as materials when utilizing the gross output approach. The VA notion prevents double-counting because it does not account for intermediary inputs (Baily, 1986). In addition, the real VA approach is directly comparable across industries, but real gross production measures are not - since each sector measures it differently. Generally, it appears that both gross output and value-added-based productivity measurements are - good complements to one another. When technological advancement has a proportionate impact on all production inputs - the former is a more accurate measure of technological change. Accordingly, using VA -based productivity indicators, one can account for the extent to which - the industry has outsourced its work and determine the significance of productivity improvements in a given industry to the economy. They indicate how much additional delivery to ultimate demand an industry creates per unit of main inputs aspects of the practical nature. Additionally, the measures of VA are frequently more readily accessible than estimates of gross output. However, gross output measures are required to produce value-added statistics in the first instance. It is necessary to account for intra-industry flows of intermediate goods to construct consistent sets of gross production measurements - which can be challenging to do empirically (OECD, 2001; Schreyer & Pilat, 2001).

This study estimates multifactor productivity (TFP) based on the value-added approach. The value-added measure, which serves as the output measure, is the gross output adjusted to account for purchases of intermediate inputs[13]. The value-added approach can be expressed symbolically as:

VA = GVP – IC and NIC …………………. (6)

In equation (6), VA represents the value-added in the national Account concept (at market price) (output), GVP represents the Gross Value of Production, IC represents the industrial costs, and NIC represents the non-industrial costs. (see the input and output in appendix sections in Appendix 1 for the detail).

4.1.6.2. Manufacturing Inputs Variable Definitions

4.1.6.2.1. Capital (K)

Several studies used a firm's fixed asset level or capital stock to measure capital input.[14] For example, according to Hossain and Karunaratne, defined capital input is

[13] In addition to total sales values, the gross value of production includes different inputs parameters. (see the appendix 1. section for the detail variables included in the VA and GVA calculation).

[14] In this case the assumption is that respondents compute capital stock as the "*initial net value plus new capital expenditures less capital sold, disposed, and depreciated* "(CSA, 2018). However, some respondents may just estimate the present value without following the necessary technique. Therefore, some firms declared capital stock may contain mistakes. In the same manner as the other variables, the sub-sector price deflator for the large and medium industry is applied to capital stock to calculate real capital stock. TFP calculation is primarily dependent on capital stock data.

"*total fixed assets aggregated from book values of machinery, land, buildings, tools, and office equipment*" in Bangladesh's manufacturing sector (Hossain & Karunaratne, 2004). Similarly, (Hailu & Tanaka, 2015) defines capital input in Ethiopian manufacturing as the net value of fixed assets at the end of the survey year.

Thus, in line with previous research, this study would define "*capital input as the total value of fixed assets at the end of the fiscal year,"* computed from the book value of dwelling houses, non-residential structures, other construction works, machinery, and equipment, cars, and other office fixtures. Besides, they are valued as the book value at the end of the reference year; that is, the "*net book value at the beginning, plus new capital expenditure minus those sold and disposed of and depreciation during the reference year* " (CSA, 2018). Therefore, this variable can be used as a capital input in the productivity analysis. In addition, several researchers use the book value at the end of the reference year as a measure of capital input in their studies in Ethiopia (Abegaz, 2013; Hailu et al., 2020).

4.1.6.2.2. Labor (L)

The total number of hours worked or the total number of employees at the end fiscal year is used to measure labor[15]. According to various studies, information on hours worked is the most relevant measure of labor input since it compensates for variations in employee work patterns and distinguishes between full-time and part-time employees. However, it is impossible to assess the quality of labor hours, making them inadequate for an estimate (Camus, 2007; OECD, 2001). In contrast, the total number of workers is easy to calculate and is the most commonly used measure of labor input. The recent empirical studies by (Fernandes, Ana Margarida, 2006; Hailu & Tanaka, 2015; Hailu et al., 2020; Lemi & Wright, 2020) and other empirical studies "*use total workers, which includes permanent and temporary workers."*

[15] In this thesis the temporary workers are converted into the equivalents of full-time workers.

4.1.6.2.3. Energy

The overall cost of fuel, lubricating oil, electricity, wood, charcoal, and water was used to calculate this study's energy measure variables. In addition, Several pieces of literature use the overall cost of fuel, lubricating oil, electricity, wood, charcoal, and water as energy measures (Hailu et al., 2020; Mitiku & Raju .S, 2015a).

4.1.6.2.4. Materials

The overall cost of raw materials utilized, including local and foreign imported raw materials, is used to calculate the material variable in this study. Besides, numerous pieces of literature use the overall cost of raw materials utilized as a material measure (Hailu et al., 2020; Mitiku & Raju .S, 2015a).

4.1.6.2.5. Age of Firm

According to existing literature, this is defined as the number of years since the firm's founding or the number of years after its inception up to the end of the survey year (Ding et al., 2016; Li, 2009; Majumdar, 1997). In this thesis, firm age is defined as the number of years since the firm was founded and calculated as the survey year minus its year of incorporation or founding. The learning-by-doing model (Arrow K. J., 1962), firm-level experience, and learning by (Lee, Yoon, & Lee, 2009) and (Crowley & Bourke, 2018) and (Jovanovic & Nyarko, 1995) and (Esaku, 2021) found that older firms achieve higher levels of productivity.

4.1.6.2.6. Ownership

According to existing works of literature, privatization positively impacts productive efficiency, and public ownership significantly negatively affects productivity. A distinct parameter in the datasets identifies the question of ownership. For instance, the public sector categories include all institutions held by the state, i.e., those that were totally or largely (with a 51 percent stake or more) owned by the government. At the same time, Individual ownership, partnership, private limited company, cooperatives, and other forms of private enterprise are included in the private sector. Thus, those firms categorized as private firms take dummy 1 and 0 otherwise.

4.1.6.2.7. Export Status

Export is - a firm-level variable with the value' 1 "if the firm is involved in Export and 0 if the firm is not engaged. Thus, in the data sets, a separate variable indicates the export value for each exporting firm. Several studies, like those conducted by (Bigsten & Gebreeyesus, 2009b) in Ethiopia, (Van Biesebroeck, 2005) in Sub-Saharan Africa, and (De Loecker, 2007) in Slovenia, revealed that exporting or engaging in the global market in general, had a productivity-enhancing effect.

4.1.6.2.8. Firm Size

The economic literature uses numerous measures of firm size, starting with the employment count used by (Gibrat, R., 1931). Among other dimensions, which include sales measure used by (Cefis et al., 2002): assets as firm size measure used by (Serrasqueiro et al., 2010). Similarly, revenue is used as a measure of firm size (Tang, 2015); at the same time, output and value-added are used as firm size measures (Harris & Moffat, 2015). However, numerous investigations using diverse data sets show that the size definition does not affect the outcome (Axtell, 2001; Daunfeldt & Elert, 2013; Tang, 2015). Thus, the more comprehensive data, the firm size is defined as the total number of employments in this study. According to Johannes Van Biesebroeck, he found that there was a significant difference between the TFP distributions of large and small African manufacturing firms (Van Biesebroeck, 2005). According to (Baldwin & Sabourin, 1998), evaluating firm size is significant since 98 percent of larger firms use more modern technology than small or medium-sized firms. Besides, Baldwin and Sabourin (1998) add that larger firms that embrace more technology get more significant productivity gains. In contrast, (Taymaz, 2002) discovered a negative relationship between productivity growth rates and the firm's size. Besides, (Fernandes, Ana Margarida, 2006) found Bangladesh's small firms are more productive than bigger firms.

In addition, several researchers, such as Li et al. (2009), quantify firm size using total employment level. Thus, for this study, the firm is classified as small and medium firms (SMF) employing 10 to 49 workers and large firms employing more than 50+ workers.[16] Accordingly, different scholars and institutions use the same classifications by the number of employees in Ethiopian productivity reports by (Hailu et al., 2020), (Soderbom, 2012), and (CSA, 2015). Thus, in this study, firms are categorized as SMF and large firms; those large firms take dummy 1 and 0 otherwise.

4.1.6.2.9. Region (Geographical Location)

A region indicator identifies the regional distribution of each surveyed firm understudy in the datasets. According to prior research, the Addis Ababa and Oromia regions have the highest proportion of establishments, implying a high concentration of industrial businesses in these areas. Accordingly, given the concentration of enterprises in and around Addis Ababa, it is apparent that the capital city and its environs are Ethiopia's primary industrial centers. As a result, it was hypothesized for this study that firms in the Addis Ababa region are more productive than their counterparts because of their proximity to an international airport, market, raw material availability, skilled workforce, and other essential infrastructures and inputs for manufacturing. Thus, those firms located in the capital city in the Addis Ababa region take dummy 1 and 0 otherwise.

4.1.6.2.10. Skill (Wage per labor)

Most studies use higher wages as a proxy for the skill of labor or higher qualifications (rewarded with higher salaries). Also, they suggest using skilled labor and policy incentives to invest in skills, encourage the use of more skilled labor, specialized and efficient work, and make greater use of training to increase productivity at the firm level. As a result, it was hypothesized that labor skill positively affects productivity in this study.

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[16] *CSA categorized micro firms as those employing less than ten workers, or < 10 (micro)*

4.1.6.2.11. Legal Form of business ownership

Following the legal structure of the firms or establishments, businesses are divided into four legal types. For instance, many kinds of groupings are provided for the statistics gathered by the CSA on Ethiopian LMSIS, such as individual proprietorship, partnership, share company, private limited company, co-operative, joint venture, and others. However, despite their differences in other features, this thesis applies the unlimited liability for the first two categories, i.e., the individual proprietor and partnership. Besides, others used the general categories for the legal form of a firm called Limited. According to different scholars, the firm's legal status conforms with the theoretical expectation that the growth of firms is positively influenced by its limited nature. This agrees with the hypothesis (Stiglitz & Weiss, 1981), as managers in those limited liability firms have the freedom to pursue those high-risk projects with high expected returns. Thus, those firms categorized as unlimited liability takes dummy 1 and 0 otherwise (limited liability).

Moreover, the external determining factors that impact firm productivity include firm infrastructure facilities, government laws, trade policies, development, and access to finance (Bloom & Van Reenen, 2010).

4.1.7. Data analysis method

The thesis principally intended to examine industrial production, multifactor productivity (TFP), and the development of industrial policies in Ethiopia in the case of the manufacturing sector.

4.1.7.1. Descriptive statistics

The firm-level descriptive statistics based on firm characteristics on continuous and dummy variables of input and output variables such as firm size, age, ownership, export status, geographical location, skill, legal form of establishment, material, energy, and other related variables are instructive about the types of firms in the manufacturing industry. In the case of a firm, size defines its size as measured by the total number of employees in that company; age describes the institution's experience as determined by subtracting its founding year from the survey period, etc.

4.1.7.1. Econometric models

4.1.7.2.1. Estimating the firm-level TFP

TFP is calculated in empirical studies as the residual of a production function with various specifications. However, there is no unified or limitless approach to computing TFP. As discussed in chapter three of this thesis, some computations begin with non-parametric index number techniques, semi-parametric methods, and entirely parametric methods. In addition, (Van Biesebroeck, 2007) study contains a thorough discussion of the comparative evaluation of the various approaches.

Besides, the total factor productivity (TFP) of a firm is an unobservable endogenous quantity that quantifies the impact of all production variables on the firm's output volume. Thus, TFP is determined primarily by finding the residual component of the production function equation. As a result, econometric models of the production function are employed to calculate each individual's productivity (van Beveren 2012). Thus, to measure the productivity of firms in the Ethiopian manufacturing sector in this study, the researcher used the Cobb-Douglass (CD) production function (PF) specification following Federica Saliola and Murat Şeker's work on productivity (Saliola & Seker, 2011).

Following the methods presented in their work (Federica Saliola and Murat Şeker (2011), they estimated TFP across countries, firms, industries, and exports. They also estimated firm-level TFP separately for each country using survey weights. Their estimations control for 2-digit industry effects as industries are likely to vary in their technology. In all specifications, they assume that all firms in a country face the same technology and thus restrict the input coefficients to be the same across industries. They call it the "*restricted mode*."

Thus, following Federica Saliola and Murat Şeker (2011), the researcher used the Cobb-Douglas production function (CD-PF) specification as (1):

$$Y_{it} = A_{it}K^{\alpha}{}_{it}\, L^{\beta}{}_{it} \text{ .... } (1)$$

In the above function, *Y* is output measured as annual value-added, *K* is the value of the capital stock, *L is the yearly* number of employees, and *A* is the TFP term. They call this specification YAKL or Solow residual. *Their YAKL specification includes only two production factors: labor and capital.*

The researcher also uses value-added as the dependent variable instead of gross value added in this thesis. Value added is calculated by subtracting industrial and non-industrial costs from gross value added (*VA=GVA-IC-NIC*). The parameters α and β are the output elasticities of capital and labor, respectively. When estimating the production function, the log of output is regressed on the log of input components. As a result, the coefficients describe the elasticity of the output concerning each of the input factors. The log of TFP is the residual term that results from estimating the log transformation of this production function (2). Accordingly, a higher estimated TFP is associated with higher productivity.

The estimation result is:

$$\log A_{it} = \log VA_{it} - \hat{\alpha} \log K_{it} - \beta \log L_{it} \text{ .... } (2)$$

Besides, total factor productivity is commonly calculated as a residual, which refers to the share of GDP that remains after accounting for the direct contributions of capital and labor inputs to total GDP (Barro, 2004).

Therefore, to answer one of the objectives of this study which is estimating the total factor productivity (TFP) level and growth in Ethiopian manufacturing firms, the researcher calculated TFP using the residual of the CD- production function[17] based on firm-level data for this study. Secondly, the researcher computed labor productivity - as the ratio of the value of output produced, which is the value-added output, and the number of employees involved.

Finally, the GMM (Generalized Method of Moments) estimation model used the available firm-level determinant indicator statistics to measure TFP determinants in Ethiopian manufacturing firms. The GMM estimation method is discussed in detail in the next section. Additionally, the LSDVC[18] estimator, a linear model containing indicator (so-called "*dummy*") variables for each panel unit, is used as the fourth estimator to compare with the GMM estimator's result.

4.1.7.2.2. Estimated model: GMM estimator and Its methodological issues

Following the estimate of the TFP values in the first stage, we continue to examine which variables are significant determinants of the TFP level. The econometric model of the TFP determinant is specified as follows (3):

$$\ln\_TFP = \beta_0 + \beta_1 firm\ size_{it} + \beta_2\ Firm\ Age_{it} + \beta_3 skill_{it} + \beta_4 ownership_{it} + \beta_5\ Export\ Status_{it} + \beta_6\ Region_{it} + \beta_7\ Material_{it} + \beta_8 legal\ form\ of\ business\ ownership_{it} + \beta_9 energy_{it} + \varepsilon_{it} \quad \ldots\ldots\ldots\ldots (3)$$

This study employs the difference GMM dynamic panel estimation methods (Arellano & Bond, 1991; Arellano & Bover, 1995) and the system GMM estimator method (Blundell & Bond, 1998) to measure total factor productivity (TFP) determinants in Ethiopian manufacturing firms.

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[17] While CD procedures are the most well-known, many researchers use the trans log form (see Caves, Christensen, and Diewert 1982), which is a second-order approximation to generic production functions and hence more adaptable, but more data-intensive.
[18] The abbreviation LSDVC stands for least squares dummy variable corrected.

The GMM estimator produces the best accurate productivity level and growth estimations among the parametric approaches. However, the past empirical work on estimating dynamic firm growth equations relied primarily on standard OLS regression analysis. This technique, however, is constrained by endogeneity and heterogeneity, and the estimators are biased. Nevertheless, the difficulty is resolved by current advancements- with the development of the GMM System technique.

The GMM estimator is divided into standard (difference) GMM and system GMM. The GMM introduced by Arellano and Bond (1991); the system GMM is then developed by Arellano and Bover (1995) and Blundell and Bond (1998). The standard (difference) GMM estimation (Arellano and Bond, 1991) uses the first difference of each variable in the regression and the lagged levels of the regressors as instrumental variables. However, if the variables are close to random walk, the lagged variables can be a weak instrumental variable for the first difference variables (Arellano & Bond, 1991).

The advantage of the GMM method is that it allows estimation against autocorrelation, multicollinearity, heteroscedasticity problem (variable variance problem), and nonlinear situations in terms of parameter or variable. Although it is effective for large samples, Hansen, demonstrated its applicability in small samples with a moving weighted matrix, (Hansen, 1982). Another advantage of the model is that it allows for overdetermination. In simultaneous equation systems, the two-stage least squares method (2SLS) is used when there is overdetermination. Still, if there is autocorrelation in the model, it is known that the GMM model has more predictive power.

In dynamic panel data analysis, estimators require the presence of one or more instrumental variables, which are lagged versions of the endogenous variables in the model. Such estimators are mostly in the presence of a linear functional relationship between the variables; when the current value of the dependent variable is related to its past value and they are preferred when the independent variables are not strongly exogenous.

Arellano and Bond (1991) propose an estimator that can be used in the presence of unobservable heterogeneity and predetermined regressors. This method has good predictive power when the cross-section dimension (N) is larger than the relative time dimension (T); in shortly, when, N > T. The estimation process first requires taking the first difference of the model to eliminate unobservable cross-section-specific individual effects. Because of this feature, the estimator in question is called the difference or 1-step difference GMM estimator (Arellano & Bond, 1991). The equation in question is shown in the equation below.

$$Y_{it} - Y_{i,t-1} = \mu_t - \mu_{t-1} + \alpha_1 Y_{i,t-1} + \beta_1 X_{1it} ... + \beta_n X_{n,it} + \varepsilon_{it} \quad ....(4)$$

The difference GMM method has been criticized for some biased results in small samples; if the variables are close to a random walk, lagged values are often poor instruments for first differences.

Following the work of Arellano and Bond (1991), Arellano and Bover (1995) and Blundell and Bond (1998) developed a system GMM estimator that includes some additional moment conditions based on two separate equations. The two equations in question are "*original equation*" and "*transformed equation by difference*." This method is also called two-step differential GMM and two-step system GMM estimators.

Blundell & Bond, (2000), argue that the difference GMM estimator is a poor estimator, especially in the context of empirical growth models when the time series is continuous, and the number of observations associated with them is small. They also state that in the case of special and spherical irregularities, the one-step and two-step GMM estimators are asymptotically equivalent to the first differentiating estimators (Blundell & Bond, 2000). Otherwise, the two-stage estimator is more efficient, and this system is always correct for GMM estimator. However, the two-stage GMM estimator has the disadvantage of gradually converging to its asymptotic distribution over Monte Carlo experiments. Therefore, two-stage GMM estimators can be severely biased downwards, leading to underestimated inferences.

The GMM-System estimator allows the use of lagged levels of the dependent variable as an instrumental variable in the first difference equations and the lagged differences of the dependent variable as an instrumental variable in level equations. For this reason, Blundell and Bond (1998) showed that soft stationarity constraints could be added to the initial conditions, allowing the use of the System GMM estimator (Blundell & Bond, 1998).

In addition, Arellano and Bover (1995) and Blundell and Bond (1998) created additional moment conditions in which the lagged differences of the dependent variable are orthogonal to the error levels. Blundell and Bond (1998) and Blundell et al. (2000) revealed that difference GMM has a weak predictive power in a finite sample and the coefficient estimates are biased. They found that the predictive power of GMM is higher.

$$Y_{it} = \alpha_1 Y_{i,t-1} + \beta_1 X_{1it} \ldots + \beta_n X_{n,it} + \eta_i + \mu_t + \varepsilon_{it} \quad \ldots\ldots\ldots (5)$$

Additionally, Hansen statistics are interpreted for 1-step robust and all 2-step predictions. The Sargan test, on the other hand, is interpreted for predictions that are not 1-step robust. In the context of the autocorrelation problem, the difference GMM estimator usually rejects the null hypothesis that the "first differences of the residuals are serially correlated" in the AR (1) process. Again, within the scope of the consistency of the GMM estimator, it is mentioned that the first differences in the residues should be uncorrelated in the AR (2) process.

According to Roodman D. (2006), the GMM system method is appropriate for the panel analysis due to some reasons listed below. Firstly, the process may be dynamic; i.e., the current dependent variable is influenced by past ones; some regressors may be predetermined but not strictly exogenous; the lagged dependent variable is an example. Then there may be arbitrarily distributed fixed firm-specific effects, α_{it}, and the idiosyncratic disturbances (μ_{it}) may have individual-specific patterns of heteroskedasticity and serial correlation. In addition, some regressors may be endogenous (for example, labor quality may be affected by firm growth). The GMM system method thus could solve those problems (Roodman, 2006).

The GMM system method is suitable in case the number of firms' understudies is very much greater than the periods (i.e. when N (number of firms) > T (period)). In this study, the number of periods of available data, nine years, is small compared to the number of firms in the sample (570 firms in the case of this thesis). Other available estimation methods could not solve all the above problems; thus, they may provide inconsistent and biased estimators (Oliveira & Fortunato, 2008). They are imposing additional moment conditions; in the case of System GMM, the differenced equations are combined with equations in levels, for which the instruments used must be orthogonal to the firm-specific effects.

Bun and Windmeijer (2007) demonstrated that when moment conditions in first-differences are combined with moment conditions for the model in levels, the system GMM estimator outperforms the GMM estimator in the first-differenced model in terms of bias and root mean squared error (RMSE) (Bun & Windmeijer, 2007). Depending on the assumptions made, the instruments used may be exogenous, predetermined, or endogenous. The validity of instruments is tested using the Hanssen and Sargan test of over-identifying restrictions and the Arellano-Bond test for autocorrelation.

Specifically, the thesis used the one-step and two-step difference GMM approach and two steps System GMM approach for different sub-sectors in the manufacturing industries in Ethiopia to answer one of the determinants of total factor productivity objectives. (see table 6.20. below a summary of all methods of estimation used in the thesis in detail). While employing the GMM technique of estimation, specification tests are carried out to determine the consistency of the GMM estimators, which is primarily dependent on the instruments' validity. Thus, all diagnostic specification tests were performed to prove the validity of estimates. The main diagnostic tests undertaken are the Arellano Bond test for first-order and second-order serial correlation tests (AR1 and AR2), Sargan or Hansen test for over-identification restrictions, and Wald chi-square or F ratio test for Joint significance of the model. Besides, the instrument number is checked to ensure they are less than the groups employed in the analysis. (See chapter for the detailed econometric model analysis of the study).

Moreover, according to Roodman (2009), some approaches, such as the least square dummy variable (LSDV) and instrumental variable approaches, may be able to fix the problem partially. Specifically, pointed out that LSDV works only for balanced panel data and does not address the possible endogeneity of other regressors. At the same time, the Monte Carlo evidence in Judson and Owen (1999) strongly supports the corrected LSDV estimator (LSDVC) compared to more traditional GMM estimators when N is only moderately large (Roodman, 2009).

Furthermore, Monte Carlo tests indicate that the LSDVC estimator beats reliable IV-GMM estimators like Anderson-Hsiao and Arellano-Bond in small samples; this occurs independently of the degree of unbalancedness in both biases RMSE; these findings substantiate (Judson & Owen, 1999) findings. The corrected LSDV estimator suited for unbalanced panels was produced and implemented using my Stata method “xtlsdvc” considering three alternate initial estimators and three levels of approximation accuracy: “Anderson-Hsiao (option: initial(ah)); Arellano-Bond (option: initial(ab))”; Blundell-Bond used David Doorman's Stata procedure “xtabond2” to achieve this which is based on the bias approximation formulae for the LSDV estimator. Moreover, the Least Squares Dummy Variables corrected estimator (LSDVC), was first suggested by Kiviet (1995) for balanced panel data and then updated by Bruno (2005) for unbalanced panel data. Thus, as the fourth estimator, this thesis used the LSDVC for the balanced panel data to compare the result with the earlier three GMM estimators.

Thus, the researcher employed one-step and two-step difference GMMs, a two-step system GMM approach, and LSDVC to answer one of the objectives of the determinant of productivity for distinct subsectors in the manufacturing industries in Ethiopia utilizing reconstructed balanced panel data.

Table 4.3. Summer of all methods of estimation used in the thesis

ISIC Code	Sub-Sector Manufacturing (Two-digit Industry)	Method of Estimations	GTP priority Areas and other categories
15-36	General Panel for all Manufacturing Sub-sectors	One-step difference*, Two-step difference**, Two-step system*** and LSDVC	Agro-processing industries, sugar and sugar-related industries, chemicals and minerals, and metal and engineering industries
15	Food & beverages	One-step difference, Two-step difference, Two-step system GMM and LSDVC	Agro-processing industries, sugar, and sugar-related industries are priority areas, and Export-oriented sub-sectors
17,18 and 19	Textiles, Garment, and Leather		
24 and 26	Chemicals and Non-metallic Minerals		Chemicals and minerals priority Areas and IS oriented sub-sectors
27 and 28	Basic metals and Fabricated metal		Metal and engineering industry's priority Areas and IS oriented sub-sectors

Source: authors compilation

*, **, ***, *indicates Arellano and Bond (1991), Arellano and Bover (1995), and Blundell and Bond (1998), respectively.*

4.2. Result and Discussion

This sub-section of chapter four focuses on the result and discussion of descriptive statistics and econometric analysis. In addition, it discusses the TFP level and growth estimation and its determinants at the firm level in general. The first section of this sub-chapter discusses the definitions, sources of variables, regional distribution of sampled firms, and the descriptive statistics of the main variables used in the study. The second component of this sub-chapter discusses the estimated result of firm-level TFP level and growth. Finally, the third section discusses the determining factors influencing firm-level TFP.

Table 4.4 shows the main variables used to estimate (TFP) and the hypothesized and expected productivity determinant variables at the firm level in manufacturing sectors in Ethiopia. The main data source for these variables is the Ethiopian central statistics agency (CSA) and the Ethiopian MPD datasets from 2012 to 2020.

4.2.1. Definitions, sources of variables, and regional distribution of sampled firms

Table 4.4 Definitions and sources of variables

Variable	Variable description	Definition	Source
Main variables used for Total factor productivity (TFP) Estimation			
Dependent variable lnrva	Log of Value-added (in the National Account concept (at market price), (output)	It is calculated as the difference between the gross value of production and the sum of industrial and non-industrial costs.	MPD, 2020
lnlab	log of labor	Labor engaged in the LMMI was computed as paid employees, working proprietors, active partners, and unpaid family workers[19].	CSA ,2020
lnrcap	Log of Capital stock	The total year-end book value of fixed assets as provided by respondents in the survey.	CSA ,2020
PD	Large and medium industry price deflator	GDP data disaggregated by sector at both current and constant prices. Compute the deflator for LMMI by dividing nominal values by real values for medium and largeenterprises.[20]	MPD, 2020

Source: Authors' compilation based on CSA and MPD survey data.

In addition, the study employs nine independent variables pertaining to productivity determinants and two independent variables related to production functions. Additionally, 570 firm samples are used for general panel data analysis, including 15 main industrial categories in manufacturing sectors for each year beginning in 2011/12 and ending in 2019/20. The thesis's methodology section discusses the sampled firms in detail for the remaining areas and sub-sectors in the study.

Variable	Variable description	Variable definition	Source
Expected determinant of productivity variables at the Firm level			
ln_TFP	Log of TFP	It is estimated as a residual from the Cobb-Douglas production function	
lnage	Log of Firms age	Computed as the survey year minus the year of firm establishment in this study	
lnrm	Log of Material	The overall cost of raw materials utilized, including local and foreign imported raw materials	

[19] Temporary workers are converted into the equivalents of full-time workers in the study.
[20] Because they assume the same price increases for all sub-sectors within the large and medium manufacturing firm group, these disaggregated price deflators are more suitable than the aggregate GDP deflator.

lnrenrg	Log of Energy	Cost of fuel, lubricating oil, electricity, wood, charcoal, and water	Ethiopian Central Statistics Agency (ECSA, (2020) (various years Datasets).
lnskill	Log of Skill	A higher wage as a proxy for labor skill is calculated as Wage per labor in this thesis.	
iexstuts	Dummy' 1' if exports,' 0' otherwise	In the data sets, a separate variable indicates the export value for each exporting firm.	
iownr	Dummy' 1' if the private sector,' 0' otherwise	In the data sets, a separate variable indicates the ownership for each firm in the survey.	
ilgfbo	Dummy' 1' if unlimited liability,' 0' otherwise	In this thesis, unlimited liability applies for the individual proprietor and partnership firms and limited categories for the remaining other business legal forms.	
ifirmsize	Dummy' 1' if large firm,' 0' Medium and Small Firm (MSF)	For this study, the firm is classified as small and medium firms (SMF) employing 10 to 49 workers and large firms employing more than 50+ workers	
iregion	Dummy' 1' if located in Addis Ababa,' 0' otherwise	This study hypothesizes that firms in the Addis Ababa Region are more productive than their counterparts because of their proximity to different services, infrastructures, resources, markets, and others.	

Source: Authors' compilation based on CSA and MPD survey data.

Table 4.5 below reports summary statistics of the regional distribution of the sampled firms. The above sample included nine regions and two city administrations, namely Addis Ababa and Dire-Dawa. From the survey datasets of 570 firms, the highest percentage of firms are sampled from Addis Ababa and Oromia regions, 35.6 percent and 34 percent, respectively. On the other hand, the lowest sample percentage was taken from Gambella and Benishangul regions, 0.18 percent each.

Table 4.5. Region distribution of sampled firms

Region Code	Region Name	Freq.	Percent	Cum.
1	Tigray	334	6.51	6.51
2	Afar	18	0.35	6.86
3	Amhara	443	8.64	15.50
4	Oromia	1,744	34.00	49.50
5	Somali	36	0.70	50.20
6	Benishangul-Gumuz	9	0.18	50.38

7	SNNPR	486	9.48	59.86
12	Gambela	9	0.18	63.17
13	Harari	63	1.23	64.40
14	Addis Ababa	1,826	35.60	100.00
15	Dire Dawa	161	3.14	62.99
Total		**5,129**	**100.00**	

Source: Authors' calculations based on CSA survey data.
** Southern Nations, Nationalities, and Peoples Region (SNNPR)*

4.2.2. Descriptive analysis result and discussion

Table 4.6 provides some of the descriptive statistics for continuous variables and dummy variables used in the study for all manufacturing sectors in 2019/20. The main key characteristics of the surveyed firms are such as the age of firms, ownership, the legal status of the firm, total number of owners, nominal and real values of the material, energy, gross value of the product (GVP), wage, value-added output, capital, labor, wage per labor, and export values as well as the intermediate cost at industry level. The mean age of the surveyed firm was 20.3 years, with a range from 9 to 58 firm age in years. This implies, on average, the firms have been operating for about 21 years, with firms in the manufacturing sector. Based on the survey result, most of the firms in the survey are privately owned firms compared to public ownership.

Moreover, the finding revealed that the average total number of owners in the survey was 4.2 persons, with a range of 1 to 354 persons (owners) in the manufacturing sector in the study. The sample firms' annual mean nominal and the real material cost was 52.5 and 42 million ETB. Similarly, the sampled firms' mean annual nominal and real yearly energy cost was 3.38 and 2.70 million ETB. Besides, the mean result of the nominal and real gross value of the product (GVP) in the survey firms was 151 and 121 million ETB, respectively. Similarly, the mean result of nominal and real value-added output (VA) amounted to 86.8 and 69 million ETB, respectively, also the intermediate cost amounts to 55.8 million ETB. The mean annual nominal wage cost was 6.567 million ETB, and the sample firms' real wage cost was 5.25 million ETB. Likewise, the real wage per labor value in the firms in the study was 583,42.05 ETB.

The table below shows that the average firm in the sample is relatively large since the average number of laborers in the studied firm amounts to 147.4, ranging from 10 to 12180 employees in manufacturing firms. Furthermore, the firm's mean average real and nominal capital stock in the sample amounts to 43.1 and 34.5 million ETB, respectively. Finally, the mean average Export value of the firms in the study amounts to 7.06 million ETB.

Table 4.6. Descriptive statistics for the main variables in the study for all manufacturing sectors in 2019/20

Variable	Mean	Std. Dev.	Min	Max	Obs.
Age of Firm	20.31754	13.92445	9	58	570
Ownership	1.129825	.3896576	1	3	570
Legal form of firm	2.745614	1.632337	1	6	570
Total No. of owners	4.191228	18.41592	1	354	570
Material	5.25e+07	1.41e+08	2.091	1.79e+09	570
Real Material	4.20e+07	1.13e+08	1.673335	1.44e+09	570
Energy	3378026	1.54e+07	117.1954	2.26e+08	570
Real Energy	2703286	1.23e+07	93.78629	1.81e+08	570
Intermediate cost	5.58e+07	1.48e+08	2199.196	1.81e+09	570
Export value	7056574	5.03e+07	0	9.61e+08	570
GVP	1.51e+08	4.56e+08	306980.3	5.74e+09	570
RGVP	1.21e+08	3.65e+08	245662.9	4.59e+09	570
Total Wage	6557933	1.86e+07	3654.18	2.38e+08	570
Real wage	5248026	1.49e+07	2924.28	1.91e+08	570
Value added output	8.68e+07	3.06e+08	177076.2	3.79e+09	570
Real VA	6.90e+07	2.45e+08	141706.3	3.03e+09	570
Capital	4.31e+07	3.94e+08	9756.755	8.84e+09	570
Real capital	3.45e+07	3.15e+08	7807.902	7.07e+09	570
Labor	147.414	573.2646	10	12180	570
Real wage per labor	58342.05	181838.5	31.81331	2898777	570

Source: Authors' calculations based on CSA survey data

The descriptive statistics for log and dummy main variables used for the econometrics analysis of TFP determinants for the firm's understudy are shown below in Table 4.7 from 2012 to 2020. The finding revealed that firms' mean log of TFP was 0.0224 in the manufacturing sector. Similarly, the mean log of the age of firms was 2.5 years in the study period.

Table 4.7. Descriptive statistics for the main variables used for TFP determinant

Variable	Variable description	Mean	Std. Dev.	Min	Max	Obs.
ln_TFP	Log of TFP estimated residual of CD	.0223516	.6470311	-3.721443	2.167998	5,129
lnage	Log of Firms age	2.475941	.8330626	0	4.574711	5,129
lnrm	Log of material	15.46623	2.492638	.5185069	21.35045	5,125
lnrenrg	Log of Energy	11.93721	2.646831	3.583519	19.57811	5,129
lnskill	Log of Skill	9.785796	1.453285	.260956	18.11528	5,119
iexstuts	Dummy '1' if exports, '0' otherwise	.1091831	.3118992	0	1	5,129
iownr	Dummy' 1' if private ownership,' 0' otherwise	.8894521	.313602	0	1	5,129
ilgfbo	Dummy' 1' if unlimited liability,' 0' otherwise	.477286	.4995325	0	1	5,129
ifirmsize	Dummy '1' if large firm, '0' Medium and Small Firm (MSF)	.4272816	.4947323	0	1	5,095
iregion	Dummy' 1' if located in Addis Ababa,' 0' otherwise	.3560148	.4788663	0	1	5,129

Source: Authors' calculations based on CSA survey data

Table 4.8 below reports summary statistics for the main variables of interest for estimation used in the production function for estimating TFP**.** The mean output (proxied as VA) and capital (proxied as real capital stock) result from the production function descriptive statistics was 16.15 and 15.11, respectively, in the manufacturing sector in the study periods. Similarly, the mean result of labor (proxied as a total number of employees) was 3.9 in the study period in the manufacturing sector

Table 4.8. Descriptive Statistics for the Main Variables in Production Function

Production function Variables	Proxy Variables	Mean	Std. Dev.	Min	Max	Obs.
Output (Y)	Real value Added	16.15477	11.27823	1.824165	21.83175	5,129
Capital (K)	Real Capital stock	15.11102	4.869816	1.877524	22.67974	5,129
Labor (L)	Total number of Employee	3.895394	2.302585	1.244749	9.407961	5,129

Note: *calculated using the log values of each production function variables.*

Table 4.9. Production function estimates and elasticities values

Dependent variable lnrva	Coef.	Std. Err.	t	P>t	[95% Conf. Interval]	
lnrcap	0.43579*	0.01030	42.31	0.000	0.41559	0.45598
lnlab	0.69116*	0.01554	44.48	0.000	0.66070	0.72162
cons	6.877193*	0.11932	57.63	0.000	6.6433	7.1111
R-squared = 0.7341					Adj R-squared = 0.7340	
Number of obs = 5,129					Root MSE = 0.94083	
Prob > F = 0.0000					Residual = 4537.33459	
Sum of Elasticities = 1.127 > 1, it implies increasing return to scale						

Source: ***Authors' calculations based on CSA survey data.***

Robust Standard Errors (to control for heteroscedasticity and autocorrelation**)**

** p<0.1, ** p<0.05, *** p<0.01*

The above table 4.9 highlights the regression analysis results and the contribution of each independent variable to the estimation of the production function used to estimate TFP in the manufacturing sector. The R-square value determines the goodness of fit in regression analysis (R^2). The estimation result for the production function above indicates that the R-square value was 0.73, indicating that this model is a good fit. Thus, the 73 % variation of the dependent variable (lnrva) is explained by independent variables (lnrcap and lnlab) in the production function estimates above. Furthermore, the F- statistics of the model reveal that it has statistically significant explanatory power, implying that the regressions are meaningful and relevant in general.

In addition, the contribution of labor and capital to the input elasticity of the production function was 0.436 and 0.691, respectively, in the production function estimation mentioned above in the manufacturing sector in the study periods. As a result, the cumulative contributions of input elasticities coefficients were greater than one (1.127 > 1), showing an increasing return to scale.

As one of the sub-objectives of the study is estimating labor productivity (LP); labor productivity in level and growth rate was assessed in this study as real value-added per employee in figures 4.1 and 4.2 below. In Ethiopia, manufacturing LP has shown an upward trend, particularly in the sampled sector in recent years.

For instance, between the two end periods, 2011/12 and 2019/20, manufacturing LP increased from 190,896 Birr per employee to 352,578 Birr per employee (see Figure 4.1 below for detail).

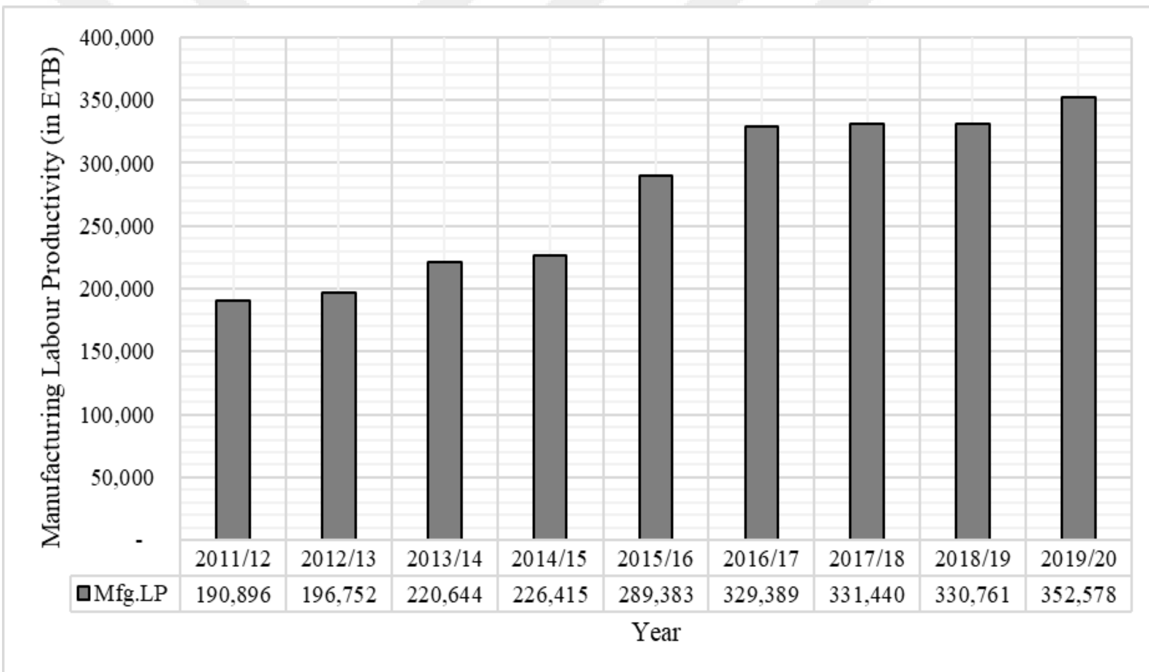

Figure 4.1 Manufacturing sector Labor productivity (real value-added per employee)

Source: authors' calculation based on the CSA's LMSMI Survey (2020) and PDC data.

However, the growth of LP was not smooth. It exhibited negative growth in 2018/19, and also low growth rate is registered in the year 2017/18, which is 0.62 %. However, between 2011/12 and 2019/20, Manufacturing LP growth increased from 3.06 percent to 6.60 percent between the two end periods. (see below Figure 7.2 for detail). Based on the sampled survey data, 2011/12 -2019/20, the average LP growth of the medium and large manufacturing sector was 8.3 %, and the median was 4.83. The results of this thesis are similar to the World Bank's (2016) estimations of the LP growth rate in Ethiopia's manufacturing sector over a different period. The variance, however, is most likely attributable to different sampling periods and data sources.

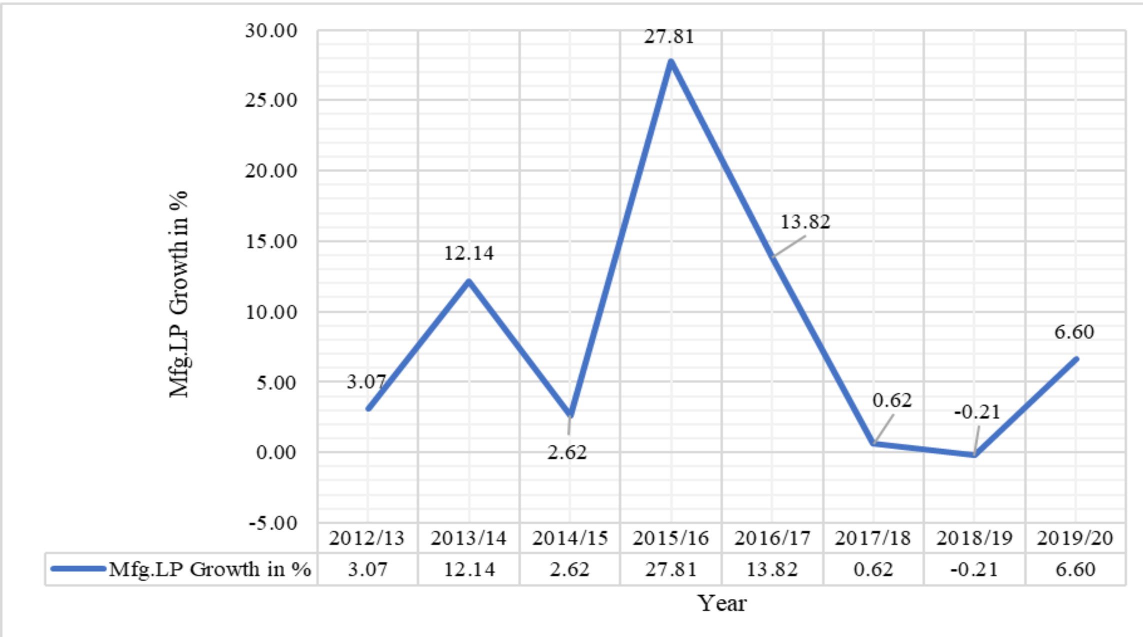

Figure 4.2 .Labor Productivity Growth in the Manufacturing sector (Real value added per employee)

Source: authors' calculation based on the CSA's LMSMI Survey (2020) and PDC data.

Table 4.10. below is the result of the TFP level in manufacturing sub-sectors in the year (2011/12-2019/20). In recent years, total factor productivity has shown an upward trend in manufacturing sub-sectors in Ethiopia, particularly in the sampled sub-sector. For instance, between 2011/12 and 2019/20, the average manufacturing TFP level increased from 1.05 to 1.49 in the food and beverage sub-sectors; the TFP level growth rate difference between 2011/12 to 2019/20 was 41.9 percent. likewise, in the textile sub-sectors, the TFP level increased from 1.16 to 1.88; the TFP level growth rate difference between 2011/12 to 2019/20 was 62.07 percent. (see Figure 7.1 above for detail). The highest TFP level was registered between 2011/12 and 2019/20 in the fabricated metal sub-sector and textile subsectors, which increased from 0.80 to 1.93 and 1.16 to 1.88,

respectively. As a result, their TFP level growth rate difference between 2011/12 to 2019/20 was 141.25 and 62.07 percent in the sampled period, respectively. However, the lowest TFP level was registered in the paper subsectors in the same period, which decreased from 1.28 to 1.14.

Table 4.10. TFP level in Manufacturing by sub-sector and year (2011/12-2019/20

Sectors	**Total Factor Productivity (TFP) level**									**The growth rate difference between 2011/12 and 2019/20 (in %)**
	2011/12	**2012/13**	**2013/14**	**2014/15**	**2015/16**	**2016/17**	**2017/18**	**2018/19**	**2019/20**	
Food & beverages	1.05	1.04	1.09	0.91	1.19	1.33	1.32	1.35	1.49	41.90
Textiles	1.16	1.08	1.36	1.16	1.28	1.43	1.51	1.6	1.88	62.07
Garment	1.12	0.99	0.86	0.93	1.05	1.23	1.30	1.32	1.57	40.18
Leather	0.99	0.89	0.80	0.97	1.18	1.28	1.27	1.33	1.46	47.47
Wood	0.93	1.12	1.00	0.80	1.18	1.40	1.36	1.56	1.59	70.97
Paper	1.28	1.01	0.87	0.88	1.03	1.11	1.06	1.13	1.14	-10.94
Publishing & printing	0.85	0.77	0.77	0.89	1.31	1.39	1.42	1.66	1.72	102.35
Chemicals	0.85	0.86	0.85	0.94	1.07	1.25	1.19	1.31	1.41	65.88
Rubber & plastics	1.31	1.24	1.20	1.43	1.54	1.55	1.53	1.51	1.52	16.03
Non-metallic minerals	0.84	0.83	0.78	0.89	1.20	1.39	1.41	1.58	1.71	103.57
Basic metals	0.80	0.77	0.83	0.77	1.13	1.45	1.53	1.60	1.67	108.75
Fabricated metal	0.80	0.73	1.04	1.12	1.37	1.56	1.71	1.722	1.93	141.25
Machinery & equipment	0.75	0.77	0.80	0.95	1.15	1.27	1.24	1.28	1.32	76.00
Motor vehicles	0.82	0.80	1.14	0.91	1.06	1.11	1.19	1.31	1.36	65.85
Furniture	0.80	0.84	0.96	1.03	1.52	1.46	1.35	1.47	1.55	93.75

Source: authors' calculation based on the CSA's LMSMI Survey (2020) and PDC data.

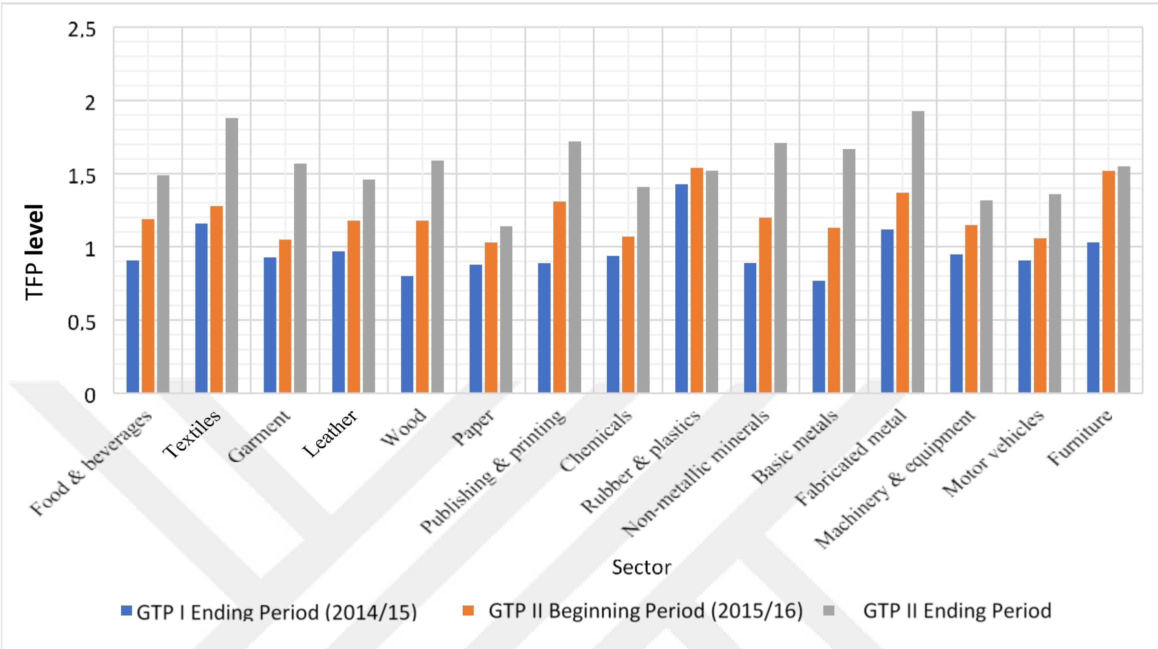

Figure 4.3. TFP level in Manufacturing by sub-sector and year (2011/12-2019/20

Source: authors' calculation based on the CSA's LMSMI Survey (2019/20) and PDC data

Figure 4.3 above shows the TFP level in the manufacturing sub-sector (2011/12-2019/20, in the Ethiopian government GTP (I and II) implementation beginning and Ending period. As shown above, the TFP level of most manufacturing subsectors increases moderately in the GTP II ending period compared with the GTP I ending and GTP II beginning period. Besides, it is increased vastly in the GTP II ending period compared with the GTP I ending, specifically in the fabricated metal, textile, and publishing and printing subsectors.

The TFP growth rate in manufacturing firms or establishments in Ethiopia is shown in Table 4.11. Achieving higher productivity levels is essential for a firm's survival in today's more competitive and globalizing market and the development of aggregate sectoral productivity. However, productivity hardly has improved in the case of the Ethiopian manufacturing firms. TFP growth was originally decreasing for most of the subsectors for a long time, but in 2015/16, it began to climb sharply in this study. For instance, from 2012/13 to 2019/20, TFP growth of the manufacturing sector increased slightly in some sectors for food & beverages, textiles, garment, and leather.

Table 4.11.The growth rate of TFP by sub-sectors (% by year) (2012-2020)

Sectors	**Total Factor Productivity (TFP) Growth (% by year)**							
	2012/13	**2013/14**	**2014/15**	**2015/16**	**2016/17**	**2017/18**	**2018/19**	**2019/20**
Food & beverages	-0.95	4.81	-16.51	30.77	11.76	-0.75	2.27	10.37
Textiles	-6.90	25.93	-14.71	10.34	11.72	5.59	5.96	17.50
Garment	-11.61	-13.13	8.14	12.90	17.14	5.69	1.54	18.94
Leather	-10.10	-10.11	21.25	21.65	8.47	-0.78	4.72	9.77
Wood	20.43	-10.71	-20.00	47.50	18.64	-2.86	14.71	1.92
Paper	-21.09	-13.86	1.15	17.05	7.77	-4.50	6.60	0.88
Publishing & printing	-9.41	0.00	15.58	47.19	6.11	2.16	16.90	3.61
Chemicals	1.18	-1.16	10.59	13.83	16.82	-4.80	10.08	7.63
Rubber & plastics	-5.34	-3.23	19.17	7.69	0.65	-1.29	-1.31	0.66
Non-metallic minerals	-1.19	-6.02	14.10	34.83	15.83	1.44	12.06	8.23
Basic metals	-3.75	7.79	-7.23	46.75	28.32	5.52	4.58	4.37
Fabricated metal	-8.75	42.47	7.69	22.32	13.87	9.62	0.70	12.08
Machinery & equipment	2.67	3.90	18.75	21.05	10.43	-2.36	3.23	3.13
Motor vehicles	-2.44	42.50	-20.18	16.48	4.72	7.21	10.08	3.82
Furniture	5.00	14.29	7.29	47.57	-3.95	-7.53	8.89	5.44

Source: authors' calculation based on the CSA's LMSMI Survey (2020) and PDC data.

Moreover, the highest TFP growth in percent is registered for textiles and garment sub-sectors; it was decreased by 6.90 and 11.61 percent in 2012/13, respectively, and increased to 17.50 and 18.94 in 2020, respectively. The table shows that the lowest percentage of TFP growth recorded in paper, rubber, and plastic subsectors were 0.66 and 0.88 during 2019/20. The decline in average TFP growth has been the highest at 20.18 and 20 percent in the case of motor vehicles and wood products in 2014/15. Despite its limits in terms of generality, this table demonstrates that productivity has increased somewhat across all sectors, including labor-intensive firms such as textiles and garment sub-sectors and capital-intensive industries such as machinery and equipment and motor vehicles sub-sectors.

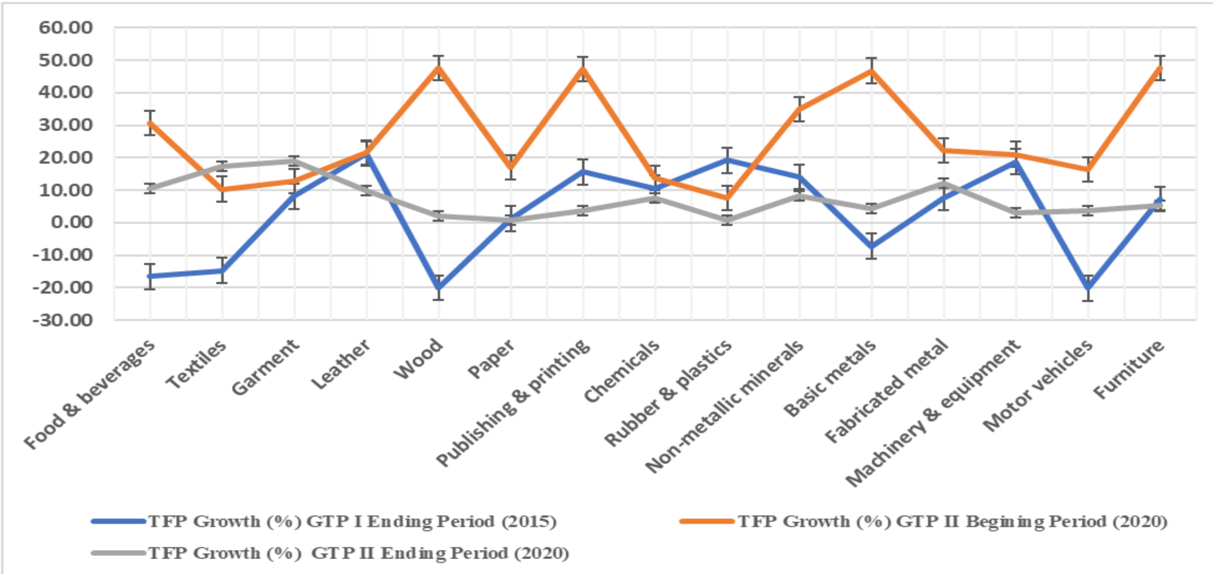

Figure 4.4 Manufacturing sub-sector TFP growth by %

Source: authors' calculation based on the CSA's LMSMI Survey (2020) and PDC data.

Figure 4.4 above plots the manufacturing sector's TFP growth rate. The food and beverage sub sector's annual average growth in 2012/13 and 2019/20 was -0.95 and 10.37. At the same time, the fabricated metal subsector's annual TFP growth rate was - 8.75 and 12.08 respectively in 2012/13 and 2019/20, and in the case of machinery and equipment, it was 2.67 and 3.13 in the same years.

Fig. 4.5 below shows were manufacturing sub-sector TFP level for selected Ethiopian government GTP (I and II) implementation beginning and ending period priority sub-sectors (2012-2020). For example, in the below figure, the eight GTP priority sub-sectors selected in the methodology section are presented: foods and beverages, textile, garment, leather products, chemicals, non-metallic minerals, basic metals, and fabricated metals from the major 15 industrial sub-sectors in this thesis. As shown below, the TFP level of most manufacturing subsectors increases moderately in the GTP II ending period compared with the GTP I ending and GTP II beginning period. Also, it is increased vastly in the GTP II ending period compared with the GTP I ending, specifically in the fabricated metal, textile, garment, basic metal, and non-metallic mineral sub-sectors.

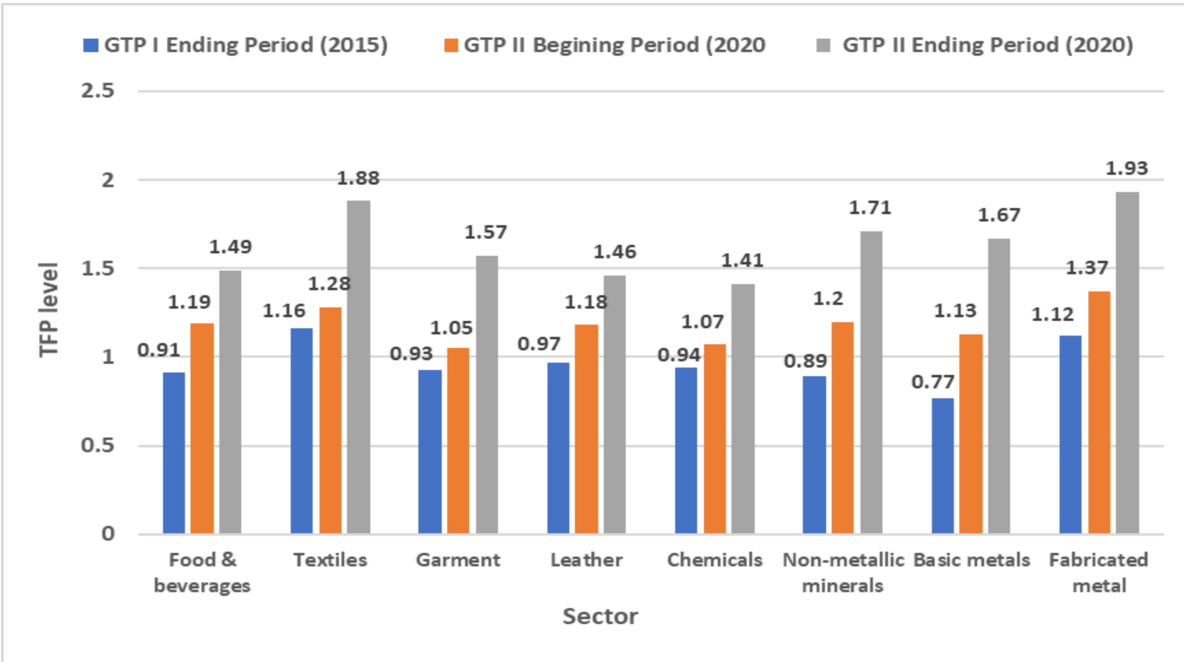

Figure 4.5 Manufacturing sub-sector TFP level for selected priority sub-sectors by year (2012-2020)

Source: authors' calculation based on the CSA's LMSMI Survey (2019/20) and PDC data.

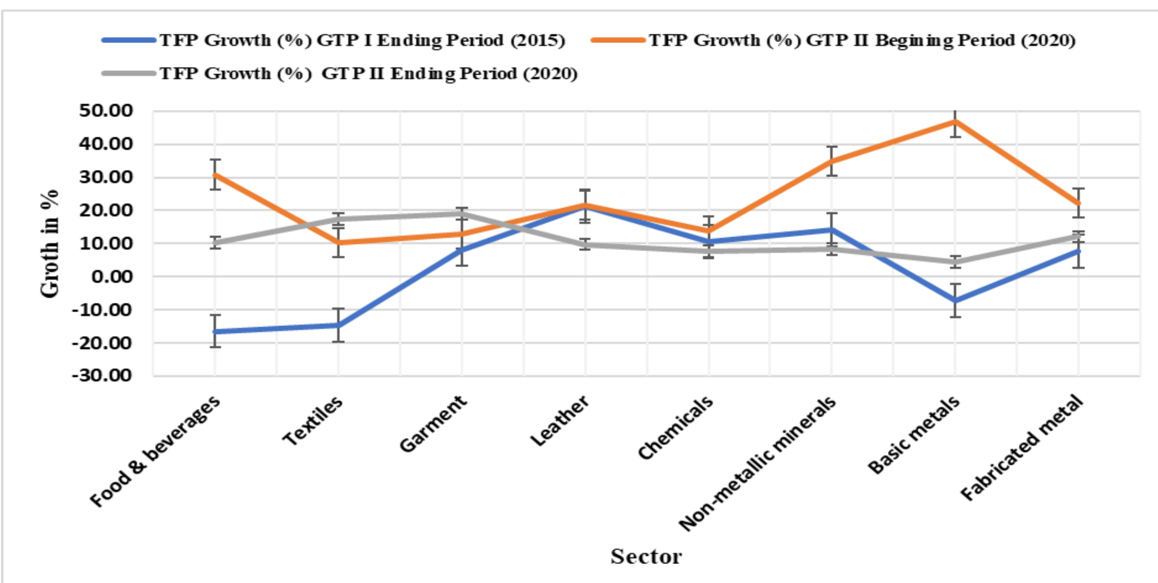

Figure 4.6. Manufacturing sub-sector TFP Growth for selected Priority sub-sectors by year (2012-2020)

Source: authors' calculation based on the CSA's LMSMI Survey (2020) and PDC.

Fig. 4.6. Shows the manufacturing sub-sector TFP growth for selected Ethiopian government GTP (I and II) implementation beginning and ending period priority sub-sectors by year (2012/13-2019/20) for eight selected GTP priority sub-sectors discussed above. As shown above, the TFP growth of most manufacturing subsectors increases moderately in the GTP II beginning period compared with the GTP I ending and GTP II ending periods. Besides, it increased slightly in the GTP II ending period compared with the GTP I ending, specifically in the fabricated metal, textile, garment, and food and beverage subsectors.

4.2.3. Estimated Models Result

4.2.3.1 Results: The Determinant of TFP in sampled general manufacturing sub-sector

The thesis examines the major determinants of the TFP level at the firm level in Ethiopia. The thesis utilized a particularly rich set of Ethiopian CSA firm-level datasets; the study used balanced micro-panel datasets of LMSMI observed annually from 2011/12 to 2019/20. The data sets are described in depth in this chapter methods section. Besides, the study used three GMM estimation methods which are Arellano and Bond (1991), Arellano and Bover (1995), and Blundell and Bond (1998) and used the LSDVC as the fourth estimator to answer the major objective of the study aforementioned before.

4.2.3.1.1. Correlation Matrix Test

The correlation matrix test of the variables used in the study is depicted in Table 7.9 below—the analysis aimed to ascertain the relationship between independent variables included in the thesis as the determinant of TFP. The firm-level determinants in this thesis are ln TFP, lnage, lnrm, lnrenrg, skill, iexstuts, ifirmsize, iownr, ilgfbo, and iregion. Based on the result of the test statistics, it can be said that the correlation coefficients between the variables generally have low values. In this context, the eight correlations in the above table, seven of the coefficients, are below the value of 0.5.

On the other hand, correlation coefficients between lnrm and lnrenrg were above 0.5. It is seen that the correlation coefficient between the variables was 0.66. Accordingly, a high correlation is one of the signs of the multicollinearity problem. Based on test results coefficients obtained, no high correlations were found within the scope of the data set used, implying no multicollinearity problem.

Table 4.12. The result of the correlation matrix test

	ln_TFP	**lnage**	**lnrm**	**lnrenrg**	**lnskill**	**iexstuts**	**ifirmsize**	**iregion**
ln_TFP	1.0000							
lnage	0.1025	1.0000						
lnrm	0.1529	0.1076	1.0000					
lnrenrg	0.0978	0.1002	0.6585	1.0000				
lnskill	0.1876	0.1039	0.4205	0.4036	1.0000			
iexstuts	0.0501	0.0952	0.1508	0.1353	0.1023	1.0000		
ifirmsize	0.0017	0.2089	0.4750	0.4459	0.0527	0.2055	1.0000	
iregion	0.0347	0.2792	0.0725	0.0596	0.0978	0.0406	0.1504	1.0000

Source: authors' calculation based on the CSA's LMSMI Survey (2020) and PDC

Table 4.13 below presents the estimated one and two-step difference, two-step system GMM, and LSDVC results for the general manufacturing sector 2012-2020. The dependent variable as being the logarithm of TFP estimated with Solow residual with a statistically significant variable as determinants for TFP level: the estimated model is specified as follows:

$$\ln\_TFP = \beta_0 + \beta_1 firmsize_{it} + \beta_2\, Age_{it} + \beta_3 skill_{it} + \beta_4 ownership_{it} + \beta_5\, Export\ Status_{it} + \beta_6\, geographical\ region_{it} + \beta_7\, ownership_{it} + \beta_8 legal\ form\ of\ business\ ownership_{it} + \beta_9 energy_{it} + \varepsilon_{it} \quad (3)$$

In equation (3), *i* denotes the cross-section units, *t* represents the time dimension, and ε is the error term. The dependent variable is the ln_TFP, and the independent variables are material, firm size, legal for business ownership, skill, ownership, export tutus, region, and age. In the estimation, lnrm, dropped due to collinearity. In all model estimations, the maximum number of lags of past variables used as instruments is limited to 1 to avoid rejecting the null for the validity of overidentifying restrictions

Table 4.13 General manufacturing sector GMM and LSDVC estimators result

VARIABLES	(1) The Difference GMM	(2) The Difference Two Steps GMM	(3) The System GMM	(4) LSDVC
L.ln_TFP	0.507***	0.505***	0.613***	0.631***
	(0.0220)	(0.0212)	(0.0218)	(0.0153)
ifirmsize	0.0510	-0.0300	-0.218***	-0.169***
	(0.0952)	(0.0909)	(0.0449)	(0.0308)
ilgfbo	0.0201	0.0357	-0.149*	0.144
	(0.113)	(0.0988)	(0.0824)	(0.109)
lnskill	0.112***	0.102***	0.0429***	0.0688***
	(0.0139)	(0.0133)	(0.0102)	(0.00724)
iownr[21]	-0.224*	-0.249	0.247**	-0.519***
	(0.128)	(0.267)	(0.109)	(0.168)
iexstuts	0.118**	0.112*	0.0810**	0.0782**
	(0.0553)	(0.0614)	(0.0373)	(0.0360)
iregion	-0.381***	-0.413***	-0.114	-0.0793
	(0.144)	(0.154)	(0.0768)	(0.0853)
lnage	0.219***	0.227***	0.0648***	0.178***
	(0.0295)	(0.0272)	(0.0185)	(0.0231)
lnrenrg	6.47e-07	1.41e-07	1.23e-09	-1.01e-08
	(7.27e-07)	(5.26e-07)	(1.63e-08)	(1.13e-07)
Constant			-0.537***	
			(0.155)	
Observations	3,926	3,948	4,518	4,518
Number of Id	569	570	570	570
AR (2)	-0.29	-0.34	-0.06	
	[0.771]	[0.734]	[0.956]	
Hansen- test	309.97	311.41	432.72	
	[0.139]	[0.127]	[0.071]	

Note: Relevant coefficients and statistics were obtained using the "Stata 15.0" and "xtabond2 and xtlsdvc" code; *** p<0.01, ** p<0.05, * p<0.1 statistically significant at 1% / 5% / 10%. *P*-values for the usual diagnostic tests' null hypotheses are reported in square brackets at the table's end [ ]. Standard errors are in parentheses; column (1), (2), and (3) indicates Arellano and Bond (1991), Arellano and Bover (1995), and Blundell and Bond (1998), respectively.

Source: authors' calculation based on the CSA's LMSMI Survey Various years.

[21] A conversion formula called ***[e^{β} -1] * 100***, where e is the exponent (i.e. the base or the anti-log) of the natural log is used when the dependent variables is expressed in natural logarithms (L. ln_TFP) and the explanatory variables are dummies variables (in this case for the variables like ifirmsize, ilgfbo, iownr, iexstuts , iregion).

The estimation results of one and two-step differences, system GMM and LCDVC are shown in columns (1) up to (4) with the full model as seen in Table 4.13. below, all usual diagnostic tests confirm the robustness of the estimation results. Furthermore, in the table, the thesis also checked the existence of the second-order autocorrelation problems within AR (2). Thus, conclude that there is no evidence of autocorrelation in the residuals of the sample. At the same time, all tests for second-order autocorrelation (AR-2) are satisfactory and significant. Besides, all the three GMM estimators are associated with significant Hansen- test statistics

According to the results obtained from the difference GMM estimator (Arellano and Bond, 1991), the lagged value of the dependent variable ln_TFP, lnskill, and lnage has a significantly positive effect on firm-level TFP level at a 99% significance level. Also, the coefficient of export status(iexstuts) variable has a significant and positive sign at a 95% significance level. However, it was found that ownership (iownr) and region (iregion) coefficients have a significant and negative sign at 95% and 90% significance levels, respectively. Therefore, they negatively impact the firm-level TFP level in the corresponding period. This result reveals the disruptive effect of ownership and region on firm-level TFP levels in the corresponding periods.

In this context, a percentage change in labor skill is associated with a 0.112 % increase in total factor productivity level at a 1% significance level, on average ceteris paribus. Hence skill of labor and TFP exhibits an inelastic relationship. Similarly, a percentage change in the age of a firm is associated with a 0.219 % increase in total factor productivity level at a 1% significance level, on average ceteris paribus. Also, the firm's age and TFP exhibit an inelastic relationship. Besides, the export status result implies that exporter firm TFP on average ceteris paribus is 12.52[22] % higher than non-exporters firms at a 5% significance level. Also, the firm ownership GMM result reveals that the private-owned firm's TFP on average ceteris paribus is 20.07[23] % lower than the public firms at a

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[22] *conversion formula is used [e^{β} -1] * 100, Thus [$e^{-0.118}$ -1] *100 = 12.52*
[23] *conversion formula is used [e^{β} -1] * 100, Thus [$e^{-0.224}$-1] *100 = -20.07*

10% significance level. Furthermore, the regional location of firms reveals that those firms located in the capital city Addis Ababa TFP on average ceteris paribus is 31.68 [24] % lower than those found in other than Addis at a 1% significance.

Besides the findings of the two-step difference and system GMM (Arellano and Bover, 1995; Blundell and Bond, 1998) together, it is seen that the lagged value of the dependent variable ln_TFP, lnskill, and lnage has a significantly positive effect on firm-level TFP level at 99% significance level. It reveals that a percentage change in labor skill is associated with a 0.102% and 0.043% increase in total factor productivity level at a 1% significance level, respectively, on average ceteris paribus. Hence skill of labor and TFP exhibits an inelastic relationship. At the same time, a percentage change in the age of a firm is associated with a 0.219% and 0.065% increase in total factor productivity level at a 1% significance level, respectively, on average ceteris paribus. Hence the age of the firm and TFP exhibits an inelastic relationship. Furthermore, export status (iexstuts) are significantly positive in both estimations. The export status result implies that exporter firm TFP on average ceteris paribus is 11.85[25] % and 8.44[26] % higher than non-exporters firms at a 10% and 5% significance level.

Similarly, the two-step differences GMM estimator (Arellano and Bover, 1995) reveals that (iregion) affects TFP growth negatively at a 99% significance level. Also, the regional location of firms shows that those firms located in the capital city Addis Ababa TFP on average ceteris paribus are 33.83[27] % lower than those found in other than Addis Ababa at a 1% significance. However, the coefficient of ilgfbo and ifirmsize has a negative sign and significant coefficients, respectively. Furthermore, the coefficient of ilgfbo and ifirmsize implies that unlimited liability firms and larger firms TFP on average ceteris paribus is 13.84[28] % and 19.59[29] % lower than the limited liability firms and small and

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[24] *conversion formula is used [e^{β} -1] * 100, Thus [$e^{-0.381}$ -1] *100 = -31.68*
[25] *conversion formula is used [e^{β} -1] * 100, Thus [$e^{0.112}$-1] *100 = 11.85*
[26] *conversion formula is used [e β -1] * 100, Thus [$e^{0.081}$-1] *100 = 8.44*
[27] *conversion formula is used [e^{β} -1] * 100, Thus [$e^{-0.413}$ -1] *100 = -33.83*
[28] *conversion formula is used [e β -1] * 100, Thus [$e^{-0.149}$ -1] *100 = -13.84*
[29] *conversion formula is used [e β -1] * 100, Thus [$e^{-0.218}$ -1] *100 = -19.59*

medium firms (SMF) firms at a 10% and 1% significance level, respectively in the system GMM estimation. Unlike the first step difference (Arellano and Bond, 1991), and LSDVC estimations, the coefficient of iownr has a significantly positive effect on firm-level TFP growth at a 95% significance level in the system GMM estimation (Blundell and Bond, 1998). Thus, the firm ownership system GMM result reveals that the private-owned firm's TFP on average ceteris paribus is 28.02[30]% higher than the public firms at a 10% significance level.

Finally, the fourth estimator in this thesis, the so-called LSDVC estimator, reveals the lagged value of the dependent variable ln_TFP, lnskill, lnage, and iexpstuts are statically significant and positive effect firm-level TFP levels at 99 and 95% significance level, respectively. At the same time, the coefficient of lnskill and lnage implies that a percentage change in labor skill and firm age is associated with a 0.068% and 0.178% increase in total factor productivity level at a 1% significance level, respectively, on average ceteris paribus. Hence skill of labor, firm age, and TFP exhibit an inelastic relationship. Besides, export status (iexstuts) is significantly positive, and the result implies that exporter firm TFP on average ceteris paribus is 8.13[31] % higher than non-exporters firms at a 5% significance.

However, the coefficient of firm size and iownr has a negative sign that significantly affects firm-level TFP growth at a 99% significance level in the LSDVC estimator. Thus, the coefficient ifirmsize and iownr imply that larger firms and private firms' TFP on average ceteris paribus is 15.54[32] % and 40.48[33] lower than the small and medium firms (SMF) firms and public firms at a 1% significance level, respectively in the LSDVC estimator.

Generally, the main results from the general manufacturing sector 2011/12-2019/20 GMM panel datasets estimators revealed that the lag of log TFP (L. ln_TFP) is

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[30] *conversion formula is used [e β -1] * 100, Thus [e $^{0.247}$ -1] *100 = 28.02*
[31] *conversion formula is used [e β -1] * 100, Thus [e $^{0.0782}$ -1] *100 = 8.13*
[32] *conversion formula is used [e β -1] * 100, Thus [e $^{-0.169}$ -1] *100 = -15.54*
[33] *conversion formula is used [e β -1] * 100, Thus [e -0.519-1] *100 = -40.48*

positive and significant for the four GMM estimators, including the LSDVC estimator. Besides, the results of lnskill, iexpstuts, and lnage are positive and significant in all four estimators discussed above. Thus, most of the statistically significant variables again have their expected signs. But some of the control dummy variables have unexpected signs, as hypothesized before.

4.2.3.2. Result: The GTP Manufacturing sector priority sub-sectors and export oriented and Import substitution (IS) sub-sectors GMM and LSDVC estimation result

4.2.3.2.1. Textile garment and the leather subsectors estimation result

This section reports the GTP manufacturing sector priority sub-sectors and the export-oriented sub-sectors of GMM estimation results. For instance, table 4.14 below shows the textile garment and leather subsector, one and two-step differences, system GMM, and LCDVC estimation results.

Table 4.14 Textile garment and leather subsectors GMM and LSDVC estimation result

VARIABLES	**(1) The Difference GMM**	**(2) The Difference Two Steps GMM**	**(3) The System GMM**	**(4) LSDVC**
L.ln_TFP	0.617***	0.622***	0.891***	0.732***
	(0.0430)	(0.0400)	(0.0558)	(0.0402)
ifirmsize	-0.0802	-0.0406	-0.0222	-0.0775
	(0.0707)	(0.0989)	(0.0408)	(0.0731)
ilgfbo	0.0120	0.0929	-0.0428	-0.0348
	(0.0901)	(0.0823)	(0.0324)	(0.149)
lnskill	0.0565***	0.0497**	0.0453**	0.0565***
	(0.0212)	(0.0231)	(0.0188)	(0.0102)
iownr	0.411	0.432	0.0112	0.399
	(0.306)	(0.318)	(0.0686)	(0.249)
iexstuts	0.122*	0.156**	0.0102	0.0937*
	(0.0662)	(0.0665)	(0.0361)	(0.0554)
iregion	-0.0852	-0.0826	-0.0473	-0.104
	(0.0614)	(0.0661)	(0.0352)	(0.0684)
lnage	0.228**	0.237***	0.0172	0.187**
	(0.0955)	(0.0727)	(0.0280)	(0.0726)
lnrm	-1.11e-08*	-1.03e-08	-2.42e-08**	-2.30e-08
	(6.26e-09)	(7.63e-09)	(1.15e-08)	(8.97e-08)
Constant			-0.388*	
			(0.229)	

Observations	623	623	713	713
Number of Id	90	90	90	90
AR (2)	-0.30	-0.22	-0.60	
	[0.768]	[0.830]	[0.551]	
Hansen- test	34.06	34.06	39.46	
	[0.199]	[0.199]	[0.142]	

Note: Relevant coefficients and statistics were obtained using the "Stata 15.0" and "xtabond2 and xtlsdvc" code. *** p<0.01, ** p<0.05, * p<0.1 statistically significant at 1% / 5% / 10%. *P*-values for the usual diagnostic tests' null hypotheses are reported in square brackets at the table's end [ ]. Standard errors are in parentheses; column (1), (2), (3) indicates Arellano and Bond (1991), Arellano and Bover (1995), and Blundell and Bond (1998), respectively.

Source: authors' calculation based on the CSA's LMSMI Survey Various years.

All usual diagnostic tests confirm the robustness of the estimation results. Furthermore, in the table, the thesis also checked the existence of the second-order autocorrelation problems within AR (2). Thus, conclude that there is no evidence of autocorrelation in the residuals of the sample. At the same time, all tests for second-order autocorrelation (AR-2) are satisfactory and significant. Besides, all the three GMM estimators are associated with significant Hansen- test statistics.

According to the results obtained from the one and two-step difference GMM estimators (Arellano and Bond, 1991 and Arellano and Bover, 1995), the lagged value of the dependent variable ln_TFP has a significantly positive effect on firm-level TFP level at a 99% significance level. At the same time, lnskill has a significantly positive impact on the firm-level TFP levels at a 99% and 95% significance level, respectively. Furthermore, it reveals that a percentage change in labor skill is associated with a 0.057% and 0.0497% increase in TFP level at a 1% and a 5% significance level, respectively, on average ceteris paribus. Hence skill of labor and TFP exhibits an inelastic relationship in both estimation situation.

Similarly, the coefficient of export status (iexstuts) variable has a significantly positive sign at a 90% and a 95% significance level, respectively, and lnage has a significantly positive sign at a 95% and a 99% significance level, respectively. Therefore, they positively impact the firm-level TFP level. Besides, the export status result implies that exporter firm TFP on average ceteris paribus is 12.97[34] % and 16.88[35] % higher than non-exporters firms at a 10% and 5% significance level, respectively.

At the same time, a percentage change in the age of a firm is associated with a 0.228% increase in total factor productivity growth at a 1% significance level, on average ceteris paribus. Also, the firm's age and TFP exhibit an inelastic relationship, respectively. However, it was found that material (lnrm) coefficients have a significantly negative sign at 90% significance levels in Arellano and Bond 1991. Furthermore, a percentage change in the material usage of a firm is associated with a 1.11% decrease in total factor productivity growth at a 10% significance level, on average ceteris paribus. Also, the firm's material usage and TFP exhibit an inelastic relationship.

The system GMM (Blundell and Bond, 1998) show that the lagged value of the dependent variable ln_TFP and lnskill has a significantly positive effect on firm-level TFP level at a 99% and a 95 % significance level, respectively. It reveals that a percentage change in labor skill is associated with a 0.0453% increase in total factor productivity level at a 5% significance level on average ceteris paribus. However, it was found that material (lnrm) coefficients have a significantly negative sign at a 95% significance level in the corresponding period also in Blundell and Bond's 1998 estimation. Thus, a percentage change in the material usage of a firm is associated with a 2.42 % decrease in total factor productivity level at a 5% significance level, on average, ceteris paribus. Also, the firm's material usage and TFP exhibit an inelastic relationship.

Finally, the LSDVC estimator result reveals that lagged values of the dependent variable ln_TFP and lnskill are statically significant and positively affect firm-level TFP level at a 99-significance level. Also, the coefficient of lnage and iexstuts has a positive sign that significantly affects firm-level TFP growth at a 95% and a 90% significance level in the LSDVC estimator. Therefore, they all positively impact the firm-level TFP level. Thus, the coefficient of lnskill and lnage implies that a percentage change in labor skill

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*[34] conversion formula is used [e^{β} -1] * 100, Thus [$e^{12.2}$-1] *100 = 12.97*
*[35] conversion formula is used [e^{β} -1] * 100, Thus [e^{156}-1] *100 = 16.88*

and firm age is associated with a 0.0565% and 0.187 % increase in total factor productivity level at a 1% and a 5% significance level, respectively, on average ceteris paribus. Thus, the skill of labor, firm age, and TFP exhibit an inelastic relationship, respectively. Besides, the coefficient of export status (iexstuts) reveals that exporter firm TFP on average ceteris paribus is 9.82[36] % higher than non-exporters firms at a 5% significance level.

Generally, the main results from the textile, garment, and leather subsectors the differences, and system GMM and LCDVC estimation results of panel datasets from 2011/12-2019/20 revealed that the lag of log TFP (L. ln_TFP) is positive and significant for all GMM estimators and LSDVC estimator. Furthermore, all four estimators found labor skill (lnskill) positive and significant. At the same time, the result of export status (iexpstuts) and firm age (lnage) are significant and have a positive sign in Arellano and Bond, 1991, Blundell and Bover,1995 and LSDVC estimations. However, the material (lnrm) coefficients have a significant and negative sign in the corresponding period only in Arellano and Bond, 1991 and Blundell and Bond, 1998 estimation. Thus, most statistically significant variables again have their expected signs, but some of the control dummy variables have unexpected signs, as hypothesized before.

4.2.3.2.2. Food and Beverage sub-sectors GMM result

This section of the GTP manufacturing priority sub-sectors a panel GMM estimation result; Table 4.15 below shows the food and beverage sub-sectors GMM result, one and two-step differences, system GMM, and LCDVC estimation results. The usual diagnostic tests confirm the robustness of all the estimation results. Furthermore, in the table, the thesis also checked the existence of the second-order autocorrelation problems within AR (2). Thus, conclude that there is no evidence of autocorrelation in the residuals of the sample. At the same time, all tests for second-order autocorrelation (AR-2) are satisfactory and significant. Besides, all the three GMM estimators are associated with significant Hansen- test statistics.

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[36] *conversion formula is used [e β -1] * 100, Thus [$e^{0.094}$-1] *100 = 9.82*

According to the results obtained from the one and two-step difference GMM estimators (Arellano and Bond, 1991 and Arellano and Bover, 1995), the lagged value of the dependent variable ln_TFP has a significantly positive effect on firm-level TFP level at a 99% significance level. At the same time, firm size (ifirmsize) has a significant negative sign, respectively. The firm size (ifirmsize) result implies that larger firms TFP on average ceteris paribus is 24.64[37] % and 28.82[38] % lower than the small and medium firm (SMF) at a 95% significance level, respectively.

In addition, lnskill significantly impacts the firm-level TFP level at a 99% and 95% significance level. Furthermore, it reveals that a percentage change in labor skill is associated with a 0.0988% and 0.0752% increase in total factor productivity level at a 1% and a 5% significance level, respectively, on average ceteris paribus. Hence skill of labor and TFP exhibits an inelastic relationship in both estimation case. Also, the coefficient lnage has a significantly positive sign at a 99% and a 90% significance level, respectively, and positively impact the firm-level TFP level. Thus, in both estimation methods under discussion, a percentage change in the age of a firm is associated with a 0.127% and 0.088% increase in total factor productivity level at a 1% and a 10% significance level, on average ceteris paribus, respectively. Also, the firm's age and TFP exhibit an inelastic relationship, respectively.

The system GMM (Blundell and Bond, 1998) and LSDVC estimator show that the lagged value of the dependent variable ln_TFP has a significantly positive effect on firm-level TFP growth at a 99% significance level, respectively. While firm size has a negative sign at a 99% significance level, respectively; The firm size (ifirmsize) result implies that larger firms' TFP on average ceteris paribus is 33.03[39] % and 22.35[40] % lower than the small and medium firm (SMF) at a 95% significance level, respectively. Besides, lnskill has a significantly positive effect on firm-level TFP levels at a 95% and a 99% significance

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[37] *conversion formula is used [e β -1] * 100, Thus [$e^{-0.283}$-1] *100 = - 24.64*
[38] *conversion formula is used [e β -1] * 100, Thus [$e^{-0.340}$-1] *100 = - 28.82*

[39] *conversion formula is used [e β -1] * 100, Thus [$e^{-0.401}$-1] *100 = - 33.03*
[40] *conversion formula is used [e β -1] * 100, Thus [$e^{-0.253}$-1] *100 = - 22.35*

level, respectively. It reveals that a percentage change in labor skill is associated with a 0.0758% and 0.0635% increase in total factor productivity growth at a 5% and a 1% significance level on average ceteris paribus, respectively.

Table 4.15 Food and Beverage Sub-sectors GMM and LSDVC estimation result

VARIABLES	**(1) The Difference GMM**	**(2) The Difference Two Steps GMM**	**(3) The System GMM**	**(4) LSDVC**
L.ln_TFP	0.401***	0.410***	0.406***	0.505***
	(0.0333)	(0.0409)	(0.0404)	(0.0310)
lnrm	0.0188	0.00471	0.0129	0.00837
	(0.0177)	(0.0153)	(0.0126)	(0.0148)
ifirmsize	-0.283**	-0.340**	-0.401***	-0.253***
	(0.144)	(0.163)	(0.153)	(0.0747)
ilgfbo			-0.167	0.0720
			(0.479)	(0.112)
skill	0.0988***	0.0752**	0.0758**	0.0635***
	(0.0269)	(0.0355)	(0.0313)	(0.0204)
iownr			0.154	
			(1.121)	
iexstuts	0.0904	0.00612	0.00746	(0.0204)
	(0.0827)	(0.0953)	(0.0758)	0.0758
iregion			-0.308	0.0902
			(0.333)	(0.123)
lnrenrg	-0.00735	-0.00483	-0.00738	-0.00617
	(0.0117)	(0.0114)	(0.0110)	(0.0122)
lnage	0.127***	0.0882*	0.106**	0.1190***
	(0.0428)	(0.0533)	(0.0506)	(0.0412)
Constant			-0.878	
			(1.267)	
Observations	865	865	1,008	1,008
Number of Id	143	143	143	143
AR (2)	-0.23	-0.05	-0.15	
	[0.818]	[0.961]	[0.881]	
Hansen- test	69.15	69.15	71.53	
	[0.249]	[0.249]	[0.299]	

Note: Relevant coefficients and statistics were obtained using the "Stata 15.0" and "xtabond2 and xtlsdvc" code. *** p<0.01, ** p<0.05, * p<0.1 statistically significant at 1% / 5% / 10%. P-values for the usual diagnostic tests' null hypotheses are reported in square brackets at the table's end [ ]. Standard errors are in parentheses; column (1), (2), (3) indicates Arellano and Bond (1991), Arellano and Bover (1995), and Blundell and Bond (1998), respectively.

Source: authors' calculation based on the CSA's LMSMI Survey Various years.

Similarly, the system GMM (Blundell and Bond, 1998) and LSDVC estimator results reveal that the coefficient of lnage has a positive sign that significantly affects firm-level TFP growth at 95% and 99% significance levels, respectively. Therefore, they all positively impact the firm-level TFP level. Thus, the coefficient of lnage implies that a percentage change in firm age is associated with a 0.106% and 0.119% increase in total factor productivity growth at a 5% and a 1% significance level, respectively, on average ceteris paribus. Thus, the skill of labor, firm age, and TFP exhibit an inelastic relationship, respectively**.**

Generally, the main results from the food and beverage subsector's differences and system GMM and LCDVC estimation results of panel datasets from 2011/12-2019/20 revealed the lag of log TFP (L. ln_TFP) is positive and significant for all GMM estimators and the LSDVC estimator. Besides, the labor skill (lnskill) and firm age (lnage) results are positive and significant in all four estimators mentioned above. However, the firm size (ifirmsize) coefficients have a significant and negative sign in the corresponding period in all four estimators in the food and beverage subsector. Thus, most statistically significant variables again have their expected signs, but some of the control dummy variables have unexpected signs, as hypothesized before in the food and beverage subsector.

4.2.3.2.3 Chemical and the non-metallic mineral sub-sectors estimation result

This section of the GTP manufacturing priority sub-sectors and Import substitution (IS) sub-sectors panel GMM estimation result; Table 4.16. below are the chemical and non-metallic mineral sub-sectors results, one and two-step differences, system GMM, and LCDVC estimation results. The usual diagnostic tests confirm the robustness of all the estimation results. Besides, in the table, the thesis also checked the existence of the second-order autocorrelation problems within AR (2). Thus, conclude that there is no evidence of autocorrelation in the residuals of the sample. At the same time, all tests for second-order autocorrelation (AR-2) are satisfactory and significant. Besides, all the three GMM estimators are associated with significant Hansen- test statistics.

According to the results obtained from the one and two-step difference GMM estimators (Arellano and Bond, 1991 and Arellano and Bover, 1995), the lagged value of the dependent variable ln_TFP has a significantly positive effect on firm-level TFP level at a 99% significance level. At the same time, lnskill significantly impacts the firm-level TFP level at a 99% and 95% significance level, respectively, in both estimators. Additionally, it reveals that a percentage change in labor skill is associated with a 0.192 % and 0.137% increase in total factor productivity level at a 1% and a 5% significance level, respectively, on average ceteris paribus. Hence skill of labor and TFP exhibits an inelastic relationship in both estimation case. Also, the coefficient lnage has a significantly positive sign at a 99% significance level in Arellano and Bond, 1991 and Arellano and Bover, 1995 estimations. This implies that a percentage change in the firm's age is associated with a 0.0605 % and 0.394% increase in total factor productivity level at a 1% significance level, on average ceteris paribus, respectively. Also, the firm's age and TFP exhibit an inelastic relationship.

The system GMM (Blundell and Bond, 1998) and LSDVC estimator show that the lagged value of the dependent variable ln_TFP has a significantly positive effect on firm-level TFP growth at a 99% significance level, respectively. In contrast, firm size (ifirmsize) has a negative sign at a 99% significance level and is only significant in LSDVC estimation. The firm size (ifirmsize) result implies that larger firm TFP on average ceteris paribus is 22.66[41] % lower than the small and medium firm (SMF) at a 95% significance level. Besides, lnskill has a significantly positive effect on firm-level TFP growth at a 90% and a 95% significance level, respectively. Furthermore, it reveals that a percentage change in labor skill is associated with a 0.108 % and 0.050% increase in total factor productivity level at a 10% and a 5% significance level on average ceteris paribus, respectively. Finally, system GMM (Blundell and Bond, 1998) and LSDVC estimator results reveal that the coefficient of lnage has a positive sign that significantly affects firm-level TFP growth at a 99% significance level respectively. Therefore, they all

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[41] *conversion formula is used* $[e^{\beta} - 1] * 100$*, Thus* $[e^{-0.257} - 1] * 100 = -22.66$.

positively impact the firm-level TFP level. Thus, the coefficient of lnage implies that a percentage change in firm age is associated with a 0.038% and 0.361% increase in total factor productivity growth at a 1% significance level, respectively, on average ceteris paribus. Thus, the skill of labor, firm age, and TFP exhibit an inelastic relationship, respectively.

The overall main results of chemical and non-metallic mineral sub-sectors differences, system GMM, and LCDVC estimation results of panel datasets from 2011/12-2019/20 revealed the lag of log TFP (L. ln_TFP) is positive and significant for all GMM estimators and the LSDVC estimator. Besides, the labor skill (lnskill) and firm age (lnage) results are positive and significant in all four estimators discussed above. However, the firm size (ifirmsize) coefficients have a significant and negative sign in the corresponding period only in LSDVC estimators in chemical and non-metallic mineral sub-sectors. Thus, most statistically significant variables again have their expected signs, but some of the control dummy variables have unexpected signs, as hypothesized before in chemical and non-metallic mineral sub-sectors.

Table 4.16. Chemical and non-metallic mineral sub-sectors GMM and LSDVC estimation result

VARIABLES	**(1) The Difference GMM**	**(2) The Difference Two Steps GMM**	**(3) The System GMM**	**(4) LSDVC**
L.ln_TFP	0.502***	0.567***	0.550***	0.693***
	(0.0490)	(0.0500)	(0.0491)	(0.0356)
lnrm	-0.0133	-0.0393	-0.0235	0.0175
	(0.0270)	(0.0275)	(0.0255)	(0.0166)
ifirmsize	-0.117	-0.0759	-0.155	-0.257***
	(0.130)	(0.107)	(0.194)	(0.0963)
ilgfbo			-0.0420	0.0515
			(0.117)	(0.448)
lnskill	0.192***	0.137**	0.108*	0.0495**
	(0.0566)	(0.0672)	(0.0545)	(0.0238)
iownr			0.700	
			(0.534)	
iexstuts	-0.108	-0.156	-0.0828	-0.0396
	(0.102)	(0.0970)	(0.116)	(0.133)
iregion			-0.147	
			(0.154)	
lnrenrg	-0.0215	-0.0146	-0.0200	0.00543

	(0.0210)	(0.0207)	(0.0204)	(0.0140)
lnage	0.0605***	0.394***	0.0384***	0.361***
	(0.0101)	(0.0895)	(0.00663)	(0.0641)
Constant			-1.428*	
			(0.860)	
Observations	683	683	782	782
Number of Id	99	99	99	99
AR (2)	-1.05	-1.00	-0.90	
	[0.292]	[0.319]	[0.370]	
Hansen- test	35.45	47.56	37.13	
	[0.128]	[0.076]	[0.173]	

Note: Relevant coefficients and statistics were obtained using the "Stata 15.0" and "xtabond2 and xtlsdvc" code. *** p<0.01, ** p<0.05, * p<0.1 statistically significant at 1% / 5% / 10. *P*-values for the usual diagnostic tests' null hypotheses are reported in square brackets at the table's end [ ]. Standard errors are in parentheses; column (1), (2), and (3) indicates Arellano and Bond (1991), Arellano and Bover (1995), and Blundell and Bond (1998), respectively.

Source: authors' calculation based on the CSA's LMSMI Survey Various years.

4.2.3.2.4. Basic and Fabricated metal sub-sectors estimation result

This section of the GTP manufacturing priority sub-sectors and Import substitution (IS) oriented sub-sectors Panel GMM estimation result; Table 4.17. below are the basic and fabricated metal sub-sectors GMM results, one and two-step differences, system GMM, and LCDVC estimation results. The usual diagnostic tests confirm the robustness of all the estimation results. Furthermore, in the table, the thesis also checked the existence of the second-order autocorrelation problems within AR (2). Thus, conclude that there is no evidence of autocorrelation in the residuals of the sample. At the same time, all tests for second-order autocorrelation (AR-2) are satisfactory and significant. Besides, all the three GMM estimators are associated with significant Hansen- test statistics.

According to the results obtained from the one and two-step difference GMM estimators (Arellano and Bond, 1991 and Arellano and Bover, 1995), the lagged value of the dependent variable ln_TFP has a significantly positive effect on firm-level TFP growth at a 99% significance level. At the same time, the legal form of business ownership (ilgfbo) has a positive sign, only significant in the first difference GMM (Arellano and Bond, 1991). The legal form of business ownership (ilgfbo) result implies that unlimited liability firm TFP on average ceteris paribus is 21.57[42] % higher than limited liability firms at a 90% significance level, in Arellano and Bond's (1991) estimation in line with the hypothesis of the study.

Besides, lnskill significantly impacts firm-level TFP growth at a 99% significance level. Furthermore, it reveals that a percentage change in labor skill is associated with a 0.322% and 0.246% increase in total factor productivity growth at a 1% significance level, respectively, on average ceteris paribus. Hence skill of labor and TFP exhibits an inelastic relationship in both estimation case. However, it was found that ownership (iownr) and energy (lnreng) coefficients have a significantly negative sign at 99% and 90% significance levels, respectively. Therefore, they negatively impact the firm-level TFP level in the corresponding period. Also, the firm ownership GMM result reveals that the private-owned firm's TFP on average ceteris paribus is 74.53[43] % and 74.02[44] % lower than the public firms at a 1% significance level, respectively. Furthermore, firms' energy (lnreng) coefficients reveal that a percentage change in energy is associated with a 0.0851% and 0.0727 % decrease in total factor productivity growth at a 10% significance level, respectively, on average ceteris paribus in both estimation cases. Similarly, the coefficient of lnage has a significantly positive sign at a 90% and 95% significance level in Arellano and Bond (1991) and Arellano and Bover's 1995 estimation. This implies a percentage change in the firm's age is associated with a 0.209 % and 0.187% increase in total factor productivity growth at a 10% and 5% significance level, on average ceteris paribus, respectively. Also, the firm's age and TFP exhibit an inelastic relationship.

The system GMM (Blundell and Bond, 1998) and LSDVC estimator show that the lagged value of the dependent variable ln_TFP has a significantly positive effect on firm-level TFP level at a 99% significance level, respectively. Furthermore, lnskill has a significantly positive effect on firm-level TFP level at a 95% and a 99% significance level,

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[42] *conversion formula is used [e β -1] * 100, Thus* $[e^{0.511}-1]*100 = -21.57$

[43] *conversion formula is used [e β -1] * 100, Thus* $[e^{-1.368}-1]*100 = -74.53$

[44] *conversion formula is used [e β -1] * 100, Thus* $[e^{-1.348}-1]*100 = -74.02$

respectively. It reveals that a percentage change in labor skill is associated with a 0.151 % and 0.107 % increase in total factor productivity level at a 5 % and a 1% significance level on average ceteris paribus, respectively. Furthermore, firms' energy (lnreng) coefficients are significant and negative. It reveals that a percentage change in energy is associated with a 0.0444% and 0.0304 % decrease in total factor productivity level at a 5% and 10% significance level, respectively, on average ceteris paribus. In addition, the coefficient of lnage has a positive sign that significantly affects the firm-level TFP level at a 90% significance level, respectively. Thus, the coefficient of lnage implies that a percentage change in firm age is associated with a 0.103 % and 0.0882 % increase in total factor productivity level at a 10 % significance level, respectively, on average ceteris paribus. Thus, the skill of labor, firms age, and TFP exhibit an inelastic relationship, respectively

Finally, LSDVC estimator results reveal that the coefficient of material (lnrm) has a positive sign that significantly affects firm-level TFP level at a 95% significance level, respectively. Therefore, it has a positive impact on the firm-level TFP level. Thus, the coefficient of lnrm implies that a percentage change in material usage is associated with a 0.0541% increase in total factor productivity level at a 5% significance level, respectively, on average ceteris paribus. Thus, material and TFP exhibit an inelastic relationship. On the other hand, it was found that ownership (iownr) coefficients have a significantly negative sign at 99% significance levels. Likewise, the firm ownership GMM result reveals that the private-owned firm's TFP on average ceteris paribus is 27.02[45] % lower than the public firms at a 1% significance level in the LSDVC estimator.

Generally, the main results from the basic and fabricated metal subsectors differences and system GMM and LCDVC estimation results from 2011/12-2019/20 GMM panel datasets revealed that the lag of log TFP (L.ln_TFP) is positive and significant for the four GMM estimators, including the LSDVC estimator. Besides, the results of lnskill and lnage are positive and significant in all four estimators discussed above. However, lnrenrg has a negatively significant in all four estimators. Furthermore,

[45] *conversion formula is used [e β -1] * 100, Thus* $[e^{-0.315}-1]*100 = -27.02$

the ownership coefficient is also significant in all estimators except in the system GMM, and the coefficient of material (lnrm) is only positive and significant in LSDVC estimation. Thus, most of the statistically significant variables again have their expected signs. But some of the control dummy variables have unexpected signs compared to what is theoretically assumed.

Table 4.17. Basic and fabricated metal subsectors GMM and LSDVC estimation result

VARIABLES	(1) The Difference GMM	(2) The Difference Two Steps GMM	(3) The System GMM	(4) LSDVC
L.ln_TFP	0.684***	0.671***	0.754***	0.794***
	(0.0885)	(0.0875)	(0.0576)	(0.0438)
lnrm	0.0286	0.0467	0.0140	0.0541**
	(0.0516)	(0.0615)	(0.0288)	(0.0217)
ifirmsize	-0.0437	-0.0957	-0.0490	-0.0574
	(0.0959)	(0.0867)	(0.0864)	(0.0996)
ilgfbo	0.511*	0.491	-0.0578	-0.0728
	(0.266)	(0.366)	(0.0904)	(0.0887)
lnskill	0.322***	0.246***	0.151**	0.107***
	(0.101)	(0.0897)	(0.0637)	(0.0283)
iownr	-1.368***	-1.348**	0.0125	-0.315***
	(0.465)	(0.557)	(0.135)	(0.105)
iexstuts	0.303	0.296	0.222	0.152
	(0.312)	(0.300)	(0.182)	(0.177)
iregion			-0.0135	
			(0.0844)	
lnrenrg	-0.0851*	-0.0727*	-0.0444**	-0.0304*
	(0.0441)	(0.0430)	(0.0219)	(0.0176)
lnage	0.209*	0.187**	0.103*	0.0882*
	(0.111)	(0.0902)	(0.0576)	(0.0498)
Constant			-1.326**	
			(0.624)	
Observations	348	348	399	406
Number of Id	51	51	51	51
AR (2)	0.21	0.05	-0.45	
	[0.831]	[0.964]	[0.650]	
Hansen- test	33.16	36.59	40.05	
	[0.192]	[0.305]	[0.337]	

Note: Relevant coefficients and statistics were obtained using the "Stata 15.0" and "xtabond2 and xtlsdvc" code. *** p<0.01, ** p<0.05, * p<0.1 statistically significant at 1% / 5% / 10%. *P*-values for the usual diagnostic tests' null hypotheses are reported in square brackets at the table's end [ ]. Standard errors are in parentheses; column (1), (2), (3) indicates Arellano and Bond (1991), Arellano and Bover (1995), and Blundell and Bond (1998), respectively.

Source: authors' calculation based on the CSA's LMSMI Survey Various years.

CONCLUSION AND RECOMMENDATION

Ethiopia began industrial development almost a century ago, even though this longtime industrialization experience is still dismal. The industrial and manufacturing sectors are undeveloped by all indicators, including poorer productivity (Zerihun, 2008) and lower export capability (Bigsten & Gebreeyesus, 2009a), lower technical competence and technology, and lower backward and forward connections (EEA 2005), and lower in everything, even today. Besides, the manufacturing sector is one of the least productive subsectors. Although Ethiopia's manufacturing sector began in the 1950s; firm-level studies have received little attention, and few studies have examined Ethiopian firm-level TFP; using recent balanced panel datasets, calculating TFP using the Value-added approach, fully measuring the Value-added variable by including stock difference values, and using four estimators makes the thesis unique. Besides, the thesis emphasizes the manufacturing sector because of the government's policy of prioritizing the sector.

The thesis's general objective is to examine the industrial production, multifactor productivity, and development of industrial policies in Ethiopia in the case of the manufacturing sector by using reconstructed balanced panel datasets. The sub-objectives considered to address and answer the overall objective of this thesis are as follows: Firstly, the sub-objective of the study is to examine the review of the Ethiopian economy in general and industrial production performance in particular. Secondly, the sub-objective of the study is to review and assess the development of industrial and manufacturing policies and institutions enacted to promote the industry in Ethiopia and to review the main investment incentives and regulations. Thirdly, the sub-objective of the study is to measure the level and growth of TFP and labor productivity (value added per employee) at the firm level and examines the TFP determinant in the manufacturing sector in Ethiopia, in general, GTP priority, export-oriented, and import-substituting sub-sectors in particular.

Ethiopia is a landlocked country in East Africa with 115 million people in 2020, after Nigeria. Ethiopia has the fastest-growing economy in the continent and region, with real GDP growth of 6.1% in 2019/20 (MPD & NBE, 2020). However, Ethiopia's economic growth in the past 15 years indicates structural change. In 2019/20, the service sector surpassed agriculture as the largest contributor to GDP with 39.5% and agriculture with 32.7%. The Industrial sector (including construction) accounted for 29% of GDP in 2019/20. Similarly, in 2019/20, the manufacturing sector accounted for 6.8% of GDP, which is lower than the GTP-II goal of 8% (NBE & MPD 2020). However, some industrial parks have become populated and functional in recent years. Moreover, the export of goods (merchandises) and the total export of goods and services in 2019/20 were USD 2.99 billion and USD 7.7 billion, respectively. Still, the volume and diversity of exports have not changed as planned. Manufacturing exports, which account for 15% of total merchandise exports, are small and stagnant compared to the GTP II implementation goal of 25.6 % in 2019/20.

Compared to other economic sectors, value addition is the distinguishing feature of the industrial, particularly the manufacturing sector. According to the World Bank Word development indicator database (2022) on the industrial value-added, the Ethiopian industrial sector, including construction, mining, water, and electricity, contributed 23.1 % of GDP in 2020, which shows a significant increase in GDP contribution compared to preceding years. Besides, Ethiopia's trends in industrial value-added (including construction) throughout the period from 2010–2019 show a sustained increase. The result shows that industrial value-added growth was demonstrated during the implementation periods of GTP (I and II). However, although the manufacturing sector showed high growth, the low contribution of the sub-sector to GDP (5.3 % in 2020) exhibits the infancy of Ethiopia's manufacturing activities or industrialization stage. Of the major reasons, the fact that the manufacturing sector was not a concern (priority) sector until 2010 is one. However, since 2010, the sector's contribution to the economy has risen due to economic reforms and objectives assigned to the sector (MoFED, 2010/11). As a result, the trends in manufacturing value-added in the economy have shown a constant increase from 2010 to 2020. Therefore, the share of the manufacturing value added (MVA) is one indicator used to assess the sector's relative performance against other economies. Besides, the Ethiopian manufacturing sector's low labor and total factor productivity were the primary reasons for its low competitiveness (World Bank, 2015; Subramanian and Matthijs, 2007).

As discussed in the industrial policies section of this thesis, many sectoral policies, strategies, and plans were issued and put into effect to elevate the manufacturing industry's importance in the overall economy. Moreover, the result recorded so far has fallen short of meeting the goal set by the GTP, the performance has been varied, and manufacturing exports have not been satisfying. The industry appeared as an economic unit in Ethiopia at the start of the twentieth century (Gebreeyesus (2013). Accordingly, the beginning of the import–substitution factory at home and, consequently, modern manufacturing enterprises began appearing in the 1920s. In Ethiopia, manufacturing started to gain pace in the 1950s, after a short period of interruption during the Second World War, and several new industries were established. These industries significantly contributed to improving the national economy; this period also manifested the beginning of the preparation of detailed development plans to spur and steer the nation's economic and industrial advancement (Shiferaw, 1995).

Over the last eighty years, Ethiopian industrial development can be divided into three periods (regimes): private sector-led and Import substitution from early 1950- 1974, which is known as the Imperial regime, import substitution and state-led starting from 1974 - 1991, which is called the Dergue regime. Moreover, the export-oriented and private sector-led, which began in 1991, is called the Ethiopian people's revolutionary democratic front (EPRDF) regime. Besides following the political ideologies that governed the economic principles of the time, subsequent rulers implemented various policies to advance the industry in the country.

Ethiopia has developed and executed several national development plans and strategies since the early 2000s; the industry sector in general and the manufacturing sector, in particular, were given priority following the formulation of the national industrial policy in 2003 by the FDRE. Furthermore, the Ethiopian government's first and second Growth and Transformation Plan (2010/11-2019/20), which is significant from a policy standpoint, and the creation of a favorable environment for the industry and manufacturing sector, in particular, is among the cornerstones of GTP strategies. Moreover, the industrial policy has identified priority sub-sectors that deserve attention to increase the industry sector's contribution and take its main leading role in the economy. In addition, the current government in power is implementing reforms to sustain economic growth, in particular, the Prime Minister's "*medemer*" or "*synergy philosophy*," the ten-year development plan 2020-2030, home-grown Economic Reform programs, and the expected new industrial policy are among the main reform activities undertaken by Government of Ethiopia from March 2018 onward (MPD, 2021).

According to the report, the Ethiopian economy was relatively good during those previous plan periods, attaining rapid economic growth, raising citizens' per capita income and living standards, and reducing poverty rates (FDRE, 2019). However, the result recorded so far has fallen short of meeting the goal set by the previous development plans and GTP. As a result, Ethiopia's growth was consistent and broad-based, but it was also far higher than the regional average (NBE, 2020; Oqubay, 2015). Moreover, the descriptive result shows that the volume and diversity of export products have not changed significantly as planned, and manufactured exports, which account for about 15 % of total merchandise export, have remained small and stagnant. Still, agriculture remained the leading employer, with a growing service sector. Furthermore, the deepening structural transformation in which the manufacturing industry dominates employment, consumption, and export has necessitated additional effort in creating institutions and technology capability.

Generally, Ethiopia's industrial policy-making process is characterized by greater flexibility and potential for policy learning. Additionally, the government of Ethiopia has broadened the range of policy instruments available to boost the designated industry over time (Gebreeyesus, (2013). Furthermore, benchmarking, institutional twinning, and kaizen were all additional assistance programs implemented by the government to assist Ethiopia's industrial sector in improving their products and services' quality, productivity, and international competitiveness. Finally, the thesis's background chapters discussed a detailed review of the Ethiopian government policy background in general and the industrial sector.

According to Van Biesebroeck (2007), the primary goal of productivity measurement is to discover output disparities that differences in input cannot explain. As discussed in the productivity measurement and methodology section of this thesis, the TFP measurements have been the subject of recent productivity debates; there are numerous approaches to empirically applying productivity measures once they have been formulated based on economic theory. Based on the statistical techniques and associated assumptions, the methodologies used in empirical literature can be roughly characterized as non-parametric, parametric, or semi-parametric. However, there has been no approach for predicting TFP completely free of constraints. Specifically, the studies of productivity at a firm's level often assume that output (normally measured as value-added or deflated sales) is a function of the inputs used by the firm and its productivity (Katayama, Lu, and Tybout, 2005). Besides, the residual TFP measure evaluates the impact of numerous policy measures following the functional relationship.

The primary data source for the main variables used in the thesis is the Ethiopian Central Statistics Agency (CSA) and the Ethiopian ministry of planning and development (MoPD) 2011/12 - 2019/20 datasets. In addition, the study employs nine independent variables pertaining to productivity determinants and two independent variables related to production function and TFP determinants. Additionally, a sample of 570 firms is used for general balanced panel data analysis, including 15 main industrial categories in manufacturing sectors covering 2011/12 - 2019/20. The thesis's methodology section discusses the sampled firms in detail for the study's GTP priority, export-oriented, and import-substituting sub-sectors. Besides, the sampled firms and manufacturing sub-sectors are discussed in detail in the methodology section.

This thesis focuses on estimating multifactor Productivity (TFP) at the firm level based on the value-added approach; since it is a critical measure of manufacturing performance and a key indicator for policymakers at the macro, industrial, and firm levels. The value-added variable is calculated by subtracting industrial and non-industrial costs from the gross value added. Finally, following Federica Saliola and Murat Seker's (2012) studies on productivity, the TFP of each sub-sector is measured as a residual of Cobb-Douglas (CD) production function specification before the estimation of the TFP determinant. Besides, labor productivity (LP) is calculated using value-added per labor for each subsector as one of the sub-objectives of the study.

The manufacturing labor productivity (LP) has increased in Ethiopia recently, particularly in the sampled sector in the study period. Moreover, LP's growth, on the other hand, was not smooth; for instance, it experienced negative growth in 2018/19 and a low growth rate in 2017/18in the sampled sector. But, on the other hand, the manufacturing LP growth increased between 2011/12 and 2019/20.

The Total Factor Productivity (TFP) has shown an upward trend in the Ethiopian general manufacturing sector, especially in the sampled subsectors. For instance, manufacturing TFP increased in the food and beverage, textile, and other subsectors. Moreover, the fabricated metal and textile subsectors had the highest TFP between 2011/12 and 2019/20, rising from 0.80 to 1.93 and 1.16 to 1.88, respectively. Besides, their TFP level growth rates difference between 2011/12 and 2019/20 were 141.25 and 62.07 percent. In the same period, the paper subsector had the lowest TFP, decreasing from 1.28 to 1.14. Most manufacturing subsectors' TFP levels increase moderately in the GTP II ending period compared to the GTP- I ending and GTP II beginning periods.

TFP growth in Ethiopian manufacturing firms had been declining for most subsectors for a long time, but in 2015/16, it began to climb sharply. TFP growth of the manufacturing sector increased slightly from 2012/13 to 2019/20 for food & beverages, textiles, garment, and leather. Besides, textiles and garment sub-sectors have the highest TFP growth in percent. At the same time, paper, rubber, and plastic subsectors had the lowest TFP growth in 2019. In 2014/15, motor vehicles and wood products registered the highest average TFP growth declines. Despite its limitation in terms of generality, the result shows that productivity has increased across all sectors, including labor-intensive industries such as textiles and garment sub-sectors and capital-intensive industries such as machinery and equipment and motor vehicles sub-sectors.

The descriptive statistics for log findings revealed that firms' average total factor productivity (TFP) was 0.0224 in the manufacturing sector. The descriptive statistics of the manufacturing sector's production function show that the mean output (VA) and capital were 16.15 and 15.11, respectively. In addition, the result of manufacturing's mean labor during the study period was 3.9. At the same time, the contribution of labor and capital to the input elasticity was calculated for the general manufacturing panel while calculating TFP using the CD production function value-added approach. Thus, their input elasticity contribution value indicates an increasing return to scale.

The thesis uses four estimation methods to analyze the determinant of TFP in the Ethiopian Manufacturing sector. These are Arellano and Bond, 1991; Arellano and Bover, 1995; Blundell and Bond, 1998 and the LSDVC estimator. The correlation coefficient test results obtained showed no high correlations within the scope of the dataset used in the general manufacturing panel datasets, implying no multicollinearity problem. Furthermore, besides the estimation results of one and two-step differences, system GMM and LCDVC manufacturing sector and the GTP priority, the export-oriented and Import substitution sub-sectors show that all usual diagnostic tests confirm the robustness of the estimation results. Furthermore, the thesis also checked the existence of the second-order autocorrelation problems within AR (2). Thus, I can be concluded that there is no evidence of autocorrelation in the residuals of the samples. At the same time, all tests for second-order autocorrelation (AR-2) are satisfactory and significant. Besides, all the three GMM estimators are associated with significant Hansen- test statistics.

According to the main findings of the general manufacturing sector, GTP priority, export-oriented, and import substitution sub-sectors for 2011/12-2019/20 GMM panel datasets estimators, the lag of log TFP (L. ln TFP) has a positive sign and is statistically significant in all four GMM estimators tested, including the LSDVC estimator. Besides, the results of lnskill, iexpstuts, and lnage are positive and significant in all four estimators in the general manufacturing sector. Furthermore, the main results from the textile garment and leather subsectors, the differences, system GMM, and LCDVC estimation results from 2011/12-2019/20 GMM panel datasets revealed that the results of lnskill are positive and significant in all four estimators. At the same time, the result of iexpstuts and lnage are significant and have positive signs in Arellano and Bond 1991, Blundell and Bover, 1995, and LSDVC estimation. However, the material (lnrm) coefficients are significant and negative in the corresponding period only in Arellano and Bond 1991 Blundell and Bond, 1998 estimators.

Similarly, the estimation results from the food and beverage subsector's first and second steps differences and system GMM and LCDVC estimation results from 2011/12-2019/20 GMM panel estimation revealed that lnskill and lnage coefficients have a positive sign and are significant in all four estimators. However, the firm size (ifirmsize) coefficients have a significant and negative sign in the corresponding period in all four estimators under discussion. Similarly, the main results of chemical and non-metallic mineral sub-sectors of four GMM estimators revealed that the results of lnskill are positive and significant in all four estimators. Besides, the lnage coefficient has a positive sign and is significant in all GMM and LSDVC estimators. However, the firm size (ifirmsize) coefficients only have a significant and negative sign in the corresponding period in LSDVC estimators.

Finally, the main results from the basic and fabricated metal subsectors differences and system GMM and LCDVC estimation results from 2011/12-2019/20 GMM panel datasets revealed the coefficient of lnskill and lnage are positive and significant in all four estimators under discussion. However, lnrenrg has a negatively significant in all four estimators. Furthermore, the ownership coefficient is also significant in all estimators except in the system GMM, and the coefficient of lnrm is only positive and significant in LSDVC estimation. In contrast to the general manufacturing panel datasets estimation result, the legal form of business ownership (ilgfbo) coefficient has a positive sign. It is statistically significant in the basic and fabricated metal subsectors estimation result. It implies that the unlimited liability firm's TFP is higher than the limited one in this case. Therefore, most of the statistically significant variables have gained their expected signs in the sub-sectors as previously hypothesized in the study. However, as previously hypothesized, some of the control dummy variables exhibit unexpected signs compared to what is theoretically assumed.

From the overall findings, the main determinant of TFP coefficients value revealed that each significant variable value differs for each sub-sector across the industry. For instance, the coefficient of lnskill scores higher values of 0.322 and 0.246 for the first and second difference GMM, respectively, and in the case of basic and fabricated metal subsectors. Besides, it registered a lower value of 0.0429 and 0.0453 in the system GMM of general manufacturing and textile garment and leather subsectors, respectively. At the same time, the coefficient of export status (iexstuts) scores a higher value of 0.156 in the two-step difference GMM of the textile, garment, and leather subsector and the second higher value of 0.118 one-step difference GMM of the general manufacturing sector. However, it registered a lower value of the export coefficient of 0.0102 and 0.0782 in the system GMM of the textile, garment, and leather sub-sectors and LSDVC of the general manufacturing panel.

Moreover, the coefficient of firm age (experience) scores the higher value of 0.394 in two steps difference GMM of chemical and non-metallic mineral sub-sector and the second higher value of 0.361 in LSDVC of chemical and non-metallic mineral sub-sectors. However, it registered a lower value of firm age coefficient of 0.0172 and 0.0384 in the system GMM of the textile, garment, and leather subsectors and chemical and non-metallic mineral sub-sector, respectively. Furthermore, regarding the effects of control variables, the results demonstrate that geographical region, ownership, firm size, material, energy, and legal form of the business variables appear to have a significant effect, in contrast to what is theoretically assumed despite having negative coefficients.

Generally, the study has found several variables that impact or are connected with the increase of TFP. These are the labor skill, age, export status, firms' size, ownership, legal form of the business, and other variables that seem to directly affect the TFP growth of Ethiopian manufacturing sectors in general and sub-sectors in particular. In comparison, the export status result is in line with Bigsten and Gebreeyesus (2009), Van Biesebroeck (2005), and De Loecker (2007; they found similar results on export status in different countries. According to the thesis, exporters had a greater TFP than non-exporters. Similarly, findings that labor skill came out as one of the strong correlates of productivity are in line with empirical research in the field: Gehringer et al. (2013) and others. Besides, the study found that TFP levels positively correlate with firm age. Although the study's findings are consistent with the learning-by-doing model (Arrow,1962), firm-level experience and learning (Yoon and Lee 2009; Burke et al. 2018; Jovanovic and Nyarko 1996) found that older firms achieve higher levels of productivity.

Furthermore, the firm's productivity levels are almost certainly associated with the firm's size, as measured by the number of employees. Thus, considering the effects of firm size, the thesis results are similar to Fernandes (2008), who found Bangladesh's small firms are more productive than bigger firms. Besides, Taymaz (2002) discovered a negative relationship between productivity growth rates and the firm's size, which is different from what Jovanovic (1982) found: bigger firms are more productive. Because the smaller firms typically organize their manufacturing processes differently than larger firms. Initially, economies of scale benefit productivity as firm size increases. However, as a corporation expands in size, diseconomies of scale may become dominant, negatively affecting production.

Surprisingly, the data show that firms in capital cities had lower TFP and were statistically significant. However, this is different from what is theoretically assumed. Moreover, due to the relatively small number of firms located in Addis Ababa compared to other locations in Ethiopia, the differences in geographical conditions between the capital city and other regions are not essential for firm productivity. Besides, the study used the region, ownership, legal form of business, and other variables as a control dummy variable. In some of the study's estimators and subsectors, the ownership coefficients (private dummies) turned negative and significant, implying that public-owned firms outperform their private counterparts in determining the TFP level. However, additional coefficients are unexpectedly emerging as strong predictors of productivity in some specifications, including the negative effect of ownership (concerning public ownership), materials, energy, and partially the legal form of business on productivity.

Accordingly, the thesis suggests the following policy recommendations to enhance productivity based on firm-level TFP determinant results and a policy framework based on the reviewed literature and macro-level descriptive statistics in the thesis. Accordingly, based on the thesis' findings, public incentives and policies to improve Ethiopian manufacturing firms' productivity and TFP level growth should target:

Skilled Labor: Labor skills proxied as wage per labor in the thesis are rewarded with higher wages for advanced training. According to the findings, it is also one of the main determinants of productivity and is in line with empirical research results. Therefore, the policy measures should provide incentives for people to invest in skills, encourage firms to use more skilled labor, specialized and efficient workers, and make more extensive use of training. Furthermore, firms have to invest in worker skill acquisition, provide incentives for on-the-job training, and skill-intensive production can enhance productivity in labor-intensive industries and reduce the negative impact of high turnover on industries. Similarly, incentives for enterprises to learn and use appropriate technology are another viable action. Besides, revisit higher education policies to build an adequately skilled workforce that industries or the market require for their growth and adjustment to the fast-changing skill sets needed in production. Besides, bridging the supply and demand gap for skilled labor through strong coordination between businesses, colleges or universities, and the government.

Export Promotion: All four of the employed estimators demonstrate that Exports significantly impact the firm's TFP, providing evidence that a focus on exports raises TFP across all exporting firms. Assuming Ethiopia's commitment to industrializing its economy, it is essential to strengthening its position in global trade by supporting existing exporting firms and creating new firms; working to improve the competitiveness of both existing and potential export entrants; and providing organized assistance to these companies in their pursuit of international markets. Accordingly, building the capability of exporting domestic firms to overcome export entry barriers, reduce bilateral trade costs, removal of trade-related obstacles to competition in the goods market, and improve the firm's access to favorable financing and foreign currency. The result also suggests the need to support those export-oriented sectors (such as textile, garment and lather, and others) to increase their export volume. Besides, promote export diversification strategy, improve the quality of export products, and bring it to global standards. As a result, it is anticipated that both static and dynamic trade gains for the country will occur.

Introducing a special support scheme for SMFs: Small and medium-sized firms (SMFs) are more active and more likely to engage in export and innovative activities. While the firm size coefficient, which is measured as the number of employees in the firm, has a negative sign. The study analysis result suggests smaller and medium-sized (SMFs) firms are more productive and have higher TFP than larger firms. Therefore, policies that encourage SMFs, such as reducing entry barriers and improving start-ups' access to finance, should be pursued to promote the formation of SMF firms.

Moreover, designing and implementing a highly effective enterprise support scheme through reductions in the tax burden, innovation loans, extra finance for SMEs, and grants and other support packages tailored to SMF should be considered and put in place. Based on the study result, SMFs firms dominate the manufacturing sector and are known as the primary drivers of productivity. As a result, the government should strive to create a comprehensive and effective national SMF support scheme by incorporating best practices (experience) and models from successful countries.

Experience (Firm Age): The study found that TFP levels positively correlate with firm age in all estimators showing the importance of learning by doing. In light of the fact that productivity increases with age (experience), policies that encourage firms to stay in the market are critical. At the same time, policies that promote experience sharing between the new and experienced ones should be encouraged and are essential in order to ensure productivity. Also, introduce policies that can facilitate increased investment in knowledge transfer by promoting stronger links between young and old firms through joint businesses and research and development (R&D).

In general, given the low manufacturing sector's contribution to the GDP, low labor productivity, and TFP, it is critical to increasing the aggregate productivity at the national level by increasing the productivity of individual firms (at the firm level) and reallocating resources from less productive to more productive firms. Besides, increasing the competitiveness at the firm level and providing support to those firms in their search for global markets will contribute to the strengthened export orientation at the national level and is believed to increase manufacturing export. However, these cannot be realized without clearly defined objectives and policies and implementing a robust mechanism that would drive effective learning, innovation, and advanced technology at the firm and national levels, together with the policies geared towards economic transformation in Ethiopia.

Furthermore, Ethiopia's industrial policy-making process is characterized by greater flexibility and potential for policy learning than neighboring African countries (Oqubay, 2015). However, respective government bodies should periodically evaluate and revise it to fit the situation. Besides, the industrial and trade policy should not be put separately, and trade should be mainstreamed in every economic sector, specifically in the industry sector.

Moreover, a policy is believed to achieve the desired goal only when "transformative institutions" drive it and when there is a strong government implementation capacity to pursue goals sustainably. Consequently, alongside the policies and strategies outlined above, the government should concentrate on developing and creating strong and transformative institutions in the country. Moreover, productivity goals that can be measured and managed should be set for the primary industries and manufacturing subsectors.

The timely dissemination of credible productivity-related statistics is critical for Ethiopia to achieve its aim of prioritizing productivity as a national goal. Therefore, the government should commit adequate resources to collect, analyze, and publish productivity-related statistics, national account statistics, and other economic sets. In particular, data for calculating TFP, the firm-level manufacturing input, output, capital stock, and firm-level other performance indicators should be improved over time and made accessible for users.

In conclusion, the thesis measured the TFP level and growth and estimated the determinant of TFP using available and manageable reconstructed panel datasets. The thesis found interesting descriptive and econometric statistics, but the CSA datasets can also be used to investigate various situations. Specifically, the thesis does not establish a full causal relationship between firm size and firm age, which is outside the scope of this thesis. However, when more survey rounds are conducted, panel data covering an adequate period may be utilized to discover causality more precisely. Moreover, other TFP determinants, measures, and approaches can be used based on available datasets in the future. Thus, productivity concerns outside the scope of this thesis will be left to other researchers to investigate further using updated datasets, improved approaches, and case studies in the future.

GENIŞLETILMIŞ ÖZET

Etiyopya'da Sanayi Üretimi, Çoklu- Faktör Verimliliği ve Sanayi Politikalarının Gelişimi: İmalat Sektörü Örneği

Giriş

Günümüzde dünya ülkelerinin sosyal ve ekonomik yapıları, endüstriyel gelişmelere bağlı olarak büyük ölçüde değişmiştir. Sanayileşmenin önemi, birçok sanayileşmiş ekonomide meydana geldiği gibi, tüm ekonomik sektörleri dönüştürme yeteneğinde yatmaktadır (EEA, 2005). Ayrıca, endüstrinin yüksek gelirli ülkelerden düşük gelirli ve gelişmekte olan ülkelere hareketi, son kırk yılda küresel ekonomideki en önemli değişikliklerden biri olmuştur. Ancak ne yazık ki, bu sanayileşme dönemi boyunca, Afrika'nın endüstriyel gelişim süreci tatmin edici olmayan sonuçlar üretmiştir (Newman ve diğerleri, 2016).

Etiyopya'nın sanayileşmesi yirminci yüzyılın başında ekonomik bir süreç olarak başlamıştır (Gebreeyesus, 2016a). Uzun süredir devam eden sanayileşme süreci çabalarına rağmen, sanayileşme deneyimi Etiyopya için hala iç karartıcı durumdadır. Sonuç olarak, sanayi ve imalat sektörleri, daha düşük verimlilik (Zerihun, 2008) ve daha düşük ihracat kapasitesi (Bigsten & Gebreeyesus, 2009a), daha düşük teknik kapasite ve teknoloji, hem geri hem de ileri ağlar ile zayıf bağlantılar (EEA, 2005) dahil olmak üzere tüm göstergeler bakımından geliştirilememiştir ve bugüne kadar her alanda oldukça düşük seviyelerde kalmıştır. Ayrıca, imalat sektörü ise verimli en düşük alt sektörlerden biridir.

Ayrıca, Etiyopya'nın imalat sektörü 1950'lerde başlamış olsa da, firma düzeyinde araştırmalar çok az ilgi görmüştür ve Etiyopya'nın firma düzeyinde TFV'yi inceleyen az sayıda çalışma vardır; Güncel dengeli panel veri setlerinin kullanılması, Katma Değer yaklaşımı kullanılarak TFV'nin (Toplam Faktör Verimliliği-Total Factor Productivity) hesaplanması, Katma Değer değişkeninin stok farkı değerleri dahil edilerek tam olarak ölçülmesi ve dört tahmin edicinin kullanılması, bu tezi benzersiz kılmaktadır. Ayrıca, tez öncelikle imalat sektörünün, hükümetin sektörlere öncelik verme politikasıyla tutarlı olduğunu vurgulamaktadır.

Bu nedenle, tez yeniden yapılandırılmış dengeli panel veri kümelerini kullanarak imalat sektörleri örneğinde Etiyopya'da endüstriyel üretim, çok faktörlü üretkenlik ve sanayi politikası gelişimini incelemektedir.

Tezin genel amacına cevap verdiği düşünülen alt amaçlar aşağıdaki gibidir: İlk olarak, Etiyopya'nın endüstriyel üretimi ve ekonomisinin genel incelemesini yapmaktır. İkinci olarak, Etiyopya'da sanayiyi teşvik etmek için yürürlüğe giren sanayi ve üretim politikalarını ve kurumları ve ana yatırım teşvikleri ve düzenlemelerini inceleme ve değerlendirilmesidir. Üçüncü alt amaç, firma düzeyinde TFV ve işgücü verimliliğini (çalışan başına katma değer) ölçer ve TFV belirleyicileri genel olarak Etiyopya'daki imalat sektöründeki (15 alt sektörleri) TFV'yi ve GTP[46] öncelikli alt sektörleri, ihracata yönelik ve ithal ikamesini inceler.

1. Teorik Çerçeve

Birleşmiş milletlere (2004) göre imalat, "*malzemelerin veya bileşenlerin fiziksel veya kimyasal olarak yeni ürünlere dönüştürülmesidir; iş ister güçle çalışan makinelerle ister elle yapılsın, ister bir fabrikada isterse işçinin evinde olsun. ürünlerin toptan veya perakende satılıp satılmadığı ve imal edilen ürünlerin parçalarının montajı da bir imalat faaliyeti olarak kabul edilir*." Bu terim ISIC (Revizyon-3.1) (International Standard Industrial Classification, Rev.3) uyarınca tanımlanmıştır. Benzer şekilde, Etiyopya Merkezi Istatistik Kurumu (CSA - Central statistics Agency) imalat tanımı yukarıdaki tanımlamayla benzerdir. Ek olarak CSA, "*büyük ve orta ölçekli üretimi, on veya daha fazla kişiyi istihdam eden ve işletmek için elektriğe güvenen tüm firmalar" olarak da tanımlamaktadır*.

Bu tezin sanayi politikaları bölümünde de tartışıldığı gibi, imalat sanayinin ekonomideki önemini artırmak için birçok sektörel politika, strateji ve plan oluşturulmuş ve uygulamaya konmuştur. Ayrıca, şimdiye kadar kaydedilen sonuç, planın belirlediği

[46] *Etiyopya'nın Büyüme ve Dönüşüm Planı II (FDRE, 2016) "2025 yılına kadar düşük orta gelirli bir ülke olma ulusal vizyonunun gerçekleştirilmesine yönelik ekonomik yapısal dönüşümü teşvik etmeyi ve hızlandırılmış büyümeyi sürdürmeyi amaçlıyor".*

hedefi tutturulamadı, performans negative yönde değişti ve imalat ihracatı tatmin edici olmadı. Ayrıca çağdaş anlamda sanayi, yirminci yüzyılın başında Etiyopya'da ekonomik bir süreç olarak ortaya çıkmaktadır (Gebreeyesus (2013). Buna göre, ülke içinde ithal ikameci fabrikalaşmanın başlangıcı ve buna bağlı olarak modern imalat işletmeleri 1920'lerde ortaya çıkmaya başladı. Etiyopya'da İmalat, İkinci Dünya Savaşı sırasında kısa bir kesinti döneminden sonra 1950'lerde hız kazanmaya başladı ve bu dönemde birçok yeni sanayi kuruldu. Bu endüstriler, ulusal ekonomiyi önemli ölçüde iyileştirerek; aynı zamanda bu dönem ülkenin ekonomik ve endüstriyel ilerlemesini teşvik etmek ve yönlendirmek için ayrıntılı planlamanın başlangıcına da gösterir (Shiferaw, 1995).

Son seksen yılda Etiyopya'nın endüstriyel gelişimi üç döneme (rejimlere) ayrılabilir. Bunlar genel olarak özel sektör öncülüğünde ve 1950-1974 başlarından itibaren İmparatorluk rejimi olarak bilinen; 1974-1991 yıllarından itibaren ithal ikameci ve devlet güdümlü olarak adlandırılan Dergue rejimi olarak tanımlanabilirler. Ayrıca, 1991'de başlayan ihracata yönelik ve özel sektör liderliğindeki, Etiyopya halkının devrimci demokratik cephesi (EPRDF) olarak adlandırılıyor. Dönemin ekonomik ilkelerine yön veren siyasi felsefeleri takip etmenin yanı sıra, sonraki hükümdarlar ülkedeki sanayiyi ilerletmek için çeşitli politikalar uygulamışlardır.

Bu konuda çeşitli araştırmalar da Etiyopya sanayi sektörünün olumsuz, çarpık ve düzensiz statüsünün sağlam sanayi politikasının olmamasından kaynaklandığını ileri sürmektedir (Mitiku & Raju. S, 2015b). Bununla birlikte, 2000'li yılların başından beri çeşitli ulusal kalkınma planları ve stratejileri geliştirilmiş ve uygulanmış olan Etiyopya'da; FDRE tarafından 2003 yılında ulusal sanayi politikasının formüle edilmesinin ardından genel olarak sanayi sektörüne ve özel olarak imalat sektörüne ulusal planlamalarda önem verilmiştir. Ayrıca, politika açısından önemli olan Etiyopya hükümetinin birinci ve ikinci büyüme ve dönüşüm planı (2010/11-2019/20), özellikle sanayi ve imalat sektörü için uygun koşulların oluşturulması, GTP stratejilerinin temel taşları arasında yer almıştır. Ayrıca, sanayi politikası, endüstrinin ekonomideki kritik lider rolünü üstlenmesi için bir platform oluşturmaya yönelik ilgiyi hak eden öncelikli sektörleri belirlemiştir.

Rapora göre, Etiyopya ekonomisi önceki plan dönemlerinde nispeten iyi performans göstererek; hızlı ekonomik büyüme sağladı, vatandaşların kişi başına düşen gelirini ve yaşam standartlarını yükseltti ve yoksulluk oranlarını azalttı (FDRE,2019). Ancak, şimdiye kadar kaydedilen sonuç, planın belirlediği hedefi tutturamamıştır. Sonuç olarak, Etiyopya'nın büyümesi tutarlı ve kapsamlı, ancak aynı zamanda bölgesel ortalamanın çok üzerindeydi. Ayrıca, tanımlayıcı sonuç, ihracat ürünlerinin hacminin ve çeşitliliğinin önemli ölçüde değişmediğini ve toplam mal ihracatının küçük bir yüzdesini oluşturan mamul ihracatının durgun kaldığını göstermektedir. Yine de tarım, artan hizmet sektörü oranıyla lider işveren sektör olmaya devam etti. Ayrıca, imalat sanayilerinin istihdama, tüketime ve ihracata hakim olduğu derinleşen yapısal dönüşüm, kurumların ve teknoloji hazırlığının oluşturulmasında ek çabayı zorunlu kılmıştır.

Aynı zamanda, Tezde, Mart 2018 reformu (the March 2018 reform), EPRDF[47]'nin halefi Etiyopya Refah Partisi (EPP - Ethiopian Prosperity Party) tarafından yürütülen bir hükümet reformuna atıfta bulunmaktadır. Şimdiki rejimin (EPP) özelliği, önceki iki GTP'nin (I ve II) hemen ardılı olan 2020'den 2030'a kadar yakın zamanda uygulanan Etiyopya 2030 refah yolu ile kalite büyümesinin sağlanması, üretkenliğin ve rekabet gücünün artırılmasının birincil stratejik ayağıdır. sektörler. Ayrıca mevcut hükümet, ekonomik büyümeyi sürdürmek, istikrarlı bir makroekonomik ortam yaratmak, uzun vadeli ve güvenli istihdam yaratmak ve güçlü uygulayıcı kurumlar oluşturmak için reformlar uygulamaktadır. Özellikle, Başbakanın "*medemer*" veya "*sinerji felsefesi*", on yıllık kalkınma planı 2020-2030, yerli ekonomik reform programları ve beklenen yeni sanayi politikası, Etiyopya Hükümet Reformu tarafından Mart 2018'den itibaren üstlenilen ana reform faaliyetleri arasındadır (MPD, 2021).

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[47] *Ethiopian People's Revolutionary Democratic Front*

Genel olarak, Etiyopya'nın endüstriyel politika oluşturma süreci, komşu Afrika ülkelerine göre daha fazla esneklik ve politika öğrenme potansiyeli ile karakterize edilir. Ek olarak, hükümet, belirlenen endüstriyi zaman içinde desteklemek için mevcut politika araçlarının yelpazesini genişletmiştir (Gebreyesus, (2013). Ayrıca, kıyaslama, kurumsal eşleştirme ve kaizen[48], Etiyopya'nın sanayi sektörüne ürün ve hizmetlerinin kalitesini, üretkenliğini ve uluslararası rekabet gücünü iyileştirmede yardımcı olmak için hükümet tarafından uygulanan ek yardım programlarıydı. Son olarak, tezin arka plan bölümleri Etiyopya hükümet politikasını ve sanayi sektörünü ayrıntılı olarak ele almaktadır.

2. Etiyopya ekonomisi ve imalat sektörlerine genel bakış

Bu tezin firma düzeyindeki üretkenliğe ilişkin mikro düzeyli analizine girmeden önce, ekonominin her düzeyindeki ekonomik faaliyetler, ülkenin genel ekonomik büyümesine katkıda bulunduğundan, temel ulusal makro ekonomik göstergeleri gözden geçirmek önemlidir. Ayrıca, nispeten güçlü makroekonomik performans, bireysel firmalar için uygun çalışma koşulları yaratarak piyasadaki arz ve talebi canlandırması dolayısıyla, firma düzeyinde mikro panel verilerini kullanan tezin ampirik analiz bölümünün anlaşılmasına yardımcı olur.

Etiyopya, Nijerya'dan sonra 2020'de tahmini 115 milyon nüfusuyla Doğu Afrika'da karayla çevrili bir ülkedir. Ayrıca ülke, 2019/20 yılında yüzde 6,1'lik ekonomik büyüme oranı ile bölgesindeki ve hatta kıta ülkeleri içerisinde en hızlı büyüyen ekonomiye sahiptir. Öte yandan, 2019/20 yılı reel GSYİH büyümesi, büyük ölçüde COVID-19 salgını nedeniyle sırasıyla %7,7 ve % 9 olduğu 2017/18 ve 2018/19'dan daha düşüktür (PDC, NBE, 2020). Sonuç olarak, Etiyopya 2025 yılına kadar düşük-orta gelirli bir ülke olmayı hedefllemektedir. Ancak Etiyopya, 102,6 ABD Doları (SAGP cinsinden 276,9) gayri safi milli geliri (GNI) ve 890 ABD Doları (2410 ABD Doları) kişi başına GSMH ile 2020'de Afrika'nın en yoksul ülkelerinden biridir ve düşük gelirli bir ülke olarak sınıflandırılmıştır

[48] *Kaizen, standart çalışma yönteminin sürekli iyileştirilmesini ifade eden Japonca bir kelimedir*(Chen, Dugger, ve Hammer, 2000) *Kai (değişim) ve Zen (daha iyisi için) olmak üzere iki kavramı içeren birleşik bir kelimedir* (Palmer, 2001). *Terim, 'Sürekli İyileştirme' (CI) anlamına gelen Gemba Kaizen'den gelir.*

(Dünya Bankası, 2020b). Ayrıca, GTP I ve II uygulama bitiş dönemlerinde kişi başına GSYİH ve kişi başına GSMH'de önemli bir büyüme olmuştur.

Etiyopya'nın son on yıllık dönemde gösterdiği ekonomik büyüme, yapısal bir değişime işaret etmektedir. Hizmet sektörü, tarım sektörünün %32.7'sine kıyasla 2019/20'de %39,5 payı ile GSYİH'ya en büyük katkı sağlayan sektör olarak tarım sektörünü geride bırakmıştır (NBE, 2020). Ancak tarım sektörü Etiyopya ekonomisi için hayati önem taşımakta olup; ülkenin GSYİH'sının yaklaşık %33'ünü oluşturan, nüfusun %70'ini istihdam eden, ihracat gelirlerinin %80'ini elde eden, hammaddesinin %70'ini ekonominin ikincil sektörüne sağlayan ülke için büyük önem taşıyan bir sektör olma özelliğini korumaktadır.

Ayrıca, sanayi sektörü[49], GTP II'nin ilk uygulama yılı olan 2015/16 ile karşılaştırıldığında, GSYİH'nın yüzde 23,7'si olan 2019/20'de GSYİH'nın yaklaşık %29'u ile en yüksek payı kaydetti. Aynı zamanda, 2019/20'de imalat sektörü, GTP-II uygulama bitiş döneminde 2019/20'deki % 8 hedefine kıyasla neredeyse hedef olan GSYİH'nın % 6.8'sini oluşturdu; bazı sanayi parkları ise son yıllarda nüfuslu ve işlevsel hale gelmeye başladı. Ayrıca, dünya COVID-19 pandemisinin makroekonomik ve sosyal etkilerinden muzdarip olsa bile Etiyopya ekonomisi bu süreçte güçlü bir şekilde büyümüştür. Sonuç olarak, reel GSYİH 2019/20'de Sahra Altı Afrika'nın ortalama %3,5'lik büyümesinin üzerinde % 6,1 artış göstermiştir (WEO, 2019).

Aynı zamanda Etiyopya'nın Büyüme ve Dönüşüm Planı (GTP), makroekonomik istikrarı ön planda tutmaktadır. Yıllık ortalama manşet enflasyon oranı 2020/21'de %19,9' dan %20,3'e yükseldi. Bunun nedeni, gıda ve alkolsüz içecek enflasyonunun %13,1'den %23,3'e, gıda dışı enflasyonun ise %11,9'dan %15,8'e yükselmesidir. Dünya Bankası'na göre, Etiyopya'da 2020'deki işsizlik oranı % 2,79'du. Önceki yıllara göre 2019 ve 2018 yıllarında sırasıyla %20,4 ve %2,07 arttı. Ayrıca, bütçe açığını azaltmak için hükümet iç geliri artırdı. Sonuç olarak, 2019/20'de genel hükümetin bütçe performansı, 2018/19'da

[49] Etiyopya'nın sanayi sektörü; madencilik ve taşocakçılığı, imalat, inşaat, elektrik ve sudan oluşmaktadır.

101,7 milyar Birr[50] ve 2017/18'de 84,5 milyar Birr olan toplam 125,83 milyar Birr açık (hibeler hariç) ortaya çıkardı. Sonuç olarak, NBE'ye (2020) göre, GSYİH'nın faiz dışı açık yüzdesi % 3,0'dan %2,5'e düşmüştür.

Öte yandan, ürün ticareti ve net hizmet ödemeleri açıklarındaki iyileşmelere rağmen, genel ödemeler dengesi 2019/20'de kötüleşti ve bir önceki yılki 941.6 milyon dolarlık açık karşısında 1.2 milyar dolarlık açık kaydetti. Etiyopya'nın GTP hedefi, en fazla döviz yaratan ihracat sektörünü dönüştürmekti. Bu hedefi gerçeğe dönüştürmek için kalkınma planı, başta mal ihracatı olmak üzere uluslararası ticaret faaliyetlerinden kaynaklanan döviz girişlerinin 2009/10'da 2,2 milyar USD'den 2014/15'te 6,5 milyar USD'ye çıkarılması çağrısında bulundu. Uluslararası ticaret alt bölümünde tartışıldığı gibi, 2019/20'de mal ihracatı ve toplam mal ve hizmet ihracatı sırasıyla 2,99 ve 7,7 milyar ABD doları olmuştur. Ancak, mal ihracatından elde edilen ihracat gelirleri açısından fiili sonuç, plan döneminde olan hedefin gerisinde kalmıştır (NBE, 2020).

Diğer ekonomik sektörlerle karşılaştırıldığında, katma değer, sanayinin, özellikle de imalat sektörünün ayırt edici özelliğidir. Sanayi katma değerine ilişkin Dünya Bankası gelişme göstergeleri veritabanına, (World Bank-World Development Indicators-WDI), (2022) göre, inşaat dahil Etiyopya sanayi sektörü, 2020'de GSYİH'nın %23,1'ine katkıda bulunmuş ve bu katkı önceki yıllara kıyasla GSYİH katkısında önemli bir artış olduğunu göstermektedir. Ayrıca, Etiyopya'da 2010-2019 dönemi boyunca endüstriyel katma değerdeki (inşaat dahil) eğilimler sürekli bir artış göstermektedir. GTP I ve II uygulama bitiş dönemlerinde de aynı önemli artış, sırasıyla 2015'te %16,3 ve 2020'de %23,105 ile gösterilmiştir. Bununla birlikte, endüstriyel Katma Değer yıllık büyüme oranı, Etiyopya'da dönem boyunca hafif bir artış göstererek, 2010-2017'ye kıyasla 2018-2020'de düştü.

Ancak imalat sektörü yüksek büyüme göstermesine rağmen alt sektördeki GSYİH yüzdesine minimum katkı Etiyopya'nın başlangıç aşamasında olan imalat faaliyetlerini

[50] *Birr, Etiyopya'da para birimidir.*

veya sanayileşme aşamasını göstermektedir. Bunlar, 2020'deki GSYİH katkısının %5,3'ünü oluşturuyor. Bunun bir nedeni, imalat sektörünün Etiyopya'da yakın zamana kadar bir endişe (öncelik) sektör olmamasıydı. Ancak son yıllarda sektöre atfedilen ekonomik reformlar ve hedefler nedeniyle sektörün ekonomiye katkısı artmıştır (MoFED, 2010/11). Sonuç olarak, Etiyopya'da 2010-2020 dönemi boyunca üretim katma değerindeki eğilimler sürekli bir artış göstermektedir. Örneğin, 2010 yılında, Üretim katma değeri (MVA- manufacturing value added) sabit ABD doları cinsinden 1444.6 civarındaydiken. 2020 yılına gelindiğinde bu rakamlar 5.390,80 milyon ABD dolarına yükselmiştir. GTP I ve II uygulama bitiş dönemlerinde Sanayi katma değerinde 2015 yılında 2,844,90 milyon USD ve 2020 yılında 5,390,80 milyon USD olmak üzere önemli bir büyüme olmuştur.

Etiyopya için MVA'nın GSYİH içindeki payı çok düşüktür ve hatta diğer Afrika EAGÜ'lerinden daha azdır. GSYİH'nın MVA yüzdesi 2010'da %4,0 ve 2020'de %5,3 idi. GSYİH'nın en yüksek MVA yüzdesi 2017'de %6,2 ile en düşük ise %3,4 ile 2012'de kaydedildi. Bununla birlikte, son yılın GSYİH'sının MVA yüzdesi önceki üç yıla (2016-2018) göre düşük, 2019 ve 2020'de sırasıyla yüzde 5,6 ve yüzde 5,3 idi. Ayrıca Etiyopya ekonomisinin MVA'sı 2010 ve 2010 yılları arasında sırasıyla 9,2 ve 7,5 büyüme oranına ulaştı. En yüksek büyüme oranı yüzde 24,7 ile 2017'de, en düşük büyüme oranı ise yüzde 6,8 ile 2018'de gerçekleşti. Sonuçlar, performansının diğer ekonomilere kıyasla zayıf olduğunu göstermektedir. Son yılın MVA büyüme oranı, önceki yıllara göre düşük gerçekleşerek 2019 ve 2020'de sırasıyla yüzde 7,7 ve 7,5 olmuştur. Ayrıca GTP II sonunda hedeflerin yıllık büyüme oranı için %22 ve GSYİH katkısı için %8 olarak gerçekleşmesi planlanmaktadır (EEA, 2017, 2018).

Öte yandan, Etiyopya imalat sanayii 2012/13 ve 2016/17 yılları arasında 300.000 istihdam sağlamıştır. GTP-I uygulaması sırasında çalışan sayısı planlandığı gibi artmamış olsa da Etiyopya'da GTP'nin imalat sektörü için ana hedefi, ihracat hacmini artırarak ve özellikle tekstil, deri ve gıda işleme alt sektörlerinde birincil emtialardan katma değerli ihracata geçerek mamul ihracat gelirlerini artırmaktır. Şimdiye kadarki sonuç, planın hedeflerinin altında kalmıştır. Genel olarak, imalat sektörünün ihracatı yetersiz seviyelerde kalmıştır. İhracat edilenlerin çoğu birincil tarım ürünleridir ve imalat ihracatı diğer ülkelere ve önceki kalkınma planı hedeflerine göre düşüktür. Bu nedenle ihracatın çeşitlendirilmesi ve ihracata yönelik hedeflerin, öncelikli alanların ve faaliyetlerin desteklenmesi, firma düzeyinden ulusal düzeye kadar her düzeyde yapılmalıdır.

Ayrıca Etiyopya, 2016'da 4 milyar USD ve 2017'de 3,6 milyar USD DYY aldı. Bu, dünya DYY'sinin % 0,25'i, Afrika'daki DYY'nin % 8,6'sı ve Doğu Afrika'da yüzde 47'dir (UNICTAD, 2018). Etiyopya yatırım komisyonu raporuna (EIC) (2019) göre, Etiyopya ilk GTP'yi (2010-2015) uygulamaya hazırlanırken DYY girişleri arttı, bu da Güney'den (özellikle Türkiye, Çin ve Hindistan) DYY'deki artışla aynı zamana denk geldi. Ayrıca, EIC raporu, Etiyopya'nın, büyük ölçüde hükümetin gerekli tüm hizmet ve altyapıya sahip modern endüstriyel parklar yaratma çabalarından dolayı, 2012'den bu yana DYY'de çarpıcı bir artış görüldüğü belirtilmektedir. Benzer şekilde, Etiyopya'nın DYY'si düşük gelirli, tarıma dayalı bir Afrika ekonomisi için olağandışı olan imalata odaklanmıştır. DYY, çoğu gelişmekte olan ülkenin madencilik, tarım ve hizmet sektörlerine hakimdir. EIC raporuna göre, Etiyopya'ya DYY akışının %60'ının imalat sektörüne yönelik olduğunu göstermektedir (EIC, 2019).

Ayrıca, imalatta en yüksek DYY akışı 2017 yılında 59,24 milyar USD olarak gerçekleşmiştir. Etiyopya, sanayi parkları nedeniyle imalatın en fazla DYY aldığı birkaç Afrika ülkesinden biri olarak karşımıza çıkmaktadır. Ülkede üretken endüstrilere yatırımlar teşvik edilerek, hükümetin nihai büyüme hedefini gösterir (EIC, 2019; NBE, 2020). Dünya bankasına (2022) göre, Etiyopya'da DYY net girişi 2010'da 288 milyon ABD Doları ve 2020'de 2.396 milyar ABD Doları olarak gerçekleşti. Ancak 2020'de DYY 2015-2019'a göre azaldı. Etiyopya'ya en önemli net DYY girişleri mevcut verilerle, sırasıyla 4.143 ve 4.017 milyar ABD doları ile 2016 ve 2017 yıllarında kaydedildi.

3. Literatür taraması

“Verimlilik” kelimesi, ekonomide oldukça önemli bir kavram olarak "*girdileri çıktılara dönüştürmede etkinlik*" olarak basitçe tanımlanabilmektedir. Bu nedenle, verimlilik seviyeleri ve büyüme ölçümleri önemli ekonomik performans göstergelerini temsil etmektedir. Ayrıca, üretkenlik genellikle "çıktı hacminin girdi kullanım hacmine oranı" olarak tanımlanır (OECD, 2001). Bu genel nokta üzerinde herhangi bir tartışma olmamasına rağmen, üretkenlik literatürünün ve çeşitli uygulamalarının hızlı bir şekilde incelenmesi, üretkenliğin tek bir nedeni veya tek bir verimlilik ölçüsü göstermemektedir (OECD, 2001). Diğer bir deyişle TFP, toplam girdinin toplam çıktıya dönüştürülme oranıdır (Diewert ve Nakamura, 2007).

Verimlilik, günümüzün sürekli değişen ve küreselleşen toplumunda dünya çapında bir endişe kaynağıdır ve üretkenliği artırmak genellikle çok çeşitli sosyal ve ekonomik sorunlara bir çözüm olarak görülür. OECD'ye (2001) göre, “*teknoloji, verimlilik kazanımları (efficiency gains), karşılaştırmalı üretim süreçleri, gerçek maliyet tasarrufu ve yaşam standartlari*” verimlilik ölçümünün temel amaçlarıdır. Ayrıca, verimlilik hem ekonomik büyüme hem de kalkınma için kritik öneme sahiptir. Çok sayıda çalışma, verimliliğin önemini farklı açılardan göstermiştir. Örneğin, Çok Faktörlü Verimlilik (MFP), ekonomiyi ve toplumu birçok yönden iyileştirir. Verimlilik kazanımları, çeşitli ekonomik sınıflar için çıktı ve geliri artırır ve üretim artışı ekonomik büyümeyi artırır. Reel gelirlerdeki artış, yaşam standardına yardımcı olur. Ekonomik teoriye göre, verimlilik kazanımları karlılığı, fiyatlandırmayı ve çalışan ücretini etkileyebilir. Böylece, bazı girdiler daha kaliteliyse veya üretim düzenlemeleri değiştirilirse, aynı girdilerle daha fazla çıktı üretilebilir.

Van Biesebroeck'e (2007) göre, verimlilik ölçümünün birincil amacı, girdi farklılıklarının açıklayamadığı çıktı eşitsizliklerini keşfetmektir. Bu tezin verimlilik ölçümü ve metodoloji bölümünde tartışıldığı gibi, TFV ölçümleri son zamanlardaki verimlilik tartışmalarının konusu olmuştur. Ekonomik teoriye dayalı olarak formüle edildikten sonra üretkenlik ölçütlerini ampirik olarak uygulamaya yönelik çok sayıda yaklaşım vardır. Ampirik literatürde kullanılan metodolojiler, kullanılan istatistiksel tekniklere ve ilgili varsayımlara dayalı olarak kabaca parametrik olmayan, parametrik veya yarı parametrik olarak karakterize edilebilir. Ancak, TFP'yi tamamen kısıtlamalardan bağımsız olarak tahmin etmek için bir yaklaşım olmamıştır.

Üretkenlik fikri ilk olarak (Solow, 1957a) tarafından büyüme modeline teknolojik ilerlemenin bir ölçüsü olarak dahil edilmiş ve dışsal bir mekanizma olarak kabul edilmiştir. Ayrıca, çeşitli araştırmacılar son yıllarda daha kapsamlı, gelişmiş ve ayrıntılı verimlilik ölçümü konuları üzerinde çalışmışlardır. Örneğin "Blundell ve Bond, 2000; Griliches, 1998; Levinsohn ve Petrin, 2003; Olley ve Pakes, 1996b" verimlilik ölçümüne ilişkin çalışmaların başlıca örnekleri arasındadır. Spesifik olarak, bir firma düzeyinde üretkenlik çalışmaları, genellikle çıktının (normalde katma değerli veya sönük satışlar olarak ölçülür) firma tarafından kullanılan girdilerin ve üretkenliğinin bir fonksiyonu olduğunu varsayar (Katayama, Lu ve Tybout, 2005). Artık TFP ölçüsü, fonksiyonel ilişkiyi takip eden çok sayıda politika önleminin etkisini değerlendirmektedir.

Ayrıca, toplam, endüstri ve firma seviyelerinde ampirik ve teorik olarak üretkenlik belirleyicileri üzerine önemli calismalar bulunmaktadir. Spesifik olarak, çok faktörlü üretkenlik (TFP) ve firmaların performansı hakkındaki literatür son yıllarda yoğunlaşmaktadir. Bunlar arasında (Jorgenson,1995b, 1995a, 2005) kapsamlı üretkenlik ve üretkenlikle ilgili çeşitli araştırma çalışmaları ve (Griliches, 1998) ve işbirlikçilerinin farklı üretkenlik ve Ulusal Ekonomik Araştırma Bürosu (NBER) üretkenlikle ilgili çalışmaları yer almaktadır. Ayrıca, benzer olarak; "Aneja & Arjun, 2021; Kumar, Mallick ve Sen, 2020; Esaku, 2021; Onubedo ve Yusuf, 2018; Satpathy; Newman ve diğerleri, 2016; Mohnen, Goedhuys ve Janz, 2008; Akinlo, vd., 2005" farklı ülkelerde üretkenlik belirleyicileri ve ilgili alanları dair güncel çalışmalarla bu konuyu incelemişlerdir.

Aynı zamanda, çeşitli bilim adamları Etiyopya'da üretkenlik üzerine çeşitli ampirik çalışmalar yürütmüşlerdir. Örneğin "Söderbom, 2012; Bigsten ve Gebreeyesus 2009; Bigsten ve Gebreeyesus 2007; Bigsten ve diğerleri., 2012; Melaku ve Abegaz, 2013; Berhane, 2013; Tekleselassie vd., 2018", Etiyopya imalat endüstrisi ile ilgili üretkenlik endişelerini araştıran diğer araştırmacıların sadece birkaç örneği olarak belirtilebilmektedir.

4. Yöntemler, Sonuçlar ve Tartışma

Tezde kullanılan ana değişkenler için birincil veri kaynağı “Etiyopya Merkezi Istatistik Kurumu” ve “Etiyopya Planlama ve Geliştirme Bakanlığı” olup; bu kurumlardan elde edilen 2011/12-2019/20 dönem aralığındaki veri setinden yararlanılarak araştırma konusu incelenmiştir. Çalışmada TFV belirleyicileri ile ilgili dokuz bağımsız değişken ve üretim fonksiyonu ile ilgili iki bağımsız değişken kullanılmaktadır.

2011/12 - 2019/20 yıllarını kapsayan imalat sektörlerinde 15 ana sanayi kategorisi de dahil olmak üzere genel dengeli panel veri analizi için 570 firmadan oluşan bir örneklem kullanılmıştır. Tezin metodoloji bölümü, çalışmanın kalan alanları ve öncelikli alt sektörleri için örneklenen firmaları ayrıntılı olarak tartışmaktadır. Ayrıca, örneklenen firmalar ve imalat alt sektörleri, tezin metodoloji bölümünde ele alınmıştır.

Bu tez, genel olarak katma değer yaklaşımına dayalı olarak firma düzeyinde çok faktörlü Verimliliği (TFV) tahmin etmeye odaklanır; çünkü bu kavram üretim performansının kritik bir ölçüsüdür ve makro düzeyde olduğu gibi endüstriyel ve firma düzeylerinde de politika yapıcılar için önemli bir göstergedir. Katma Değer değişkeni, Brüt Katma Değerden, endüstriyel ve endüstriyel olmayan maliyetlerin çıkarılmasıyla hesaplanır (VA= GVA-IC-NIC).

Son olarak, bu tezde verimlilik üzerine Federica Saliola ve Murat Şeker (2012) çalışmalarının ardından, TFV belirleyicisi tahmininden once, her bir alt sektörün TFV 'si Cobb-Douglas (CD) üretim fonksiyonu spesifikasyonunun bir kalıntısı olarak ölçülmüştür. Örneğin aşağıdaki fonksiyonda Y: yıllık katma değerli çıktı, K: sermaye stok değeri, L: yıllık çalışan sayısı ve A: TFV terimidir. Bu nedenle bu spesifikasyonu YAKL veya Solow Artığı (solow residual) olarak adlandırabilirler.

$$Y_{it} = A_{it}K^{\alpha}{}_{it}\, L^{\beta}{}_{it} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

TFV genellikle sermaye ve emek girdilerinin muhasebeleştirilmesinden sonra kalan GSYİH payı olan artık olarak hesaplanır (Barro, 2004). Ayrıca, çalışmanın alt amaçlarından biri olarak her bir alt sektör için emek başına düşen katma değer kullanılarak emek verimliliği (labour productivity) hesaplanmıştır. Etiyopya'da emek verimliliği üretiminin sonucu, özellikle örneklenen sektörde son yıllarda artmıştır. Örneğin, imalat sektörü'nün emek verimliliği, 2011/12 ve 2019/20 arasında çalışan başına 190.896 Birr'den, çalışan başına 352.578 Birr'ye % 0.85 oranında yükseldi. Ayrıca, emek verimliliği'nin büyümesi de istikrarli değildir. Örneklenen sektörde 2018/19'da negatif büyüme ve 2017/18'de yüzde 0,62'lik düşük bir büyüme oranı yaşanmıştır. Öte yandan, imalat sektörün'nün emek verimliliğinin büyüme oranı 2011/12 ve 2019/20 arasında sırasıyla yüzde 3,06'dan yüzde 6,60'a yükseldi.

TFV, Etiyopya genel imalatında son yıllarda, özellikle örneklenen alt sektörde artış eğilimi göstermiştir. Örneğin, yiyecek ve içecek imalatı TFV 2011/12 ve 2019/20 arasında %41.9 artışla 1,05'ten 1,49'a yükseldi. Tekstil alt sektörlerinde TFV, 2011/12'den 2019/20'ye yüzde 62,07 artışla 1,16'dan 1,88'e yükseldi. Ayrıca, fabrikasyon metal ve tekstil alt sektörleri sırasıyla 0,80'den 1,93'e ve 1,16'dan 1,88'e çıkarak 2011/12 ve 2019/20 arasında en yüksek TFV'ye sahip olmuştur. Örnek olarak incelenen dönemde TFV büyüme oranları yüzde 141,25 ve yüzde 62,07 idi. Aynı dönemde kağıt alt sektörleri en düşük TFV'ye sahip olarak 1,28'den 1,14'e gerilemiştir. Çoğu imalat alt sektörünün TFV seviyeleri, GTP II bitiş döneminde, GTP-I bitiş ve GTP II başlangıç dönemlerine kıyasla orta derecede artar.

Etiyopya imalat şirketlerindeki TFV büyümesi, çoğu alt sektör için çalışma döneminde uzun süredir düşmekte iken 2015/16'da keskin bir şekilde tırmanmaya başlamıştır. İmalat sektörünün TFV büyümesi, yiyecek ve içecek, tekstil, hazır giyim ve deri için 2012/13'ten 2019/20'ye biraz artmıştır. Ayrıca tekstil ve hazır giyim alt sektörleri yüzde olarak en yüksek TFV büyümesine sahip olan sektrler olarak; 2012/13'te yüzde 6,90 ve yüzde 11,61 azalmışken, 2019/20'de sırasıyla positive büyüme sağlayarak 17,50 ve 18,94'e yükseldi. Aynı zamanda, kağıt, kauçuk ve plastik alt sektörleri 2019/20'de sırasıyla

0,66 ve 0,88 ile en düşük TFV büyümesine sahip olmuştur. 2014/15'te motorlu taşıtlar ve ahşap ürünler, yüzde 20,18 ve yüzde 20 ile en yüksek ortalama TFV büyüme düşüşlerine sahiptir.

Genel olarak sınırlarına rağmen sonuçlar göstermektedir ki, Etiyopya'da tekstil ve hazır giyim alt sektörleri gibi emek yoğun sektörler ile makine, teçhizat ve motorlu taşıt alt sektörleri gibi sermaye yoğun sektörler de dahil olmak üzere tüm sektörlerde verimlilik artmıştır.

Logaritma (log) bulguları için tanımlayıcı istatistikler, imalat sektöründe firmaların ortalama toplam faktör verimliliğinin (TFP) 0,0224 olduğunu ortaya koymuştur. Öte yandan, imalat sektörünün üretim fonksiyonu tanımlayıcı istatistikleri, ortalama çıktı (VA) ve sermayenin sırasıyla 16.15 ve 15.11 olduğunu göstermektedir. Ek olarak, üretimin çalışma süresi boyunca ortalama emeğinin sonucu 3,9'dur. Ayrıca, yukarıda bahsedilen fonksiyon tahmininde, çalışma dönemlerinde genel imalat sektöründe emek ve sermayenin üretim fonksiyonunun girdi esnekliğine katkısı sırasıyla 0.436 ve 0.691'dir. Dolayısıyla, girdi esnekliği katkı değeri (1.127 > 1), ölçeğe göre artan bir getiriyi gösterir.

İlk aşamada TFV değerlerini tahmin ettikten sonra şimdi de TFV büyüme belirleyicilerini inceliyoruz. TFP belirleyicilerine ilişkin araştırma modelimiz aşağıdaki gibidir:

$$\ln\_TFP = \beta_0 + \beta_1 firma\ boyutu_{it} + \beta_2\ firma\ yaşı_{it} + \beta_3 beceri_{it} + \beta_4 mülkiyet_{it} + \beta_5\ İhracat\ durumu_{it} + \beta_6\ bölge_{it} + \beta_7\ maddi_{it} + \beta_8 yasal\ işletme\ mülkiyeti\ biçimi_{it} + \beta_9 enerji_{it} + \varepsilon_{it} \ldots\ldots\ldots\ldots (2).$$

Bu çalışmada, üç GMM (Generalized method of moments) dinamik panel tahmin yöntemi (Arellano & Bond, 1991; Arellano & Bover, 1995), sistem GMM tahmincisi (Blundell & Bond, 1998) ve dördüncü tahminci olarak LSDVC kullanılmaktadır.

Korelasyon testi sonuçları, genel üretim panel veri setlerinde yüksek korelasyon göstermedi ve bu da çoklu bağlantı sorunu olmadığını göstermiştir.

Ayrıca birinci ve ikinci adım fark GMM (one and two step difference GMM) tahmin sonuçları, sistem GMM ve LCDVC genel imalat alt sektörleri, GTP öncelikli alt sektörler ve ihracata yönelik ve ithal ikamesi alt sektörleri, tüm olağan tanı testlerinin tahmin sonuçlarının sağlamlığını doğruladığını göstermektedir. Testlerde ayrıca AR içindeki ikinci mertebeden otokorelasyon problemleri de kontrol edilmiştir. Böylece, numunelerin artıklarında otokorelasyon kanıtı olmadığı sonucuna varılmıştır. Aynı şekilde, tüm AR-2 testleri tatmin edici ve anlamlıdır. Son olarak üç GMM tahmincisi, önemli Hansen testi istatistiklerine sahiptir.

Genel imalat sektörü, GTP önceliği, ihracata yönelik ve ithal ikamesi alt sektörleri 2011/12-2019/20 GMM panel veri kümeleri tahmin edicilerinin ana bulgularına göre, log TFV (L.ln TFP) gecikmesinin bir pozitif işaretlidir ve LSDVC tahmincisi de dahil olmak üzere test edilen dört GMM tahmincisinin hepsinde istatistiksel olarak anlamlıdır.

Ayrıca, işgücü becerisi (beceri), ihracat durumu (iexstuts) ve firma yaşı (lnage) genel imalat sektörü tahmin sonuçları, dört tahmin edicinin hepsinde de pozitif ve anlamlıdır. Bununla birlikte, genel imalat sektöründeki Arellano ve Bover, 1995 tahmin edicisi dışındaki tüm tahmin edicilerde kontrol değişkeni sahipliğinin (iownr) anlamlı ve negatif bir işarete sahip olduğu bulunmuştur. Ayrıca kontrol değişkeni bölge (iregion) katsayıları sadece fark GMM tahmin edicilerinde anlamlı ve negatif işaretlidir (Arellano ve Bond (1991) ve Arellano ve Bover, 1995). Son olarak, işletme sahipliğinin yasal biçiminin (ilgfbo) kontrol değişkeni katsayısı negatif bir işarete sahiptir ve yalnızca genel imalat sektöründe GMM sisteminde anlamlıdır.

Tek adımlı fark (one-step difference) GMM tahmincisi durumunda (Arellano ve Bond, 1991), işgücü becerisindeki bir yüzde değişikliği, %1 anlamlılık düzeyinde TFP düzeyinde %0.112'lik bir artışla ilişkilidir. Dolayısıyla emek becerisi ve TFV esnek olmayan bir ilişki sergilemektedir.

Benzer şekilde, bir firmanın yaşındaki yüzdelik bir değişiklik, % 1 anlamlılık düzeyinde, ceteris paribus'ta TFV düzeyinde yüzde 0,219'luk bir artışla ilişkilidir. Bu nedenle, firmanın yaşı ile TFV arasında da esnek olmayan bir ilişki vardır. Ayrıca, ihracat durumu sonucu, ihracatçı firma TFV'nin ortalama ceteris paribus'un ihracatçı olmayan firmalardan %5 önem düzeyinde %12.52[51] daha yüksek olduğunu göstermektedir. Ayrıca firma sahipliği sonucu, özel sermayeli firmanın TFV'sinin ortalama ceteris paribus'ta kamu firmalarından %10 önem düzeyinde % 20.07[52] daha düşük olduğunu ortaya koymaktadır. Ayrıca firmaların bölgesel konumu, başkent Addis Ababa TFV'de bulunan firmaların ortalama ceteris paribus'ta Addis dışındaki firmalardan %1 önemde %31.68[53] daha düşük olduğunu ortaya koymaktadır.

Ayrıca, iki aşamalı fark ve sistem GMM'nin (Arellano ve Bover, 1995; Blundell ve Bond, 1998), bulguları birlikte, işgücü becerisindeki bir yüzde değişikliğinin, TFP düzeyinde ortalama ceteris paribus'ta sırasıyla %1 anlamlılık düzeyinde %0.102 ve %0.043'lük bir artışla ilişkili olduğunu ortaya koydu. Dolayısıyla emek becerisi ve TFV esnek olmayan bir ilişki sergilemektedir. Aynı zamanda, ortalama ceteris paribus'ta, bir firmanın yaşındaki bir yüzdelik değişim, TFV düzeyinde sırasıyla %1 anlamlılık düzeyinde %0.219 ve %0.065'lik bir artışla ilişkilidir. Dolayısıyla, her iki tahmin de firmanın yaşı ile TFV'nin esnek olmayan bir ilişki sergilediğini göstermektedir. Ayrıca ihracat durumu sonucu, ihracatçı firma TFV'nin ortalama ceteris paribus'un, ihracatçı olmayan firmalardan sırasıyla %10 ve %5 önem düzeyinde sırasıyla %11,85[54] ve %8,44[55] daha yüksek olduğunu göstermektedir.

Benzer şekilde, iki aşamalı farklar GMM tahmincisi (Arellano ve Bover, 1995), işletme sahipliğinin yasal biçiminin (ilgfbo) ve firma boyutu (ifirmsize) katsayısı, sınırsız sorumlu firmaların ve daha büyük firmaların TFP'nin ortalama ceteris paribus'un limited firmalara ve küçük ve orta ölçekli firmalara (SMF) göre sistem GMM tahmininde %10 ve

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[51] *dönüşüm formülü kullanılır [e^{β} -1] * 100, böylece [$e^{-0.118}$ -1] *100 = 12.52*
[52] *dönüşüm formülü kullanılır [e^{β} -1] * 100, böylece [$e^{-0.224}$-1] *100 = -20.07*
[53] *dönüşüm formülü kullanılır [e^{β} -1] * 100, böylece [$e^{-0.381}$ -1] *100 = -31.68*
[54] *dönüşüm formülü kullanılır [e^{β} -1] * 100, böylece [$e^{0.112}$-1] *100 = 11.85*
[55] *dönüşüm formülü kullanılır [e β -1] * 100, böylece [$e^{-0.081}$-1] *100 = -8.44*

%1 önem düzeylerinde sırasıyla %13.84 ve %19.59 daha düşük olduğunu ifade eder. İlk adım farkı (Arellano ve Bond, 1991) ve LSDVC tahminlerinden farklı olarak, mal sahibi katsayısı, sistem GMM tahmininde %95 anlamlılık düzeyinde firma düzeyinde TFV büyümesi üzerinde önemli ölçüde olumlu bir etkiye sahiptir (Blundell ve Bond, 1998).

Son olarak bu tezdeki dördüncü tahmin edici, sözde LSDVC tahminci sonucuna göre, işgücü becerisindeki ve firma yaşındaki bir yüzde değişikliğinin, TFP seviyesinde sırasıyla %1 anlamlılık düzeyinde %0.068 ve %0.178'lik bir artışla ilişkili olduğunu (ortalama ceteris paribus varsayımında) ortaya koymaktadır. Dolayısıyla emek becerisi, firma yaşı ve TFP esnek olmayan bir ilişki sergiler. Ayrıca, ihracat durumu (iexstuts) önemli ölçüde pozitiftir ve sonuç ihracatçı firma TFV 'nin ortalama ceteris paribus'un, ihracatçı olmayan firmalardan %5 önemle %8,13[56] daha yüksek olduğunu göstermektedir. Ancak LSDVC tahmin edicisinde, firma büyüklüğü ve sahiplik katsayısı, firma düzeyinde TFV büyümesini %99 anlamlılık düzeyinde etkileyen negatif bir işarete sahiptir. Dolayısıyla firma büyüklüğü ve sahiplik katsayısının, daha büyük firmaların ve özel firmaların TFV'sinin ortalama ceteris paribus'un küçük ve orta ölçekli firmalar (SMF) firmalarından ve kamu firmalarından %1 önem düzeyinde sırasıyla LSDVC tahmin edicisinde %15.54[57] ve %40.48[58] daha düşük olduğunu işaret eder,

Öte yandan tekstil, hazır giyim ve deri alt sektörlerinden elde edilen ana sonuçlar, 2011/12-2019/20 yıllarına ait panel veri setlerinin tüm GMM ve LCDVC tahmin sonuçları, log TFP (L.ln TFP) gecikmesinin pozitif olduğunu ortaya koyar ve tüm GMM tahmin edicileri ve LSDVC tahmin edicisi için önemlidir. Ayrıca dört tahmincinin tümü, emek becerisini (beceri) olumlu ve anlamlı bulunmuştur. Aynı zamanda, Arellano ve Bond, 1991 ve Blundell ve Bond, 1998 tahminlerinde ihracat durumu (iexpstuts) ve firma yaşı (lnage) sonuçları anlamlıdır ve pozitif bir işarete sahiptir. Ancak, malzeme (lnrm) katsayıları sadece Arellano ve Bond, 1991 Blundell ve Bond, 1998 tahmininde karşılık

[56] *dönüşüm formülü kullanılır* [e β -1] * 100, böylece [e 0.0782 -1] *100 = 8.13
[57] *dönüşüm formülü kullanılır [e β -1] * 100, böylece [e $^{-0.169}$ -1] *100 = -15.54*
[58] *dönüşüm formülü kullanılır [e β -1] * 100, böylece [e -0.519-1] *100 = -40.48*

gelen dönemde anlamlı ve negatif işaretlidir. Bu nedenle, istatistiksel olarak anlamlı değişkenlerin çoğu yine beklenen işaretlere sahip olmakla birlikte, ancak daha önce varsayıldığı gibi kontrol kukla değişkenlerinden bazıları beklenmedik işaretlere sahiptir.

Yiyecek ve içecek alt sektörünün farklılıkları ve 2011/12-2019/20 panel veri setlerinin sistem GMM ve LCDVC tahmin sonuçlarından elde edilen ana sonuçlar, log TFP (L.ln_TFP) ve LSDVC tahmincisi gecikmesinin tüm GMM tahmin edicileri için pozitif ve anlamlı olduğunu ortaya koymuştur. Ayrıca, işgücü becerisi (beceri) ve firma yaşı (yetkinlik) sonuçları yukarıda belirtilen dört tahmin edicinin hepsinde pozitif ve anlamlıdır. Ancak yiyecek ve içecek alt sektöründeki dört tahmin edicinin tamamında firma büyüklüğü (ifirmsize) katsayıları karşılık gelen dönemde anlamlı ve negatif işaretlidir. İstatistiksel olarak anlamlı değişkenlerin çoğu yine beklenen işaretlere sahiptir, ancak daha önce yiyecek ve içecek alt sektöründe varsayıldığı gibi, kontrol kukla değişkenlerinden bazıları beklenmedik işaretlere sahiptir.

Kimyasal ve metalik olmayan mineral alt sektörlerinin genel ana sonuçları, 2011/12-2019/20 panel veri setlerinin farklılıkları, sistem GMM ve LCDVC tahmin sonuçları, log TFP (L.ln_TFP) gecikmesinin pozitif olduğunu ortaya koydu ve tüm GMM tahmin edicileri ve LSDVC tahmincisi için önemlidir. Ayrıca işgücü becerisi (beceri) ve firma yaşı (yetkinlik) sonuçları yukarıda tartışılan dört tahmin edicinin hepsinde pozitif ve anlamlıdır. Ancak, firma büyüklüğü (ifirmsize) katsayıları, kimyasal ve metalik olmayan mineral alt sektörlerinde sadece LSDVC tahmincilerine karşılık gelen dönemde anlamlı ve negatif bir işarete sahiptir. Bu nedenle, istatistiksel olarak anlamlı değişkenlerin çoğu yine beklenen işaretlere sahiptir, ancak daha önce kimyasal ve metalik olmayan mineral alt sektörlerinde varsayıldığı gibi, kontrol kukla değişkenlerinden bazıları beklenmedik işaretlere sahiptir.

Son olarak, temel ve fabrikasyon metal alt sektörlerinden elde edilen ana sonuçlar, birinci ve ikinci adım fark ve sistem GMM, 2011/12-2019/20 panel veri setlerinin LCDVC tahmin sonuçları, log TFP (L.ln_TFP) gecikmesinin pozitif olduğunu ortaya koydu ve tüm GMM tahmin edicileri ve LSDVC tahmin edicisi için önemlidir. Ayrıca, işgücü becerisi (beceri) ve firma yaşı (yetkinlik) sonuçları yukarıda belirtilen dört tahmin edicinin hepsinde pozitif ve anlamlıdır. Bununla birlikte, enerji (lnrenrg) dört tahmin edicinin hepsinde negatif anlamlıdır. Sahiplik katsayısı GMM sistemi dışındaki tüm tahmin edicilerde de anlamlıdır ve malzeme katsayısı (lnrm) sadece LSDVC tahmininde pozitif ve anlamlıdır.

Genel imalat panel veri kümeleri tahmin sonucunun aksine, işletme sahipliğinin yasal şekli (ilgfbo) kukla katsayısı pozitif işaretlidir, temel ve fabrikasyon metal alt sektörleri tahmin sonucunda istatistiksel olarak anlamlıdır. Sınırsız sorumlu şirketin TFV'sinin fabrikasyon metal alt sektörlerinde limited şirketten daha yüksek olduğu anlamına gelir. Böylece istatistiksel olarak anlamlı olan değişkenlerin çoğu, çalışmadaki alt sektörlerde beklenen işaretlerini almıştır. Bununla birlikte, daha önce varsayıldığı gibi, bazı kontrol kukla değişkenler, teorik olarak varsayılana kıyasla beklenmedik işaretler sergilemektedir.

Sonuç ve Tavsiye

Bu tez Etiyopya'nın imalat sektörlerinde endüstriyel üretimi, çok faktörlü üretkenliği ve endüstriyel politika gelişimini incelemektedir. Etiyopya Merkezi İstatistik Kurumu (CSA) verileri kullanılarak, 2011/12-2019/20 yılları arasında, genel imalat paneli ve GTP öncelikli alt sektörleri ile ihracata yönelik ve ithalat ikamesi alt sektörlerindeki 570 firma için TFV düzeyi, büyüme ve belirleyicileri ölçen dengeli panel veri kümeleri yeniden oluşturulmuştur. Tez, Etiyopya imalat TFP'sini dört tahmin yöntemi kullanarak (Arellano & Bond, 1991, Arellano & Bover, 1995; Blundell & Bond, 1998) ve LSDVC) tahmin etmektedir.

Tüm tanısal tahmin testleri, analiz için anlamlı ve tatmin edicidir. TFV gecikmesinin (L. ln _TFP) logaritması pozitiftir ve dört GMM tahmin edicinin ve tez paneli tahminlerinin hepsinde anlamlıdır. Dört genel imalat tahmincinin tümü, işgücü becerisi (beceri), ihracat durumu (iexpstuts) ve firma yaşı (yetkinlik) için pozitif ve anlamlı sonuçlar göstermektedir. Ayrıca işgücü becerisi dört tekstil hazır giyim ve deri alt sektör tahmincilerinin tamamında pozitif ve anlamlıdır. Arellano ve Bond'un (1991) ve

Blundell ve Bond'un (1998) tahminlerinde sadece ihracat durumu ve firma yaşı anlamlıdır olup pozitif işaretler göstermektedir.

Aynı zamanda, dört yiyecek ve içecek alt sektörü tahmincisinin tümünde işgücü becerisi ve firma yaşı katsayıları pozitif ve anlamlıdır; dördü de alt sektörde negatif firma büyüklüğü (ifirmsize) katsayılarına sahiptir. Dört GMM tahmincisinin kimyasal ve metalik olmayan mineral alt sektörlerinde işgücü becerisi değerleri pozitif ve anlamlıdır. Tüm GMM ve LSDVC tahmin edicileri, önemli bir firma katsayısı yaşına sahiptir. Ancak, LSDVC tahmin edicilerinde firma büyüklüğü katsayıları sadece anlamlı ve negatiftir. Ana ve fabrikasyon metal alt sektörlerinde, firmanın işgücü becerisi ve yaşı pozitif ve anlamlıdır. Benzer şekilde, malzeme (lnrm) katsayısı sadece LSDVC tahmininde önemlidir. İşletme sahipliğinin yasal şekli (ilgfbo) katsayısı sadece bu alt sektörde istatistiksel olarak anlamlıdır.

Genel bulgulardan, TFV katsayıları değerinin ana belirleyicisi, her bir anlamlı değişken değerinin sektör genelinde her alt sektör için farklı olduğunu ortaya çıkarmıştır. Örneğin, beceri katsayısı birinci ve ikinci fark GMM için ve temel ve fabrikasyon metal alt sektörleri için sırasıyla 0,322 ve 0,246 gibi daha yüksek değerler alır. Ayrıca genel ve tekstil hazır giyim ve deri alt sektörlerinin GMM sisteminde sırasıyla 0,0429 ve 0,0453 alt değerini kaydetti. ihracat statü katsayısı (iexstuts) tekstil, hazır giyim ve deri alt sektörünün iki aşamalı fark GMM'sinde 0,156'lık daha yüksek bir değere sahiptir. Ayrıca, genel imalat sektörünün tek aşamalı fark GMM'sinde kaydedilen 0.118'lik ikinci yüksek değerdir. Ancak, tekstil, hazır giyim ve deri alt sektörlerinin GMM sisteminde ve genel imalat panelinin LSDVC'sinde 0,0102 ve 0,0782 ihracat katsayısının daha düşük bir değerini kaydetmektedir.

Firma yaşı (deneyim) katsayısı, kimyasal ve metalik olmayan mineral alt sektörlerinin GMM farkının iki aşamalı farkı olan 0,394'lük daha yüksek değeri ve kimyasal ve metalik olmayan mineral alt sektörlerinin LSDVC'sinde 0,361'lik ikinci yüksek değeri puanlamaktadır. Bununla birlikte, tekstil, hazır giyim ve deri alt sektörlerinin ve kimyasal ve metalik olmayan mineral alt sektörlerinin GMM sisteminde sırasıyla 0,0172 ve 0,0384'lük daha düşük bir firma yaş katsayısı değeri kaydetti. Ayrıca, kontrol değişkenlerinin etkilerine ilişkin sonuçlar, coğrafi bölge, mülkiyet, firma büyüklüğü, malzeme, enerji ve işin yasal biçiminin negatif katsayılara sahip olmasına ragmen, teorik olarak varsayılanın aksine tüm değişkenlerin önemli bir etkiye sahip olduğunu göstermektedir.

Genel olarak, çalışma TFV'yi belirleyen birkaç değişken buldu. Bunlar işgücü becerisi, firma yaşı, ihracat durumu, firma büyüklüğü, mülkiyet, işin yasal şekli ve Etiyopya imalat sektörleri ve alt sektörlerinde TFV büyümesini doğrudan etkileyen diğer değişkenlerdir. İhracat durumu sonucu Bigsten ve Gebreeyesus (2009), Van Biesebroeck (2005) ve De Loecker (2007) ile benzerdir. Mevcut araştırmalara göre ihracatçılar, ihracat yapmayanlara göre daha fazla TFV'ye sahiptir. Benzer şekilde, emek becerisinin üretkenliğin güçlü bağıntılarından biri olarak ortaya çıktığına dair bulgular, bu alandaki ampirik araştırmalarla uyumludur (Gehringer vd., 2013). Ayrıca çalışmada, TFV düzeylerinin firma yaşı ile pozitif ilişkili olduğu sonucu elde edilmiştir. Çalışmanın bulguları, yaparak öğrenme modeli (Arrow, 1962), firma düzeyinde deneyim ve öğrenme (Yoon ve Lee 2009; Burke ve diğerleri 2018; Jovanovic ve Nyarko 1996) ile tutarlı olmasına rağmen, daha deneyimli firmaların daha yüksek verimlilik seviyelerine ulaştığını ortaya koymaktadır.

Verimlilik seviyeleri, çalışan sayısıyla ölçüldüğü üzere, kesinlikle firmanın büyüklüğü ile ilgilidir. Dolayısıyla, firma büyüklüğü dikkate alındığında, tez sonuçları Bangladeş'in küçük firmalarının büyük firmalardan daha verimli olduğunu bulan Fernandes (2008) ve verimlilik artış oranları ile firma büyüklüğü arasında negatif bir ilişki bulan Taymaz (2002) ile benzerlik göstermektedir. Çünkü küçük firmalar üretimi büyük firmalardan farklı organize etmektedirler. Başlangıçta ölçek ekonomileri firma verimliliğini artırır. Bununla birlikte, bir şirketin büyüklüğü arttıkça, ölçek ekonomileri baskın hale gelebilir ve üretimi olumsuz yönde etkileyebilir.

Kontrol değişkeni analizi, başkent Addis Ababa'da yerleşik firmaların daha düşük TFV'ye sahip olduğunu ve istatistiksel olarak anlamlı olduğunu göstermektedir. Ancak bu, teorik olarak varsayılandan farklı bir bulgudur. Diğer Etiyopya bölgelerine kıyasla Addis Ababa'daki firma sayısının az olması nedeniyle, firma verimliliği için coğrafi koşullar şart değildir. Bazı tahmin edicilerde ve alt sektörlerde, sahiplik katsayıları (özel kuklalar) negatif ve anlamlı hale gelmiştir. Bu da kamuya ait firmaların TFV düzeyini belirlemede özel sektör şirketlerinden daha iyi performans gösterdiğini işaret etmektedir. Bununla birlikte mülkiyetin (özel mülkiyete ilişkin), malzemelerin, enerjinin ve kısmen yasal iş biçiminin verimlilik üzerindeki olumsuz etkisi de dahil olmak üzere, bazı özelliklerde verimliliğini güçlü tahmin edicileri olarak ek katsayılar beklenmedik bir şekilde ortaya çıkmaktadır.

Bu çalışma firma düzeyinde TFV belirleyici sonuçlara dayalı olarak verimliliği artırmak için aşağıdaki politika önerilerini ve gözden geçirilmiş literatüre ve tezdeki makro düzeyde tanımlayıcı istatistiklere dayalı bir politika çerçevesini önermektedir. Bu nedenle, tezin bulgularına dayanarak, Etiyopyalı imalat firmalarının verimliliğini ve TFV düzeyindeki büyümeyi iyileştirmeye yönelik kamu teşvikleri ve politikaları aşağıdakileri hedeflemelidir:

Vasıflı emek (Skilled Labor) vasıflı emek, üretkenliğin temel belirleyicilerinden biridir ve ampirik araştırma sonuçlarıyla uyumludur. Bu nedenle, politika önlemleri, insanları becerilere yatırım yapmaya teşvik etmeli, firmaları daha vasıflı işgücü ve uzman ve verimli işçi kullanmaya teşvik etmeli ve eğitimden daha kapsamlı yararlanmalı. Ayrıca, firmalar işçi beceri kazanımına yatırım yapmalı, iş başında eğitim için teşvikler sağlamalıdır ve beceri yoğun üretim, emek yoğun sektörlerde verimliliği artırabilir ve yüksek cironun sektörler üzerindeki olumsuz etkisini azaltabilir. Benzer şekilde, işletmelerin uygun teknolojiyi öğrenmesi ve kullanması için teşvikler de bir başka uygulanabilir eylemdir. Ayrıca, endüstrilerin veya pazarın büyümeleri ve üretimde ihtiyaç duyulan hızlı değişen beceri setlerine uyum sağlamaları için ihtiyaç duyduğu yeterli beceriye sahip bir işgücü oluşturmak için yüksek öğretim politikalarını yeniden gözden geçirin.

İhracat Teşviki: İhracatın, firmanın TFV'si üzerinde büyük bir etkisi vardır. Etiyopya'nın ekonomisini sanayileştirme taahhüdünü varsayarak, mevcut ihracatçı firmaları destekleyerek ve yeni firmalar yaratarak küresel ticaretteki konumunu güçlendirmesi esastır. Buna göre, ihracata giriş engellerini aşmak, ikili ticaret maliyetlerini azaltmak, mal piyasasındaki rekabetin önündeki ticaretle ilgili engelleri kaldırmak ve firmanın uygun finansman ve dövize erişimini iyileştirmek için yerli firmaların ihracat kapasitesini geliştirmek. Sonuç aynı zamanda ihracata yönelik sektörlerin (tekstil, hazır giyim ve köpük ve diğerleri gibi) ihracat hacimlerini artırmaları için desteklenmesi gerektiğini de ortaya koyuyor. Ayrıca, ihracat çeşitlendirme stratejisini teşvik etmek, ihraç ürünlerinin kalitesini artırmak ve küresel standartlara getirmek. Sonuç olarak, ülke için hem statik hem de dinamik ticaret kazanımlarının gerçekleşmesi beklenmektedir.

KOBİ'ler için özel bir destek planının tanıtılması: Küçük ve orta ölçekli firmalar (SMF'ler) daha aktiftir ve ihracat ve yenilikçi faaliyetlerde bulunma olasılıkları daha yüksektir. Bu nedenle, SMF firmalarının oluşumunu teşvik etmek için giriş engellerini azaltmak ve yeni başlayanların finansmana erişimini iyileştirmek gibi KOBİ'leri teşvik eden politikalar izlenmelidir. Ayrıca, vergi yükünde indirimler, inovasyon kredileri, KOBİ'ler için ek finansman, hibeler ve KOBİ'lere özel diğer destek paketleri yoluyla son derece etkili bir işletme destek planının tasarlanması ve uygulanması düşünülmeli ve uygulamaya konmalıdır. Sonuç olarak, hükümet başarılı ülkelerden en iyi uygulamaları (deneyimleri) ve modelleri birleştirerek kapsamlı ve etkili bir ulusal SMF destek planı oluşturmaya çalışmalıdır.

Deneyim (Firm Age): Çalışma, yaparak öğrenmenin önemini gösteren tüm tahmin edicilerde TFV düzeylerinin firma yaşı ile pozitif ilişkili olduğunu bulmuştur. Verimlilik yaş (deneyim) ile birlikte arttığından, firmaları piyasada kalmaya teşvik eden politikalar kritik öneme sahiptir. Aynı zamanda, yeni ve deneyimliler arasında deneyim paylaşımını teşvik eden politikalar teşvik edilmeli ve verimliliğin sağlanması için gereklidir. Ayrıca, ortak işletmeler ve araştırma ve geliştirme (Ar-Ge) yoluyla genç ve yaşlı firmalar arasında daha güçlü bağları teşvik ederek bilgi transferine artan yatırımı kolaylaştırabilecek politikalar ortaya koyun.

Bundan başka, yukarıdaki politika ve stratejilerle birlikte ilgili hükümet organları mevcut sanayi politikalarını duruma göre zamanında değerlendirmeli ve revize etmelidir; sanayi ve ticaret politikası birbirinden ayrı tutulmamalı ve ticaret her ekonomik sektörde ana akım haline getirilmelidir. Benzer şekilde, ana sanayiler ve imalat alt sektörleri için ölçülebilen ve yönetilebilen verimlilik hedefleri belirlemeli ve uygulama için güçlü ve dönüştürücü kurumlar oluşturmalıdır. Politika tavsiyelerinin yanı sıra, verimlilikle ilgili güvenilir istatistiklerin zamanında yayılması, Etiyopya'nın ulusal bir hedef olarak üretkenliğe öncelik verme hedefine ulaşması için kritik önem taşımaktadır. Bu nedenle hükümet, verimlilikle ilgili istatistikleri, ulusal hesap istatistiklerini ve diğer ekonomik kümeleri toplamak, analiz etmek ve yayınlamak için yeterli kaynakları tahsis etmelidir.

Sonuç olarak, tez, TFV düzeyini ve büyümesini ölçmüş ve mevcut ve yönetilebilir yeniden yapılandırılmış panel veri kümelerini kullanarak TFV'nin belirleyicisini tahmin etmiştir. Ayrıca, Tez ilginç tanımlayıcı ve ekonometrik istatistikler buldu, ancak CSA veri kümeleri çeşitli durumları araştırmak için de kullanılabilir. Spesifik olarak, tez firma büyüklüğü ile firma yaşı arasında bu tezin kapsamı dışında kalan tam bir nedensel ilişki kurmamaktadır. Bununla birlikte, daha fazla anket turu yapıldığında, nedenselliği daha kesin bir şekilde keşfetmek için yeterli bir dönemi kapsayan panel veriler kullanılabilir. Ayrıca, gelecekte mevcut veri kümelerine dayalı olarak diğer TFP belirleyicileri, ölçüleri ve yaklaşımları kullanılabilir. Bu nedenle, bu tezin kapsamı dışındaki verimlilik endişeleri, gelecekte güncellenmiş veri kümeleri, geliştirilmiş yaklaşımlar ve vaka çalışmaları kullanılarak daha fazla araştırma yapmak için diğer araştırmacılara bırakılacaktır.

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APPENDIX

Appendix Table A1: The main input and output variable definition

The difference between the gross value of production and the total industrial and non-industrial costs is defined as value-added in the National Account concept at market prices. (CSA, 2018). Shortly: ***VA = GVP – IC and NIC.***

Gross Value of production includes:
1. Total sales values
2. Value of contracted work done for others using the firm's materials
3. Receipts for repair and maintenance work done for others
4. Receipts for products bought and resold without processing
5. Value of capital goods produced by the firm's employees and materials for its use.
6. Interest received
7. Rental income from the lease of machinery and equipment
8. Insurance claims, and
9. Other income, but excludes subsidies received
10. Stock[59] difference (Stocks at the beginning of the year minus the end of the year.
Industrial cost is the sum of:
1. Values of total raw materials
2. Fuel and lubricating oil
3. Electricity consumed
4. Wood and charcoal for energy
5. Cost of repair and maintenance
6. Water consumed
7. Goods bought and resold, and
8. Contract works are done by others for the establishment
Non-industrial cost includes the sum of:
1. License fees
2. Cost of advertising
3. Stationery
4. Telephone and mailing
5. Accounting and legal commissions, and
6. Rent payable for rental of structures and equipment

Source: CSA various years survey

[59] *The value of stock includes the finished and semi-finished goods, raw materials, and goods bought for resale.*

The medium and large manufacturing industry deflator is used to calculate real value-added. Besides, all data in the study have been changed (modified) to reflect current market circumstances; thus, they are all real figures.

Intermediate inputs (M): this variable represents the total cost of all raw materials (foreign and locally produced products) and energy inputs, such as electricity, water, and any other industrial or non-industrial expense.

Gross output is primarily a measure of sales or income generated from production for most sectors. For margin enterprises, including such retail and wholesale businesses, it is calculated as sales or revenue less the cost of products sold

The difference in Stocks in the Value of Finished and Semi-Finished Goods: - is the net change in stocks in the value of finished and semi-finished goods between the end and beginning of the reference period.

In the National Account Concept (at Basic Price), Value Added is the difference between the gross value of production and intermediate consumption, which is adjusted for product taxes such as licensing tax.

Source: CSA various years survey

Appendix Table A2: Part of CSA Metadata files and their description, ISIC 3.1 codes, and variable definitions

Variable Name	Descriptions of the variables
ESTID	establishments (Firm) Id
ID08	Survey reference year
ID09	International standard industrial classification
ID10	Establishment number
P2Q2	Number of establishments
P2Q3M	Month of commencement
P2Q3Y	Year of commencement
P2Q4	Keep books of accounts
P2Q5	Type of calendar for accounts and books
P2Q6	Type of ownership
P2Q7	Ownership transferred from public to private
P2Q8M	The month of ownership transferred
P2Q8Y	Year of ownership transferred
P2Q9	The legal form of the establishment
P2Q10M	Number of male owners
P2Q10F	Number of female owners
P2Q10T	Total number of owners
P2Q11A	Initial paid-up capital (private Ethiopia
P2Q11B	Initial paid-up capital (private Ethiopia
P2Q11C	Initial paid-up capital (private non-Eth
P2Q11D	Initial paid-up capital (public)
P2Q11E	Initial paid-up capital (other)
P2Q11F	Total initial paid-up capital
P2Q12A	Current paid-up capital (private Ethiopia
P2Q12B	Current paid-up capital (private Ethiopia
P2Q12C	Current paid-up capital (private non-Eth
P2Q12D	Current paid-up capital (public)
P2Q12E	Current paid-up capital (other)
P2Q12F	Total current paid-up
P2Q13	Number of months the establishment opera
P2Q14A	The first significant problem prevented the establish.
P2Q14B	The second major problem prevented the establishment
P2Q14C	The third major problem prevented the establishment
P2Q15	Ownership of non-residential buildings
P31C3T	Total number of male Ethiopian employees
P31C4T	Total number of female Ethiopian employee
P31C5T	Total number of foreigner employees for
P31C6T	Total number of male Ethiopian employees
P31C7T	Total number of female Ethiopian employee
P31C8T	Total number of foreigner employees for
P31C9T	Total number of male Ethiopian employees
P31C10T	Total number of female Ethiopian employee
P31C11T	Total number of foreigner employees for
P33C14T	Total number of permanent employees with
P33C15T	Total number of permanent employees with

Variable Name	Descriptions of the variables
P82C9T	The total value of imported raw materials
P31C12T	Total number of male Ethiopian employees
P31C13T	Total number of female Ethiopian employee
P31C14T	Total number of foreigner employees for
P32C3T	Total wage for male Ethiopian
P32C4T	Total wage for female Ethiopian
P32C5T	Total wage for foreigners
P32C6T	Wage total
P32C7T	Commission, bonuses, professional and hard
P32C8T	Actual cost of the establishment on food
P32C9T	Establishments contribution on behalf of
P33C3T	Total number of permanent employees with
P33C4T	Total number of permanent employees with
P33C5T	Total number of permanent employees with
P33C6T	Total number of permanent employees with
P33C7T	Total number of permanent employees with
P33C8T	Total number of permanent employees with
P33C9T	Total number of permanent employees with
P33C10T	Total number of permanent employees with
P33C11T	Total number of permanent employees
P41C8T	Total value of production
P41C10T	Total sales value
P41C12T	Total value of exported sales
P42C2	Value of contract work done for other by
P42C3	Receipt for repair and maintenance work
P42C4	Receipts of products bought and resold w
P42C5	Value of capital goods produced by own e
P42C6	Interest received
P42C7	Rental income from lease of machinery an
P42C8	Insurance claims
P42C9	Subsidy
P42C10	Other income
P42C11	Total value of services and other receipt
P61C7T	Total value of local raw materials
P61C9T	Total value of Imported raw materials
P61C11T	Value of total raw materials
P62C6T	Total value of fuel and lubricating oil
P62C7T	Electricity consumption in KWH
P62C8T	Value of electricity consumed
P62C9T	Wood and charcoal for energy
P62C10T	Cost of repair and maintenance
P62C11T	Value for water consumed
P62C12T	Cost of goods bought and resold
P62C13T	Cost of contract work done by others for
W08	No. of shifts

Variable Name	Descriptions of the variables
P2Q16	Source of non-residential buildings
P62C14T	Total value of other inputs
P63C2	License fee
P63C3	Advertising
P63C4	Stationary, telephone and mailing expense
P63C5	Payment for accounting, legal commission
P63C6	Transport cost
P63C7	Interest payments
P63C8	Bank charges
P63C9	Rent payable for rental of structures an
P63C10	Insurance premium on property
P63C11	Amortization
P63C12	Others non-industrials costs
P63C13	Total value of other non-industrial expense
P64C2	Value added tax
P64C4	Ex-tax
P64C3	TOT tax
P64C5	Income tax paid on profit
P64C6	Total taxes paid
P71C3	Total book value of the fixed assets at
P71C4	Total investment for purchase and capital
P71C5	Total sold and disposed during the year
P71C6	Total depreciation during the year
P71C7	Total book value of the fixed assets at
P72C3T	Total investment on fixed assets
P72C4T	Total working capital
P82C7T	Total value of production (if working at
P83C7T	Total value of estimated raw materials (imported +Local)
P81	Percentage as compared to the factory's
P84A	Three major problems that prevented operate
P84B	Three major problems that prevented operate
P84C	Three major problems that prevented operate
P85	Reason for lack of market
P86	Factory made attempt to take loan
P87A	Reason for not solving the loan problem
P88A	First major problem faced the establishments
P88B	Second major problem faced the establishments
P88C	Third major problem faced the establishments
P89	Faced problems during export
P810A	Problem faced during export (1)
P810B	Problem faced during export (2)
P810C	Problem faced during export (3)
P811	Reason for using imported raw materials
P33C12T	Total number of permanent employees with
P33C13T	Total number of permanent employees with

Source: CSA various years survey

Appendix Table A3: Industry names and descriptions

Industry	Description
Food & beverages	Manufacturing of food products and beverages
Textiles	Manufacturing of textiles
Garment	Manufacturing of wearing apparel, except fur apparel
Leather & footwear	Tanning and dressing of leather; manufacturing of footwear, luggage, and handbags
Wood	Manufacturing g of wood and products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
Paper	Manufacturing of paper, paper products, and printing
Publishing & printing	Publishing, printing, and reproduction of recorded media
Chemicals	Manufacturing of chemicals and chemical products
Rubber & plastics	Manufacturing of rubber and plastics products
Non-metallic minerals	Manufacturing of other non-metallic mineral products
Basic metals	Manufacturing of basic metals
Fabricated metal	Manufacturing of fabricated metal products except for machinery and equipment
Machinery & equipment	Manufacturing of machinery and equipment.
Motor vehicles	Manufacturing of motor vehicles, trailers, and semi-trailers
Furniture	Manufacturing of furniture; and manufacturing NEC.

Source: CSA various years survey

Appendix 1: A copy of Jimma University's cooperation letter for survey data request and a copy of the CSA's filled and signed form requesting raw data access.

JIMMA UNIVERSITY

ጅማ ዩኒቨርሲቲ

ቁጥር Ref.No. E/Econ 13/2020

ቀን Date 04/09/2020

From: Department of Economics

BECO, Jimma University

Jimma

To: <u>Ethiopian Stastics Agency</u>

Subject: <u>Letter of Co-operation</u>

Mr. Ismael Mohammed Nasir, who is staff in Economics department, Jimma University; PhD scholar in Department of Economics Nacemmettin Erbakan Üniversity and conducting PhD Thesis entitled "**Industrial Production, Multi-Factor Productivity and Development Of Industrial Policies In Ethiopia: The Case Of Manufacturing Sector ".**

Therefore, this is to kindly request your good office to provide support for this researcher. The department would like to appreciate your kind co-operation and wants to thank in advance for your unreseryed support.

CENTRAL STATISTICAL AGENCY

FORM FOR REQUESTING ACCESS TO RAW DATA

1. Name of organization/person requesting the raw data:-
JIMMA UNIVERSITY

2. Requesting Organization/Person: -
- [ ] Governmental Office
- [ ] Research Institution
- [x] Higher Education Institution
- [ ] Researcher
- [ ] University Student
- [ ] An Org. who contributed for the specific survey/census
- [ ] Private /Consultant Organization
- [ ] NGO
- [ ] International /Foreign Organization
- [ ] Other /specify/ ____________________

3. Year of undertaking and the name of the CensKebele ample survey from which the raw data are being requested: - ETHIOPIA Other /MANUFACTURING ESTABLISHMENT SURVEY (1996 - 2017)

4. The raw data is requested at: -
- [x] Country level
- [x] Regional level
- [x] Zonal level
- [x] Wereda level
- [ ] Kebele level
- [ ] Other /specify/ ____________________

5. For what purpose do you need the raw data? /please describe in short your proposal/
The data is requested for the purpose of undertaking research for the fullfilment of PhD

6. Comments, the name and the signature of the head of the department from which access to raw data is requested
Plese provide the client LMSMIS Report / Raw level data as per requested

Name Signature

7. Authorized person, please make access to raw data -

☑ Free of charge

☐ With charge

Signature ____________

8. Head, Planning Service, if it's with charge, specify the total budget allocated for the census/survey/ in Birr/ ____________

Signature and date ____________

9. Head, Public Relations Service, if it's with charge the total amount to be paid /in Birr/ ____________

Signature ____________

10. Date/Month/Year/ ____________

11. Obligations of organization/person requesting to access raw data

11.1 The organization/person requesting to access raw data shall not transfer the raw data it obtained with or without charge to third party.

11.2 The organization/person requesting to access raw data shall not use the data it obtained with possible identification of individual return or part thereof;

11.3 The researchers and students of higher educational institutions, who are allowed to have access to raw data without charge are obliged to give the copy of their report presenting the analysis of the data;

11.4 The organization/person requesting to access raw data shall not process the raw data below the lowest reporting level;

11.5 I the under signed organization/person agreed to obey the rules and regulations set from article 11.1-11.4. If failed to follow these obligations, shall be liable to the penalty provided under the appropriate article of the civil code issued in 1956 and order No. 79 of 1972 and proclamation No. 303 of 1972 to establish and define the powers of the Central Statistical Authority.

12. Witnesses names and signatures: -

12.1 ________________ __________ __________

12.2 ________________ __________ __________

12.3 ________________ __________ __________

13. Name of the Requesting Organization/Person

Signature ____

Date

Appendix Table A4: A correlation matrix with a significance value

	ln_TFP	**lnage**	**lnrm**	**lnrenrg**	**skill**	**iexstuts**	**ifirmsize**	**iregion**
ln_TFP	1.0000							
lnage	0.0995*	1.0000						
	0.0000							
lnrm	0.1537 *	0.1061*	1.0000					
	0.0000	0.0000						
lnrenrg	0.0991*	0.1009*	0.6589*	1.0000				
	0.0000	0.0000	0.0000					
skill	0.1894*	0.1038*	0.4213*	0.4050*	1.0000			
	0.0000	0.0000	0.0000	0.0000				
iexstuts	0.0500*	0.0948*	0.1497*	0.1344*	0.1015*	1.0000		
	0.0003	0.0000	0.0000	0.0000	0.0000			
ifirmsize	-0.0007	0.2092*	0.4748*	0.4456*	0.0529*	0.2053*	1.0000	
	0.9574	0.0000	0.0000	0.0000	0.0002	0.0000		
iregion	0.0321*	0.2800*	0.0732*	0.0604*	0.0972*	0.0400*	0.1511*	1.0000
	0.0216	0.0000	0.0000	0.0000	0.0000	0.0042	0.0000	

Source: Author's calculation-based CSA datasets

Appendix Table A5: Tables of frequencies for all dummy variables used in study

Tabulate own (Ownership)

own		**Freq.**	**Percent**	**Cum.**
1	Private	4,562	88.95	88.95
2	Government	468	9.12	98.07
3	Joint (Public and private)	99	1.93	100.00
Total		**5,129**	**100.00**	

Tabulate lgfo (Legal form of business ownership)

lgfo		**Freq.**	**Percent**	**Cum.**
0	N/A	54	1.05	1.05
1	Individual proprietor	1,890	36.85	37.90
2	Partnership or joint venture	504	9.83	47.73
3	Share company	423	8.25	55.98
4	Private limited company	1,637	31.92	87.89
5	Co-operative	360	7.02	94.91
6	Others	261	5.09	100.00
Total		**5,129**	**100.00**	

N/A: not available or no answer.

Tabulate ifirmsize (Firm size)

i.firmsize		**Freq.**	**Percent**	**Cum.**
0	SMF	2,918	57.27	57.27
1	large Firm	2,177	42.73	100.00
Total		**5,095**	**100.00**	

Tabulate iexstuts (Export stutus)

i.exstuts		**Freq.**	**Percent**	**Cum.**
0	Non-exporter firms	4,569	89.08	89.08
1	Exporter firms	560	10.92	100.00
Total		**5,129**	**100.00**	

Tabulate iregion (Region)

i.region	**Definition**	**Freq.**	**Percent**	**Cum.**
0	Other regions	3,303	64.40	64.40
1	Located in Addis Ababa	1,826	35.60	100.00
Total		**5,129**	**100.00**	

Appendix Table. A6: Trends in the Manufactured Export receipt, growth in % and share in%

	2010/11	**2011/12**	**2012/13**	**2013/14**	**2010/11**	**2011/12**	**2012/13**	**2013/14**	**2011/12**	**2012/13**	**2013/14**
Sectors	**Growth in %**										
Consumer Goods											
Food & Beverage	75671,5	118727,9	89608,2	80479,7	251,0	56,9	-24,5	-10,2	30,74	18,96	19,89
Tobacco	267,8	250,2	252,0	240,4	-20,0	-6,6	0,7	-4,6	0,06	0,05	0,06
Textile	11779,1	77181,3	89587,8	96352,8	-19,1	555,2	16,1	7,6	19,98	18,95	23,81
Wearing apparel	809,0	13275,0	10412,8	1940,3	-88,1	1540,8	-21,6	-81,4	3,4	2,2	0,5
Leather	99360,5	161924,6	236785,6	197018,3	157,7	63,0	46,2	-16,8	41,9	50,1	48,7
Wood			29,0	27,6	-100,0			-4,6	0,0	0,0	0,0
Furniture		13,4	2015,2	28,0	-100,0		14951,7	-98,6	0,0	0,4	0,0
Paper and Printing		5834,3	3075,8	22,0	-100,0		-47,3	-99,3	1,5	0,7	0,0
Rubber & Plastic	22212,8	334,3	33610,9	9205,3	7981,9	-98,5	9953,9	-72,6	0,1	7,1	2,3
Consumer Goods	**210100,8**	**377540,9**	**465377,2**	**385314,4**	**147,5**	**79,7**	**23,3**	**-17,2**	**97,7**	**98,4**	**95,2**
Intermediate Goods											
Chemicals	7926,0	7559,4	4983,5	3680,6		-4,6	-34,1	-26,1	2,0	1,1	0,9
Non-Metalic Minerals	1813,6	561,6	1042,4	4988,8	761,4	-69,0	85,6	378,6	0,1	0,2	1,2
Intermediate Goods	**9739,6**	**8121,0**	**6025,9**	**8669,4**	**4526,1**	**-16,6**	**-25,8**	**43,9**	**2,1**	**1,3**	**2,1**
Capital Goods											
Basic Iron and Steel	2014,1				-31,8	-100,0			0,0	0,0	0,0
Fabricated Metal	183,8	624,5	1332,4	5466,9	-95,1	239,7	113,3	310,3	0,2	0,3	1,4
Machinery and Equipment				5156,4	-100,0				0,0	0,0	1,3
Motor Vehicles									0,0	0,0	0,0
Capital Goods	**2197,9**	**624,5**	**1332,4**	**10623,3**	**-68,6**	**-7.6**	**113.3**	**697.3**	**0.2**	**0.3**	**2.6**
Total	**222038,4**	**386286,4**	**472735,5**	**404607,2**	**141.1**	**74.0**	**22.4**	**-14.4**	**100.0**	**100.0**	**100.0**

Source: CSA, (Various issue

Appendix Table A7: Manufacturing Industries by the size of persons engaged, in %

Sectors	Percent of establishments by the size of persons engaged					
	2009/10, Base year			**2013/14**		
	10 – 19	**20 - 49**	**50 & Over**	**10 - 19**	**20 - 49**	**50 & Over**
Consumer Goods						
Food and Beverages	29,5	30,2	40,2	31,9	31,7	36,4
Tobacco	0,0	0,0	100,0			100,0
Textiles	5,0	5,0	90,0	5,8	24,6	69,6
Wearing Apparel	25,5	27,5	47,1	16,1	22,6	61,3
Leather	14,9	34,2	50,9	20,0	30,7	49,3
Wood & Cork, Except Furniture	42,6	20,4	37,0	50,0	27,1	22,9
Paper and Printing	22,0	35,8	42,3	26,5	28,6	44,9
Furniture; Manufacturing N.E.C.	59,8	26,3	13,9	62,5	24,0	13,5
Rubber and Plastic	20,9	30,2	48,9	15,7	29,4	54,9
Sub-total	**32,6**	**29,0**	**38,4**	**34,6**	**29,0**	**36,4**
Intermediate goods						
Chemicals	17,7	25,0	57,3	12,8	24,0	63,2
Other non-metallic mineral	60,2	23,4	16,4	55,0	28,8	16,1
Sub-total	**53,1**	**23,7**	**23,2**	**48,4**	**28,1**	**23,6**
Capital goods						
Basic iron and steel	30,8	25,6	43,6	31,6	15,8	52,6
Fabricated metals	45,5	24,7	29,9	45,7	20,2	34,1
Machinery and equipment N.E.C.	20,0	33,3	46,7	38,1	23,8	38,1
Motor vehicles, trailers & semi-trailers	27,3	9,1	63,6	11,1		88,9
Sub total	**40,2**	**24,7**	**35,2**	**41,5**	**19,1**	**39,4**
TOTAL	**38,8**	**27,2**	**34,0**	**39,2**	**27,8**	**33,0**

Source: CSA (2013-14)

Appendix Table A8: Value of Imports by End-Use (In Millions of USD)

Categories	**2017/18**		**2018/19**		**2019/20**	
Import	**value**	**% Share**	**value**	**% Share**	**value**	**% Share**
Raw Materials	138.0	0.9	151.5	1.0	162.2	1.2
Semi-finished Goods	2,527.8	16.6	2,778.8	8.4	3,110.7	22.4
Fertilizers	478.5	3.1	499.7	3.3	597.8	4.3
Fuel	2,319.3	15.2	2,600.7	17.2	2,088.1	15.0
Petroleum Products	2,227.2	14.6	2,493.4	16.5	2,003.7	14.4
Others	92.0	0.6	107.3	0.7	84.3	0.6
Capital Goods	5,269.1	34.5	5,030.6	33.3	4,122.0	29.7
Transport	1,130.9	7.4	1,429.2	9.5	397.6	2.9
Agricultural	51.5	0.3	58.6	0.4	88.2	0.6
Industrial	4,086.7	26.8	3,542.9	23.4	3,636.2	26.2
Consumer Goods	4,707.0	30.9	4,273.1	28.3	4,010.6	28.9
Durables	1,351.7	8.9	1,200.7	7.9	920.5	6.6
Non-durables	3,355.3	22.0	3,072.3	20.3	3,090.1	22.3
Miscellaneous	294.2	1.9	277.2	1.8	387.8	2.8
Total Imports	**15,255.3**	**100**	**15,112.0**	**100**	**13,881.3**	**100**

Source: Ministry of Revenues and Ethiopian Petroleum Enterprise

Appendix Table A9: Export to and import from Africa, in a million Birr

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Export										
Total export	50326,7	56276,3	55501,1	64762,7	59071,4	59838,5	67655,1	73979,1	79131,1	113493,4
Export to Africa	9475,6	11865,2	10746,6	14329,0	11815,7	11026,9	14501,7	16205,6	15610,4	20467,8
Share of Africa (in %)	18,8	21,1	19,4	22,1	20,0	18,4	21,4	21,9	19,7	18,0
Import										
Total Import	157721,8	208102,1	224968,1	301047,2	343649,5	356809,2	379130,7	420140,4	423436,2	458050,6
Import from Africa	6924,2	9230,8	5696,1	13932,5	15584,2	14792,3	21885,7	25905,5	27532,4	37514,7
Share of Africa (in %)	4,4	4,4	2,5	4,6	4,5	4,1	5,8	6,2	6,5	8,2
Trade (Export + Import)										
Total Trade	208048,5	264378,4	280469,2	365809,9	402720,9	416647,7	446785,7	494119,4	502567,2	571544,0
Trade with Africa	16399,8	21096,0	16442,7	28261,5	27400,0	25819,2	36387,4	42111,1	43142,8	57982,5
Share of Africa (in %)	7,9	8,0	5,9	7,7	6,8	6,2	8,1	8,5	8,6	10,1

Source: NBE, quarterly bulletin vol 37 no 3.

Appendix Table A10: The Ethiopian industrial policy and development Stage (Phases)

	Imperial regime	**The Dergue regime**	**The EPRDF regime**
Guiding policy/vision	Market-oriented	Command economy	Market-oriented
Public-private role	Private-led	State-led	Private-led but also strong state
Ownership structure	Domination of foreign owned enterprise	Domination of public owned enterprises	Domination of domestic private-owned enterprises
Priority(target) industries	Import substituting and labor-intensive industries (such as Textile, food, cement)	Import substituting and labor-intensive industries but also primary industries	Export-oriented & labor-intensive industries (such as Textile, leather, agro-processing, cement)
Envisaged key player	Foreign investment	Public sector investment	Private sector Domestic
Policy instruments	Protection of domestic market through high tariff and prohibition of certain imports and Provision of economic Incentives and preferential credit scheme.	Protection of domestic market through high tariff and quantitative restrictions and Financing, subsidizing, ensuring monopoly power for the SOEs.	Direct support for preferred export sectors through capacity building and other means and Provision of economic incentives & preferential credit scheme.

Source: Gebreeyesus, (2013)