FACTORS AFFECT THE PRODUCTIVITY OF LARGE AND MEDIUM -SCALE MANUFACTURING INDUSTRY IN ETHIOPIA

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ABSTRACT

One of the contributions of the productive manufacturing sector is employment creation, strong linkages, and spill-over effects. It also accelerates long-term economic growth through targeted investment in productive capacity and manufacturing sector-driven growth. The study aims to investigate the main factors of total productivity of large and medium-scale manufacturing industries in Ethiopia from 2001 to 2017. Generalized Method of Moments of the econometric model system was applied to analyze the determinant factor of the total productivity of large and medium-scale manufacturing industries. The result confirmed that the loan provided to the manufacturing industries, the intensity of imported raw materials, human capital development , foreign direct investment, and infrastructure growth (road coverage) had a significant positive effect on the factor of productivity. Nevertheless, export intensity and macroeconomic instability(inflation) adversely affected the total factor of productivity. The descriptive analysis indicates that the number of firms, jobs created, and value-added per worker are increasing sustainably and are dominated by the agro-processing sector and mineral industries. However, there was no similar progress shown in manufactured exports. It affects by a shortage of supply of raw materials, weak infrastructure, absence of demand for products, and lack of working capital. The practical significance of this research allows creating a new idea of an investment that encouraged producers to improve efficiency and productivity using the result of the study. It also creates stable macroeconomic stability in the area of large and medium scale manufacturing industries and the country in general. Finally, it contributes significantly to the country's economic growth and poverty reduction.

Keywords: Manufacturing, industry, productivity, determinants, generalized method of moment

Jel classification: L60, L69, D24

INTRODUCTION

Ethiopia has achieved sustainable and inclusive economic growth during the last fifteen years, resulting in infrastructure development, improved education, and major progress in the industrial sector. The country has designed a Gross and Transformation Plan (GTP I and II) to achieve the country's long-term national vision of industrialization and structural transformation (FDRE 2010;Abrehet,2020). The GTP II set objectives to consolidate and further develop infrastructure focus on agricultural development as the basis of fast economic growth, emphasizing the need to increase productivity and promote the industrial sector as a leading sector, and manufacture goods to double export (%GDP) 5% (2015) to 18% (2025) and agro-processing (%GDP) - to 3.39 in 2020 and industry form 15% in 2015 to 28% by 2025.

In this regard, the emphasis is given to the manufacturing sectors based on resource availability, labor intensity, linkages to agriculture, export potential, and low technological entry barriers. The priority sectors identified in these strategies are Leather and leather product, textile and Garment, Wood and Metal Products, Agro-Processing, Mineral, and Mineral products (NPC 2016). Subsequently, the economic productivity helped sustain its growth with an average GDP growth rate of 10.1 percent from 2010-to 2014(NPC 2016).However, the Ethiopian economy is still subject to structural problems.Compared with other undeveloped countries, the base of Ethiopia's manufacturing sector remains insignificant (Haile, 2017). The industry sector in general and the manufacturing sector have a limited share in terms of production, employment, exports, and inter-sectoral linkages (AACCSA, 2014 and Arkebe, 2018).

The manufacturing sector to the gross domestic product was only about 6.4 % in 20018 (NBE, 2018). Its share to GDP is still lower than the sub-Saharan African average which is nearly 10% (Signe, 2018). Though the share of the manufacturing sector is showing slight improvement over time, the service and agriculture sectors are still dominant, constituting about 39% & and 35 % of the country’s gross value added, respectively (NBE, 2018). However, GTP I have placed the top priority to accelerate and integrate the manufacturing industry to create jobs and lift workers from low-productivity agriculture into higher-productivity areas (Cheru 2014).

Many economists argued that the expansion of the manufacturing sector is an engine of the growth and development process. It plays a key role in the socio-economic transformation of the economy of a given country (Eshetie, 2018). The importance of the manufacturing sector for economic growth has been ascribed to higher income elasticity of demand for manufactured goods and higher potential of productivity catch-up (Rodrik, 2011 and Haraguchi, 2015). Again, when the productivity in the manufacturing sector increases, surplus labor will shift from non-manufacturing activities where there are diminishing returns (Olamade & Oni,2016).

Recognizing this role, Ethiopia has given more emphasis to the development of labor-intensive manufacturing industries which have a strong backward linkage to agriculture (Ansu et al., 2016). Despite the policy prescriptions, the manufacturing sector is still in its infant stage, dominantly focusing on semi-processing sub-sectors. This implies that the industrialization policy prescriptions could not radically change the industry and the manufacturing sector in general.

The performances of the manufacturing industries have generally been far from the target set on the GTP (UNDP, 2017). During the first Growth and Transformation Plan implementation period (2010/11-2014/15), it fell short of the planned target in growth performance and structural change (GTP-II, 2016). During this period, the share of the manufacturing sector in total GDP remained below 5 %, it has registered an annual average growth rate of 14.6 %. The contribution of the manufacturing sector to overall GDP has not only been below the planned target but also remained low relative to the mean performance of the Sub-Saharan Africa (SSA) countries. In the second growth and transformation plan (GTP-II), the manufacturing industry is expected to grow by an average annual growth rate of 21.9%.

Its share in the overall GDP was anticipated to increase from less than 5% in 2014/15 to 8% by 2019/2020. Still, the overall GDP share of the sector in 2018 was poor accounting for about 6 % (NBE, 2018). This figure is still lower than the sub-Saharan Africa average of nearly 10% (Signe, 2018). Further, the share of manufactured exports in total exports remained less than 13% (Arkebe, 2018). This is unexpected due to the emphasis placed by the Ethiopian government to achieve structural transformation through industrial policy.

For many decades, economists have debated on the sources of factor productivity in the manufacturing sector. Many factors determine the performance of the manufacturing sector productivity in developing countries (UNDP,2017). The theoretical and empirical literature clearly shows that the factors that affect the factor productivity and output of the manufacturing sector vary from country to country however, the common determinants of factor of production examined in the empirical literature includes variables such as trade integration, macroeconomic stability (inflation rate), human capital development, financial institutions and lending rate, governance, economic growth, infrastructure, and research and development, and FDI among others (Todaro & Smith, 2012; Frija et.al, 2015; Arisoy, 2012; Park, 2010; Baltabaev, 2013; Demena & van Bergeijk, 2019; Calderón & Servén, 2014; Frija, et.al, 2015; Isaksson, 2007; Kariithi,2017; Jun, et. al, 2007; Xu, et. al.2020; Fadiran & Akanbi, 2017; Rasheed, 2010; Habib, Abbas, & Noman; 2019; Timuno, 2017; Odior, 2013 and Olomola & Osinubi, 2018). A large variety of variables determine total factor productivity. For that, the context of this study identifies variables that are commonly touched on in the above theoretical and empirical studies. In addition, the availability of data in Ethiopia is considered while identifying the main determinants of TFP in the large and medium scale manufacturing industries.

Some scholars like Arkebe (2018) have made descriptive analyses on the structure and performance of manufacturing industries in Ethiopia. But his study does not objectively identify the main factor behind the performance of the sector. Melaku (2013) also analyzed the trend and components of factor productivity growth in the manufacturing sector in Ethiopia. But he did not identify the main factors behind factor of production growth in the manufacturing sector. Further, there are limited time-series empirical studies that attempted to analyze the determinants of factor of production growth in the manufacturing sector in Ethiopia. This observable gap has instigated this research to identify the main determinants of factor of production growth in large and medium scale manufacturing industries in Ethiopia using quantitative data. In addition, the trend and structure of the Ethiopian manufacturing sector are analyzed descriptively. The main objective of the study is to analyze the determinants of total factor productivity in the large and medium-scale manufacturing industry in Ethiopia over the period 2001-2017. The study tries to address the following specific objectives:

1.To analyze the trend and structure (number, employment, and value-added) of the large and medium-scale manufacturing industry in Ethiopia over time.
2.To investigate the main determinants of factor productivity in the large and medium-scale manufacturing industry in Ethiopia.

I. METHODOLOGY

Data Sources

The study has used 6-year time series data starting from 2001 to 2017. This is due to the required data series being available only for the 2001–2007-year period. The annual data were obtained from Central Statistical Agency, National Bank of Ethiopia (NBE), Ethiopian Economic Association (EEA), National planning commission, and other international data sources like WB, UNCTAD, and IMF.

Measurement and Estimation of Factor of Productivity

Factor of Productivity measures captures the share of output not described by the number of physical inputs used to produce the output in which its level is determined by how efficiently and intensely the inputs are utilized in production (Comin, 2010). Productivity can be measured in terms of single-factor productivity measures, and multi-factor productivity measures.(Tsegay et.al, 2017). In this research, the Tornqvist-Theil index was used to construct the Factor Productivity index based on simple pre-defined formulas and without the need for econometric estimation. This approach avoids the statistical problems resulting from 2nd-stage regressions as the omitted variable problem not resolved in the 1st stage may provide inefficient and biased estimates in the 2nd stage regression (Wang and Schmidt, 2002). According to this approach, growth in factor productivity is considered comparable to growth in technical change. The Tornqvist-Theil output, input, and factor productivity index in logarithm form can be specified as follows:

$$Output\ index = ln\left[\frac{Q_t}{Q_{t-1}}\right] = \frac{1}{2}\sum_j (R_{j,t} + R_{j,t-1})\ ln\left(\frac{Q_{j,t}}{Q_{j,t-1}}\right)$$

$$Input\ index = ln\left[\frac{X_t}{X_{t-1}}\right] = \frac{1}{2}\sum_j (S_{j,t} + S_{j,t-1})\ ln\left(\frac{X_{j,t}}{X_{j,t-1}}\right)$$

$$FP\ index = ln\left[\frac{FP_t}{FP_{t-1}}\right] = ln\left[\frac{Q_t}{Q_{t-1}}\right] - ln\left[\frac{X_t}{X_{t-1}}\right]$$

Where;
Rj,t = the share of output (*j)* in total revenue in time (t),
Qj,t = the output (*j)* in time (*t),*
Si,t = the share of input (*i)* in total input cost, and
Xi,t = the input (*i)* in time (*t),*

The factor productivity index measures factor productivity changes by calculating the weighted differences in the growth rates of outputs and inputs. The growth rates are in log-ratio form, and the weights are revenue and cost shares for outputs and inputs, respectively.

THE MODEL

The focus of this study is to analyze the determinants of factor productivity in the medium and large-scale manufacturing sector by using time series data over 2001-2017. Once the factor of productivity is estimated by using the Tornqvist-Theil technique, the following estimable time series model is specified to investigate the factor of productivity that can be measured in terms of single-factor productivity measures, and multi-factor productivity measures.(Tsegay et.al, 2017). in the medium and large-scale manufacturing sector in Ethiopia.

$$FP_t = \beta_0 + \beta_1 IMPIN_t + \beta_2 LOAN_t + \beta_3 FDI_t + \beta_4 EXPIN_t + \beta_5 ENROL_t + \beta_6 ROAD_t + \beta_7 GDPPC_t + \beta_8 INF_t + \nu_t \quad (4)$$

Where β_0 is the constant term, **IMPIN** is the imported intensity of raw materials, **LOAN** is access to medium and large scale manufacturing sector, **FDI** is foreign direct investment index, **EXPIN** is the intensity of exported outputs, **ENROL** is the growth rate of secondary school enrolment, **ROAD** is growth in road coverage which is a proxy for infrastructure development, **GDPPC** is the growth rate of real per capita income, **INF** is the rate of inflation, and ν_{it} is an error term that captures all other omitted factors with $\sum(\nu_t) = 0$ for all i and t . Parameters β_1 to β_8 are the elasticities of **FP** for each explanatory variable.

Method of Estimation

Econometric modeling and descriptive statistics were employed to analyze the data. Descriptive statistics were used to show the structure and performance of medium and large-scale manufacturing industries. An econometric model (Generalized Method of Moment) was applied to analyze the determinants of manufacturing industry growth. Generalized Method of Moment estimators are found more efficient than the common method of moment estimators as it uses a weighted matrix estimation technique that allows accounting for heteroskedasticity and/or serial correlation (Hall, 2005; and Baum, Schaffer, & Stillman, 2003). Generalized Method of Moment is also a robust estimator in that it does not require information on the exact distribution of the disturbances (Eviews Manual).

Difference Generalized Method of Moment and system Generalized Method of Moment are the two recent common variants of Generalized Method of Moment. But, given the poor performance of the difference Generalized Method of Moment models, particularly in the presence of high serial correlation, Blundell and Bond (1998) designed a system Generalized Method of Moment that uses lagged first differences of the explanatory variables and the dependent variable as instruments in addition to the lagged level instruments.

Therefore, the system GMM was used to identify the factors which affect the factor of productivity in the manufacturing sector in Ethiopia over the period 2001-2017. Before estimating the Generalized Method of Moment model, the stationarity of the series over time was checked. To do this, the standard *Augmented Dickey-Fuller* (ADF) and *Phillips–Perron* (PP) unit root tests were applied. In addition, to test the adequacy of the GMM model, Sargan's J-test of over-identifying restrictions was used.

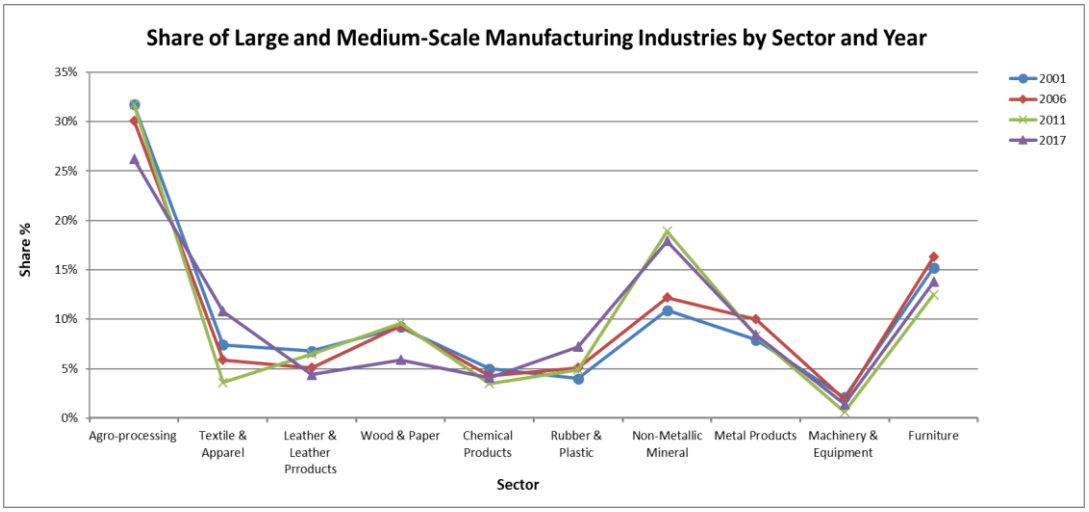
II. RESULTS AND DISCUSSION

Descriptive Analysis

Trend and Structure of Large and Medium-scale Manufacturing Industries

Under this section, therefore, the trend and structure of large and medium scale manufacturing industries are assessed in terms of the total number of firms, size of employment created, value-added, value-added per labor, and export intensity (export per value of production).

Figure 1: Share Of Large And Medium-Scale Manufacturing Industries By Sector (2001-2017)



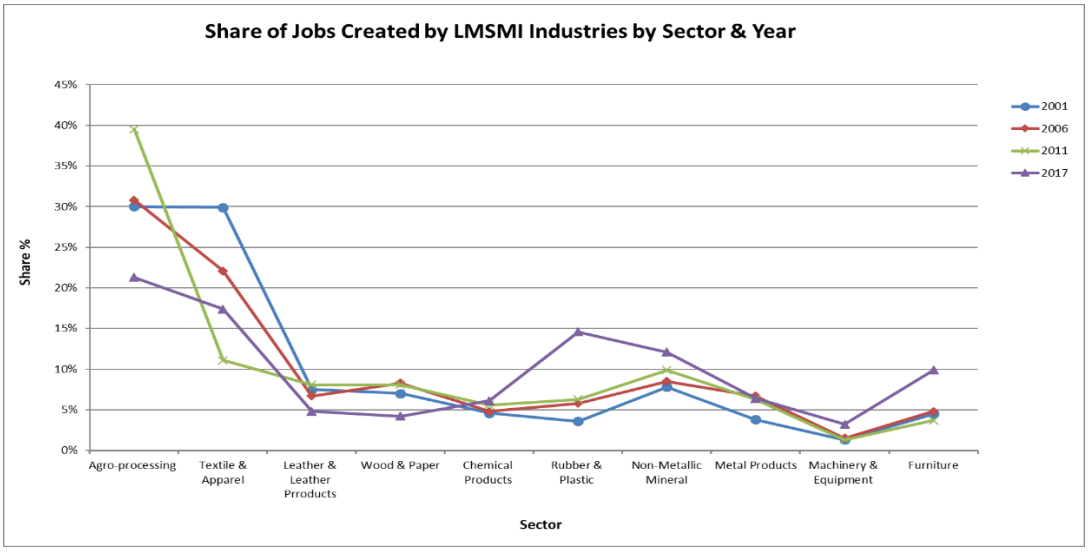
Source: Own computation based on CSA data

The total number of firms:

As depicted in Figure-1, the total number of large and medium scale manufacturing industries are continuously increasing from time to time. In 2001 the total number of large and medium scale manufacturing firms was 642. After ten years this number has almost doubled and reached 1243 in 2006. In the next eleven years, the number of large and medium scale manufacturing firms has increased by around three-fold and reached 3627 in 2017. This significant increment in the number of firms and employment is due to the government interventions to support the manufacturing sector through a range of incentives like favorable land lease rates, access to commercial credit, free imports of inputs, generous tax breaks, together with substantial investments to improve infrastructure and human capital (Ansu et al., 2016).

The distribution of the firms by sector is reported in figure 1. Accordingly, agro-processing, chemical and mineral products, and wood products are more than 50% of the large and medium scale manufacturing firms.

Figure 2: Share Of Jobs Created By Large and Medium- Scale Manufacturing Industry By Sector (2001-2017)



Source: Own computation based on CSA data

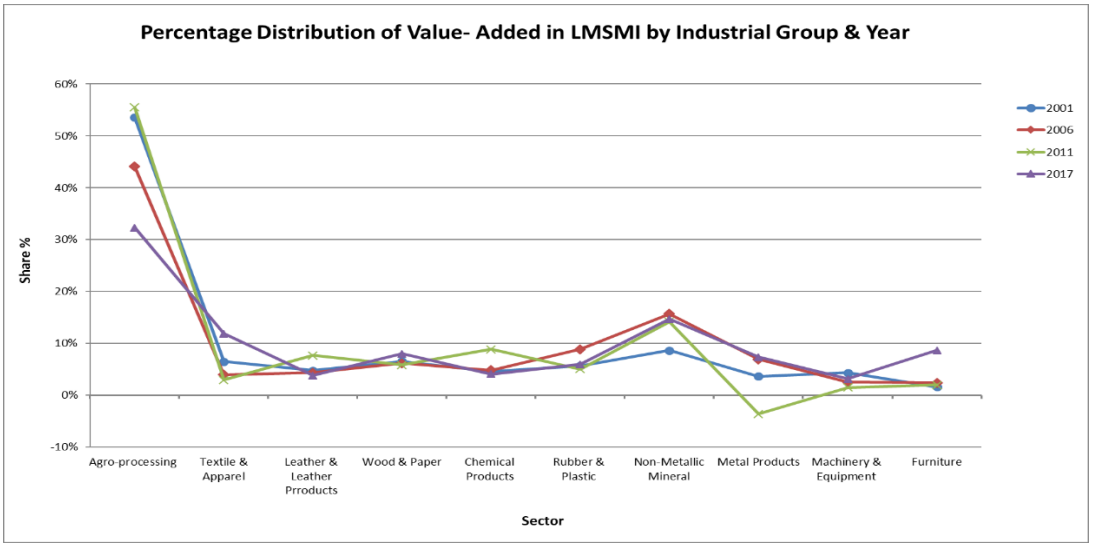
Jobs/employment created:

As depicted in Figure 2 the total size of jobs opportunity by the large and medium scale manufacturing sector is generally increasing during the last two decades, except for the year 2015.

During 2001-2006, the total number of jobs created in this sector increased by nearly 32%. In the next eleven years, total employment created by the firms has increased by 147.4%. This significant increment in the number of firms and employment is due to the government interventions to support the manufacturing sector through a range of incentives like favorable land lease rates, access to commercial credit, protect medium and large scale manufacturing industry to sustain in the market, technology link with kaizen institute, value chain(textile), free imports of inputs, generous tax breaks, together with substantial investments to improve infrastructure and human capital (Ansu et al., 2016).

On the other hand, agro-processing, textile and garment industries, and wood and paper industries were the three-dominant job-creating sectors constituting nearly 72% of the total employment created a job opportunity in the study sectors in 2001. Figure 2 depicts that, in 2017, the share of rubber & plastic, and non-metallic mineral industries continuously increased over time and become among the main job creators in the industry. At the end of 2017, agro-processing, textile and garment, rubber & plastic, and non-metallic mineral industries together accounted for more than 65% of total registered manufacturing employment. This clearly shows that the manufacturing sector in Ethiopia is at its early stage of development which exists before industrialization "take off". In this early stage, labor-intensive industries have higher development potential in terms of value-added (Haraguchi, 2015).

Figure 3: Percentage Distribution Of Value-Added In Large and Medium Scale Industry, By Industrial Group (2001–2017)



Source: Own computation based on CSA data

Value-added:

The value added by the large and medium scale manufacturing industries is sustainable increment throughout the given year. Not only the total value-added but also the value-added per worker is increasing continuously. The value added by the large and medium scale manufacturing industries was worth about 1.6 billion Birrs in 2001. In the same year, the value-added per person was 17,507 Birr. In the next decade, these figures (value-added and value-added per worker) have almost doubled to 3.7 billion Birr and 30,996 Birr in 2006

After 2006, the value-added and value-added per worker has tremendously increased and reached 80.3 billion Birr and 273,930 Birr in 2017, respectively. This seems promising performance, though the share of the manufacturing industry to the entire economy is still very low. This research also indicated that the largest value addition was come from the agro-processing industries (food & beverage subsectors), non-metallic mineral industries, and textile and wearing apparel, which together accounted for close to 60% share between 2001-2017. However, the relative share of the value added by the food and beverage industries declined after 2006.

Exports performance:

Regardless of the continuous rise in manufacturing value-added and employment, there has been no similar progress in manufactured exports. As reported from the survey, the ratio of export to a gross value of production is highly volatile. In the year 2001-2017, the highest export to a value of production (9.4%) was recorded in 2003 while the lowest ratio (2.8%) was in 2010. The composition of the export reported in the survey, almost all the manufactured exports were low-value products, which were generated in the leather and leather product, agro-processing, and textiles and apparel industries. This could be due to weak international competitiveness that results from low productivity, low-quality products, and a lack of support for market integration.

Firm-level major operational problems

Based on the 2017 CSA annual survey on Large and Medium Scale Manufacturing Industries in Ethiopia, the first major operational problem faced by the LMSMIs is all manufacturing industries reported a shortage of supply of raw materials as the first major operational problem faced during each survey year due to the weak linkage with the agricultural sectors and shortage of foreign currency. Next, the industries reported the absence of demand for products (except for Leather and leather products) as the second major operational problem they faced.

Then, lack of working capital (agro-processing; Textile & Wearing apparel; Metal; Machinery, Equipment & Motor vehicle, and Furniture) and shortage of supply of spare parts (for Wood & Paper; Chemicals & Chemical Products and Rubber & Plastic) are the third major operational problem the large and medium scale manufacturing industries faced.

III. CONCLUSION AND RECOMMENDATIONS

Conclusions

This empirical study seeks to analyze the determinants of total factor productivity in large and medium scale enterprises in Ethiopia. In addition, it tries to assess the trend and structure of large and medium scale enterprises. This study, therefore, concludes that intensity of imported raw materials, the loan provided to the manufacturing industries, foreign direct investment, human capital formation, stable macroeconomic environment (stable inflation), and infrastructure growth (road coverage) are necessary to improve total factor productivity of Large and Medium Scale manufacturing industries. However, there is no significant evidence to suggest that growth in per capita income influence the Large and Medium Scale manufacturing industries' growth, despite strong theoretical support. The study also highlights the negative effect of export intensity on Large and Medium Scale manufacturing industries' growth. This could be because most of the manufactured exports in Ethiopia are characterized by low-value products and high competition in export markets. On the other hand, the descriptive analysis confirmed that the number, jobs created, and value-added per worker of large and medium scale manufacturing industries are continuously increasing from time to time. This seems promising performance, though the share of the manufacturing industry to the entire economy is still very low. This sector is dominated by agro-processing industries and non-metallic mineral industries. However, regardless of the continuous rise in number, employment, and value-added, there has been no similar progress in manufactured exports. This could be due to the weak international competitiveness of the firms that results from low productivity and low-quality products.

Currently, the operation of Large and Medium Scale Manufacturing Industries in Ethiopia is highly constrained by a shortage of supply of raw materials; absence of demand for products, and lack of working capital.

Recommendation

After identifying the main determinants of Large and Medium Scale manufacturing industries, it is important to discuss what sort of policies can be formulated to increase Large and Medium Scale manufacturing industries growth in large and medium scale manufacturing industries in Ethiopia.

First, policies aimed at human capital formation are very important to increase Large and Medium Scale manufacturing industries. Human capital development will help firms to easily upgrade the skills of their workers, to use new and advanced technology, and uninterruptedly advance productivity for the continuous growth of efficiency and competitiveness. Human capital, which includes education and training is not only crucial for increasing total factor productivity but also helpful to transfer technology from abroad. Therefore, quality institutional arrangements that enhance investment in human capital development are more central. Second, technology transfer through FDI attraction should be fully exploited to boost the total factor productivity in large and medium scale manufacturing industries. Therefore, this research suggests that there should be reforms targeted at attracting more foreign direct investment towards this sector. In line with attracting FDI, the government should further ensure peace and security that create a predictable and safe business environment for foreign firms.

The government should also facilitate loan access to Large and Medium Scale manufacturing industries. This intervention can enhance Large and Medium Scale manufacturing industries' growth by creating sufficient capital or funds to boost their business. This measure can also allow creating a new area of investment and enhance the productivity of firms. In addition, resources should be directed towards infrastructure development. Such policy can facilitate the reliability of raw material supply and output delivery, reduce the delivery time of goods, and ultimately results in increased productivity and profitability of manufacturing industries.

Further, achieving high Large and Medium Scale manufacturing industries growth also requires creating stable macroeconomic stability that creates a stable and predictable business environment. The rate of inflation should be reasonably moderate and stable to intensify the demand for final goods and services which will, in turn, lead to increased production, and as a result, improved productivity. Otherwise, macroeconomic instability (high and unstable inflation) can negatively affect productivity growth by discouraging producers to produce more goods and services by employing different factors of production.

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