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THE ROLE OF MANUFACTURING AND SERVICE EXPORTS IN ETHIOPIA'S ECONOMIC GROWTH PERFORMANCE

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ABSTRACT: *The purpose of this study is to investigate the role of manufacturing and service exports in Ethiopia's economic growth performance from 1995 until 2018. To accomplish the objective, the study developed two versions of an augmented Solow's (1956) model. Both versions include manufacturing and service exports as potential determinants of total factor productivity (TFF). However, the first version proxies physical capital accumulation with the investment rate, and the second version uses capital per worker. The autoregressive distributed lag (ARDL) bounds testing results of the first version suggest that there is no long-run relationship among the variables. Moreover, the investment ratio and labour force growth rate variables are statistically insignificant, which contradicts the theoretical predictions of the Solow model. On the other hand, the second version of the Solow model with capital per worker shows evidence of a long-run cointegrating relationship among the variables which support the manufacturing export-led growth hypothesis in Ethiopia, in which manufacturing exports are statistically significant, while service exports are statistically insignificant in the long run. Conversely, the results of the first version show that capital per worker has a positive and significant effect on Ethiopia's economic growth performance. Overall, the main findings suggest that the Ethiopian government should strengthen current policies that emphasize manufacturing exports and maintain high investment rates in physical capital.*

KEYWORDS: Output per worker, Manufacturing exports, Service exports, Capital per worker, Augmented Solow model, ARDL model.

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INTRODUCTION

A central topic in trade and economic growth studies is the export-led growth (ELG) hypothesis. Some argue that exports are growth drivers, while others maintain that exports are the endogenous outcome of the growth process itself (Giles & Williams, 2000). Based on the ELG hypothesis, some researchers associate the positive role of exports on economic growth with increased efficiency of production due to improved allocation of resources (Beckman, 1965). Others assert that exports enhance foreign exchange earnings to purchase productive imports from abroad and also facilitate the transfer of new technologies (Lamfalussy, 1963; Beckman, 1965; Thirlwall, 2001; 2011; Philip & Adeyemi, 2013).

Kaldor (1970) argues that in an open economy, exports are a key initiating source of growth. This implies that exports foster economies of scale, technological innovation, the development of higher quality products and services, and minimise economic inefficiencies and thus promote economic growth (Rodrik, 1988; Vohra, 2001). According to Thirlwall (2001; 2011), the rapid growth of exports also relaxes a balance-of-payments constraint on demand growth. Faster growth of exports allows other components of demand with import matters to grow at a rapid rate without causing balance-of-payments difficulties (Nell & Thirlwall, 2018).

Verdoorn's law (1949) cited in Nell and Semmler (1991) states that because of static and dynamic economies of scale in the manufacturing industry, productivity growth in manufacturing is faster than in other sectors. Several studies show that most of the benefits of exports outlined above are typically associated with the exports of manufacturing products rather than with most agriculture and service exports (Kaldor, 1966; McCombie, 1982; Thirlwall, 1983; Tregenna, 2009; Nell, 2020).

Based on these views, the scope for static and dynamic increasing returns to scale of production techniques in services is limited. Most services are non-tradable, employ low-skilled workers, and therefore suffer from low productivity and low levels of innovation compared with manufacturing (Baumol, 1967; Kaldor, 1966; Wells & Thirlwall, 2003; McMillan & Rodrik, 2011; Rodrik, 2013, 2016; De Vries, Timmer & De Vries, 2015; Ghani & O'Connell, 2016).

However, several recent studies indicate that, in contrast to conventional wisdom, services are not a structural burden for aggregate productivity and output growth in both high and low-income countries (Gallouj & Savona, 2008; Mishra et al., 2011). According to these arguments, technology, trade and supply chains have altered the features of services. This implies that many services have high-income elasticities of demand that induce rapid growth in productivity and employment (Timmer & De Vries, 2009; Felipe, Bank, León-Ledesma & Lanzafame, 2009; Eichengreen & Gupta, 2011; Ghani & O'Connell, 2014).

Gabriel (2006) states that developed and developing countries export different types of services. Developed countries have been experiencing a boom in advanced technology service sectors although they are still non-existent or nascent in most developing countries. According to this view, service exports in poor countries tend to grow mainly from the least advanced and less dynamic service sub-sectors.

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On the other hand, Dasgupta and Singh (2005; 2006) argue that not only modern services but conventional services also meet Kaldor's dynamic sector requirements to be considered as an engine of growth in many developing countries. Rodrik (2018) however asserts that some services are dynamic, but will not help developing countries much because they are skill intensive. However, the findings by Sermcheep (2019) show that service exports from both modern and traditional sectors have become increasingly significant as a new engine of growth, especially the role of traditional services in the members of the Association of Southeast Asian Nations (ASEAN).

Empirical studies such as Mehrara and Baghbanpour (2016), Hossain and Karunaratne (2010), Chandra Parida and Sahoo (2007), and Abu-Qarn and Abu-Bader (2004) show that increasing manufacturing exports is positively related to economic growth in developing countries while Soderbom and Teal (2003) find that manufacturing exports do not have significant effects on the economic growth of African countries. The findings by Priyankara (2018), Dash and Parida (2013), Mishra et al. (2011), and Philip and Adeyemi (2013) indicate that service exports support the ELG hypothesis in developing countries, while a study by Gabriel (2006) shows that the ELG hypothesis in developing countries is relatively weaker than developed countries.

From the discussion above, the evidence from empirical studies is mixed. The traditional view emphasises the importance of manufacturing exports relative to service exports (Kaldor, 1966; Cornwall, 1977; Fagerberg & Verspagen, 1999), while the more recent literature shows that the contribution of service exports has increased over time (Ghani & O'Connell, 2014; Tregenna, 2008; Dasgupta & Singh, 2006).

Despite the increasing importance of services, manufacturing remains relevant in the growth and development performance of developing countries (Attiah, 2019; Cramer & Tregenna, 2020). From the above discussion, there appears to be a growing view among scholars and policymakers that there is a potential for both manufacturing and service exports in developing countries to serve as growth-inducing sources. However, an appropriate model of development for low-income countries is not an easy answer. It is country-specific and will be influenced by many factors – there is no 'one size fits all' growth recipe (Rodrik, 2006; Ghani & O'Connell, 2014).

Based on the theoretical advantages of exports of manufactured goods, the Ethiopian government formulated a comprehensive industrial policy document in 2003. The policy emphasised the export-oriented use of labour-intensive manufacturing sectors to exploit its comparative advantage of a large and cheap labour force (Gebreeyesus, 2017; Ohno, 2013). Since then, the government has been providing multifaceted support in the form of infrastructural access, huge industrial parks, and export diversification initiatives in resource-based light-manufacturing industries such as textiles, leather, and other agro-industries.

Between 1995 to 2018, Ethiopian total exports were 3.3 billion dollars while the share of manufacturing exports and service exports to total exports was 6.0 % and 44.9 % in 1995 and 3.4% and 64.5% in 2018, respectively (WDI) (World Bank, 2020). Moreover, the study by Kebeta and Sidhu (2016) indicates that the service sector in Ethiopia has played the main role in productivity growth and inter-sectoral shifts. This suggests that the policies should give more attention to

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services. International studies generally show that the linkage between manufacturing and service exports and economic growth is positive and significant (Philip & Adeyemi, 2014; Mehrara & Baghbanpour, 2016; Bbaale & Mutenyo, 2011).

All the studies in Ethiopia have focused on examining the effect of total exports on economic growth (Allaro, 2012; Jarra, 2013; Leta & Zemedkun, 2018). The disaggregated effect of manufacturing and service exports on Ethiopia's economic growth has not been sufficiently investigated. Hence, the main aim of this study is to empirically examine the role of manufacturing and service exports on Ethiopia's growth performance to ascertain the validity of the ELG hypothesis during the period 1995 to 2018.

Objective of the Study

The main objective of this study is to explore the relationship between manufacturing exports, service exports, and economic growth in Ethiopia over the period 1995-2018. The specific objectives are:

- To develop a theory-consistent augmented Solow model in which output per worker is specified as a function of manufacturing exports (as a ratio of total exports), service exports (as a ratio of total exports), gross fixed capital formation as a ratio of GDP (investment rate), and labour force growth rate;
- Based on the finding of Bosworth and Collins (2003) that the changes in the capital stock, rather than the investment rate, is a better measure of physical capital's contribution to growth, the analysis also develops an alternative augmented Solow specification, in which the capital stock replaces the investment rate; and
- To estimate the model with the autoregressive distributed lag (ARDL) modelling procedure developed by Pesaran et al. (2001). The approach has several advantages: it provides efficient estimates in small samples and allows for variables to be integrated into different orders.

LITERATURE REVIEW

Manufacturing export-led growth: Theory

Kaldor (1966) was the first to hypothesise that the manufacturing sector is the engine of growth relative to the agriculture and service sectors. The second growth law is related to Verdoorn's (1949) law and states that there is a positive relationship between productivity growth in manufacturing and manufacturing output growth. Because of dynamic and static economies of scale that exist in the production of manufacturing goods, faster manufacturing output growth generates faster labour productivity growth.

Kaldor's third law states that the growth of productivity in non-manufacturing industries is positively linked to growth in manufacturing. To develop manufacturing, Kaldor (1966) suggests that domestic demand should first come from agriculture in the early stages of development.

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During the later stages, when the manufacturing sector is more developed and productive, its production should be geared toward exports in foreign markets (Thirlwall, 1983). Exports also play a prominent role in Kaldor's (1970) regional growth rate model, as formalised by Dixon and Thirlwall (1975). According to this model, faster export growth induces faster growth in a region or country. Through a process of circular and cumulative causation, working through Verdoorn's law and price competition, the initial growth advantage relative to other regions or countries is enhanced.

Feder's (1983) neoclassical model assumes that since the export sector is exposed to the foreign competition it confers positive externalities on the non-export sectors. The main assumption of the model is that the productivity level in the export sectors is higher than in the non-export sectors. Many endogenous growth models such as Arrow (1962) and Matsuyama (1992) generate sustained economic growth through learning-by-doing effects in the manufacturing sector. Manufacturing induces more learning-by-doing than primary commodity exports, and this knowledge could be passed on to the non-export sectors.

All the export-led arguments have thus far emphasised the supply side. Thirlwall (2001; 2011) asserts that rapid export growth has aided in relaxing a balance-of-payments constraint on domestic demand growth. Faster growth of exports allows other demand components with import contents to grow faster without causing shortages of foreign exchange (Nell & Thirlwall, 2018). Xu (2000) notes that a gradually increasing level of primary exports supplies the foreign exchange needed to purchase imports, particularly advanced technology and capital inputs to enhance the productivity of the manufacturing sector. It is also necessary to achieve a particular level of manufacturing exports before the efficiencies of economies of scale are realised, thus making it necessary to reach a threshold level of manufacturing exports before positive spill-over effects take place (Sheridan, 2014).

Export-Led Growth via Services: Theory

Lewis (1954) and Kaldor (1966) believe that most services are not as dynamic as manufacturing activities. Kaldor's (1966) growth laws imply that service sector growth is a result and not a cause of manufacturing growth. The lack of productivity growth in the service sector implies that it cannot generate additional demand, and therefore cannot sustain economic growth. Tregena (2015), on the other hand, argues that some service sub-sectors may have some of the progressive features linked to manufacturing in an advanced economy. These features may include growing returns to scale, the potential for improvements in cumulative productivity, good ties with other industries, advancement in technology, and so on. However, Su and Yao (2017) argue that such features are unlikely to be present in the service sector in developing countries.

Park and Chan (1989) argue that the growth of the manufacturing structure determines the emergence of modern service activities. From this view, they conclude that the development of the service sector depends more on manufacturing than vice versa. Chang (2012), on the other hand, argues that the reliance on services on dynamic manufacturing does not prevent a country from specialising in services and exporting them. Nonetheless, specialisation in services cannot be sustained without a strong manufacturing sector.

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Business services behave similarly to manufacturing and play an essential role in the creation and diffusion of knowledge, new technologies, and non-technological modes of innovation to achieve productivity improvements in developing countries (Dasgupta & Singh, 2005, 2006; Ghani & O'Connell, 2016). Ghani and Kharas (2010) and Roncolato and Kucera (2014) argue that services can drive sustainable growth, employment creation, and poverty reduction, and can provide developing countries with an alternative route to economic development instead of manufacturing.

In recent years, the increasing importance of the tourism economy has led many scholars and policymakers to explore tourism as an engine of growth in less-developed regions, and many studies have focused their attention on the tourist sector's positive impact on relaxing the balance-of-payments constraint (Hazari & Sgro, 1999; Balaguer & Cantavella, 2002). Gnangnon (2020) describes that a higher manufacturing export performance is associated with greater business and traditional services export diversification, and the magnitude of this positive effect is higher for less advanced countries than for relatively advanced economies.

Empirical Evidence that Supports Manufacturing Export-Led Growth

Most of the previous studies testing the ELG have focused on analysing the relationships between export and economic growth at the aggregate level, while several recent studies have deepened the study by disaggregating total exports into primary commodities and manufactured exports. Table 1 (see annexe) presents a summary of a set of empirical studies on the effects of manufacturing exports on economic growth. Most of the studies such as Mehrara and Baghbanpour (2016), Hossain and Karunaratne (2010), Chandra Parida and Sahoo (2007), and Abu-Qarn and Abu-Bader (2004) show that increasing manufacturing exports is positively related to economic growth in developing countries, while Soderbom and Teal (2003) find that manufacturing exports do not have an impact on African countries' economic growth. In general, the empirical evidence in Table 1 is consistent with evidence found in countries such as South Korea, Hong Kong, Singapore, Taiwan, Malaysia, Thailand, and China that labour-intensive manufacturing exports are important for long-run growth (Helleiner, 1995; Krueger, 1997; Riedel, 1993).

Empirical Evidence that Supports Service Export-Led Growth

Table 2 in the annex displays the empirical literature that explores the relationship between service exports and economic growth in developing countries. The majority of the evidence shows that service exports have a positive and significant effect on economic growth. The findings by Priyankara (2018), Dash and Parida (2013), Mishra et al., (2011) and Philip and Adeyemi (2013) indicate that service exports support the ELG hypothesis in developing countries. On the other hand, a study by Gabriel (2006) shows that the service ELG hypothesis in developing countries is relatively weaker than in developed countries.

Empirical Evidence of SSA and Ethiopia

Bbaale and Mutenyo (2011) explore the relationship between exports and economic growth for 35 SSA countries, including Ethiopia, by using the generalised method of moments (GMM) estimator

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over the period 1988 to 2007. The findings suggest the presence of a positive and significant linkage between agricultural exports and per capita income growth for their sample of countries. The contribution of manufactured exports to per capita income growth, however, is negligible in SSA countries. The study by Philip and Adeyemi (2013) examines the effect of trade services on economic growth in 33 SSA countries (including Ethiopia) by employing panel data analysis over the period 1990 to 2010. The study finds that service imports and exports can improve the economic growth performance in SSA countries.

Mehrara and Baghbanpour (2016) analyse the link between the exports of manufacturing and agricultural products and economic development in 34 developing countries, including Ethiopia, over the period 1970 to 2014. The results show that there is a positive and significant correlation between the exports of manufacturing products and economic growth, whereas the effect of agricultural exports is insignificant. The findings show that an increase of one percentage point in exports of manufacturing products, government gross fixed capital formation, and government consumption results in an increase of economic growth by 0.2, 0.6, and 1.0 percentage points, respectively.

Jarra (2013) investigated the link between total exports and economic growth in Ethiopia between1960 and 2011 using the Vector Autoregressive (VAR) model and found that the presence of a positive relationship between the process of economic growth and domestic demand as well as between economic growth and total exports. Similarly, Allaro (2012) explored the impact of total export on Ethiopian economic growth performance from 1974 to 2009 employing A VAR Granger causality test and uncovered evidence of the uni-directional causality of Ethiopia's economic growth from exports.

METHODOLOGY

Model specification

In this section, the study develops two augmented versions of the Solow (1956) model. Both versions include two trade variables as potential determinants of total factor productivity (TFP). The main distinguishing feature between the two versions of the Solow model developed here is the following. The first model follows the specification in Mankiw et al. (1992) and includes the investment rate as a proxy for physical capital accumulations. Following the observation in Bosworth and Collins (2003) that the capital stock is a better measure of the growth effect of physical capital accumulations, the second model includes capital per worker instead of the investment ratio.

The Solow model with the investment ratio

The conventional Cobb-Douglas production function of the Solow (1956) model takes the following form:

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$$Y_t = K_t^{\alpha}(A_t L_t)^{1-\alpha} \tag{1}$$

where Y_t is output at time t, K_t is capital, L_t is labour and A_t is technological progress or knowledge input. The Solow model assumes that $0 < \alpha < 1$, which implies $\alpha + (1-\alpha) = 1$. Thus, the production function exhibits constant returns when both capital and labour are increased by 1% but diminishing returns to capital alone.

Equation (1) can be converted in its intensive form by dividing both sides by AL:

$$y_t = k_t^{\alpha} \tag{2}$$

where, $y_t = \frac{Y_t}{A_t L_t}$ is the output-technology ratio, and $k_t = \frac{K_t}{A_t L_t}$ is the capital-technology ratio.

The capital accumulation equation of the Solow model is given by:

$$\dot{K}_t = iY_t - \delta K_t \tag{3}$$

where $\dot{\boldsymbol{K}}_{\boldsymbol{t}}$ is the time derivative of the capital stock, $\frac{\boldsymbol{dK_t}}{\boldsymbol{d_t}};$ $i = I / Y$ is the fraction of output devoted to investment (I) and δ is the rate at which the capital stock depreciates due to wear and tear.

The growth rate of capital is obtained by dividing equation (3) through by $\boldsymbol{K_t}$:

$$\frac{\dot{K}_t}{K_t} = \frac{iY_t}{K_t} - \delta \tag{4}$$

Using growth rates of the capital-technology ratio, $k_t = \frac{K_t}{A_t L_t}$, gives:

$$\frac{\dot{k}_t}{k_t} = \frac{\dot{K}_t}{K_t} - g - n \tag{5}$$

where g is the exogenous growth rate of technology and n is the labour force growth rate, which is assumed to be equal to population growth. The assumption of diminishing returns to capital in the model implies that the long-run growth rate, g, is exogenously fixed. Thus, the change in the investment rate (i) and labour force growth rate (n) generate temporary growth effects but permanent level effects in output per worker.

Substituting (4) into (5) gives:

$$\frac{\dot{k}_t}{k_t} = \frac{iY_t}{K_t} - (g + n + \delta) \tag{6}$$

Multiplying both sides by the capital-technology ratio, k_t, gives:

$$\dot{k} = iy_t - (g + n + \delta)k_t \tag{7}$$

The original Solow (1956) model is augmented by including manufacturing and service exports as determinants of TFP:

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$$A_t = A_0 e^{gt} mexp^{\beta_1} sexp^{\beta_2} \quad (8)$$

where *mexp* is the share of manufacturing exports in total exports and *sexp* is the share of service exports in total exports.

By setting $\dot{k}$ = 0 in equation (7), and substituting for $y_t = k_t^{\alpha}$, the steady-state capital-technology ratio (or capital per unit of effective labour) can be solved as:

$$k^* = \left(\frac{i}{n+g+\delta}\right)^{\frac{1}{(1-\alpha)}}$$
(9)

Substituting equation (9) into equation (2) gives the steady-state output-technology ratio:

$$y^* = A_t \left(\frac{i}{n+g+\delta}\right)^{\frac{1}{(1-\alpha)}} \quad (10)$$

The equation for output per worker becomes:

$$\left(\frac{Y}{L}\right)_t^* = A_t \left(\frac{i}{n+g+\delta}\right)^{\frac{1}{(1-\alpha)}} \quad (11)$$

Substituting equation (8) into equation (11) and taking logs, gives the empirical equation for the Solow model with the investment ratio ($i \equiv inv$):

$$ln\left(\frac{Y_t}{L_t}\right) = \beta_0 + g_t + \beta_1 \, ln \, ln \, (mexp) + \beta_2 l(sexp) + \frac{\alpha}{1-\alpha} ln \, ln \, (inv) - \frac{\alpha}{1-\alpha} ln \, ln \, (n + g + \delta) + \varepsilon_t \quad (12)$$

where, $\beta_0 = lnA_0 \; and \; \varepsilon_t \; is \; an \; error \; term.$

The Solow model with the capital per worker ratio

Following Bosworth and Collins (2003), an alternative Solow specification is derived with capital per worker as a proxy for physical capital accumulation.

The Cobb-Douglas production function in equation (1) can be rewritten as:

$$Y_t = A_t K_t^{\alpha} {L_t}^{1-\alpha} \quad (13)$$

Equation (13) in per worker terms can be written as:

$$\left(\frac{Y_t}{L_t}\right) = A_t \left(\frac{K_t}{L_t}\right)^{\alpha} \quad (14)$$

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$$ln\left(\frac{Y_t}{L_t}\right) = \beta_0 + gt + \beta_1 \, ln \, ln \, (mexp) \; + \beta_2 l(sexp) \; + \alpha \, ln \, ln \, \left(\frac{K}{L}\right)_t + \varepsilon_t \quad (15)$$

Data and Variables

To estimate equations (12) and (15), the data for gross fixed capital formation as a percentage of nominal GDP and the capital per worker ratio are sourced from the United Nations (UN) and Penn World Table (PWT) 9.1, respectively, while data for the remaining variables are sourced from World Development Indicators (WDI) (World Bank, 2020). The analysis uses annual time series data that cover the period from 1995 to 2018 for equation (12) with the investment ratio. For the alternative Solow specification with capital per worker in equation (15), the sample period is from 1995 to 2017. The latest version of PWT (9.1) from which the capital per worker series is sourced, only has data until 2017.

Correlation Analysis

Tables 3 and 4 below report the correlation coefficients among the variables in equations (12) and (15), together with their significance levels (p-values in parentheses). The preliminary results show that output per worker is positively and significantly correlated with the fixed investment ratio and capital per worker while it is negatively but insignificantly correlated with the manufacturing export ratio. However, it is positively and insignificantly correlated with the service export ratio and negatively and insignificantly correlated with labour force growth.

Thus, the correlation exercise exhibits theory-consistent signs on the investment ratio, capital stock ratio, service exports ratio, and labour force growth while the ratio of the manufacturing export contains the incorrect theoretical sign. Note further that the correlation coefficient between output per worker and capital per worker is three times larger in Table 3 compared with the correlation coefficient in Table 4 when the investment ratio is used as a proxy for physical capital accumulation. This suggests, consistent with Bosworth and Collins (2003), that the capital per worker ratio is a better measure of capital's contribution to growth. However, the correlation exercise only provides preliminary evidence and is not a substitute for a rigorous econometric analysis in which the effect of one variable is analysed, holding all the other variables constant. More rigorous and robust econometric evidence is provided in the next section.

Table 3: Correlation coefficients among the variables in equation (12) (1995-2018)

Covariance Probability	***ln*(*Y/L*)**	***ln(mexp)***	***ln(sexp)***	***ln(inv)***	***ln* (*n* + *g* + *δ*)**
***ln(Y/l*)**	0.121355 -----				
ln(mexp)	-0.014159 (0.1515)	0.018111 -----			
ln(sexp)	0.010954 (0.1634)	-0.012763*** (0.0000)	0.011453 -----		

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ln(inv)	0.073181***	-0.019585***	0.013173**	0.075600	
	(0.0000)	(0.0078)	(0.0283)	-----	
ln **(*n* + *g* + *δ*)**	-0.004537	0.005232**	-0.002883**	-0.005668	0.004248
	(0.3492)	(0.0021)	(0.0447)	(0.1321)	-----

Note: p-values are in parentheses. *** denotes significance at the 1% level and ** at the 5% significance level.

Source: Author's computation using EViews 11.0

Table 4: Correlation coefficients among the variables in equation (15) (1995-2017)

Covariance Probability	***ln*(*Y/L*)**	***ln(mexp)***	***ln(sexp)***	***ln(K/L)***
***ln(Y/l*)**	0.108916			
	-----			
ln(mexp)	-0.005719	0.014268		
	(0.5090)	-----		
ln(sexp)	0.004184	-0.009613***	0.008987	
	(0.5430)	(0.0000)	-----	
l*n(K/L*)	0.218918***	-0.035733**	0.024510	0.491956
	(0.0000)	(0.0424)	(0.0835)	-----

Note: p-values are in parentheses. *** denotes significance at the 1% level and ** at the 5% significance level.

Source: Author's computation using EViews 11.0

Graphical Analysis

Figures 1(a)-(f) below present the trends of all the variables over the period 1995-2018. Real GDP per worker in Figure 1(a) and capital per worker in Figure 1(e) are plotted on log scales. For ease of exposition, the rest of the variables are not plotted in their logarithmic form. The export ratios can, therefore, be interpreted as percentage shares of total exports, while the labour force growth variable ($n + g + \delta$) is in growth rates.

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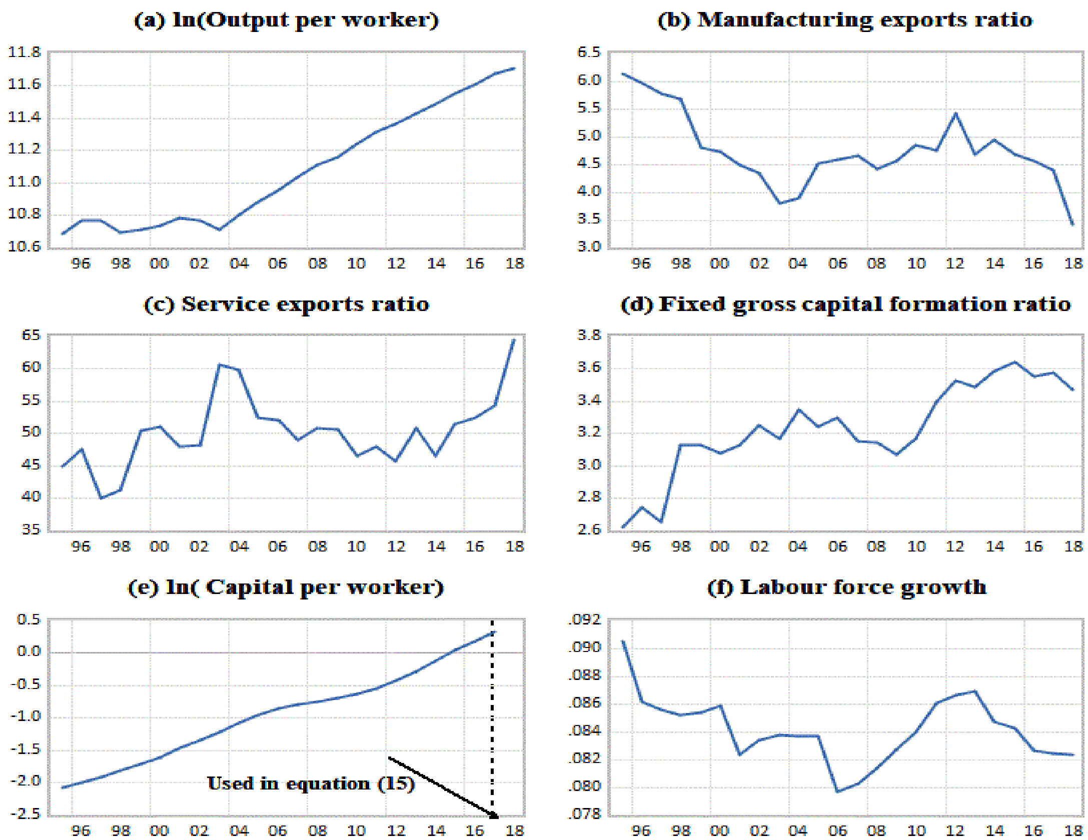

Figure 1: Trend of the variables: 1995-2018

Source: Author's computation using Eviews 11.0

As shown in Figure 1(a), Ethiopia experienced a slow average output per worker growth rate of 0.5% over the period 1995-2003. A surge in growth, however, is observed over the sub-period 2004-2018, with an average annual growth rate of 6.64%

Faster growth over the period 2004-2018 relative to 1993-2003 is consistent with major policy reforms that were initiated in the Ethiopian economy in early 2003. The government undertook major economic reforms and stabilisation measures through agriculture-led growth, industrialisation, trade liberalisation, and public sector reforms (Moller et al., 2015; Ohno, 2013; Oqubay, 2018).

There is a decreasing trend in manufacturing exports in Figure 1(b) from 1995 to 2003. The manufacturing export ratio decreased from 6.0% in 1995 to 3.6% in 2003. There appears to be an upward shift from 3.9% in 2004 to 5.4% in 2012; thereafter it decreases from 4.7% in 2013 to 3.4% in 2018. However, the average percentage share of manufacturing exports in total exports

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over the period 1995-2018 is only 4.8%. This suggests that the direct effect of manufacturing exports on output per worker may be relatively small. Nevertheless, there could perhaps be a strong indirect effect through, for example, technology spill-overs on other sectors of the economy.

As displayed in Figure 1(c), over the sub-period periods 1995-2003 and 2013-2018 the service export ratio shows upward trends. The downward trend from 2004 until 2012, however, is inconsistent with Ethiopia's growth acceleration phase. The average share of service exports in total exports of 50.3% is much larger than the share of manufacturing exports. Although the trend movements in service exports do not correspond with the growth surge in the post-2003 period, it would be premature to conclude that its effect on output per worker is negligible until its effect is tested in a theory-consistent econometric model.

The surge in the investment rate in Figure 1(d) since 2009 corresponds with some part of Ethiopia's growth acceleration phase. The correlation exercise in Table 3 shows a positive and significant relationship between output per worker and the gross fixed investment ratio. Capital per worker shows a trend increase over the sample period from 1995 to 2017, with a faster increase since 2011. The correlation exercise in Table 4 shows that the capital per worker ratio exhibits a positive and significant relationship with output per worker and that this correlation is larger compared with the investment ratio.

Movements in the labour force growth ($n + g + \delta$) variable in Figure 1(f) seem unrelated to Ethiopia's growth acceleration phase in the post-2003 period. Based on the theoretical model developed earlier, faster population growth should correspond to slower output per worker growth. Yet, for a large part of Ethiopia's post-2003 growth acceleration phase, population growth increased.

EMPIRICAL RESULTS

ARDL Economic Methodology

This section describes the autoregressive distributed lag (ARDL) bounds-testing approach developed by Pesaran et al. (2001) that will be used to estimate the theoretical models. Consider the augmented Solow model in equation (12) in which physical capital accumulation is proxied by the investment ratio. Equation (12) can be expressed as a general unrestricted error-correction version of the ARDL model:

$$\Delta\, ln\, ln \left(\frac{Y}{L}\right)_t = \beta_0 + \sum_{j-1}^{p} \beta_{1j}\Delta ln\left(\frac{Y}{L}\right)_{t-j} + \sum_{j-0}^{q} \beta_{2j}\Delta ln(mexp)_{t-j} + \sum_{j-0}^{r} \beta_{3j}\Delta ln(sexp)_{t-j}$$

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$$+\sum_{j-0}^{s} \beta_{4j}\Delta ln(inv)_{t-j} + \sum_{j-0}^{t} \beta_{5j}\Delta ln(n+g+\delta)_{t-j} + \alpha_0\left(\frac{Y}{L}\right)_{t-1} + \alpha_1 ln(mexp)_{t-1}$$

$$+ \alpha_2 ln(sexp)_{t-1} + \alpha_3 ln(inv)_{t-1} + \alpha_4 ln(n+g+\delta)_{t-1} + \alpha_5 TREND_t + u_t \quad (16)$$

where Δ denotes the first difference operator and u_t is the error term. The differenced variables denote the short-run part of the model and the lagged level variables the long-run part.

The null hypothesis of no cointegration among the variables in equation (16) is $H_0\colon \alpha_0 = \alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = \alpha_5 = 0$, against the alternative of cointegration, H_1: $\quad_0 \neq 0; \alpha_1 \neq 0; \alpha_2 \neq 0;\ \alpha_3 \neq 0;\ \alpha_4 \neq 0;\ \alpha_5 \neq\ 0$.

Consider now the augmented Solow model in equation (15) in which physical capital accumulation is proxied by capital per worker. The ARDL specification of equation (15) is given by:

$$\Delta\, ln\, ln\left(\frac{Y}{L}\right)_t = \beta_6 + \sum_{j-1}^{a} \beta_{7j}\Delta ln\left(\frac{Y}{L}\right)_{t-j} + \sum_{j-0}^{b} \beta_{8j}\Delta ln(mexp)_{t-j} + \sum_{j-0}^{c} \beta_{9j}\Delta ln(sexp)_{t-j}$$

$$+\sum_{j-0}^{d} \beta_{10j}\Delta ln\left(\frac{K}{L}\right)_{t-j} + \alpha_6\, ln\, ln\left(\frac{Y}{L}\right)_{t-1} + \alpha_7 ln(mexp)_{t-1}$$

$$+ \alpha_8 ln(sexp)_{t-1} + \alpha_9 ln\left(\frac{K}{L}\right)_{t-1} + \alpha_{10} TREND_t + \varepsilon_t \quad (17)$$

where $\varepsilon_t is\ the\ error\ term$

The null hypothesis of no cointegration among the variables in equation (17) is $H_0\colon \alpha_6 = \alpha_7 = \alpha_8 = \alpha_9 = \alpha_{10} = 0$, against the alternative of cointegration, $H_1\colon \alpha_6 \neq 0; \alpha_7 \neq 0; \alpha_8 \neq 0;\ \alpha_9 \neq 0;\ \alpha_{10} \neq 0$.

Provided that there is a long-run association among the variables, the long-run coefficients of the Solow specifications in equations (12) and (15)) can be obtained by dividing the estimates of the lagged level variables in equations (16) and (17) through by the absolute values of the error-correction coefficients α_0 and α_6, respectively. The final step is to estimate the restricted error-correction versions of equations (16) and (17). The empirical research in this study is performed using EViews 11.0, which includes the ARDL modelling procedure and relevant diagnostic and stability tests.

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Unit Root Tests

To determine whether the bounds tests in the next sections should use the critical values for I(0) or I(1) variables in Pesaran et al. (2001), this section performs Augmented Dickey-Fuller (ADF) unit root tests (Dickey & Fuller, 1979) and Phillips-Perron (PP) unit root tests (Phillips & Perron, 1988). A variable is integrated of order one, i.e. I(1) when its level is non-stationary but its first difference is stationary. Table 5 reports ADF and PP unit root tests for all the variables in equations (16) and (17) using the intercept and trend option.

Table 5: ADF and PP unit root test results (1995-2018)

Variables	**ADF test: t-values (Constant and Linear Trends)**		**PP test: t-values (Constant and Linear Trends)**		**Conclusion**
	Level	**1st difference**	**Level**	**1st difference**	
ln(Y/L)	-1.67	-3.89**	-1.67	-3.93**	I(1)
ln(mexp)	-1.66	-4.01**	-1.65	-4.02**	I(1)
ln(sexp)	-2.23	-4.84***	-2.19	-4.89***	I(1)
ln(inv)	-2.70	-5.84***	-2.70	-5.84***	I(1)
ln(g+n+δ)	-2.74	-4.62***	-2.81	-4.62***	I(1)
ln(K/L)[1]	-4.63***	-2.09	-1.53	-1.78	Structural break
MacKinnon (1996) critical values:		(i)	1%	-4.42	
		(ii)	5%	-3.62	
		(iii)	10%	-3.26	

***, ** and * denote significance at the 1%, 5% and 10% levels respectively

Source: Author's compilation using EViews 11.0

The unit root tests show that the null hypothesis of a unit root cannot be rejected for the majority of the level variables; the absolute values of the t-statistics fall below the absolute critical values of Mackinnon (1996). In the first difference, however, the null is rejected. All the variables except capital per worker are therefore integrated into order one i.e. I(1).

Using the ADF test, capital per worker appears to be I(0) in levels but I(1) in first differences, which is a counterintuitive result. The PP test shows that capital per worker is non-stationary in levels and first differences. However, it is well known that unit root tests tend to under-reject the null of a unit root when the series contains a structural break. A visual inspection (not reported here) shows that there appears to be a break in the capital per worker series, with slower growth

[1] The sample period for capital per worker is from 1995 until 2017. Recall that the latest version of PWT (9.1) only report data until 2017.

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from 2007 until 2011. Overall, the unit root tests suggest that the bounds tests in the next sections should use the critical values for I(1) variables.

Bounds Test for Cointegration: Solow Specification with the Investment Rate

Consider the ARDL specification of the Solow model with the investment rate in equation (16). Before the bounds test is performed, it is important to establish the optimal lag length of the equation (16). By starting with an initial lag length of 1, the Akaike (1974) Information Criteria (AIC) in Figure 2 selects a lag length of ARDL-AIC (1,1,1,1,0)[2].

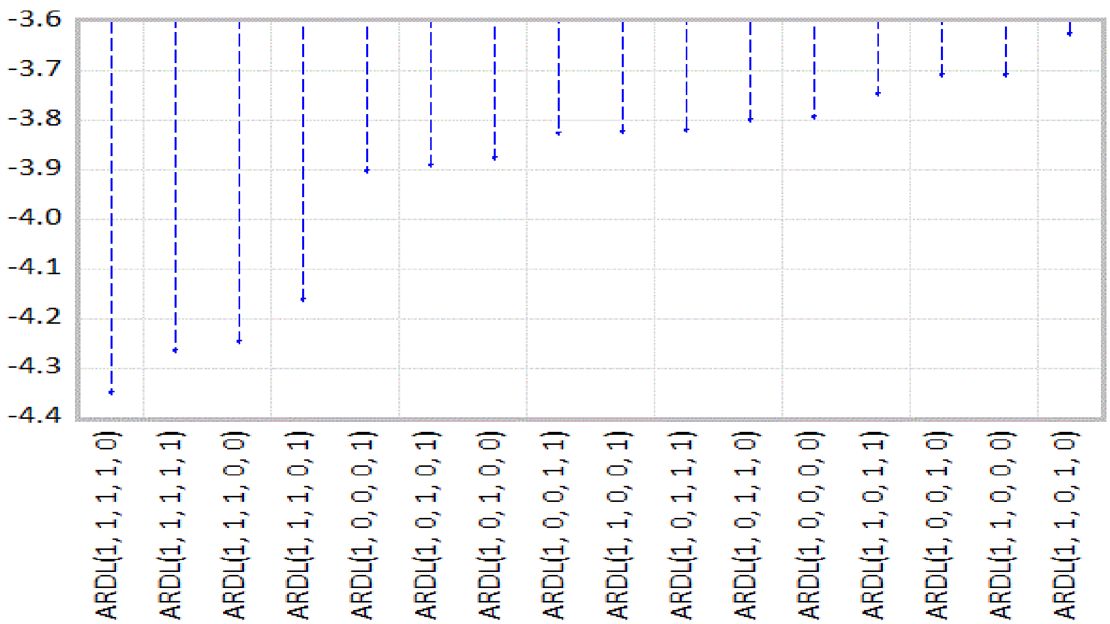

Figure 2: AIC of equation (16)

Source: Author's compilation using EViews 11.0

Table 6 reports the bounds test for cointegration, using the critical values in Pesaran et al. (2001) that relate to the unrestricted intercept and trend option[3].

[2] The lag order is selected using the AIC because it performs better than alternative model selection criteria in small samples (Liew, 2004).

[3]The results are robust when the critical values of Narayan (2005) are used for small samples.

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Table 6: Bounds test for cointegration: 1995-2018

Dependent Variable	Test Statistic	Value	Critical value bounds			Conclusion
			Signif.	**I (0)**	**I (1)**	
Output per worker $\ln(Y/L)$	F-statistic k	3.04063 4	10%	2.45	3.52	No Co-integration
			5%	2.86	4.01	
			2.5%	3.25	4.49	
			1%	3.74	5.06	

Source: Author's compilation using EViews 11.0

Although the bounds test suggests that there is no long-run relationship among the variables, it is informative to examine the solved long-run results of the ARDL-AIC (1, 1, 1, 1, 0) model. Table 7 shows that the long-term coefficients of the service and manufacturing export ratios are positive and statistically significant at the 1% level. However, the investment ratio and labour force growth variables are statistically insignificant and therefore not consistent with the Solow model's theoretical predictions. The lack of cointegration and the theory-inconsistent results advise that the results should be interpreted with some caution. The next section considers the alternative Solow model.

Table 7: Estimated Long-run coefficients: 1995-2018

Dependent variable: GDP per worker ($\ln(Y/L)$)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
$\ln(mexp)$	1.57^{***}	0.30	5.21	0.00
$\ln(sexp)$	1.41^{***}	0.40	3.53	0.00
$\ln(inv)$	-0.14	0.10	-1.34	0.20
$\ln(n+g+\delta)$	0.01	0.24	0.04	0.97
***, ** and * denotes significance at the 1%, 5% and 10% levels respectively				

Source: Author's compilation using EViews 11.0

Bounds Test for Cointegration: Solow Specification with Capital Per Worker Ratio

In light of the unsatisfactory results obtained from the Solow model with the investment rate, consider the ARDL specification in equation (17) where physical capital accumulation is proxied by the capital per worker ratio. The AIC in Figure 3 selects a lag length of ARDL-AIC (1, 1, 1, 1, 1) for equation (17).

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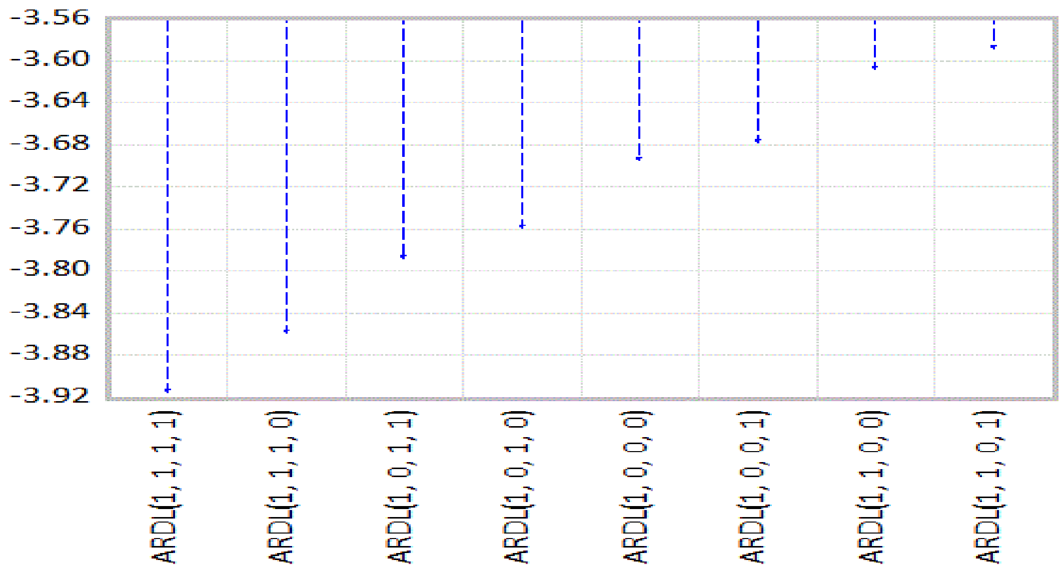

Figure 3: AIC of equation (17)

Source: Author's compilation using EViews 11.0

Table 8 reports the cointegration result for the ARDL-AIC (1,1,1,1) in equation (17) using the critical values for the unrestricted intercept and no trend option in Pesaran et al. (2001)[4]. Since the F-statistic (6.70) exceeds the upper bound critical values for I(1) variables, the null hypothesis of no long-run level relationship is rejected at all the conventional significance levels, and it is plausible to conclude that there is a co-integrating relationship among the variables.

Table 8: Bounds test for cointegration: 1995-2017

Dependent Variable	Test Statistic	Value	Critical value bounds			Conclusion
			Signif.	**I (0)**	**I (1)**	
Output per worker ln(*Y/L*)	F-statistic	6.70	10%	2.72	3.77	Co-integrated
	k	4	5%	3.23	4.35	
			2.5%	3.69	4.89	
			1%	4.29	5.61	

Source: Author's compilation using EViews 11.0

[4] The results are robust when the critical values of Narayan (2005) are used for small samples.

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The solved long-run result for the ARDL-AIC (1,1,1,1) model is shown in Table 9 below. In contrast to the estimates in Table 10, the results now show that the manufacturing export ratio is statistically significant at the 5% level and the service export ratio is insignificant at any conventional level. A 1% increase in the manufacturing export ratio leads to a 2.10% increase in output per worker.

Table 9: Estimated long-run coefficients: 1995-2017

Dependent variable: GDP per worker ($\ln(Y/L)$)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob**
ln(*mexp*)	2.10**	0.95	2.21	0.04
ln(*sexp*)	1.89	1.49	1.26	0.22
ln(*k*)	0.62***	0.08	7.42	0.00

***, ** and * denotes significance at the 1%, 5% and 10% levels respectively
Source: Author's compilation using EViews 11.0

The importance of manufacturing exports relative to service exports in Ethiopia supports the panel study of Mehrara and Baghbanpour (2016), which shows that manufacturing exports are still important for growth in developing countries. Thus, manufacturing still prevails despite the recent emphasis in the literature on services.

The results in Table 9 further show that capital per worker is statistically significant at the 1% level. A 1% increase in capital per worker raises output per worker by 0.62%. In contrast to the Solow specification with the investment ratio, the alternative Solow model in Table 9 emphasises the importance of capital accumulation for growth. The results support the proposition of Bosworth and Collins (2003) that the capital per worker ratio is a better proxy for physical capital accumulation than the investment ratio.

Evidence of co-integration and the theory-consistent nature of the Solow specification with capital per worker suggests that policy implications should be derived from the estimation results of this model. Thus, the results support recent government policies in Ethiopia that have favoured or encouraged manufacturing exports. The positive and significant effect of physical capital accumulation on output per worker suggests that Ethiopian policymakers should maintain high investment rates.

Error-Correction Model Estimates

Table 10 reports the restricted error-correction model estimates of the ARDL-AIC (1,1,1,1,1) model in the previous section: i.e., the Solow specification where capital per worker is a proxy for the rate of physical capital accumulation.

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Table 10: Error-correction model estimates: 1995- 2017

	Dependent variable: GDP per worker (Δ**ln** $\boldsymbol{Y/L}$)			
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	0.33***	0.05	6.24	0.00
$\Delta ln(mexp)_t$	0.24*	0.11	1.99	0.07
$\Delta ln(sexp)_t$	0.13	0.10	1.27	0.22
$\Delta ln\ (K/L)_t$	-0.14	0.16	-0.80	0.43
ECM_{t-1}	-0.27***	0.05	-5.70	0.01
ECM=ln(Y/L) –[2.10*ln(mexp) + 1.89*ln(sexp) + 0.62*ln(K/L)]				
R-squared	0.71			
F-Statistic	10.19***(0.00)			
Heteroscedasticity (F-test)	0.81 (0.68)			
LM Serial Correlation (F-test)	0.38 (0.29)			
Normality(($x2$)	0.83 (0.63)			
Functional form (F-test)	1.58 (0.23)			

***, ** and * denote significance at 1%, 5% and 10% levels, respectively. P-values are in parentheses.

Source: Author's compilation using EViews 11.0

The diagnostic tests in Table 10 show that the error-correction model is well-specified. The p-values indicate that the null hypothesis of homoscedasticity, no first-order serial correlation, normality of the error terms, and no functional form misspecification cannot be rejected at any conventional significance levels. The stability of the error-correction model is tested using the CUSUM and CUSUMSQ tests. From Figure 4 it can be seen that the estimates of the CUSUM and CUSUMSQ tests fall within the 5% critical bounds. This confirms that the model is structurally stable.

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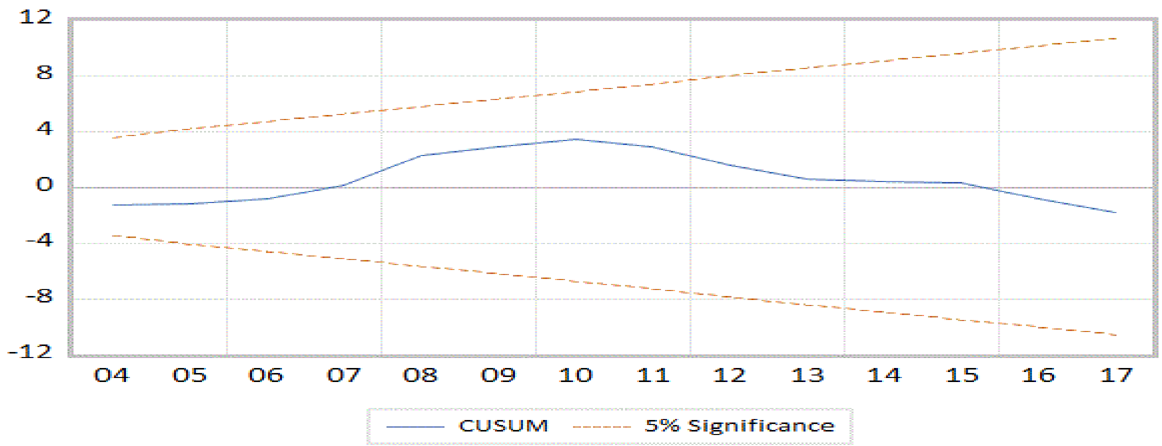

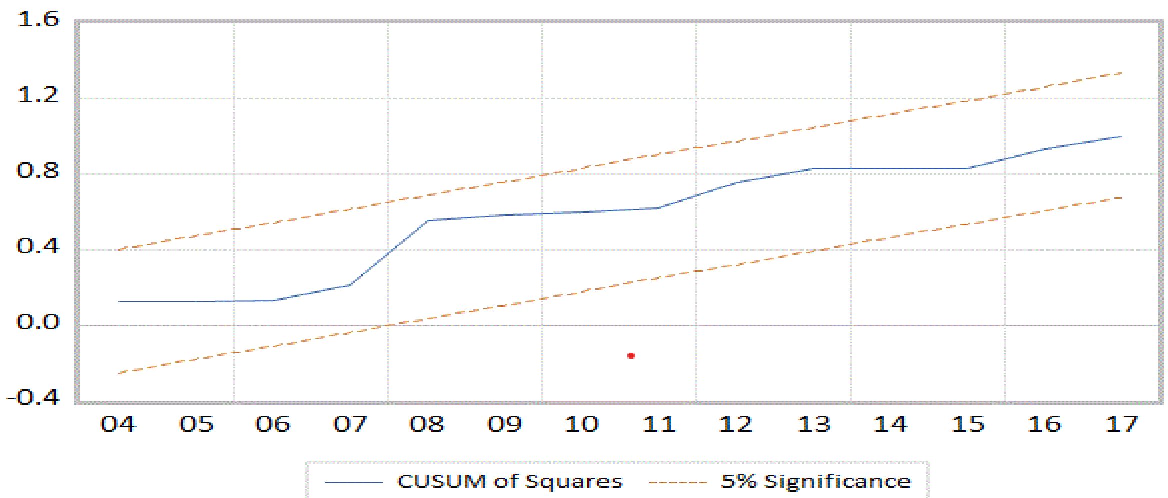

Figure 4: CUSUM and CUSUMSQ plots of the error-correction model in Table 12

Sources: Author's compilation using Eviews 11.0

CONCLUSION

This paper aimed to determine the effect of manufacturing and service exports on output per worker growth in Ethiopia for the period 1995 to 2018. The study used two versions of an augmented Solow (1956) model in which physical capital accumulation is proxied by the investment rate and capital per worker. Traditionally, manufacturing has been seen as the engine of growth. However, there is an emerging literature which shows that services also exhibit many of the growth-enhancing properties of manufacturing. The survey of empirical studies such as Abu-Qarn and Abu-Bader (2004), Parida and Sahoo (2007), Hossain and Karunaratne (2010), and Mehrara and Baghbanpour (2016) shows that manufacturing exports remain an important growth determinant in developing economies. However, several studies also show the importance of

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service exports (Mishra et al., 2011; Dash & Parida, 2013; Philip & Adeyemi, 2013; Priyankara, 2018).

The main empirical results for Ethiopia can be summarised as follows. The bounds test for the first version of the Solow model with the investment ratio over the period 1995-2018 suggests that there is no long-run relationship among the variables, despite significant long-run coefficients of the manufacturing and service export ratios. In addition, the investment ratio and labour force growth variables are statistically insignificant, so the findings are inconsistent with the Solow model's theoretical predictions.

In contrast to the first version of the augmented Solow model, the bounds test of the second version with capital per worker over the period 1995-2017 shows evidence of a long-run cointegrating relation among the variables. The long-run results indicate that the manufacturing export ratio is statistically significant while the service export ratio is insignificant. Moreover, in contrast to the Solow model with the investment ratio, the alternative Solow model emphasises the importance of capital accumulation for growth. Capital per worker is statistically significant and correctly signed in the alternative model, which implies, in line with Bosworth and Collins (2003), that it is a better proxy for physical capital accumulation than the investment ratio. Evidence of co-integration and the theory-consistent nature of the Solow specification with capital per worker suggests that policy implications should be derived from the estimation results of this model. This is further underlined by the statistically robust performance of the underlying error-correction model which is structurally stable and passes all the required diagnostic tests.

POLICY RECOMMENDATIONS

The main findings show that manufacturing exports are more important than service exports for Ethiopia's economic growth performance. It tends to support the view that faster economic growth is associated with a larger share of manufacturing exports in total exports. The long-run results show that a 1% increase in the manufacturing export ratio raises output per worker by 2.10%, while the service export ratio is statistically insignificant. This study, therefore, recommends that the government should strengthen current policies that encourage manufacturing export-led economic growth, despite the growing importance of services in the global economy. The results also show that the accumulation of physical capital per worker has a positive effect on growth and development. In this regard, the government of Ethiopia should continue its efforts to invest in infrastructures such as industrial parks, hydroelectric generating dams, and roads to accelerate growth in the economy.

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ANNEXES

Table 1: Effect of manufacturing exports on economic growth: International evidence

Author/year	Region(s) / Country and Period	Methodology	Variables	Main results
Kalaitzi and Cleeve (2017)	1981-2012: United Arab Emirates (UAE)	Johansen cointegration test	**Dependent variable** ● GDP **Independent variable** ● Primary exports ● Manufactured exports ● Import of goods and services ● Physical capital stock ● Human capital	Co-integration finding indicates that in the long run, manufactured exports contribute more to economic growth than primary exports of commodities. In the short term, there is a bi-directional causality between manufactured exports and economic development, while the ELG hypothesis applies to the UAE in the long term.
Mehrara and Baghbanpour (2016)	1970-2014: 34 developing countries	Panel data analysis	**Dependent variable** ● GDP per capita **Independent variable** ● Agricultural exports ● Manufactured exports ● Import of goods and services ● Government final consumption ● Gross fixed capital formation	The result shows a positive and important confirmation of the correlation between manufacturing exports and economic growth, but agricultural exports have no impact on economic growth.

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Author/year	Region(s) / Country and Period	Methodology	Variables	Main results
Kilavuz and Topcu (2015)	1998-2006: 22 developing countries	Panel data analysis	**Dependent variable** ● Real GDP growth **Independent variable** ● Real investment ● High-tech real manufactured exports ● Low-tech real manufacturing exports ● High-tech real manufacturing industry imports ● Low-tech real manufacturing industry imports	Exports from the high-tech and low-tech manufacturing industries have a positive and substantial impact on growth.
Sheridan (2014)	1970-2009: 117 high- and low-income countries	Both panel data and cross-sectional data analysis	**Dependent variable** ● GDP per capita growth **Independent variable** ● Manufacturing exports ● Primary exports ● Human capital ● Physical capital ● Population growth ● Capital stock	Since low-income countries exhibit low levels of investment and human skills, their economic growth is negatively linked to manufacturing exports. This means that, before an effective transition from dependence on primary exports to manufacturing exports, a country needs to achieve a minimum level of human capital.

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Author/year	Region(s) / Country and Period	Methodology	Variables	Main results
Neveen (2011)	1980-2008: Egypt	Co-integration analysis and Error Correction Model (ECM)	**Dependent variable** ● Real GDP **Independent variable** ● Manufacturing exports	Confirmation of long-term causality in Egypt between exports from manufacturing and economic development.
Hossain and Karunaratne (2010)	1974-1999: Bangladesh	Vector error correction modelling (VECM)	**Dependent variable** ● Real GDP growth **Independent variable** ● Real total exports ● Real manufacturing exports ● Real capital formation	Total exports and manufacturing exports have both had a positive and statistically important impact on Bangladesh's long-term growth.
Dunusinghe (2009)	1977-2007: Sri Lankan	Time series regression analysis	**Dependent variable** ● Real GDP growth **Independent variable** ● Manufacturing exports ● Agricultural exports ● Other exports ● Investment ● Capital ● Labour force	The expansion of the export sector is having a positive and important impact on GDP growth. It also indicates that the manufacturing export sector has higher levels of productivity relative to other industries.

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Author/year	**Region(s) / Country and Period**	**Methodology**	**Variables**	**Main results**
Parida and Sahoo (2007)	4 South Asian Countries: India, Pakistan, Bangladesh, Sri Lanka: 1980-2002 (Annual Data	Panel Data Analysis	**Dependent Variables** ● Real GDP ● Real Non-Export GDP **Independent Variables** ● Real manufacturing Exports ● Real Gross Fixed Capital Formation ● Rael public Health and Educational Expenses, ● Real manufacturing Industry Import ● Real total export	Confirmation of export and manufacturing industry ELG hypothesis.

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Author/year	Region(s) / Country and Period	Methodology	Variables	Main results
Soderbom and Teal (2003)	1970- 1990: Nine African countries	Panel data regression analysis	**Dependent variable** ● GDP per capita growth **Independent variable** ● Manufacturing exports ● Total exports	Confirmation of statically insignificant link between manufacturing exports and economic growth in most of the sample countries while there is positive and significant correlation between economic growth and total exports
Abu-Qarn and Suleiman (2001)	Algeria, Sudan (1968-1996) Egypt, Morocco, Tunisia, Turkey (1966-1996) Iran (1974-1995) Israel (1976-1996)	Time Series simple Ordinary Least Squares (OLS) regression.	**Dependent Variable** ● Real GDP growth **Independent Variables** ● Real total Exports ● Real total Imports ● Real manufacturing exports	Confirmation of Algeria and Sudan's ELG hypothesis for the export and manufacturing sector, Rejection of the hypothesis for other countries.

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Table 2: Effect of service exports on economic growth: International evidence

Author/ year	Region(s)/ Country and Period	Methodology	Variable	Main results
Sermcheep (2019)	1980 to 2014: ASEAN countries	Two stage least square/Both bivariate and multivariate	**Dependent variable** ● GDP growth **Independent variable** ● Service exports ● Goods exports ● Initial GDP per capita ● Government expenditure ● Gross fixed capital formation	The results show that there has been evidence of services export-led growth in ASEAN countries (Brunel, Cambodia, Myanmar, Philippines, Vietnam) during the past decades while the estimations show that both goods and service exports contribute to the GDP growth with the weaker positive effect coming from modern service exports.
Priyankara (2018)	1984 to 2013: Sri Lanka	Vector autoregressive model (VAR)	**Dependent variable** ● Real GDP growth **Independent variable** ● Real service exports ● Real goods exports ● Terms of trade	The result suggests that exports to the service sector are correlated with economic development. Therefore, the ELG hypothesis holds for service exports of Sri Lanka.
Philip and Adeyemi (2013)	1990 to 2010: sub-Saharan Africa (SSA)	Panel data analysis	**Dependent variable** ● GDP per capita growth **Independent variable** ● Service exports ● Service imports ● Gross fixed capital formation ● Labour force	The economic growth model in SSA is supported by both exports of services and imports of services.

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Author/ year	Region(s)/ Country and Period	Methodology	Variable	Main results
Parida et al. (2012)	1996-97 to 2010-11: India	ADRL and vector error correction model (VECM)	**Dependent variable** ● Real GDP growth **Independent variable** ● Real service exports ● Real service imports ● Real FDI	Long-run interaction between these variables. The findings of causality suggest the existence of a bidirectional causal relationship between FDI and economic performance as well as between exports of services and economic performance.
Mishra (2011)	1990 to 2007: 103 cross countries	Panel data analysis	**Dependent variable** ● GDP per capita growth **Independent variable** ● Service exports ● Human capital ● Financial development ● Share of trade to GDP ● Rule of law	Panel data analyses suggest a positive correlation between per capita sales growth and greater efficiency of exports of services.
Gabriel (2006)	1980- 2000: 114 cross countries	Panel analysis	**Dependent variable** ● GDP Growth **Independent variable** ● Service exports ● Goods exports	Service ELG hypothesis in developing countries is relatively weaker than developed countries

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