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Article

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The role of foreign direct investment in structural change in Ethiopia

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Abstract: The paper examines the effect of foreign direct investment (FDI) on the structural changes in Ethiopia using an ARDL model. The authors found both FDI and domestic investment to have a positive effect while trade openness and inflation to have a negative effect on structural change. However, government expenditure does not seem to have a significant effect. The study concludes that FDI is an important tool for Ethiopia to achieve its transformation agenda generally and to bring about structural changes in particular. To this end, the government needs to attract sufficient FDI and ensure that it is used efficiently by improving absorption capacity and enabling domestic firms to make links with foreign investors.

Subjects: Economics; Finance; Industry & Industrial Studies

Keywords: Structural change; foreign direct investment; industrialization; Ethiopia; ARDL

1. Introduction

Ethiopia has been nicknamed the "African tiger" due to a decade of double-digit economic growth from 2004, a reference to the legendary "Asian tigers," a group of four East Asian countries (South Korea, Singapore, Taiwan, and Hong Kong) known for their rapid sustainable economic growth between 1960 and 1990 (AllAfrica, 2017). The Asia tigers' experiences demonstrate that structural transformation is both a necessary and sufficient condition for development (World Bank, 2012). It has been characterized by a sustained economic growth and capital accumulation. It is also described by characteristics such as resource and production shifting from low- to high-productivity sectors, urbanization, demographic transition, changes in nutrition patterns, a surge in manufacturing exports, and a shift in mindset (Syrquin & Chenery, 1989). It is divided into three stages: first, the agricultural sector dominates the economy, accounting for more than half of total GDP and more than 69.5 percent of total employment; second, the industrial sector takes over; and finally, the service sector takes over, with agriculture accounting for less than 5 percent of total

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employment (Foster-McGregor & Verspagen, 2016; Timmer, 2012). A structural change, which is mainly described as the movement of resources from one sector to another, especially from agriculture to the industrial sector, also known as industrialization, is the core element of structural transformation (Gui-Diby & Renard, 2015). Basically, the industry sector is at the heart of structural change because it is technologically dynamic sector, produces more tradable goods, and has a higher productivity level and growth rate (Bernanke & Rotemberg, 1997; Rogers, 2004). The sector has many opportunities for specialization and interconnections with other sectors, and it can employ a large number of workers (Braude & Menashe, 2011; Tunali & Boru, 2019).

Despite a decade of tremendous economic growth (Berehe et al., 2019), structural change in Ethiopia is poor (Soderbom, 2012). The economy has still been dominated by agriculture; for example, agriculture accounts for more than 75 percent of total employment, 80 percent of exports, and approximately 40 percent of GDP (USAID, 2021). Over the last two decades, on average, manufacturing has contributed 4.4 percent to the GDP, which is far less than the African average of 10.6 percent (Abera, 2022; Shikur, 2020). Because of an agricultural sector with very low marginal output as a result of high population on one side and an infant industry sector on the other side, unemployment is currently a serious problem. Accordingly, youth unemployment, called "red flag" by Reda and Gebre-Eyesus (2019), stood at 25.3 percent in 2018, while there were 37 percent of unpaid family workers and 45 percent of disguised unemployment in Ethiopia in 2021; therefore, unemployment continues to be high and a cause of political unrest and conflicts (Berhe, 2021). The country is not only suffering from rampant unemployment, but also from chronic poverty. Latest data from the World Bank also confirms that 30.8 percent of the population lived below the absolute poverty line (1.9 USD per day).

Addressing these issues requires a structural change in the economy. Nevertheless, structural change can not occur without a flourishing industrial sector, but that requires considerable investment in Ethiopia, which has suffered from severe resource shortages, low technology, and low investment for a long time (Altenburg (2010; National Bank of Ethiopia, 2006); Brautigam et al. (2018); Berehe et al., 2019). For example, a gross capital formation as a percentage of GDP was 31 percent in 2020, with gross domestic saving trailing at 20.9 percent of GDP, resulting in a 10 percent saving-investment gap (World Bank, 2022). Similarly, the trade balance, according to the World Bank, is negative 9 percent of GDP, which is higher than the 4.1 percent average for Sub Saharan Africa (SSA). Thus, the government has been experiencing a severe foreign exchange shortage, with the foreign reserve only lasting 2.4 months (National Bank of Ethiopia, 2021). In 2021, the budget deficit was also estimated to be 2.9 billion USD, or around 2.7 percent of GDP (Reuters, 2021).

Experiences from Asian Tigers and many economists have suggested foreign direct investment (FDI) is an effective way to address the saving-investment gap in developing countries like Ethiopia (Barakat, 2009; Burger, 1999; Hauge, 2019; Lloyd, 1996). It also promote economic growth and development by generating export revenue, contributing to corporate tax revenues, absorbing large amounts of labor (employment), stimulating demand for agricultural products, and connecting the domestic economy to the global market (Chen, 2021; Gui-Diby & Renard, 2015; United Nations Conference on Trade and Development, 2007). FDI is best known for its contributions to structural change and production upgrading via technology and knowledge transfer through vertical linkage (forward and backward links), and horizontal linkage (demonstration, competition, and labor migration; Amendolagine et al., 2017; Kaldor, 1968). However, FDI does not drive benefits automatically and is fundamentally dependent on the presence of host countries' absorptive capacity, such as adequate human capital, financial availability, and institutions' quality (Fu et al., 2021; Mamba et al., 2020). FDI characteristics and the mode of entry also play important roles. Manufacturing FDI, for example, offers better potential for technology transfers and structural transformation than primary-sector based FDIs (Brautigam & Tang, 2014). Similarly, Greenfield FDI (FDI that begins new production) and efficiency-seeking FDI are more important

for structural change than FDI such as Mergers and Acquisitions (M&As)—buying local enterprises or merging with them) and resource- or market-seeking FDIs (Charaia, 2017).

In Ethiopia, there are 115 million people (72 percent are under 30 years of age), making it the second most populous country in Africa after Nigeria, and an attractive low-cost labor market (Council on Foreign Relations, 2020). In spite of Ethiopia's 858 United States Dollars (USD) per capita, its GDP is 107.4 billion USD, which gives multinational enterprises (MNEs) access to the market's size (Geda, 2022). Ethiopia's cattle population, as well as its large cotton production, provide fertile ground for MNEs looking to invest in the leather and textile manufacturing industries (Mbate, 2016). Ethiopia's proximity to both Asia and Europe as well as its hub of air transportation due to Ethiopian Airlines allows it to serve these markets more efficiently (Lee et al., 2020). A number of market-oriented economic reforms and privatization initiatives, including tax and tariff exemptions, subsidized land leases, and industrial parks establishment have been implemented to attract FDI (Hauge, 2019; Jie & Shamshedin, 2019). Consequently, Ethiopia's net inflow of FDI increased from 4 million USD in 1993 to its peak of 4143 million in 2016, and recently stands at 2395 million in 2020 (United Nations Conference on Trade and Development, 2022).

So far, the literature has largely ignored the effect of FDI on structural change, although this is likely to be relevant to developing economies like Ethiopia (Muhlen & Escobar, 2020). In addition to the limited evidence, even the few existing empirical studies of FDI and structural change are inconclusive. Thus, generalizing based on one country to another is misleading, since FDI's effect on structural change highly depends on a country's absorption capacity. In light of this, the question, "Does FDI contribute to structural change in Ethiopia's economy?" remains an important one, but one that is not well answered. Brautigam and Tang (2014), Hauge (2019), and Jie and Shamshedin (2019) all attempted to investigate the role of FDI in economic structural change in Ethiopia. However, Brautigam and Tang (2014)'s and Hauge's studies used descriptive methodology and were more qualitative in nature, with Brautigam and Tang (2014)'s study focusing on the effect of a single industry park, whereas Jie and Shamshedin (2019) used quantitative approach but the methodology they utilized is problematic and did not control the crucial variables for structural change such as domestic capital accumulation, macroeconomic stability, and institutional quality (openness of economy). In general, no econometric study has examined FDI's effect on structural change in Ethiopia in a proper way; therefore, this paper fills that gap. The objective of our analysis is to examine the effect of inward FDI on structural change in Ethiopia using an Autoregressive Distributed Lag Model (ARDL) using annual data from 1981–2019.

This paper contributes to the growing literature on structural change in two ways. First, the analysis focuses on the role of FDI on structural change, a practical policy problem less addressed in the literature. Second, since FDI played an essential role in the structural transformation of East Asian Tigers, this study investigates if the same happened for African tigers like Ethiopia. Moreover, this research assists policymakers in their decision-making process, research communities as references, and international organizations like the United Nations, the World Bank, and the International Monetary Fund in developing plans and programs to assist poor countries in their development.

The remaining part of this article is organized as follows: Section 2 defines the basic concepts of FDI and reviews relevant theories and previous empirical studies on FDI-structural change. Section 3 provides an overview of the data used as well as econometric and methodological issues. Section 4 provides the empirical findings and their interpretation, while Section 5 concludes and summarizes the results from the study.

2. Theoretical and empirical literature review

The increasing share of the secondary sector (industry) in terms of employment and output indicates structural change; thus, the realization of structural change means quicker growth in the industry, particularly in the manufacturing sector. Therefore, it is commonly referred to as

industrialization. International Monetary Fund (IMF) defines FDI as investments involving more than ten percent of voting shares in an enterprise in the host country; any investment below that is classified as a portfolio investment. In accordance with the percentage of voting power held by the foreign investor, FDI is referred to as (i) a "subsidiary" in the case of an incorporated business where the foreign investor directly or indirectly holds more than 50 percent of the voting power, (ii) a "associate" in the case of a business where the direct investor and its subsidiaries hold between 10 percent and 50 percent of the voting shares, and (iii) a "branch" in the case of an unincorporated business (wholly owned by the foreign investor). FDI consists of three components: (i) initial investment (equity capital), (ii) reinvested earnings, and (iii) intra-company loans from the quarter office to subsidiaries. It is crucial to understand two terminologies: "Home country" refers to a country that sends FDI, whereas "host country" refers to a country that receives FDI. Multinational enterprises (MNEs) are considered as the carrying horses for FDI and are defined as enterprises that produce goods or deliver services across borders. FDI is frequently cited as a more reliable source of capital flow for low-income countries, making it possibly more appropriate and progressive than portfolio flows.

However, both theoretically and empirically, there has been a heated debate over FDI effect on host countries' economies. There are two major types of FDI-development nexus theories: modernization theories, and dependency theories. From modernization point of view, for example, Lewis, in his two-sector model (Lewis, 1954), argues that FDIs cause structural change by stimulating the industrial sector, generating funds for further development, and utilizing rural surplus labor. Similarly, Rostow-lenear-stage growth model claims that the take-off period is a vital stage for industry development, which requires large-scale FDI investments (Rostow, 1959). The Solow (1957) growth model, however, argues that FDI affect structural change through technology transfer rather than capital formation. Romer (1986) proposed the New Growth (Endogenous) theory, which holds that FDI facilitates structural change by facilitating knowledge spillover and technology transfer.

FDI, according to Hymer's (1960), can be beneficial to developing countries through the ability to offer cutting-edge technologies since MNEs is made FDI because of some unique technology that can only be exploited through direct ownership. This point is also reinforced in Vernon's (1966) product life-cycle theory, as capital-intensive products tend to transfer over time from pioneering countries to developing countries through FDI. In Kojima's (2000) catching-up product lifecycle model, countries that succeed in becoming high-value-added capital goods exporters begin to produce consumer products overseas via outward FDI, allowing low-productivity developing exporters to jumpstart their own consumer goods exports. FDI, according to Rodriguez-Clare (1996) theory, makes poor countries more productive by utilizing local resources, employing labor, and encouraging the creation of new local firms. It is demonstrated by Blomstrom and Kokko (1998) that FDI promotes structural change by reducing monopolistic distortions and introducing new technologies. Markusen and Venables's (1999) theory also claims that the competition of FDI and the backward linkages it presents the result in structural changes. Similarly, Barrios et al. (2005) theorize that a crowding-out effect by MNEs is a short-run problem. However, long-term, domestic firms will be able to adjust themselves to be competitive enough, so the outcome is positive. However, the technology gap between MNEs and local firms determines the FDI spillover effect. As argued by Sjoholm (1999) and other scholars, a large technological gap between MNEs and local firms will enhance positive spillovers whereas Blomstrom and Kokko (1998) contend that domestic firms need at least a minimum level of technical capacity to benefit from spillovers.

Historically, the dependency theory holds that developing countries are not to blame for their lack of structural change, but rather, developed countries are. For instance, Santos (1970) defined FDI as a "new type of colonization" that harms structural change in developing countries by creating dualism via focusing on the most profitable export sectors while neglecting traditional underdeveloped sectors, deteriorating the balance of payment by profit repatriation, and lowering raw material prices while raising industrial output prices. MNEs' fundamental goal, according to

Baran (1957) and Frank (1966), is to exploit cheap labor and precious minerals, and to do this, they use corruption as a technique to manipulate local government officials and compradors. Cardoso (1972) theorizes that MNEs are responsible for income inequality by promoting a small number of privileged groups.

The evidence is mixed and ambiguous not only theoretically, but also empirically. FDI inflows, according to some earlier studies, are crucial to the nation's structural change. For instance, Adegboye et al. (2016) used panel data from 43 African countries to investigate the impact of FDI on African industrialization by using Ordinary Least Square (OLS). The findings disclose that FDI has a positive impact on structural change by encouraging saving, investment, knowledge transfer, and domestic productivity. Muhlen and Escobar (2020), citing fixed effects regression evidence from Mexico, argue that FDI positively affects growth-enhancing structural change. Indeed, FDI allows workers to relocate to more productive sectors. The findings of Steenbergen et al. (2020) in Indonesia suggest that FDI promotes structural change by increasing formal employment, paying high wages, and increasing output in manufacturing. Wang et al. (2020) in China present evidence of FDI's effectiveness in improving industry structure via supply and technology spillovers. As noted by Azolibe (2021), FDI in oil and gas manufacturing contributes positively to structural change in the Middle East and Northern Africa (MENA) by boosting domestic investment levels and productivity. In addition, the findings of a literature survey-based study in developing countries by Fu et al. (2021) show that FDI has a significant positive impact on structural change through technology diffusion and knowledge transfer, productivity and export growth, export diversification and sophistication, and service sector growth. Human capital, financial development, and good institutional qualities are also identified as propagating FDI-driven benefits. In Zambia and Malawi, according to a qualitative nature study conducted by Xiaoyang (2021), Chinese MNEs are the most vertically integrated firms.

On the other hand, the study by Aitken and Harrison (1999) in Venezuela found that increased MNEs in the manufacturing sector significantly reduce the productivity of domestic manufacturing firms. Azeroual (2016) discovered a similar conclusion using the System Generalized Method of Moments (GMM) in Morocco. It was argued that FDI has negative effects because of the high technology gap between MNEs and local firms, inhibiting technology transfer from the former to the later. It also suggests that because MNEs pay premium wages to their workers, skilled workers/managers do not relocate from MNEs to local enterprises, preventing technology transfer from MNEs to local firms. Nwosa's (2018) study shows that FDI in Nigaria has adverse effects since it has been concentrating in the oil sector, which is an extractive sector, with a low technology transfer contribution. Moreover, the study by Maroof et al. (2018) shows that FDI affects industrial development negatively and significantly in South Asian Association for Regional Cooperation (SAARC) countries because of the repatriation of profits and market stealing effect. Based on evidence from the Augmented Mean Group (AMG) and Common Correlated Effect Mean Group (CCEMG) estimation, Appiah et al. (2022) and Wako (2021) in Africa also claim that FDI has a negative impact on African industrialization. Because FDI inflows into Africa are natural resources-motivated FDI which has a reputation for having weak ties to local enterprises and being linked to corruption among despotic political elites. As reported by Chen (2021) in Nigeria, Chinese MNEs have a negative impact on structural change due to a lack of skill-training, Chinese-led managerial responsibility, lack of linkages, lack of hard-tech transfer, and establishment of polluting and energy-intensive industries. Oduola et al. (2022)'s findings also support the claim that FDI hinders the industrialization of SSA. Their findings show that domestic firms are being displaced by high technology and high capital-based competition from multinational corporations. Moreover, the majority of FDI received by SSA countries is primarily targeted at natural resources rather than markets or manufacturing, which means it is difficult for manufacturing-based businesses to take advantage of FDI's opportunity, and FDI can adversely affect the balance of payments when profits are repatriated.

A third argument is that FDI has no influence on structural change. For instance, using the feasibility of generalized least squares methods (FGLS), Gui-Diby and Renard (2015) demonstrated

that FDI did not contribute significantly to structural change on the African economy due to governments' failure to create an enabling environment, and the hosting of large amounts of resource-seeking FDI. Nnadozie et al. (2018) in Nigeria also produce comparable results to Gui-Diby and Renard (2015). In SSA countries, Megbowon et al. (2019) investigated the impact of FDI from China on industrialization via Panel Corrected Standard Error (PCSE). In their study, FDI plays only a negligible role in industrialization due to MNEs' lack of interest in manufacturing, their crowding-out effect, and their refusal to make use of local suppliers. Additionally, the PCSE estimate of the findings of Mamba et al. (2020), in eight countries of the West African Economic and Monetary Union (WAEMU), supports those of Megbowon et al. (2019).

Another argument is that its effectiveness is dependent on the amount and quality of FDI, as well as the host countries' absorptive capacity. For example, Paus and Gallagher (2008) suggest that its effectiveness is strongly influenced by the spillover capacity of FDI and the countries' absorption capacity. This implies that a country with good absorption capability and able to attract FDI with high technology spillover has the best chance of reaping maximum benefits from FDI. Likewise, Samouel and Aram (2016) argue that its effectiveness on structural change varies according to geographical area. As their findings show, it has no effect on countries located in northern, eastern, western, and central Africa, but is highly beneficial to those located in southern Africa. In addition, Ben Mim et al. (2022) argue that for a country to achieve good industrialization, the amount of FDI matters. There is a concern that FDI inflows at substantial levels may crowd out domestic investment, while low levels of FDI cannot provide important backward and forward links with domestic firms and cannot ensure technology transfer at the level expected. The suggested amount of FDI to positively influence industrialization is moderate level, but the amount of moderate level is not specified.

With regard to Ethiopia, the interview-based qualitative study of Brautigam and Tang (2014) concerning China-based industrial parks, whose goal is to facilitate technology transfer, on structural change performs poor in terms of horizontal and vertical ties with local firms. Those operating in this industry park, such as a Huajian tannery, seek out local suppliers for intermediate supplies but are unable to obtain more than 30 percent of their leather inputs locally. Brautigam et al. (2018) used a qualitative approach to discover that there is not only a scarcity of supply (skins and hides), but also the quality of it is poor, making business economies of scale and linkages with local firms challenging in leather industry. It is claimed by Seyoum et al. (2015) that FDI spillover effects are dependent on absorption capacity. They find that the instrumental variable-based two stage least square regression (IV2SLS) and the OLS regression show that Ethiopian firms are smaller, therefore experiencing negative spillovers. Berehe et al. (2019) also discovered reverse labor mobility (from local to MNEs) as a result of MNEs attracting skilled labor from local enterprises by providing high wages. It was found that Ethiopia and the Asian Tigers have almost the same incentive scheme for foreign firms, but Hauge (2019) found that the impact of FDI on industrialization is low in Ethiopia, mainly because Ethiopia uses the carrot rather than the stick—forcing MNEs to form joint ventures, use subcontracting to link with suppliers, and rely on local raw materials. VECM (Vector Autoregressive Model) analysis by Jie and Shamshedin (2019) determined that FDI contributed to industrialization between 1992 and 2017. However, the study maintains that VECM does not address endogenous problems since many potential variables were omitted, including domestic investment, macroeconomic stability, and institutional quality indicators.

The literature review section was largely summarized by delivering four issues. (i) Research findings regarding the relationship between FDI and structural change are mixed, inconclusive, and thus require further investigation. (ii) There is little empirical research on FDI-structural structure, despite being critical to developing countries. (iii) Because FDI's relationship with structural change depends heavily on the host country's capacity to absorb FDI and the amount and quality of FDI it receives, general conclusions drawn from one country may not apply to another. (iv) There are very few studies specifically on Ethiopia, and most of those that exist are qualitative and methodologically biased. These challenges were therefore addressed in the study.

3. Data and methodology

3.1. Sources and measurements of data

Annual time series data on structural change and FDI, as well as control variables, were collected, as shown in Table 1. Because of data availability concerns, the annual data spans the years 1981 to 2019, a total of 39 years.

3.2. Estimation methods

Time series analysis method selection is mostly based on the results of the unit root test, which define the variable's stationarity (Shrestha & Bhatta, 2018). A stationary time series is one whose statistical features, such as mean, variance, and autocorrelation, remain constant across time (Nkoro & Uko, 2016). Therefore, the stationary time series is represented by I(0) since it does not need to be differentiated or is stationary at the level (Mukhtar & Rasheed, 2010). On the other hand, non-stationary time series do not tend to revert to their long-run average value; therefore their mean, variance, and co-variance fluctuate over time (Shrestha & Bhatta, 2018). It could results in spurious regression results (there appears to be a significant relationship between two variables when, in fact, they are uncorrelated; Akinboade et al., 2008). It can be converted into stationary series by differentiating; if the series becomes stationary after differentiating once, it is called an integrated series of order one, and is denoted by I(1), whereas if it becomes stationary after differentiating twice, it is called I(2; Nkoro & Uko, 2016).

In a situation where all variables are stationary, the best estimation can be achieved using models such as the ordinary least square (OLS) or vector autoregressive (VAR) developed by ; Hakimipour et al., 2013). However, if all of the variables of interest are non-stationary, or if some are stationary and others are non-stationary, OLS or VAR models may not be efficient for assessing the relationship (Shrestha & Bhatta, 2018). Because differentiation actually eliminates the long-term aspect of the time series, therefore, working with VAR or OLS does not provide information on the long-run relationship between them and could produce spurious regression results (Nkoro & Uko, 2016). Testing for the existence of long-term relationships between variables is called a co-integration test (Akrout et al., 2021); if the variables have a long-term relationship, it is termed co-integration (Pradhan et al., 2013). There are different types of co-integration analyses.

Co-integration test method introduced by Engle and Granger (1987) only deals with one stationary linear combination of variables, but multivariate practice may involve multiple stable linear combinations, and hence Engel-Granger co-integration is not appropriate in this scenario (Naik,

Table 1. Sources and measurement of data

Variables	Symbols	Unit of Measurement	Source
Structural Change	IVA	Industry sector value added (% of GDP)	WDI
Foreign Direct Investment	FDI	Net inflows (% of GDP).	UNCTAD
Domestic Investment	DI	Measured by Gross Fixed Capital Formation (GFCF) at constant prices (2015) in millions USD (in logarithm form)	UNCTAD
Government Expenditure	TGE	Percentage of GDP	UNCTAD
Inflation	INF	Percentage change of CPI	WDI
Openness of Economy	OT	(Export + Import)/ GDP*100	UNCTAD

Note: *UNCTAD = United Nations Conference on Trade and Development, WDI = World Development Indicator; CPI = Consumer Price Index*

2013; Shrestha & Bhatta, 2018). The Johansen and Juselius (1990) test, unlike the Engle-Granger test, allows for more than one co-integrating association. However, both the Engle-Granger and Johansen co-integration techniques do not deal with the issue of endogeneity (Muhammad & Umer, 2010; Mukhtar & Rasheed, 2010). They also require that all variables in the system be stationary and have an equal order of integration—I(1); they are not suitable if some variables are I(0) or I(1) or all variables are not non-stationary (Bekhet & Matar, 2012). When dealing with variables that are integrated in different orders, I(0), I(1), or a combination of the two, the Pesaran et al. (2001) Autoregressive Distributed Lag (ARDL) co-integration technique is preferred. This technique is also known as the bounds testing technique (Shrestha & Bhatta, 2018). Compared to other co-integration tests, it has a number of advantages. Firstly, it offers unbiased estimates and correct t-statistics regardless of the endogeneity of some regressors (Akrout et al., 2021; Jalil & Ma, 2008). Secondly, it allows for a large number of lags which is not possible with other co-integrations tests (Zheng et al., 2020). Thirdly, it accepts the creation of a dynamic error correction model (ECM) that coordinates short-run elements with long-run stability, ensuring no long-run data is lost (Pradhan et al., 2014). Lastly, Pesaran et al. (2001) claim that this method is better suited to small sample sizes, whereas Johansen's approach requires a large sample to yield valid results. To apply the ARDL bound testing method, however, there must not be any I(2) variables. In our study, all variables are I(0) and I(1), as shown in Table 2. Therefore, the ARDL bound co-integration test is used in this study

3.3. Model specification

The generalized ARDL (p q) model is stated as follows using the bounds-testing approach proposed by Pesaran et al. (2001).

$$\begin{aligned}\Delta IVA_t = {} & \beta_0 + \sum_{i=1}^{p} \beta_{1i}\Delta IVA_{t-i} + \sum_{i=0}^{q} \beta_2 \Delta FDI_{t-i} + \sum_{i=0}^{q} \beta_3 \Delta lnDI_{t-i} + \sum_{i=0}^{q} \beta_4 \Delta lnTGE_{t-i} \\ & + \sum_{i=0}^{q} \beta_5 \Delta OT_{t-i} + \sum_{i=0}^{q} \beta_6 \Delta INF_{t-i} + \beta_7 IVA_{t-1} \\ & + \beta_8 FDI_{t-1} + \beta_9 lnDI_{t-1} + \beta_{10} lnTGE_{t-1} + \beta_{11} OT_{t-1} + \beta_{12} INF_{t-1} + \varepsilon_{it}\end{aligned} \tag{1}$$

Where: Δ denotes the difference operator, IVA_t is the share of industry value-added output; i = 1, 2 are the corresponding long-run multipliers; p, q are optimal lag orders of dependent variable and independent variables; ε_{it} is an error term. In the Equation (1), β_0 represents drift component, β_1-β_6 are short-term coefficients, and β_7-β_{12} refers to long-term coefficients of the ARDL model. The presence of long-run relationship among the variables is tested by F-statistic (Hoque & Yusop, 2010). A joint significance F-test is used to test the null hypothesis of no co-integration (H_0: $\beta_7 = \beta_8 = \beta_9 = \beta_{10} = \beta_{11} = \beta_{12} = 0$) to the alternative hypothesis of co-integration (H_1: $\beta_7 \neq \beta_8 \neq \beta_9 \neq \beta_{10} \neq \beta_{11} \neq \beta_{12} \neq 0$). Lower and upper bound critical values are provided by Pesaran et al. (2001), with the lower bound critical values assuming all variables are I(0) and the higher bound critical values assuming all variables are I (1). If the estimated F-statistic is greater than the upper bound of the critical value, the null hypothesis of no co-integration is rejected, implying that the variables in the model are co-integrated; however, if the estimated F-statistic is less than the lower bound of the critical value, the null hypothesis of no co-integration cannot be rejected, implying that the variables are not co-integrated (Chandio & Jiang, 2019).

The ECM can be estimated by approximating its short-run counterpart once we reject the null hypothesis of no co-integration:

$$\begin{aligned}\Delta IVA_t = {} & \beta_0 + \sum_{i=1}^{p} \beta_{1i}\Delta IVA_{t-i} + \sum_{i=0}^{q} \beta_2 \Delta FDI_{t-i} + \sum_{i=0}^{q} \beta_3 \Delta lnDI_{t-i} + \sum_{i=0}^{q} \beta_4 \Delta lnTGE_{t-i} + \sum_{i=0}^{q} \beta_5 \Delta OT_{t-i} \\ & + \sum_{i=0}^{q} \beta_6 \Delta INF_{t-i} + \gamma ECM_{t-i} + \varepsilon_t\end{aligned} \tag{2}$$

Where: the ECTt-1 is an error correction term which denotes the long-run equilibrium speed of adjustment following a short-term shock.

3.3.1. Variable definitions

It is imperative that all variables in the econometric model be defined in order to make the study more understandable and to make the reader's task easier. Thus, their definitions were presented in Table 2.

The study attempted to show Ethiopia's structural change status through descriptive analysis using graphs and tables, as well as productivity decomposition analysis. Labor productivity increases through two mechanisms: (i) within economic sectors via capital deepening,

Table 2. Definition of variables and expected signs

Symbol	Definition
IVA	The share of industry in total output (IVA) is simple, widely used, and can more accurately indicate the structural shift from an agrarian to an industrial economy than other options (Lindmark & Vikstrom, 2002; Chen, 2021). Consequently, it was used as a dependent variable in econometric analysis as a proxy for structural change. Generally, it includes the value-added output of mining, manufacturing, utilities, and construction industries.
FDI	It is the amount of equity capital, earnings reinvestment, and other intra-firm loans as represented in the balance of payments as net FDI inflows. It is hypothesized, based on the literature presented in this study, that FDI can be positively significant to structural change since it provides physical capital, technology, and managerial expertise, as well as access to global markets.
TGE	It is a proxy for domestic absorption capacity. It encompasses all of the state's operations or measures aimed at enhancing infrastructure, human capital, and commercial activity, as well as the country's social and security position. Government spending, therefore, plays a role in propagating the effect of FDI in industrialization (Lautier & Moreaub, 2012; Ogundipe et al., 2020). Hence, government spending is hypothesized to have a positive and significant effect on structural change.
DI	GFCF is also a proxy for domestic investment. The presence of a vibrant domestic private sector is critical for reaping the benefits of FDI through vertical and horizontal linkages as well as joint ventures (Hermes & Lensink, 2003). Investments create demand for manufactured goods, and domestic investment returns are more likely to be reinvested in the domestic economy. DI has thus been hypothesized as having a positive and significant effect on structural change.
OT	The openness of the economy is vital for structural change by permitting a large number of traded goods embedded new technologies such as capital goods (Yang & Lin, 2012). Therefore, economic openness is expected to have a positive substantial effect on structural change.
INF	Inflation is defined as a rise in general prices, which causes the general level of prices for goods and services, as well as inputs for production, to rise. Inflation harms industrialization by increasing the production costs, reducing market demand, and creating uncertain environment for investment (Panditharathna & Jayatilake, 2017; Gokmen & Dinc, 2019). Hence, it is hypothesized to have a negative and significant impact on structural change.

technological development, or reduction of misallocation across plants—this mechanism is called the "within effect", and (ii) labor can move across sectors—this is called the "structural change effect". There have been different decomposition methods of labor productivity growth. For instance, decomposition used McMillan et al. (2014) has limitations which lead to an overestimation of the relative contribution from within sector productivity growth, and an underestimation of the contribution from structural change. As a result, some scholars have relied on Haltiwanger's (2000) decomposition analysis, but this method overestimates the role of structural change. Alternately, the decomposition method developed by M.P. Timmer and de Vries (2009) is employed. This and the previous two methods capture only the static measure of the reallocation effect but ignore the productivity growth rate differences across sectors. Thus, the decomposition method developed by De Vries et al. (2015), in Equation (3), captures the dynamism effect of structural change on labor productivity and is hence recommended by most researchers. This led to its selection for this study as well.

$$\Delta L_t = \sum_{i=n} l_{i,t-k}\Delta A_{i,t} + \sum_{i=n} A_{i,t}\Delta l_{i,t} + \sum_{i=n} \Delta A_{i,t}\Delta l_{i,t} \tag{3}$$

Where L_t and $A_{i,t}$ are the overall and sectoral labor productivity levels, respectively and $l_{i,t}$ is the share of employment in sector i. The Δ operator represents the difference in employment or productivity between t-k and t. The first term in Equation (3) indicates "within effect", the second term indicates "static structural change effect"—the capability of a country to move labor from less productive activities to higher-producing ones, and the third term indicates "dynamism effect of structural change"—the potential of a country for reallocating its labor towards industries with high productivity growth. If workers move to sectors experiencing positive (negative) productivity growth, the signs of the dynamism effect will be positive (negative).

4. Findings and discussion

4.1. Structural change performance

This section examines Ethiopia's structural change performance by examining the changes in output, employment, productivity, and total merchandise export share over time by sector (agriculture, industry, manufacturing, and services).

4.1.1. Output share shift across sectors

From 1981 to 2019, agriculture's share of output fell by 21.22 percent, from 54.74 to 33.52 percent. Over the same period, the share of industry output increased by 16.08 percent from 8.74 to 24.82, and the service sector output increased by 6.38 percent from 30.77 to 37.15. It implies that the structural changes have been very minimal, but the trajectory of change seems normal since a large amount of production resources flow to the industrial sector instead of the service sector. In most cases, the level of industrialization is determined by the share of manufacturing output. Nevertheless, as illustrated in Figure 1, manufacturing output share has increased by 1.2 percent (4.39 to 5.59) since 1981 implies that it does not reflect any fundamental change in the production structure. The average share of manufacturing output in total value-added output was 4.75 percent, which is far too low in comparison to the African (11 percent; Martins, 2018). Ethiopia, despite being an economic giant for more than a decade, has seen poor transition, and according to C.T. Timmer and Akkus (2008) and Baymul and Sen (2020)—a country in early stages of structural transformation as one with an industry, service, and agriculture covering 20, 30 or 50 percent of GDP, respectively, is still at an early stage of structural transformation. A graph showing the output share of an industry sector, Figure 1, is evident for being at an early stage, as the graph is at an increasing stage of a theoretically hump-shaped industry graph.

4.1.2. Employment share shift across sectors

Due to a lack of employment data, the study was limited to a descriptive analysis of the structural change in employment from 1990 to 2018. The rate of structural change in Ethiopia has been very slow, with a drop of 10.22 percentage points in the share of the workforce employed in agriculture

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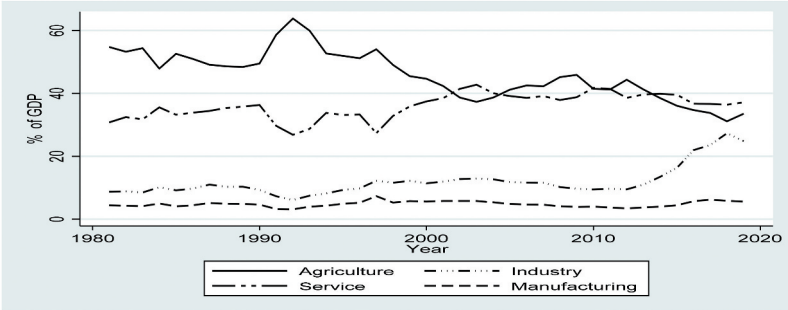


Figure 1. Value added (% of GDP) for different sectors (1981–2019).

from 76.85 to 66.63 percent from 1990 to 2019. Figure 2 in contrast, shows that over the past 30 years, industry employment increased by 2.53 percent, from 6.79 to 9.32 percent, and the service sector employment increased by 7.69 from 16.36 to 24.05.

It implies that Ethiopia has not only experienced low structural change but also distorted industrialization, with labor being shifted directly from agriculture to service sector, a sector that lags behind the industry sector in terms of labor productivity.

4.1.3. Labor productivity growth

Labor productivity is inextricably linked to the concept of structural change. It is a combination of "within-sector effect", "static structural change effect", and "dynamic structural change effect". As shown in Table 3, Ethiopia has achieved an average labor productivity of 0.94 percent over the period 1990–2018. As an Asian tiger's development model follower, Ethiopia's productivity growth is very low, with a poor structural transformation as opposed to Asian tigers such as Taiwan and South Korea who took advantage of 5.30 percent and 4.45 percent average growth respectively for their overall productivity between 1950 and 2005 (Yilmaz, 2016).

The majority of this growth resulted from "within-sector effects" rather than "structural changes effects". On average, Table 3 shows that 94.77 percent (0.888) of total productivity growth was driven by "within-sector" productivity change, while 3 percent (0.028) was driven by "static

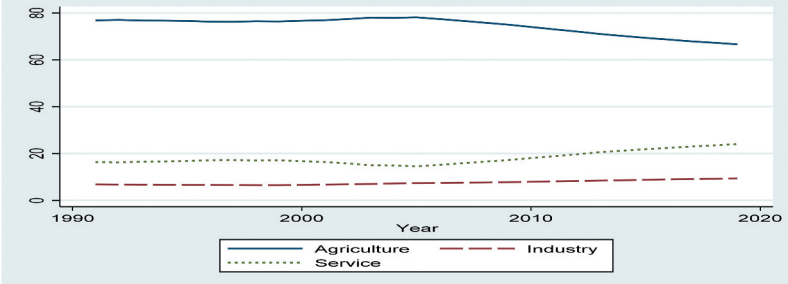


Figure 2. The share of employment by different sectors (1991–2019.

Data Source: WDI

Table 3. The contribution of "within", "structural change" and "dynamic change" to labor productivity

	Overall	Within	Structural change	
			Static	Dynamic
Agriculture Sector	0.598	0.612	−0.006	−0.008
Industry Sector	0.103	0.072	0.018	0.013
Service Sector	0.236	0.204	0.016	0.016
Total	**0.937**	**0.888**	**0.028**	**0.021**
Manufacturing	0.025	0.017	0.006	0.002

structural change", and 2.23 percent (0.021) was driven by "dynamic structural change". This implies that the Kaldor (1968) argument, which suggests that "within-sector effects" on aggregate labor productivity growth weigh more heavily than employment reallocation effects, holds for Ethiopia. The results concur with those of M.P. Timmer and de Vries (2009) where they find that overall reallocation effects are positive in developing countries; however, within-sector effects are larger. The finding of this analysis is also consistent with Yilmaz's (2016) finding for developing countries, however it stands in contrast to the results of De Vries et al. (2015) for Ethiopia who found a higher contribution to overall productivity growth from "static structural changes" than from "within-sector effects".

Regarding the "dynamic reallocation term" in particular, its value is positive, which means that rapid reallocation of workers has a positive effect on productivity growth rates in growing sectors, mainly in the industrial sector. It rejects the value associated with De Vries et al. (2015)'s "negative dynamic structural change effect" in Africa that the marginal productivity of additional workers in expanding sectors has been below that of existing activities in those sectors. Like "within effect", agriculture accounts the lion share which is about 63.82 percent (0.598) of the growth in total productivity, while the service sector accounts for 25.18 percent (0.235), and the industry sector accounts for 11 percent (0103). Interestingly, this result also confirms Yilmaz's (2016) findings in Colombia and Bolivia that agriculture has a large impact on overall productivity growth. The study also contradicts Pieper (2000) who found that industry is a major contributor to productivity growth in 30 developing countries, and Roncolato and Kucera (2014) who contend that labor productivity growth in developing countries as a whole is driven primarily by the services sector.

4.1.4. Manufacturing export performance

We were limited to data from 1997 to 2019 for a descriptive analysis of manufacturing exports due to a lack of data. As shown in Table 4, the average manufacturing share of merchandise export is 11.56 percent from 1997 to 2019. It implies that the country's performance in the global market is poor and incompetent. According to Figure 3, the problem is not only poor performance, but also an erratic pattern over the study period.

In general, Ethiopia has experienced a slow pace of structural change due to a poor achievement in terms of decreasing agricultural output and employment while a weak increasing industrial, manufacturing, and service sector employment and output as poor overall labor productivity improvement.

4.2. Descriptive results of FDI and other variables

According to Table 5, FDI stood at 1.78 percent of GDP on average, with a minimum and maximum share of −0.04 and 1.94 percent, respectively. The standard deviation was also 1.94 percent. The magnitude of FDI inflows in terms of GDP is very low.

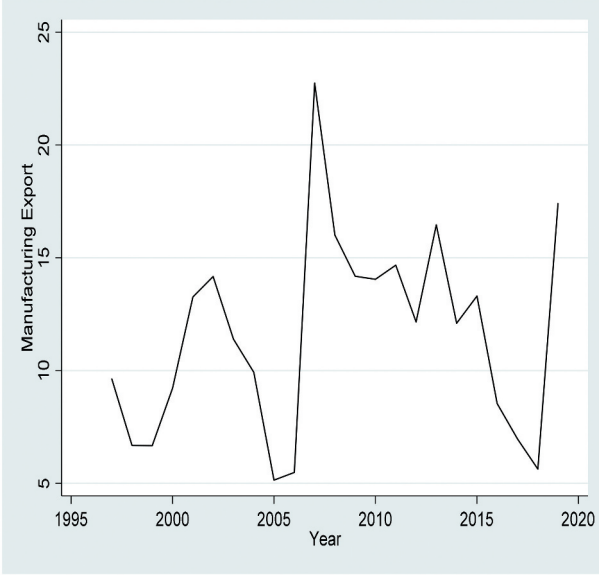
On Figure 4a, FDI inflows in Ethiopia are mainly a phenomenon of the late 1990s with erratic trends after that period. Ethiopia was known to be in a command economy system and to have been involved in civil war all the way up until the Ethiopian People's Revolutionary Front seized

Table 4. Manufacturing export

Year	% total merchandise export)
1997–2000	8.05
2001–2005	10.78
2006–2010	14.49
2011–2015	13.73
2016–2019	9.64
1997–2019	11.56

Source: WDI

Figure 3. Manufacturing export.



power in 1991 (Milas & Latif, 2002). By implementing policies such as deregulation and privatization, the market-based economy with a significant government intervention has been growing. FDI inflows have also been increasing since the implementation of these policies. According to Figure 4b, it seems that the average growth rate of FDI inflows has remained stable in terms of GDP, albeit slightly skewed towards downward trends. Figure 4c also depicts a positive relationship between FDI inflows and IVA from origin to right.

TGE and DI reported averages of 12.39 percent of GDP and 7196.18 million USD, respectively. TGE and DI have maximum and minimum values of 19.21 and 7.90 percent, and 41,144.79 million and 909.97 million USD, respectively. The statistics also revealed a mean of 33.80 percent for economic openness and 9.27 percent for inflation. Individually, the maximum and minimum values of these variables are 51.08, 11.79, and 44.39, −9.81.

4.3. Different diagnostic tests

In an econometric analysis, before estimating the time series, the variables in the model are tested for stationarity. There are commonly known stationary tests, for example, Durbin-Watson (DW) test is simple but unreliable for integrated variables in general. Alternately, Dickey-Fuller (DF) or Augmented Dickey-Fuller (ADF) tests can also be employed, but ADF is preferred over DF for the reason that it accounts for autocorrelation by including lag values (Nkoro & Uko, 2016); it is used in this study. As shown in Table 6, the overall result indicated a mixed order of stationarity, which led the study to select the ARDL bound test as the best method.

Table 5. Descriptive statistics of variables

	IVA	MVA	FDI	TGE	DI	OT	INF
Observations	39	39	39	39	39	39	39
Mean	11.88	4.75	1.78	12.39	7196.18	33.80	9.27
Max.	27.30	7.30	1.94	19.21	41,144.79	51.08	44.39
Min.	6.09	3.11	−0.04	7.90	909.97	11.79	−9.81
Std. Dev.	4.73	0.90	1.94	3.39	10,579.31	9.66	10.98
Variance	22.39	0.82	3.75	11.51	1.12e+08	93.30	120.53
Skewness	1.98	0.40	0.689	0.3217	1.85	−0.07	1.12
Kurtosis	6.28	3.03	2.05	1.81	5.23	2.36	5.04

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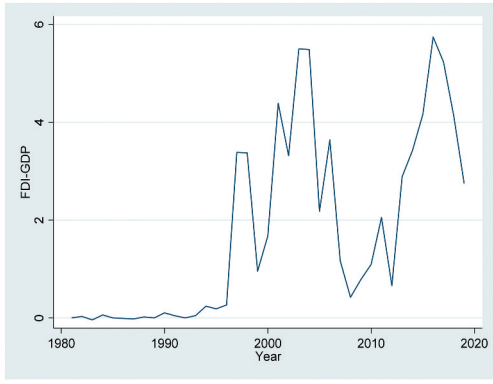
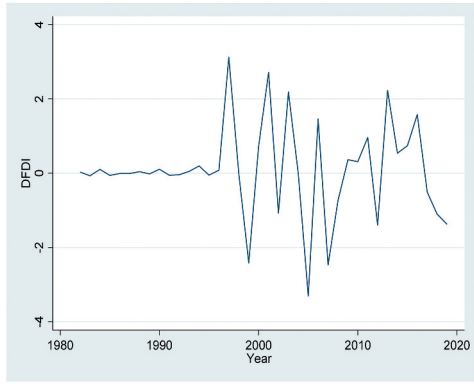
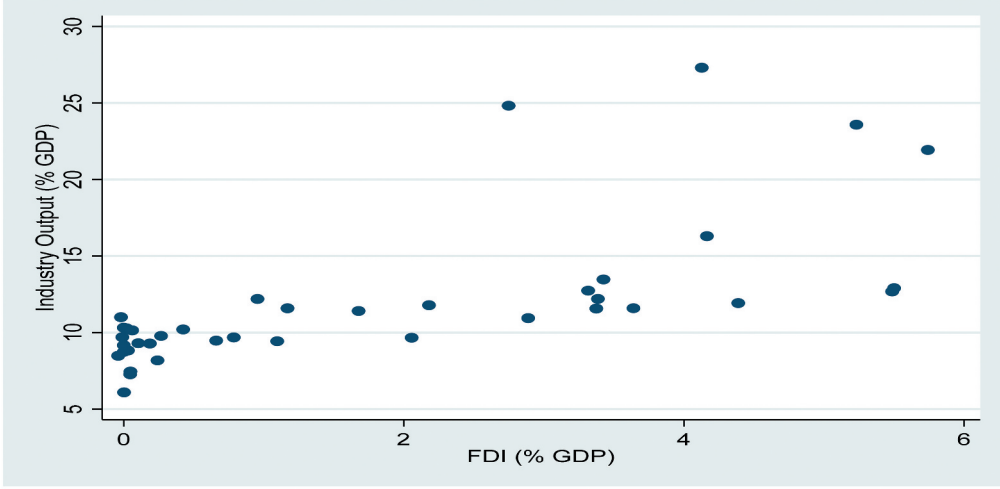
Figure 4. FDI (%GDP). The rate of FDI inflows. Graphical presentation the relationship of FDI inflow and IVA.



(a): FDI (%GDP)



(b): The rate of FDI inflows



(c): Graphical Presentation the Relationship of FDI inflow and IVA

Once the unit root tests have been checked, the ARDL model with the appropriate lag length is the next step in the bounds test approach for co-integration. Pesaran et al. (2001) demonstrated that the Schwarz Criterion (SIC) should be used over other model specification criteria to choose lag length because it frequently has much more parsimonious specifications: the limited data sample in our current study reinforces this point. Consequently, we chose three as the maximum lag length.

Table 6. Unit root test result

Variables	At level (at 5% significance level)			At first difference (at 5% significance level)			Conclusion
	t-statistic	Critical value	p-value	t-statistic	Critical value	p-value	
IVA	−1.728	−2.972	0.4166	−3.126	−2.975	0.0247	I(1)
FDI	−1.906	−2.966	0.3291	−5.187	−2.969	0.000	I(1)
TGE	−0.349	−2.966	0.9183	−5.244	−2.969	0.000	I(1)
lnDI	1.989	−2.966	0.9987	−3.504	−2.969	0.008	I(1)
OT	−1.382	−2.969	0.2908	−3.634	−2.972	0.005	I(1)
INF	−4.810	−2.964	0.000	-	-	-	I(0)

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Table 7. Bound co-integration test output

F-statistic	Level of Significance	Lower bound I(0)	Upper bound I(1)
10.46	1%	3.41	4.68
	5%	2.62	3.79
	10%	2.26	3.35

The bound test for co-integration with the null hypothesis of no long-run relationship among the variables is rejected if the F-statistic is greater than the critical value for I (1; Nkoro & Uko, 2016), indicating evidence of a long-run equilibrium relationship. The bound co-integration test result, as shown in Table 7, demonstrated the presence of a long-run relationship between the variables because F-statistic = 10.46 is greater than the critical values for I(1) at the 1, 5, and 10 percent significance level.

Tables 8 and 9 show the results of these tests, which show that the model is free of misspecification, serial correlation, heteroskedasticity, non-normality distribution, and multicollinearity problems.

4.4. Long-run estimates output of ARDL approach

If R-squared is close to one, it indicates that the model is well-fitting. Therefore, our model is good because the value of r-squared in our model is 0.7733 implying that variables in the model explained about 77.33 percent of the variation in structural change. At the 5 percent significance level, the lag error correction mechanism ECM_{t-1} revealed an inverse sign that was statistically significant. This finding implies that short-run deviation returns to long-run equilibrium at a rate of 37.39 percent per year, implying that it takes nearly 3 years to fully restore.

Based on the long-run parameters shown in Table 10, FDI, domestic investment, openness of the economy, and inflation play significant roles in structural change in Ethiopia, while government expenditure plays a marginal role. The coefficient of FDI inflows is positive and significant at the 5 percent level of significance. It is estimated that for every one percent increase in FDI inflows, structural change will improve by 0.72 percent, ceteris paribus. The findings show that FDI is one of the most important factors influencing Ethiopia's structural change. Domestic investments also

Table 8. Pearson pair-wise correlation coefficient for multicollibearity test

	FDI	lnTGE	lnDI	OT
FDI	1			
TGE	0.57	1		
lnDI	0.59	−0.47	1	
OT	0.48	0.51	0.45	1
INF	−0.06	0.28	0.26	0.21

Table 9. Diagnostic tests

Tests	Null Hypothesis	Prob>chi2	Decision
Breusch-Godfrey LM Test	H0: No Serial Correlation	0.4391	No serial correlation
White's Test	H0: Homoskedasticty	0.4215	Homosckedasticitic
Jarque-Bera Normality Test	H0: Normality	0.5164	Normally distributed
Ramsey Test	H0: No Omitted variable	0.068	No omitted variable

Note: If the value of Prob>chi2 is greater than 0.05, fail to reject the null hypothesis

Table 10. Long-run ARDL model estimation output

	Coefficient	Standard Error	t-value	P-value
EMC_{t-1}	−0.3739	0.0740	−5.05	0.000
FDI	0.7271	0.0594	2.16	0.042
TGE	−0.1072	0.1679	−0.64	0.529
lnDI	3.2889	0.7162	4.59	0.000
OT	−0.1273	0.0594	−2.14	0.040
INF	−0.2391	0.0844	−2.83	0.009

R-squared = 0.7733

play an important role in promoting structural change, just as FDI does. A percentage change in domestic investment results in a 3.29 percent structural change improvement, ceteris paribus. Openness of the economy, however, unexpectedly, has a detrimental effect on structural change in Ethiopia's economy. It is statistically significant and the structural change of a country decreases by 0.13 percent for every 1 percent increase in trade openness. The effects of inflation on structural change are also significant and adverse. Inflation lowers the structural change by 0.24 percent per percent rise in inflation, all else being equal.

4.5. Discussion of results

A major reason why FDI is having a positive impact on structural change is because new FDI goes into manufacturing sectors, such as textiles and leathers, according to Hauge (2019), therefore improving manufacturing output and export. Additionally, it is noted that FDI in manufacturing does not only enhance output and export but also improves the productivity of domestic firms by introducing new methods and practices of production, management, and developing international markets and trade knowledge, as well as creating backward links with local economies. This result supports the hypothesis proposed by the theory of modernization, which states that FDI can substantially contribute to structural transformation in developing countries; and it disproves the dependency theory of negative results. The result is consistent with the ones found by Adegboye et al. (2016), Thirion (2020), Muhlen and Escobar (2020), and Steenbergen et al. (2020), and Wang et al. (2020), and Azolibe (2021) that claim FDI fuels structural change via increases in industry production, technology transfer, employment, and income (salaries). This finding, on the other hand, contradicts those of Okey (2019), Megbowon et al. (2019), and Mamba et al. (2020) who found that FDI is not a significant factor of structural change, as it does not significantly impact productivity in industries, and manufacturing. It stands in opposition to the findings of Gui-Diby and Renard (2015) in Africa, which suggest that FDI does not significantly contribute to structural change due to ineffective government interventions and the failure of governments to create an enabling environment for FDI to flow into manufacturing sector. Moreover, this study negates the negative connotations (FDI adversely affects structural change through repatriation of profit and market stealing effect) of Aitken and Harrison (1999), Azeroual (2016), Nwosa (2018), Maroof et al. (2018), and Wako (2021), and Oduola et al. (2022).

Similarly, the coefficient of domestic investment is also positive and significant, confirming the theoretical claim that more domestic investment leads to higher capital stock addition, which is linked to productivity and employment growth, both of which are crucial for industrialization. In Turkey, Tunali and Boru (2019)'s finding supports our finding by reporting that private domestic investment helps by reducing transaction costs, improving technology diffusion, and widening interfirm division of labor, which in turn enables host countries to reap maximum benefits from FDI. Additionally, our findings are consistent with Lautier and Moreaub's (2012) finding that domestic investment serves as a signal to foreign firms in poor countries, thereby promoting FDI flows and improving structural change.The findings of Sankaran et al. (2020) in India, Mohsen et al. (2015) in Syria, and Oduola et al. (2022) in SSA also support the finding by stating that domestic

capital is a major source of industry output growth. It disproves the argument put forward by Gui-Diby and Renard (2015) who connect the adverse effects of domestic investment on structural change in Africa with the occurrence of a natural resources curse phenomenon and that a boom in natural resource sectors diverts resources away from the manufacturing sector. Moreover, it also opposes Nwosa's (2018) finding that domestic investment plays an insignificant role in structural change.

The negative relationship between trade openness and structural change is explained by Ethiopia's reliance on exporting raw materials like coffee, skins, minerals, and gold. On the other hand, Ethiopia imports consumption goods like wheat, edible oil, and clothes that contribute less to industrial development. This is why trade openness has a negative impact on structural change. It is in line with the findings of Gui-Diby and Renard (2015), who state that Africa's exports are simple and highly dependent on raw materials, limiting local firms' opportunity to learn from international firms and preventing the creation of micro, small, and medium manufacturing firms. Industrialization in developing countries may be impossible without micro-, small-, and medium-scale manufacturing firms. It is also in line with those of Shafaeddin (2006), Umer and Alam (2013), Ojuolape et al. (2020), and Kaba et al. (2022) that trade openness impedes structural change because developing countries particularly SSA countries export raw materials, do not use trade to industrialize, and do not invest commodity export revenues in better labor-intensive manufacturing activities. It is also in agreement with those of Nnadozie et al. (2018) who asserts that consumption-commodity imports erode the weak industrial base by crowding local firms out of the market. The findings of Edwards and Jenkins (2015) and Makoto and Ngendakumana (2018) support this assertion as they note that import penetration from China has negatively affected clothing and textiles in South Africa, and wood, furniture and paper production industry in Zimbabwe. Additionally, Kaplinsky (2008) noted that the importation of Chinese clothes and shoes led to the closure of textile and shoe factories in Zambia, Ethiopia, and South Africa. Thus, it resulted in massive job losses and a decline in domestic output. Our findings, on the other hand, contradict the maxim that trade openness promotes industrialization by expanding markets, transferring technology and knowledge, and optimizing resources. This also stands in contrast to the findings of Adofu and Okwanya (2017) in Nigeria which state that trade openness encourages structural change through importing technologically advanced goods.

Inflation, like openness, hampers structural change by causing rapid fluctuations in real interest rates and making lending and investing extremely difficult. It is consistent with Umer and Alam (2013) and Amaefule and Maku (2019) in Nigeria and Pakistan. By requiring investors to spend more time and money looking for ways to protect themselves, higher inflation reduces allocation efficiency and slows economic structural change. In turn, uncertainty harms long-term economic growth by reducing investment profits in the future. The results of this study contradict the claims of Maroof et al. (2018) and Ojuolape et al. (2020) that inflation spurs industrialization by lowering the rate at which goods are imported because consumers prefer local goods during inflation. It also contradicts Oduola et al. (2022) that inflation contributes to structural change due to societies' expectations and a diminished fear of deflation; therefore, it increases output, productivity, and aggregate demand. Furthermore, it opposes Nwosa (2018)'s claim that inflation does not contribute significantly to structural change.

Finally, the statistical evidence suggests that the government spending has a negative but negligible effect on structural change. Government expenditures are crucial to industry development, but their use largely determines their outcome. In Ethiopia, for example, Eshete (2014) found that over 2006–2011, expenditures on industry and agriculture accounted for 2.43 percent and 16.29 percent respectively, and their share is small compared with administration expenditure (17.74 percent), which implies that it is not biased towards structural change.

Figure 5. Stability test output.

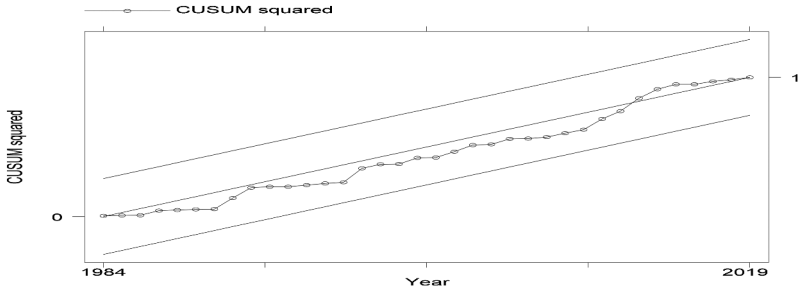

Table 11. Vector Error Correction Model (VECM) regression output

	Coefficient	Standard Error	z-value	P-value
FDI	−1.44	0.06	2.81	0.000
TGE	0.64	0.17	3.62	0.000
lnDI	−3.96	0.80	−4.92	0.000
OT	0.17	0.35	−4.09	0.005
INF	0.64	0.07	8.33	0.000

4.6. The model stability test

Besides the diagnostic tests mentioned above, we have also tested the stability of long-term estimates using the cumulative sum of recursive residuals squared (CUSUMS) test. A CUSUMS test is shown in Figure 5, confirming the model is stable since the plot of the CUSUM test does not fall outside the critical range.

4.7. Robustness checking

To assess the robustness of the output from the ARDL model, Asumadu-Sarkodie and Owusu (2016), Işik et al. (2017), Sultanuzzaman et al. (2018), and Zheng et al. (2020) used the Vector Error Correction Model (VECM). We have also used the VECM regression model for long-run analysis to test the ARDL model's robustness. Table 11 demonstrates that all variables, including FDI, government spending, inflation, domestic investment, and the openness of the economy, have a significant effect on structural change. Except for government spending, all variables' signs and significance match those discovered in the ARDL model. In ARDL and VECM, government spending has a similar sign but a different relevance, where it is significant in ARDL but not in VECM. The VCM results have generally demonstrated our ARDL model is reliable, stable, and well-fit.

5. Conclusion remarks

Structural change continues to be one of the most important economic development strategies for developing countries. In recent years, as East Asian Tigers have actively industrialized, developing countries are under more pressure to do the same. FDI has been viewed as the foundation for the industrialization of the East Asian Tigers. Ethiopia is one of the many developing nations that have attempted to adopt the development strategies of the East Asian Tigers. As a result, Ethiopia has been growing quickly since 2004 at an average yearly pace of about 11 percent. The Ethiopian economy has grown fast, but not with the structural changes seen in the East Asian Tigers. Consequently, this study attempts to answer the question "Does FDI contribute to structural change in Ethiopia's economy?" A 39-year annual time series dataset from 1981–2019 was used and analyzed by ARDL model.

Data analysis reveals FDI and domestic investments both play a crucial role in Ethiopia's economic structural change. FDI remains an important tool for Ethiopia to accomplish structural

changes and transformations despite retaining a small amount. Trade openness and inflation, however, adversely affect structural change, while government expenditures have little impact.

Ethiopian government efforts should be focused first on creating favorable conditions for investment in order to receive sufficient amounts of FDI. This means improving supportive settings, ensuring economic stability, improving the quality of institutions, and providing adequate infrastructure. Even though FDI inflows are crucial for structural changes, the government should take care of opening up the economy, favoring FDI in the value-adding manufacturing sector and utilizing local resources (labor, materials) prior to importing from abroad. The gains of FDI do not come automatically. For FDI to contribute to structural change and growth, spillovers and backward links are crucial. Therefore, FDI policies and programs primarily focus on these objectives by providing relatively educated labor and providing infrastructure support (such as electricity, road, and telecommunication) to local firms as well as foreign firms. Expanding access to capital for small firms to import technology and develop local businesses through credit availability is critical for structural change. In addition, further initiatives can be taken to promote a systematic exchange of technology, skills, and knowledge between multinational corporations and local firms, such as encouraging multinational corporations to hire skilled local employees, encouraging foreign firms to collaborate and communicate more effectively with local schools and universities, and rewarding foreign firms for outsourcing duties and using local inputs.

It should be highlighted, however, that this work has limitations due to the use of relatively short-term data due to data unavailability, the lack of reliable statistics on employment in the industry sector and particularly manufacturing sector output, employment, and export, and the lack of FDI breakdowns by sector over the time period analyzed. It would be useful to conduct future research specifically on the effect of FDI on manufacturing sector employment and output, since manufacturing is central to industrialization and has traditionally been regarded as a measure of both FDI quality and industrialization.

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