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# **ECONOMETRICS | RESEARCH ARTICLE**

# An empirical investigation of the impact of foreign direct investment on economic growth in Ethiopia

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economics & finance

Melkamu Wondimu<sup>1</sup>\*

**Abstract:** The main objective of this study is to empirically investigate the impact of foreign direct investment on economic growth of Ethiopia by using a time series data for the period 1992–2019. Other explanatory variables like trade openness, human capital, national saving and gross capital formation were incorporated in the model. For the purpose of undertaking the study, Autoregressive Distributed Lag (ARDL) econometric model was employed. Moreover, a Toda-Yamamoto Causality test was performed to identify the direction of the causality between economic growth and foreign direct investment. Findings from the study show that, both in the short run and long run, foreign direct investment has a positive and significant impact on economic growth. As an outcome of Toda-Yamamoto Causality test shows, there is a unidirectional causality running from economic growth to foreign direct investment. On the basis of the findings, recommendations are made for the government authorities to expand infrastructural facilities for enabling a free movement of the investors to the remote and marginalized areas to further expand investment activities that result in higher economic growth.

Subjects: Environmental Economics; Economics; Business, Management and Accounting

Keywords: economic growth; foreign direct investment; Autoregressive Distributed Lag

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#### 1. Introduction

Foreign direct investment is one of the most important elements of international economic integration. Foreign direct investment (FDI) creates a direct, stable and lasting connection between economies. This facilitates the transfer of technology and know-how between countries and allows the host economy to promote its products more widely in the international market. FDI can serve as additional source of funding for investment in an environment where there is a sound economic policy, serving as a tool for economic growth and development (OECD, 2002).

In the 1950s and early 1960s, some developing countries were very skeptical of foreign direct investment. Foreign direct investment was seen as the dominant factor and multinational corporations were suspected of manipulating transfer prices and creating economic territories, reducing public welfare. There is now evidence that developing countries' attitudes towards FDI have changed radically. Suspicious behavior has now been replaced by attracting policies targeting significant FDI inflows (Oman, 2000). This shift in attitude has been enriched in part by an increasingly liberal global economic environment and by the economic literature emphasizing the merits of FDI. Indeed, some scholars (Dunning, 1993) (Moran, 1998), and (Lall, 2000) have assessed its wide role on economic development. Most countries are looking to attract foreign direct investment because it can play an important role in raising the skill level of the country, creating new jobs and spurring economic growth. Therefore, many countries are actively trying to attract foreign investors to help develop their economies (Blomström, 2002).

In order to increase the benefit from competitive environment and increase the growth in output, giant enterprises need to have an advanced technology. In this process, an investment in human capital stock, research and development have to be supplemented by FDI inflows. There is a common agreement that there are many positive effects of FDI, such as increased capital accumulation, transfer of advanced technology, skilled labor and superior managerial knowledge. These factors can help to encourage the businesses and in the long run, generate productivity growth in the economy.

Studying the impact of FDI on economic growth of developing countries like Ethiopia is important to identify whether it can bring a macroeconomic stability by increasing productivity, bringing the balance of trade and competitiveness in a global market, creating employment and increasing the wages that workers receive or not. Workers in sectors and regions with a higher presence of foreign firms are generally more likely to be formally employed and receive higher wages. Conservative estimates suggest that FDI contributed to lifting at least 35,000 individuals out of poverty in Ethiopia during the period 2009 up to 2014 (World Bank, 2020). During these periods Ethiopia has attracted below US\$500 million. However, the situation has gradually changed and FDI inflows to Ethiopia have grown by 50 per cent per year on average, reaching the peak of \$4.1 billion in 2017. As a result, FDI has become a major contributor to domestic capital formation and productive capacity building in Ethiopia (Ethiopian Investment Commission, 2019).

Apart from employment creation, domestic capital formation, technology transfer and improvement in the living standard of the society, FDI may pose an adverse impact on environmental sustainability. According to economic theories of sustainability, economic growth and the increased inflows of FDI can aggravate the existing unsustainable patterns of development unless matched by regulation (Mabey & McNally, 1998). Recognizing this, in order to maximize the net benefits from FDI inflows and promote environmental sustainability, Ethiopia has enacted the Environmental Impact Assessment (EIA) proclamation in 2000. According to this proclamation, it is vital to conduct environmental impact assessment of investment projects to identify their potential harms to the environment. Furthermore, Ethiopia has adopted the Climate Resilient Green Economy (CRGE) strategy which aims to attain a carbon free economic growth in which the industrial sectors are identified as a key target in mitigating emissions. By following strict environmental regulations and standards, Ethiopia can take advantage of the emerging global consensus that greening industry is an important pathway to achieving sustainable development to pursue FDI to comply with the environmental standards in which the green production and environmental performance is considered as a source of competitive advantage G/Eyesus et al. (2017).

The link between economic growth and foreign direct investment is complicated and continuing efforts to understand the relationship are yielding different results. Some studies have found a positive relationship (Chukwuka & Stella, 2012; Mohammed & Abadi, 2011); and some others have found a negative relationship at all Hodrab et al. (2016).

In this context, since 1992, Ethiopia has adopted an approach in which FDI is a major component of its development plan. Therefore, a number of steps have been taken to further attract interest in FDI. After the inflow of FDI into Ethiopia, many researchers have attempted to study the impact of FDI on economic growth, and come up with varying results.

The study conducted by Wondoson, (2011) has confirmed the existence of negative impact of FDI on economic growth for the period 1993–2005. Even if the study attempts to examine the impact of FDI on growth, it has a limitation that there is no appropriate test of stationarity and cointegration taken to avoid statistical problems. Admas (2009) has analyzed the impact of foreign direct investment (FDI) and domestic investment (DI) on economic growth in Sub-Saharan Africa for the period 1990–2003 and found a negative impact of FDI in the earlier period and positive impact on the later periods for Ethiopia. However the study doesn't provide an economic justification for the reason why the effect of FDI was initially negative and later become positive. Meskerem (2014) tried to examine the relationship between economic growth and foreign direct investment in Ethiopia using Ordinary Least Square (OLS) method for the period 1974–2011. The study employed human capital, trade openness, and gross fixed capital formation as additional explanatory variables. The result of the analysis indicated that foreign direct investment has positive and statistically significant impact on growth. However, since the study has employed OLS method the direction of causality between the variables of interest is not clearly investigated.

In general, although FDI is influencing the economy of developing countries like Ethiopia very little emphasis were given to explore its direct and indirect impacts on economic growth. As stated above these studies have their own knowledge and methodology gaps and also there is no consistence in the findings of the results of the study. This study is different from the previous studies in the sense that it attempts to describe and investigate the impacts of foreign direct investment on economic growth by identifying the direction of causality between FDI and economic growth by employing a Toda-Yamamato causality test and adds to the existing literature by providing awareness about the extent to which FDI will pose an impact on economic growth of Ethiopia.

# 2. Literature review

# 2.1. Theoretical literature review

# 2.1.1. Definition and concepts of economic growth

Economic growth can be defined as positive changes in the level of goods and services produced by a country over a given period of time. An important characteristic of economic growth is that it is not the same or the same in all sectors of the economy. Economic growth is measured as an increase in a country's gross product or real gross domestic product (GDP) or gross national product (GNP). A country's gross domestic product (GDP) is the total value of all final goods and services produced in a country in a given period of time. Thus, an increase in GDP is an increase in a country's production (Agarwal, 2017). Economic growth is influenced by direct factors such as human resources, the quality of natural resources, increases in employed capital, or technological advances. It is also affected by indirect factors such as institutions, the size of aggregate demand, savings and investment rates, the effectiveness of budget and fiscal policies, and labor and capital mobility. The four main drivers of economic growth are human resources, natural resources,

capital accumulation and technology, but the importance that researchers attach to each determinant has always been different (Teodor & Constantinescu, 2015).

## 2.1.2. Definition and concepts of foreign direct investment

Foreign direct investment (FDI) is an investment that reflects a long-term interest and ownership in a company in another economy by a foreign direct investor based in one economy (foreign affiliate). Capital contributed by a foreign direct investor to a foreign affiliate or capital received by a foreign direct investor from a foreign affiliate are both considered FDI inflows. From the standpoint of the other economy, FDI outflows are the same as FDI inflows. FDI flows are reported as net, that is, as credits minus debits. As a result, FDI may be negative in circumstances of reverse investment or disinvestment. The value of capital and reserves attributable to a non-resident parent company, including the net indebtedness of foreign affiliates to the parent company, is referred to as FDI stock (UNCTAD, 2019).

FDI allows for the establishment of direct, stable, and long-term ties between economies. It can be a crucial opportunity for local enterprise development in the correct policy environment, and it can also assist the recipient and investing economies enhance their competitiveness. FDI can promote the transfer of technology and know-how between economies. It also allows the host economy to promote its products on a larger scale in overseas markets. FDI is an essential source of capital for a variety of host and home economies, and have a positive impact on the development of international trade (OECD, 2008).

#### 2.1.3. Foreign direct investment theories

There are distinctive theories of FDI like Vernon's Product Life cycle Theory, the Internalization Theory, Neoclassical Theory and the export concept.

Vernon's Product Cycle concept shows that, corporations adopt FDI at unique tiers within-side the existence cycle of merchandise they have got innovated. It offers greater emphasis to invention, the consequences of scale economies, and the jobs of lack of awareness and uncertainty in influencing exchange patterns. Vernon, (1966) cited by Denisia, (2010) shows that there is an enormous gap between the knowledge of scientific principles and the application of these principles in the generation of new marketable products. The essence of the theory is the assumption that diffusion of new technology occurs gradually enough to create temporary differences between countries in available production technology. Vernon's hypothesis is applicable only to innovation in certain kinds of products, namely to those associated with high income and those who are able to substitute capital for labor. Therefore, the relation between external FDI and trade is a function of the nature of the product and the growth status of a divergent location and ownership advantages supporting FDI.

The internationalization concept is the alternative FDI concept which become evolved through efforts of Buckley and Casson, (1976), Rugman (1981), and Hennart, (1982) cited by Verbeke, (2008). The concept states that at firm-stage multinational groups will exert proprietary manipulate over an intangible, know-how-primarily based totally, and firm-particular benefit which might be constructed primarily based totally on efficiency. The theory states that the tendency of firms to invest in a foreign country relies on cost benefit analysis of particular factors in both its home country and the receiving country. For this theory the decision to invest in a country not only depend on the expected returns, but also on country specific factors like barriers to entry, political stability, cost of capital and production, economies of scale and demand for products.

The different outstanding theories are the Neoclassical and the export concept of foreign direct investment. The Neoclassical concept states that the destiny investment flows are immediately related to the package deal of incentives, which have an effect on the predicted price of return; the safety of the investments; the scope and velocity with which businesses are capable of disinvesting. FDI influences economic growth by increasing the amount of per capital income. It affects the long-run growth through investment on research and development and human capital. Through technology transfer to their affiliates and technological spillovers to unaffiliated firms in the host economy, Multinational Corporations (MNCs) can speed up the development of new intermediate product varieties, raise product quality, facilitate international collaboration on R&D, and introduce new forms of human capital. The tax regime, investments code or guidelines and universal macroeconomic regulations are all factors affecting FDI (Cockcro & Ridde, 1991).

Export concept however argues that, nations want to export items and offerings for you to generate earnings to finance imports which cannot be produced domestically. The export theory can be classified under the neoclassical growth models and suggests that export performance has a stimulating effect to a country's economy especially in form of technology spillovers through foreign direct investments in the form of MNCs.

The theories of FDI discussed in these research show the multifaceted contribution of FDI to economic growth of the host country. FDI contributes directly and indirectly to economic growth, and that the host country's growth may attract more FDI. FDI can bolster the economy of the host country through increased capital formation and technological diffusion. However, its impact depends on the host country's conditions, such as the level of technology diffusion, education and competency, the economic, political, social and cultural conditions (Mahembe & Odhiambo, 2014). Foreign Direct Investment (FDI) has the potential to impact economic development in a host economy far more efficiently than domestic industry alone. The value of FDI to a developing country goes far beyond the value of the capital investment and jobs created. It can complement domestic saving, increase a country's exports and improve the current account balance, and results in the improvement of managerial skills (Killen & Ghimire, 2016).

In general, the theories from the literature review indicates the significance of foreign direct investment in influencing the home country's economic growth through the transfer of technology, increasing domestic saving, skill and knowledge creation, and efficient use of domestic resources which leads to an increase in productivity further.

#### 2.2. Empirical literature review

In the previous sections the theoretical review of the relationship between economic growth and foreign direct investment was discussed and this part deals with the discussion of some of the empirical foundations that suggest how growth and FDI are related to each other.

Using the time series data over the period 1994–2003 (Ek, 2007) have analyzed the impact of foreign direct investment on GDP in 30 different regions in China. Based on the empirical results, it was discovered that FDI has no statistically significant impact on growth in China when including the poorest regions in the western area.

By using FDI and GDP inflow data series (Mwangi, 2014) explored the impact of foreign direct investment on the Kenyan economy from 2004 to 2013. The researcher has employed different types of Statistical Packages, inferential analysis, descriptive analyses, Correlation analysis and trend to establish relationships between the variables and have founded a positive impact of FDI on the economy of Kenya.

For the period 1995–2011, Hodrab et al., (2015) examined the impact of foreign direct investment on Palestinian's economic growth. Least square method has been adopted to test the impact of FDI on GDP of Palestine. The results show that FDI has negative impact on Palestinian's economic growth.

By collecting an empirical data for Central and Eastern European Countries for the period 2005–2016 and employing least square panel method Ioan et al., (2020) have tried to investigate the effects of imports, exports, financial direct investment inflow and financial direct investment

outflow on sustainable economic growth measured by several macroeconomic indicators like (gross domestic product, gross domestic savings, gross domestic capital). According to the findings from the study, imports and financial direct investment inflow have positive influence on the economic growth of Central and Eastern European Countries. Financial direct investment will pose a positive impact on growth by contributing to increased value added of products manufactured in these countries by creating new jobs and granting fiscal facilities to companies investing in these regions.

Joshua et al. (2021) have collected an empirical data for Sub-Saharan African countries for the period 1990 to 2018 and employed an Autoregressive Distributed Lag (ARDL) model. The findings from the study reveal a positive and significant impact of FDI, external debt and Official development assistance (foreign aid) on economic growth as confirmed by all estimation techniques (Pooled OLS, Fixed Effects, Random Effects, and System GMM) used in the study. While exchange rates exhibit a negative and significant influence on growth with the Pooled OLS estimator, their impact is positive and significant when included in the FE, RE, and GMM models. The effect of trade openness on growth in this study is mixed. While openness exhibits a negative and significant influence on economic growth in the POLS estimation, it appears to have a positive and significant influence when included in the other three estimation techniques.

Having discussed the literature regarding the impact of FDI on economic growth in both developed and developing countries, we now move to the discussion of some of the researches which were conducted by the scholars in Ethiopia to have a deep understanding of how FDI affects growth.

To examine the impact of foreign direct investment on economic growth of Ethiopia Dejene, (2015) has collected a yearly time series data for the period 1974–2013. Additional explanatory like gross domestic saving, trade, government consumption and inflation were also incorporated in the model for analysis. The researcher have employed a vector autoregressive model and found a positive and a stable long-run relationship between foreign direct investment and economic growth.

Using a time series data collected for the period 1974 –2014 Mulatie, (2017) employed the simultaneous equation econometric model and 3 Stage Least Square estimation technique; and found a positive and statistically significant impact of FDI on economic growth in Ethiopia.

By collecting an annual time series data for the periods of 1982 to 2018 and employing Ordinary Least square (OLS) method approach Urgessa, (2020) has tried to examine the impact of foreign direct investment on economic growth in Ethiopia. The researcher has also incorporated other explanatory variables such as gross capital formation, gross domestic saving and infrastructural level. According to the findings of the study, foreign direct investment, gross capital formation, gross domestic saving and infrastructural level have positive and significant impact on economic growth.

To sum up, many of the studies which were conducted in different countries show the existence of mixed results (positive, negative and no impact) of foreign direct investment on economic growth.

To the best of the knowledge of the researcher, some of the studies which were undertaken in Ethiopia have not conducted a Toda-Yamamoto causality test and have also used a preliberalization data which contradicts with the existing reality related to the formal inflows of FDI in Ethiopia as part of a development plan. Therefore, relying on the previous studies, this study tries to further assess and examine the impact of FDI on economic growth in Ethiopia. Depending on the literature review, the underlying macroeconomic variables like foreign direct investment, human capital, gross capital formation, trade Openness and national Savings used for this study are expected to have a positive impact on economic growth of Ethiopia.

# Figure 1. Channels from FDI to economic growth.

Source: Own construction based on the theories from literature review.



# 2.3. Conceptual framework of the study

Capital accumulation is often referred to as the accumulation of valuables, wealth accumulation, or wealth creation. Conventional wisdom posits capital formation as a prerequisite for economic growth and development. This study focuses on the impact of FDI on growth in a host country and based on the existing literature, a multiple channel between FDI and economic growth is shown in Figure 1.

Figure 1 shows the FDI-growth nexus. An increase in the degree of trade openness would lead to an increase in the inflow of foreign direct investment, which in turn results in the formation of the physical capital stock (facilitation of an investment on domestic asset). In addition to these, the inflow of FDI will result in an increase in the stock of human capital; through technology transfer, skill improvement and know-how which helps the output to grow as fast as possible. In short, if the spillover effects are fixed, an increase in the inflow of FDI can lead to an increase in economic growth through an amusement of the domestic asset.

# 3. Materials and methods

# 3.1. Data source and methods of data analysis

To conduct the study, the researcher has relied on annual time series data collected from various secondary sources. Data for real GDP per capital, trade openness, domestic savings rate and gross capital formation were obtained from the National Bank of Ethiopia, while the data for foreign direct investment and human capital were obtained from World Bank Development Indicators (WDI) database. The data collected from the secondary sources were systematically analyzed by using Eviews 9 and Stata 13 Software.

# 3.2. Research design

The method used in this study was a time series study design with both descriptive and inferential statistics which show the patterns of changes overtime and help to establish the direction of causal relationships between the variables. Time series design enables to make precise comparison of treatments in terms of age or time-related changes (Cook & Ware, 2018).

# 3.3. Description of the variables, their computation and expected signs

The dependent variable employed for this study is real GDP per capita which is a measure of the total output of the country. This variable is computed as the ratio of GDP to the total population.

Explanatory variables and their expected sign

# 3.3.1. Human Capital (HC)

Due to the fact that human capital is multifaceted and includes a complex set of human attributes, the stock of human capital held by individuals is hard to measure with accuracy in quantitative form. However, for the purpose of this study secondary school enrollment is used as a proxy. School enrollment is the ratio which measures the number of students enrolled at a grade level relative to the total population of corresponding age group. This variable is expected to influence economic growth positively.

# 3.3.2. Foreign Direct Investment (FDI)

World Bank (WB) defines FDI as the net inflows of investment to acquire a lasting management interest (10 percent or more of voting stock) in an enterprise operating in an economy other than that of the investor. This variable is measured in terms of million dollars net inflows as a percentage of GDP. It frequently measures the amount of resource inflow and expected to influence economic growth positively.

# 3.3.3. Trade Openness (TO)

The trade openness is frequently used to measure the importance of international transaction relative to domestic transaction. This indicator is calculated as the simple average (i.e. the mean) of total trade (i.e. the sum of exports and imports of goods and services) relative to GDP. Trade openness is expected to have a positive impact on economic growth of Ethiopia.

# 3.3.4. National Saving (NS)

Refers to the total saving in the economy from households, business and the government. In the other words it is the total amount of money putted either in banks or other asset as a portfolio. This variable is measured in terms of Ethiopian birr. The expected sign of this variable with respect to real GDP is positive.

# 3.3.5. Gross Capital Formation (GCF)

Statistically measures the value of acquisitions of new or existing fixed assets by the business sector, government and "pure" households (excluding their unincorporated enterprises) less disposals of fixed asset. It is a component of expenditure on gross domestic product, and thus shows something about how much of the new value added in the economy is invested rather than consumed. This variable is measured in terms of the amount of money invested in tangible asset and expected to have a positive impact on output growth.

# 3.4. Estimation strategy

For the purpose of estimating the model, six separate econometric tests were undertaken.

First, the test of stationarity of the individual series in the regression model was undertaken to determine the order of integration of the variables and the Augmented Dicky Fuller (ADF) test is used for checking the stationarity of the variables included in the model and the test equation can be given as follows:

$$\Delta Yt = \alpha + \delta t + \lambda Yt - 1 + B1 \Delta Yt - 1 + \ldots + Bj - i\Delta Yt - j + 1 + \mu t$$
(1)

Where  $\alpha$  is a constant term,  $\delta$  is the coefficient of the time trend, j is the optimal lag length,  $\Delta$  is the difference operator, t represents the time trend and  $\mu$  represents the Gaussian white noise. The test for stationarity is carried out under the null hypothesis  $\lambda = 0$  as against the alternative hypothesis  $\lambda < 0$ . After computation of the test statistic, it is then compared with the critical values. Therefore, if the test statistics is larger than the critical value, then the null hypothesis of  $\lambda = 0$  is rejected implying that there is an absence of unit root (stationarity) problem. Similarly, the acceptance of the null hypothesis implies that the series has a unit root and hence non stationary.

In this case the test statistics is less than the critical values. If data is not stationary at level we take first difference, second difference and so on until it becomes stationary (Gujarati, 2004).

Second, the Autoregressive Distributed Lag (ARDL) bound approach to cointegration was undertaken to identify if a model empirically exhibits a meaningful long run relationship or not. For this purpose the ARDL bound approach to cointegration test is conducted. Cointegration methods like Johansson & Juselious can only applied to variables in differenced form and when there are multiple cointegrating vectors. However, when one cointegrating vector exists, and the variables are integrated of different orders I(0), I(1) or both ARDL bound approach to cointegration can be applied (Pesaran et al., 2001). The general version of the ARDL bound test modeling requires the construction of the following unrestricted error correction model:

$$\Delta X = \alpha_0 + \sum_{i=1}^{k} \beta' \Delta X_{t-1} + \sum_{i=0}^{k} \mu' \Delta Z_{t-1} + \gamma_1 X_{t-1} + \gamma_2' Z_{t-1} + U_t$$
(2)

Where  $\Delta$  represents the first difference operator,  $X_t$  vector of dependent variables,  $Z_t$  vector of k determinants of  $X_t$  and  $U_t$  refers to residual error term which is assumed to be white noise error, with zero mean and constant variance.

The ARDL bound approach to cointegration involves testing the presence of long run relationship among the variables. In this approach long run and short run parameters of the model are estimated simultaneously and the ARDL formulation can be written as follows:

$$\Delta \text{InRGDP}_{t} = \beta_{0} + \sum_{i=1}^{n} \beta_{1t} \Delta \text{InRGDPt}_{-1} + \sum_{i=1}^{k} \beta_{2t} \Delta \text{InHC}_{t-1} + \sum_{i=1}^{k} \beta_{3t} \Delta \text{InFDI}_{t-1} + \sum_{i=1}^{k} \beta_{4t} \Delta \text{InTO}_{t-1} + \sum_{i=1}^{k} \beta_{5t} \Delta \text{InNS}_{t-1} + \sum_{i=1}^{k} \beta_{6t} \Delta \text{InGCF}_{t-1} + \alpha_{1} \text{InRGDP}_{t-1} + \alpha_{2} \text{InHC}_{t-1} + \alpha_{3} \text{InFDI}_{t-1} + \alpha_{4} \text{InTO}_{t-1} + \alpha_{5} \text{InNS}_{t-1} + \alpha_{6} \text{InGCF}_{t-1} + \mathbf{e}_{t}$$

$$(3)$$

In equation (3.3)  $\beta_1$ ,  $\beta_2$ ,  $\beta_3$ ,  $\beta_4$ ,  $\beta_5$ , and  $\beta_6$  represents the coefficients of the short run dynamics, whereas  $\alpha_1$ ,  $\alpha_2$ ,  $\alpha_3$ ,  $\alpha_4$ ,  $\alpha_5$ , and  $\alpha_6$  coefficients show the long run relationship between the variables in the model. The null hypothesis that the coefficients of the lag level variables are zero is to be tested against the alternative hypothesis that the lag level variables are non-zero. The rejection or acceptance of the null hypothesis is based on the whether or not the Pasaran F-statistic critical values fall above or below the upper and lower critical value bounds. If the computed F-statistic exceeds the upper bound of the critical value band denoted by I(1) in the cointegration test table, the null hypothesis can be rejected and then there exists evidence of cointegration, and if the computed F-statistic falls below the lower bound of the critical value band denoted by I(0) the null hypothesis cannot be rejected, then there is no cointegration. If the computed statistic falls within the critical value band, the result of the inference is inconclusive and depends on whether the underlying variables are I(0) or I(1). It is at this stage in the analysis that the researcher may have to carry out unit rot tests on the variables (Pesaran et al., 2001).

Third, the long-run linear log-log regression model which shows the linear relationship between the dependent and independent variables was estimated. The basis of this model is the application of the extended Cobb-Douglas production function applied by Mwangi, (2014). The model takes the form of:

Real GDP Per capital = f (HC, GCF, FDI, TO, NS), where: HC = Human Capital, GCF = Gross Capital Formation, FDI = Foreign Direct Investment, TO = Trade Openness and NS = National Saving.

Mathematically, a long-run linear log-log model showing the relationship between the dependent and independent variables can be represented using the following version of the ARDL model:

$$lnRGDP_{t} = \alpha_{0} + \sum_{i=1}^{n} \alpha_{1} lnRGDP_{t-1} + \sum_{i=1}^{k} \alpha_{2} lnHC_{t-1} + \sum_{i=1}^{k} \alpha_{3} lnFDI_{t-1} + \sum_{i=1}^{k} \alpha_{4} lnTO_{t-1} + \sum_{i=1}^{k} \alpha_{5} lnNSt_{-1} + \sum_{i=1}^{k} \alpha_{6} lnGCF_{t-1} + u_{t},$$
(4)

Fourth, Diagnostic tests were performed to confirm that there were no problems with the stable long-term equilibrium relationship between the variables in the model.

Fifth, a Toda-Yamamato causality test was performed to know the direction of the causal relationship between FDI and economic growth.

One of the most important causality tests which are commonly used to examine the causal relationship among variables in the short-run is a Granger causality test. The Granger causality test is applicable when the variables are stationary at level or when the variables are nonstationary but cointegrated. Then, the short-run causality can be tested using the joint significance of the coefficients on the first-difference terms and the long-run causality can be tested using the error-correction term. One of the causality test that can be used when the variables are integrated of different order, say I(0), I(1), I(2) or a mixture of all series, is a Toda-Yamamato causality test.

To perform a Toda-Yamamato test it is important to determine the lag length (k) and the maximum order of integration (dmax) of the series. Once these two values have been determined, the Toda-Yamamato test can be performed by constructing Vector Autoregression (VAR) model of (k + dmax) size (Riyath, 2018). The relevant VAR model specified for the purpose of undertaking a Toda-Yamamato causality test can be written as follows:-

$$\ln RGDP_{t} = a_{0} + \sum_{i=1}^{K+dmax} a_{1} \ln RGDPt_{-1} + \sum_{i=1}^{K+dmax} a_{2} \ln FDIt_{-1} + \Theta_{Yt},$$
(5)

$$\ln FDI_{t} = \beta_{0} + \sum_{i=1}^{K+dmax} \beta_{1} \ln FDIt_{-1} + \sum_{i=1}^{K+dmax} \beta_{2} \ln RGDPt_{-1} + \Theta_{xt,}$$
(6)

The null hypothesis of  $a_2 = 0$ , i.e lnFDI doesn't granger cause lnRGDP has to be tested against the alternative hypothesis of  $a_2 \neq 0$  (lnFDI does granger cause lnRGDP for equation 3.5) and  $\beta_2 = 0$  (lnRGDP) doesn't granger cause lnFDI has to be tasted against alternative hypothesis of  $\beta_2 \neq 0$  (lnRGDP does granger cause lnFDI for equation 3.6).

As the final step, a stability (structural break down) test was performed to check whether the model parameters were stable or not.

# 4. Results and discussion

## 4.1. Descriptive analysis

The summaries of descriptive statistics of the variables included in the model for the sample period 1992–2019 are discussed in Table 1. As it was shown in the table, foreign direct investment, human capital, and real gross domestic product per capital have a highest maximum value of 22.11, 15.32 and 14.35 respectively. On the other hand, trade openness, gross capital formation, and national saving have a lowest minimum value of –2.10, 10.27 and 10.31 respectively. The standard deviation which reflects the deviation of the values from the mean shows that the

| Table 1. Summary statistics of the variables |           |           |           |          |  |
|--|-----------|-----------|-----------|----------|--|
| Variables                                    | Mean      | Std. Dev. | Min       | Max      |  |
| InRGDP                                       | 12.69382  | 0.7576236 | 11.84519  | 14.35655 |  |
| InHC   | 14.29484  | 0.7216443 | 13.05658  | 15.32736 |  |
| lnFDI  | 19.06857  | 2.226936  | 12.04355  | 22.11384 |  |
| lnTO   | -1.044668 | 0.3558224 | -2.100311 | 6722369  |  |
| lnNS   | 11.39475  | 0.891915  | 10.31451  | 13.28825 |  |
| lnGCF  | 11.47618  | 0.9476869 | 10.27598  | 13.39959 |  |

Source: Authors Own Computation by Stata 13.

| ומחוב ל. טווור נסטר ובא  |                        |                           |                     |                 |                     |                      |
|--------------------------|------------------------|---------------------------|---------------------|-----------------|---------------------|----------------------|
| Variables                |                        | ADF t- statistic at level |                     | ADF t-statistic | at first difference |                      |
|                          | Intercept              | Intercept and trend       | None                | Intercept       | Intercept and trend | Order of integration |
| InRGDP                   | 0.974201               | -1.675251                 | 3.301148*           | -3.883865**     | -4.292849*          | I(1)                 |
| InHC                     | -1.148685              | -2.555608                 | 1.364776            | -9.417479*      | -4.258294**         | I(1)                 |
| InFDI                    | -8.146303*             | -2.866327                 | 0.613227            | -4.959993*      | -4.766522*          | I(0)                 |
| InTO                     | -3.355176**            | -2.660920                 | -2.868928*          | -0.941526       | 0.859917            | I(0)                 |
| InNS                     | 2.270050               | -0.674852                 | 4.697563*           | -3.737222**     | -5.027056*          | I(1)                 |
| InGCF                    | 2.642224               | -0.815056                 | 3.427785*           | -4.175720*      | -3.787901***        | I(1)                 |
|                          | <b>Critical Values</b> | Intercept                 | Intercept and trend | None            |                     |                      |
|                          | 1%                     | -3.886751                 | -4.616209           | -2.708094       |                     |                      |
|                          | 5%                     | -3.052169                 | -3.710482           | -1.962813       |                     |                      |
|                          | 10%                    | -2.666593                 | -3.297799           | -1.606129       |                     |                      |
| Source: Authors Own Comp | utation by Eviews 9.   |                           |                     |                 |                     |                      |

source: Authors Own Computation by Eviews 9. Note: \*, \*\*, \*\*\* Shows that the variables are significant at 1%, 5% and 10% respectively.

Wondimu, Cogent Economics & Finance (2023), 11: 2281176 https://doi.org/10.1080/23322039.2023.2281176 variables with the highest deviation was foreign direct investment with a value of about 2.22 and the lowest deviation is observed in trade openness with a value of 0.35.

# 4.2. Stationarity test results

While using a time series data it is important to perform stationarity test, because it enables to determine and avoid the existence of spurious regressions in the model. The results of the ADF test statistics are shown in Table 2.

As it was shown in Table 2, out of the six variables for which the Stationarity test was performed, four of them, namely InRGDP, InHC, InNS and InGCF were stationary after the first difference. On the other hand, the Stationarity test for the other two variables, InFDI and InTO, shows that the variables are stationary at the level. Since none of the variables included in the model are integrated of order two or I (2) it is possible to apply Autoregressive Distributed Lag model.

# 4.3. Cointegration test results

To verify that there is a long-run relationship between the variables underlying the ARDL model, it is plausible to run the bound cointegration test. This test was developed by Pesaran et al., (2001) and can be applied to variables whose order of integration is I (0), I (1), or both.

According to the results of the bound cointegration test depicted in Table 3, since the critical value of the Pesarian F statistics of 4.43 is greater than the critical value of the Pesarian upper limit I(1) of 3 at 1% level of statistical significance, the null hypothesis of no cointegration is rejected and the existence of a long-run relationship between the variables included in the model is determined.

# 4.4. The ARDL model and the long-run coefficients

Once the existence of the long-run relationship between variables is checked, the next issue is to estimate the long-run coefficient of the ARDL model. In all regression analysis, the value of the unknown dependent variable is predicted from the known values of the independent variables.

The results from model selection by the method of Akaike information criterion (AIC) shows that, model (1, 1, 1, 0, 1, 0) is the best ARDL model having a maximum of one lag. Following the determination of the lag length, the long-run ARDL model equation can be written as follows:

$$\ln RGDP = 9.33 + 0.36 \ln HC + 0.04 \ln FDI + 0.000447 \ln TO + 0.000003 \ln NS - 0.22 \ln GCF$$
(6)

As it was shown in Table 4, the R-square of the model tells that 99% of the change in real GDP per capital, which is the dependent variable, is explained by all the independent variables included in the model. In addition to the R-squared value, since the F-Statistical probability value of 0.00 is very significant, the model is precise.

| Table 3. ARDL-bound approach to cointegration |       |  |      |      |  |
|---|-------|--|------|------|--|
|   |       | Critical value bounds based on<br>Pasaran et.al values of 2001 |      |      |  |
| Test statistic                                | Value | level of<br>Statistical<br>significance                        | I(0) | I(1) |  |
| F- statistic                                  | 4.43  | 1%   | 2.08 | 3    |  |
|   |       | 5%   | 2.39 | 3.38 |  |
|   |       | 10%  | 2.7  | 3.73 |  |

Source: Authors Own Computation by Eviews 9.

| Table 4. Coefficients of the Long Run Model |             |            |                    |  |  |
|---|-------------|------------|--------------------|--|--|
| Variables                                   | Coefficient | Std. Error | T-Ratio [Prob.]    |  |  |
| InHC  | 0.366857    | 0.146901   | 2.497315 [0.0412*] |  |  |
| InFDI                                       | 0.042997    | 0.018105   | 2.374879 [0.0493*] |  |  |
| InTO  | 0.000447    | 0.000556   | 0.805428 [0.4471]  |  |  |
| InNS  | 0.000003    | 0.000001   | 2.577137 [0.0366*] |  |  |
| InGCF                                       | -0.222819   | 0.376779   | -0.591377 [0.5729] |  |  |
| С   | 9.330938    | 3.003076   | 3.107127 [0.0172*] |  |  |

R-squared = 0.9942, Adjusted R-squared = 0.9986, Prob (F-statistic) = 0.0000.

Source: Authors Own Computation by Eviews 9.

Note: \*, indicates that the probability values of the coefficients in parentheses are significant at the 5% level of significance.

Coming to the explanation of the impact of independent variables on the dependent variable, Human capital development measured by secondary school enrollment rate is found to have a positive and significant impact on economic growth as expected. A 1% increase in human capital will result in a 36.66% increase in GDP, other things being equal. This is similar to the finding of Hassen & Anis, (2012), in which national education policies contribute to improving skills and know-how to reduce the indirect impact of FDI on the local socio-economic condition of the host country.

Foreign direct investment turns out to have a positive and significant impact on economic growth as expected. Keeping other things constant, a 1% increase in foreign direct investment will lead to a 4.29% increase in economic growth. There are also other empirical studies showing a positive relationship between FDI and growth. Ilhan (2007) conducted more than 50 empirical investigations on the relationship between FDI and economic growth, and 40 of these studies showed a positive correlation with only 2 reporting negative and the rest showing no effect. These empirical results show that most FDI leads to the growth of an economy. In addition, a study conducted by Sokang, (2018) in Cambodia also showed a positive impact of FDI on growth.

Even though the magnitude of its influence is not great, National saving is also found to affect economic growth positively in the long run as expected. A one percent increase in national saving affects the growth of Ethiopian economy by 0.0003 percent holding other factors constant. The findings of the study undertaken by Tang and Chau, (2009) on the relationship between savings and growth in Malaysia by using non parametric cointegration test and DOLS method have also found a positive impact of saving on economic growth.

| Table 5. Estimation of the short-run error correction term (ECT) |             |            |                     |  |  |
|--|-------------|------------|---------------------|--|--|
| Variable   | Coefficient | Std. Error | T-Ratio [Prob.]     |  |  |
| Δ(LNHC)  | 0.082823    | 0.028998   | 2.856186 [0.0245]*  |  |  |
| Δ(LNGCF)   | 0.158724    | 0.113470   | 1.398822 [0.2046]   |  |  |
| Δ(LNFDI)   | 0.017662    | 0.007292   | 2.422017 [0.0460]*  |  |  |
| Δ(LNTO)  | -0.000618   | 0.000208   | -2.965858 [0.0209]* |  |  |
| Δ(LNNS)  | 0.000001    | 0.000000   | 3.446486 [0.0107]*  |  |  |
| ETC(-1)  | -0.410768   | 0.117971   | -3.481941 [0.0102]* |  |  |

Source: Authors Own Computation by Eviews 9.

Note: \*, indicates that the probability values of the coefficients in parentheses are significant at 5% level of significance.

## 4.5. Results of short run Model estimation and error correction term

Once the long-run model is well defined and the effects of the independent variables on the dependent variable is clearly explained, the next task is to estimate the short-run coefficients with a short run Error Correction Term (ECT) which shows the short-run dynamics of the model beside the long run adjustment. To confirm an adjustment towards long-run equilibrium, the lagged values of ECT should be negative and statistically significant.

As it was shown in Table 5, the lagged value of ECT is negative and statistically significant. The magnitude of the error correction term in this model is about 0.4107, which represents an adjustment of about 41.07% deviation from the long-run equilibrium in an economy during each year.

Besides the long-run model, in the short-run, human capital is found to have a positive and statistically significant impact on the Ethiopian economy. A 1% increase in secondary school enrollment rate will result in 8.28% increase in real GDP per capital, all other things being equal.

Foreign direct investment is also found to have a positive and significant impact on economic growth in the short run. When foreign direct investment inflows increase by 1%; economic growth rate will increase by 1.76% holding other factors constant.

Similar to the estimation results of the long-run model, the results of the short-run model show a positive and significant effect of national saving on real GDP per capital growth. Keeping other factors constant, when the domestic savings rate increases by 1%, the economic growth rate increases by 0.0001%.

In the short run trade openness is found to have a negative and statistically significant impact on the economy. When the degree of economic openness increase by 1%; growth rate of real GDP per capital will decrease by 0.06%. This negative impact of trade openness on an economy may result from Ethiopia's trade structure, which is characterized by persistent deficits.

#### 4.6. Model diagnostic test results

Once the long-run and the short-run coefficients are estimated, the next most important step in any model is to undertake the model diagnostic tests on the estimates of the residual of the ECM model. Diagnostic checks are crucial in this analysis, because if there is a problem in the residuals from the estimation of a model, it is an indication that the model is not efficient, such that parameter estimates from the model may be biased. Results from various tests such as the

| Table 6. Diagnostic tests |             |                |  |  |  |
|---------------------------|-------------|----------------|--|--|--|
| Types of tests            | LM –Version | F –Version     |  |  |  |
| Serial Correlation        | [0.2758]    | [0.6631]       |  |  |  |
| Normality                 | [0.1484]    | Not applicable |  |  |  |
| Hetroscedasticity         | [0.7558]    | [0.8953]       |  |  |  |
| Ramsey RESET test         | [0.3515]    | [0.3515]       |  |  |  |

Source: Authors Own Computation by Eviews 9.

| Table 7. Toda-Yamamato causality test  |            |        |            |  |  |
|--|------------|--------|------------|--|--|
| Null hypothesis                        | Chi-Square | Prob.  | Decision   |  |  |
| LNFDI does not Granger<br>Cause LNRGDP | 0.44       | 0.8025 | Not Reject |  |  |
| LNRGDP does not Granger<br>Cause LNFDI | 6.01       | 0.0495 | Reject     |  |  |

Jarque Bera normality test, Breusch Pagan Godfrey serial correlation LM test, the Breusch Pagan Godfrey heteroskedasticity and Ramsey RESET model specification tests undertaken in this study are presented in Table 6.

The analysis results show that the residuals of the error correction model are normally distributed because the values of the series, represented as figures in parentheses, are not significant. The null hypothesis of no serial correlation, as confirmed by the LM test of serial correlation, is not rejected, since the test statistics are insignificant. The test also confirmed the absence of Hetroscedasticity using the Breusch Pagan Godfrey (BPG) Hetroscedasticity test. The Ramsey RESET test also shows that there are no specification errors in the model, because the null hypothesis that says there is no omitted variable in the model is not rejected. From the diagnostic tests undertaken, it can be easily understood that there is no diagnostic problems in the model and hence the model is a nicely fitted one.

# 4.7. Toda-yamamato causality test results

To determine the direction of the causality between FDI and economic growth, a Toda-Yamamato causality test was performed. The empirical result obtained from the test shows the existence of unidirectional causality running from economic growth to foreign direct investment.

According to the information obtained from the modified WALD test depicted in table 7, the estimates follow the chi-square distribution with 2 degrees of freedom with appropriate lag length and the corresponding probability. Since the null hypothesis of LNFDI doesn't Granger cause LNRGDP is not rejected and the null hypothesis of LNRGDP doesn't Granger cause LNFDI is rejected at the 5% level of significance, it is possible to conclude that increasing economic growth leads to more Foreign Direct investment inflows into Ethiopia. The findings of this study are similar to that of Shettima & Saleh, (2017), which indicates a one-way causal relationship running from economic growth (measured by GDP at current base prices) to FDI in Nigeria. Therefore, by depending on the domestic resource base and devising a sound economic policy like an increase in the degree of trade openness, the economy of Ethiopia can grow rapidly to create an enabling environment for more FDI inflows.

#### 4.8. Stability (structural breakdown) test results

In order to ensure the stability of the model, Cumulative Sum (CUSUM) and CUSUM of squares structural breakdown tests for the long-run relationship equation were conducted and it was





Figure 3. CUSUM of squares test.



observed that there is no structural break in the model. Since the cumulative sum and the cumulative squares of the residuals lie between the two critical lines as shown in Figures 2 and 3), respectively, the parameters of the model are stable.

# 5. Conclusion and policy recommendations

# 5.1. Conclusion

This study was conducted to investigate the impact of foreign direct investment on Ethiopia's economic growth using the Autoregressive Distributed Lag (ARDL) econometric model. For the purpose of studying the impact of foreign direct investment on economic growth; a time series data for macroeconomic variables like gross capital formation, national savings, human capital, foreign direct investment, real GDP per capital, and trade openness were collected for the period 1992–2019 from National Bank of Ethiopia and World Development Indicators database. Moreover, a Toda-Yamamato causality test was undertaken to determine the direction of the causality between economic growth and foreign direct investment.

The results of the study show that human capital measured by secondary school enrollment, inflows of foreign direct investment measured in terms of US billion dollars, and domestic savings measured in terms of Ethiopian birr are found to have a positive and significant impact on economic growth of Ethiopia both in the short and long run. Degree of trade openness, which is measured as the ratio of exports plus imports to GDP, has a significant negative impact on Ethiopia's economic growth in the short run. The results of the causality test also show that there is a one-way causality that runs from economic growth to foreign direct investment.

The positive impact of FDI on economic growth for the sample period (1992–2019) considered for an investigation shows that, the economy of Ethiopia have benefited a lot and could even continue to show a high prospect for future advancement by creating a conducive environment for the inflows of large amounts of foreign direct investment that utilize domestic resources to increase competitiveness in international trade through promoting exports.

# 5.2. Policy recommendations

Depending on the result of the study which shows a positive impact of foreign direct investment on economic growth many policy implications are drawn. In order to maximize the net benefit resulting from the inflows of foreign direct investment and enhance economic growth, the

government has to increase the level of human capital investment for reducing the spillover effects of technology associated with FDI inflows. In addition to this a focus should be also given to increasing degree of trade openness for engaging in mutually beneficial trade arrangements. This is because the more open an economy is, the more there is FDI inflows which speed up the growth of an economy. An emphasis should be also given to the expansion of infrastructural facilities, so that there is a free movement of the investors to the remote and marginalized areas to further expand investment activities that result in higher economic growth. Policy makers should also give a due attention to mobilize domestic resources for raising the saving rate and increasing the formation of human capital stock to increase the gain from foreign direct investments.

# 5.3. Suggestions for further research

This study is not without limitations, as the objective of this study is only limited to the investigation of the impact of foreign direct investment on economic growth, future studies may consider the impact of foreign direct investment on domestic investment, and economic growth. In addition to this, interested researchers can also deeply investigate the impact of FDI on environmental quality by giving a due attention to both micro and macro level factors.

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#### Supplemental data

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