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# RESEARCH ARTICLE

## FACTORS AFFECTING FOREIGN DIRECT INVESTMENT INFLOWS: AN EMPIRICAL INVESTIGATION IN ETHIOPIA

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## ABSTRACT

This study aims to find out potential macroeconomic causal factors of FDI flows into Ethiopia quantitatively to signalize analytical and policy arguments. Annual time series data on our dependent variable FDI inflows, and control variables: exchange rate, inflation rate, access to electricity, trade, control of corruption, and GDP growth, over the years, 1992 to 2016 are used. Appropriate functional form are established and variables are analyzed using Unit root test, Co-integration and Vector Error Correction Model (VECM) and checked for validity of the estimate using OLS and estimates of first difference. Unit root tests revealed that, variables are non stationary at level and stationary at first difference. Also Johansen's test found that variables are cointegrated. We found significant and negative relationships between our dependent variable, and exchange rate in Ethiopia, and also a significant and positive relationship existed between inflation rate and FDI inflows. The coefficient of lagged error correction term was found significantly negative (-0.8993499), indicates that variables are adjusting to long-run equilibrium at an incredible speed of about 89.93 per cent per annum representing the existence of long-run relationship amongst variables. The negative relationship of exchange rate insights that depreciation of the local currency would attract greater FDI flows into the country. These findings insight that trade with the rest of the world, creating stable macroeconomic conditions, major improvements in transport services, as well as anti-corruption surges are essential to attract FDI flows into Ethiopia. The study recommends among others, that government should revise, formulate and implement policies that would increase trade facilitation, should keep in mind while devaluating the national currency (depreciation without exporting more becomes a burden to the economy of a country) to attract more FDIs.

***Keywords:*** Determinants, Ethiopia, Foreign Direct Investment, VECM.

## INTRODUCTION

One of the major objectives of governments all over the world is to launch and implement policies which focuses on the improvement of the living standards of their citizen and also ensure economic growth in the short run leading to sustainable development in the long run. The achievement of this objective in developing countries and Sub-Saharan Africa (SSA) countries like Ethiopia has been challenged by low levels of domestic capital formation. This could be the essence for the need for bridging the prevailing gap from abroad. One channel through which foreign investments flow into developing countries like Ethiopia is by Foreign Direct Investment (FDI). Thus, the FDI is imperative for economies like Ethiopia to fill the gap between savings and investment. FDI along with financial and non-financial resources bring entrepreneurial, managerial and technological skills. The Ethiopian Government have been trying to attract FDI through implementing various reforms. Some of the policies that were put in place to attract FDI include; the deregulation of the economy in the 1991s, the new industrial policy, and establishment of the Investment Agency in early 1990s. The Ethiopian Investment Agency, bills itself as 'the one-stop-shop for exploring and planning foreign investment and new business in Ethiopia. The Agency's mandate is to facilitate foreign investments and advocate on behalf of foreign investors in the areas of favorable government policies. The Agency helps to create a conducive and friendly investment climate to investors.

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Adefeso *et al.* (2012) stated that the overwhelming importance of FDI inflows to the developing countries has occupied a substantial body of economic literature. Again, it addresses the vicious circle of economic misalignments. According to Ngowi (2001) cited in Adefeso, *et al.* (ibid), FDI creates employment and acts as a means of technology transfer, provides superior skills and management techniques, facilitates local firms' access to international markets and increase product diversity and overall an engine of economic growth and development where its need cannot be over emphasized. Unfortunately, Ethiopia (before 1992) had not enjoyed these benefits because of the inflexibility of the regime which had resulted the declining and fluctuating foreign investment inflows. Ethiopia alone cannot provide all the needed domestic funds to invest in all the sectors of the economy, to make it one of the largest and fastest growing economies in the world by 2020. In a simple world of two factor economy (labor and capital), it is a known fact that developing economies like Ethiopia have abundant manpower but scarce capital due to shortage of domestic savings mobilization which places limitation on capital formation and economic development. Even when domestically generated capital and manpower are in abundant supply, increased production may be constrained by shortage of foreign input like technologies upon which manufacturing of goods and services in developing economies depend. This makes international capital inflow an important aspect of the efforts by developing countries to minimize their investment versus savings gap. The effects of FDI can be wide ranging since FDI typically encompasses packages of capital as well as technical, managerial and organizational know-how (Getinet and Hirut, 2006). FDI has an increasingly important role in the development of capital deficient developing countries. This is

because, it is not only a stable source of capital inflows, but it also helps in technology transfer and employment generation (Getinet H. and Hirut A., ibid). FDI also provides a viable way for developing countries to increase their savings and achieve economic growth. However, flows of FDI have varied across developing countries. The rapid growth in FDI over the last few decades has initiated a large body of empirical literatures to examine the determinants and the growth enhancing effects of FDI in cross country as well as country specifically. In the process of attracting FDI, most of the African countries have liberalized their trade practices and attempted to create conducive environment in recent years. Ethiopia, like many other African countries, took some steps towards liberalizing trade and the macroeconomic regime as well as introducing measures focused at improving the FDI regulatory framework.

Ethiopia has been a recipient of FDI overtime but the major determinants and their impacts in the growth of the economy have not been fully well studied with recent data and potential factors affecting the existing inflow of FDI. At the same time even when regarded as a major recipient in Africa, Ethiopia is still with weak manufacturing sector, real sector under development, and over dependent on foreign aid and remittances to cover its budget deficit. The FDI in Ethiopia has not really translated to the growth of the economy and this raises questions to the key determinants during the post liberalization of the economy in the Ethiopian history. Though the study on determinants of FDI is one of the most interesting issues in international economics. There is a very few studies on determinants of FDI flows into Ethiopia. Most of the previous studies on FDI in Ethiopia had lack of detailed studies on FDI in general and determinants of FDI in particular has partially affected the formulation of appropriate policy for promoting FDI in Ethiopia. As for the detailed research in this area little or no study has been conducted other than Getinet H. and Hirut A.'s (2006) research into the determinants of FDI into Ethiopia, Dipti Ranjan (2014) and Amanuel, (2014). Unfortunately, studies conducted have varying results on the determinants of FDI into Ethiopia. And hence, it would be agreed that the factors determining FDI inflows to Ethiopia is yet unclear. The net result of this is that the Ethiopian government has implemented a number of policy reforms so as to attract FDI. Despite these reforms, the perceived and obvious needs for FDI inflows to Ethiopia have remained low compared to other developing Asian countries.

This development is disturbing and sending signals of seemingly little hope of economic growth and development. Thus, calls for academic concern. Moreover, recognizing the current globalization process and the insufficiency of capital at home, the Ethiopian government liberalized several sectors of the economy for foreign investment. Thus during the last 5 years (2010/11-2014/15), real GDP growth rate averaged 10.1 per cent. The Ethiopian Investment Authority has taken the initiatives to mobilize the foreign investment sector. However, the performance of the country in attracting FDI is not encouraging. Thus, it is important to figure out the rationale behind the low performance of the sector. Therefore, this study comes to contribute to an ongoing discussion on the determinants of FDI flows into Ethiopia by utilizing data over the periods 1992 to 2016 there by filling the gap in their research. The findings of this study would be a great deal of interest to investors, the government, the academics, the policy makers, researchers, the general public and also add to the literature by providing new study evidence on the causal factors of FDI flows in the Ethiopian economy.

## REVIEW OF LITERATURES

**Theoretical explanations:** Foreign Direct Investment (FDI) is used as a tool by countries for boosting economies through employment of resources and maximize their benefits. According to the definition of World Bank (1996), FDI is an investment made to acquire a long lasting management interest (normally 10% of voting stock) in a business enterprise operating in a country other than that of the investor. Odozi (1995) observes FDI as the inflow of foreign resources in the form of equity capital, reinvested earnings or net borrowing of firm's parent companies or affiliated subsidiaries. It consists of the transfer of a package of resources including capital, technology, and management and marketing expertise with the purpose of acquiring lasting interest in the management of a firm without necessarily having majority shareholding. Caves (1996), however, observed that the rationale for increased efforts to attract foreign direct investment has several positive effects among which are productivity gains, technology transfer, the introduction of new processes, managerial skills, capital formation, access to markets and international production networks. The theoretical explanations of FDI largely emanated from traditional theories of international trade that are based on the theory of comparative advantage and differences in factors endowments between countries. Multinational companies are attracted to a particular country by the comparative advantage that the country or region provides. To mention a few examples to clarify, multinational companies may establish foreign subsidiaries in one country to take advantage of its lower labor costs or its large market size. Thus, in their basic form, traditional theories of international trade do offer some explanation of FDI. Nonetheless, the traditional trade theories do not provide full answers as to why multinational companies prefer to operate in a foreign country rather than engaging in exporting or licensing, which are alternatives to FDI. This has led to the development of alternative explanations of FDI. The following are some of the main FDI theories which are incorporated to analyze the determinants of FDI flows to Ethiopia.

***Portfolio Theory:*** Investors want to build an efficient portfolio of investment to avoid risk. The rates of return of the different alternative investments are matched with an element of risk in the choice between substitutable assets to build an efficient portfolio. Moreover, the theory of portfolio investment (the neoclassical financial theory of portfolio flows) is one of the earliest explanations of FDI. The basis for this explanation lies in interest rate differentials between countries. Capital, according to this explanation, moves in response to changes in interest rate differentials between countries/regions and multinational companies are simply viewed as arbitrageur of capital from countries where its return is low to countries where it is high. This explanation, however, fails to account for the cross movements of capital between/across countries. In practice, capital moves in both directions between countries. In addition, that capital is only a complementary factor in direct investment and that this theory does not explain why firms go abroad contribute to the criticism of the neoclassical theory of portfolio investment (Harrison *et al.,* 2000).

***The Product Cycle Model:*** The product cycle model, developed by Raymond Vernon in 1966, was a response to the stylized fact that United States (US) firms invested abroad at a rapid rate. Vernon argues that, each product has a life cycle and will go through three phases: innovation, maturity and

standardization. Domestic demand can be an incentive to innovate, while international demand similarity stimulates exports. Specifically, the theory described that US endowment of highly skilled labor, and Research and Development resources, matched with sophisticated domestic demand, facilitated the innovation among US firms. Vernon's product life cycle theory is another explanation of FDI worthy of some discussion. This theory focuses on the role of innovation and economies of scale in determining trade patterns. It states that FDI is a stage in the life cycle of a new product from its invention to maturity. A new product is first manufactured in the home country for the home market. When the home market is saturated, the product is exported to other countries. At later stages, when the new product reaches maturity and loses its uniqueness, competition from similar rival products becomes more intense. At this stage producers would then look for lower cost foreign locations. This theory shows how market seeking and cost reduction motives of companies lead to FDI. It also explains the behaviors of multinational companies and how they take advantage of different countries that are at different levels of development. Additionally, it has been noted that Vernon's theory perceives foreign direct investment as a defensive strategy by firms to protect their existing market position (Dunning, 1993) Knickerbocker (1973), following Vernon's theory, argues that there is follow-the-leader type of defensive FDI especially in industries characterized by oligopoly. His argument relies on uncertainty and risk aversion behavior of oligopolists. This theory suggests that firms go abroad because of oligopolistic reaction which is "an interactive kind of corporate behavior by which rivals in industries composed of a few large firms counter one another's moves by making similar moves themselves" (Knickerbocker, ibid). However, this theory does not explain why FDI is more efficient than exporting or licensing for expanding abroad.

***The Hymer-Kindleberger Hypothesis:*** Hymer's (1976) pioneering study on multinational companies draws attention to the role of multinational companies as global industrial organizations. Hymer's major contribution was to shift attention away from neoclassical financial theory. He argued that the need to exercise control over operation is the main motive for FDI than the mere flow of capital. Capital is used to facilitate the establishment of FDI rather than an end in itself. He states that for firms to engage in cross border activities, they must possess some kind of monopolistic advantages. The advantages result from a foreign company's ownership of patents, know how, managerial skills and so on and these advantages are unavailable to local companies. His argument relies on the existence of market imperfections, such as difficulty of marketing and pricing know how, or in some cases markets may not exist for such products, or if they exist, they may involve huge transaction costs or time-lags. In such cases it would be more efficient for the company to engage in direct investment than exporting or licensing. FDI will allow the companies to control and exploit their monopoly power to the full. Hymer's argument led the way to the development of internalization theory. According to this theory the firms internalize their activities whenever there are inefficiencies in dealing with the external market and FDI would occur when this internalization involves operation across countries (Harrison *et al.,* 2000). This is mainly because foreign firms have necessarily some disadvantages vis-à-vis domestic firms (like knowledge of the market, communication), they must possess some firm-specific advantages if they are to engage in foreign production. Hymer (1960) argues that, FDI is not simply about the transfer of capital, it is about the international transfer of proprietary rights and intangible assets-technology, business techniques, and skill personnel. Hymer (1960) claimed that the existence of FDI is exclusively resulted from international market imperfection for these assets. Therefore, the firms "internalizes or supersedes" these market failures through direct investment (Hymer, 1960).

***The Eclectic or OLI Paradigm and International Investment Path***

Dunning (1979), suggests that a given firm will be engaged in FDI if the following three conditions are satisfied:

- The ownership advantages of a firm: These advantages are firm specific as they are assumed to be exclusive to the firm that owns them. These advantages arise from firms possessing proprietary technology or other unique intangible assets, and the firm's ability to coordinate complementary activities such as manufacturing and distribution. These kinds of advantages give foreign firms more power over their local counterparts.
- Internalization advantages: These advantages refer to the firm's ability to internalize its activities, which can be done through market transactions. Through internalization, the firm can reduce its transaction costs. Moreover, the firm can retain exclusive rights to its assets and it maintains its competitive advantage.
- Location specific advantages: these advantages include host countries natural resource endowments, superior infrastructure, and macroeconomic stability. These location advantages determine the profitability with which the ownership advantage and internalization advantage of the firm should be combined.

From these three advantages if only one is met, then firms will rely on exports, licensing or the sale of patent, to service foreign markets. Thus, the generalized predictions of the eclectic theory are that a firm can only capture a foreign market through FDI if it has the capacity to exploit simultaneously all the three advantages. In Dunning's eclectic theory, the ownership and internalization advantages are firm specific features while the location advantages are country specific characteristics which the host country can influence directly. In general, countries that have location advantages can attract more FDI. But firms do not undertake FDI only for the presence of location specific advantages in the host country. Their location choice decisions consider the profitability with which the ownership and internalization advantage can be combined with the location ones. Dunning (1993) pointed out that the principal objective of firms in undertaking foreign production is to advance their long-term profitability. In addition to the profitability motives, some firms may undertake FDI as part of their corporate strategies. For instance, firms may try to spread or reduce risks, and to match competitors' actions. In general Dunning (1993) identified three possible motives for FDI:

- Market seeking FDI: refers to FDI for the purpose of serving local and regional markets. Host countries' characteristics that can attract market seeking FDI include market size of the host country, per capita income and growth (potential) of the market.
- Resource/asset seeking FDI: refers to FDI for the purpose of acquiring resources which are not available

in the home country. Such resources include natural resources, availability of raw materials, and productivity and availability of skilled and unskilled labor.

- Efficiency seeking FDI: This kind of FDI occurs when the firm can gain from the common governance of geographically dispersed activities, especially in the presence of economics of scale and scope and diversification of risk.

The above three motives of FDI are categorized under economic determinants of FDI. Besides these economic determinants, there are also two other crucial determinants of FDI: host country FDI policy framework and business facilitation.

***Agglomeration Effect:*** Given rapid rate of globalization in the world today and implicit standardization of strategies of MNEs, it is argued that, locational determinants of FDI in host countries are more important factor determining FDI. In addition, UNCTAD (2001) hypothesizes that although traditional factors driving FDI may still be relevant, they are diminishing in importance in the era of globalization, particularly for more dynamic and high-tech industries. Instead, locations of FDI are seen to be increasingly based on the ability of host countries to provide complementary skills, infrastructure, suppliers and institutions (UNCTAD, ibid). Increasing returns in production activities are needed if we want to explain economic agglomerations without appealing to the attributes of physical geography. Externalities from agglomeration are known to encompass specialized labor markets and supplier networks as well as knowledge spillovers.

**Main Determinants of FDI Inflows:** FDI is classified into two types: market oriented and export-oriented FDIs. And in these two categories, there are a lot of factors that determine the inflow of FDI into a particular country. These factors can be classified into micro determinants and macro determinants. Krugell (2005) and Wang and Swain (1997) have explained the micro determinants of FDI as FDI that are mainly concerned with those location specific factors that have an impact on the profitability of FDI at firm's or industry level. The host country characteristics that influence productivity and cost at this micro level include market size and growth, labor costs, tariffs, host government policies and trade barriers. The macro determinants of FDI are the factors that influence profitability and the choice to invest at an economy-wide level (Krugell, ibid). These are the size and growth of the host market, exchange rates and political stability. These factors are referred to as export oriented in nature and it looks at cost competitiveness. Holland *et al.* (2000) reviewed several studies on determinants of FDI and produced evidence of the importance of market size and growth potential as determinants of FDI. Below are the factors that determine the FDI inflows into a country. This is based on the micro and macro-determinants discussed above and other factors discussed individually on the FDI determination in an economy. There are also some factors in common for both types of FDI. Ethiopia is thought to have all these characteristics:

**Market Size** and growth has been said to have positive effect on FDI because it directly affects the expected revenue of the investment (Sun *et al.,* 2002), thus it is one of the important determinants that have been used in empirical studies to explain the inflow of FDI to a host country. It has been observed that host countries with larger market size, faster economic growth and higher degree of economic development will provide more and better opportunities for these industries to exploit their ownership advantages and therefore, will attract more market-oriented FDI. Ethiopia is the most populous country in Africa with a population of about 100 million. FDIs are likely to be attracted by large market size which allows them internalize profits from sales within the host countries.

**Openness to international trade and access to international markets:** Chakrabarti (2001) defines openness totrade as intensity which refers to the ease with which capital can be moved in or out of a country by investors. Since economic liberalization in 1991, Ethiopia has had one of the most open regimes in Africa for foreign investors. Openness to international trade induces FDIs inflow but at the same time, may have negative influence on domestic industry in terms of competition.

**Development of the regulatory framework and economic policy coherence:** Ethiopia has been working hard to improve its reputation abroad, and it has made substantial progress in addressing the issues that have worried outside investors in the past. The country has also formulated and implemented a series of preferential policies to encourage international trade. These policies range from restoring the rule of law, and challenging corruption and gratification.

**Exchange Rate:** Several studies report the effects of changes in the real exchange rate and the terms of trade on investment. Most studies generally found that the variability of the real exchange rate is usually more of a disincentive for investment than is the level (Serven and Solimano, 1993).

**Inflation Rate:** Asiedu (2002) notes that the inflation rate is used as a measure of overall macroeconomic stabilityof a country. A low inflation rate serves as FDI determinants in a country while a high inflation rate can serve as a disincentive on FDI to a country as it increases the user's costs of capital. Inflation reduces private investment by increasing risk, reducing average lending maturities, distorting the informational content of relation prices, and indicating macroeconomic instability.

**Infrastructure:** previous empirical studies have generally focused on the role of host country infrastructures in influencing the FDI inflows. According to Head (2000), in his study, he demonstrated that FDI inflows is attracted to regions with high levels of final demand for the output, but also to region with high densities of manufacturing activities and extensive transportation infrastructure. Ethiopia's infrastructure is still not on the high side. There has been tremendous change in the transportation sector. The availability of adequate infrastructure represents the ease of operations in a location for foreign investors and allows foreign investors to move their production materials and products more easily to designated areas. Infrastructure has low productivity levels and the low return to private investment discourages both domestic and foreign investors. Infrastructure ranges from highways and railroads, telecommunication system to institutional development. Deteriorating infrastructural facility, in particular in the area of telecommunication, transport and power supply, severely hamper the attraction of FDI in labor intensive industries.

## EMPIRICAL STUDIES

There is a vast empirical literatures on FDI that includes developed and developing countries, focusing on various sectors and for different time periods. However, the papers reviewed here focuses solely on developing countries and regions as this is the context of the present study. There is a number of arguments amongst researchers and economists regarding the main determinants of FDI inflow in Africa. Ayanwale (2007) succinctly argued that the role of FDI on growth can either be country specific, and can be positive, negative or insignificant, depending on the economic, institutional and technological conditions in the recipients' countries. Economic growth has been identified as a determinant of FDI flows. It has been argued that growing economies attract more FDI than sluggish ones. This explains why Asian countries like India and China attract more FDI than African countries like Ethiopia, Nigeria, Ghana, etc.

Moreover, among factors affecting FDI inflow to a given economy the following are the major ones to mention: openness of the economy, market size of the host country, economic growth, technological capability, and government policy. In general, the conventional empirical studies on the determinants of FDI have used the following ten variables suggested by Dunning and Narula (1997), namely: natural and created assets; capital intensity; market size and market growth; infrastructural development; labor cost and productivity; degree of openness; government policies; political stability; profitability and geographical proximity. Akin (2009) argued that their finding that FDI is not related to GDP per capita suggests that the small size of the market in low income countries is not an important determinant in the decision to invest internationally, although again this is sample specific. With respect to infrastructure variables, there is further controversy. Adefeso and Agbrola (2012), and Soremekun and Malgwi (2012) found a positive and significant relationship between infrastructure and FDI inflows due to the fast penetration and adoption of mobile phones in the sample of developing countries they studied. However, Wadhwa and Sudhakara (2011) used internet access as a measure of infrastructure and found a negative relationship to FDI, explained by the fact that developing countries have started using internet services extensively only in the last couple of years and hence are yet to have a positive influence on FDI inflows.

Governance measures like political instability have been used extensively in FDI studies, and in particular with developing country samples. J. Y. Woo (2009) found a negative relationship between FDI and corruption as well as GDP per capita in a sample of developing Asian countries and suggested this was due to weak economic reforms, monopolistic power and rent seeking behaviors of government officials, all of which deters investors. Focusing on manufactured goods, primary commodities and services, Kandieru and Chitiya (2003) analyzed the impact of openness on FDI in 51 African countries. Their founding indicate that FDI responds significantly to increased openness in the whole economy and in the services sector in particular. In general, the empirical evidence supports the theoretical argument in favor of favorable government policies and liberal trade regimes as important determinants of FDI. Asiedu (2006), found that efficient legal system and low inflation promotes FDI but corruption and political instability have negative effect on FDI of Africa. Asiedu (2002) has also explained the impact of natural resources, infrastructure and openness to trade on FDI flows to SSA. Her findings indicate that FDI in Africa is not solely determined by availability of natural resources and that governments can play an important role in directing FDI through trade reform, macroeconomic and political stability, efficient institutions and improvement in infrastructure. Chakrabarti (2001) found openness to trade, measured by exports plus imports to GDP, being positively correlated with FDI. Salisu (2003) found openness to trade having positive and significant effect on FDI inflows. Chakrabarti (2001) concludes that host country market size, measured by per capita GDP, has positive and significant effect on FDI. On the other hand, however, Salisu (2003) found both per capita income and growth rate of GDP to be statistically insignificant determinants of FDI in Nigeria.

In Ethiopia Getinet and Hirut (2006) investigated the determinants of FDI by using time series analysis for the years between 1974 and 2001.This study provides an extensive account of the theoretical explanation of FDI as well as reviewed the policy regimes, FDI regulatory framework and institutional set up in the country over the study period. It also attempted empirical analysis to find the determining factors of FDI flows into Ethiopia. The output showed that market size variable (RGDPC), growth rate of domestic product (GDP) and trade liberalization have positive and significant impact on FDI flows into Ethiopia. And inflation and infrastructure indicators, telephone lines per 1000 people, is found to yield a negative and significant coefficient. Moreover, Dipti Ranjan (2014) explained the determinants of FDI inflows to Ethiopia during the period 1992 to 2012. According to his findings majority of the explanatory variables specified in the econometric model are seemed to be significant in attracting FDI inflows to Ethiopia. His empirical evidence underlined the importance of gross domestic product, gross capital formation, infrastructure availability, trade openness, export, import, external debt, costs of starting business and etc., as potential determinants of FDI inflows to a country. It has been observed that, the rate of FDI inflow into Ethiopia is low despite incentives been offered to foreign investors. Some researchers agreed that the market size is the major determinants of FDI inflow into a host country (Getinet and Hirut, 2006). This is because, it enable the investors to make profit but it is also observed by some market speculators in Ethiopia that what makes foreign investors to come in a country is a political stability of the country relative to its neighboring countries that is highly developed. This is one of the issues that deters the foreign investors in Ethiopia, apart from the issues mentioned above Soludo (1998) maintained that it is not profitability of investment today that attract investors to invest, but how long will the profit remain fairly stable overtime. From the statement, it is seen that stable social political and economic environment lures FDI inflows into a country. Once an environment is volatile, an investor prefers to wait or invest in a project of short term in nature. Based on the above cross-country and country specific studies, we might face some difficulties in identifying what factors determines FDI flows into Ethiopia by considering the years between 1992 and 2016, therefore, this paper examined factors affecting the FDI flow into Ethiopia. Based on the above discussed theoretical as well as empirical literatures, the identified variables relevant to this study are exchange rate, inflation rate, trade, control of corruption, Growth of Gross Domestic Product (GGDP) and transport services.

**Table 1. Summary of Empirical Findings on FDI Determinants**

| Determinants of FDI | Significant | Insignificant | Positive | Negative |
|---|---|---|---|---|
| Trade(Openness) | Chakrabarti (2001); J.Y. Woo (2009); Dipti Ranjan (2014); Salisu (2003); Amanuel M.(2014) | | Chakrabarti (2001); J. Y. Woo (2009); Dipti Ranjan (2014); Salisu (2003); Amanuel M. (2014) | |
| Exchange Rate | Dipti Ranjan (2014) | Nyarko et al. (2011) | Dipti Ranjan (2014) | |
| Growth of GDP | J. Y. Woo (2009); Getinet H. and Hirut A. (2006) | Akin (2009); Salisu (2003); Dipti Ranjan (2014) | Chakrabarti (2001); J. Y. Woo (2009); Dipti Ranjan (2014); Getinet H. and Hirut A. (2006) | |
| Inflation rate | Asiedu (2006); Getinet H. and Hirut A. (2006); Amanuel M. (2014) | Dipti Ranjan (2014) | | Dipti Ranjan (2014); Asiedu (2006); Getinet H.and Hirut A.(2005); Amanuel M. (2014) |
| Political Instability | | Asiedu (2002) | | Oke et al. (2012) |
| Infrastructure | Adefeso and Agbrola (2012); Soremekunand Malgwi (2012); Getinet H. and Hirut A.(2006) | | Soremekun andMalgwi (2012); Adefeso andAgbrola (2012) | Wadhwa and Sudhakara (2011); Getinet H.and Hirut A.(2006) |
| Corruption | J. Y. Woo (2009) | | Asiedu (2006) | J. Y. Woo (2009) |

Source: Compilation from literatures

As can be generalized from the above reviews, topics specific to developing countries tend to be with mixed findings and controversies on their relationship with FDI. The literature which link on Ethiopia's FDI inflows and the existing growth of the economy as well as the potential causal factors is limited. Useful but largely focused on reviewing the past and present regimes and used limited number of macroeconomic variables to explain the FDI flows which appear in Getinet and Hirut (2006) for 1974 - 2001. Detailed time series empirical studies of the FDI flows to the country are limited to those of Dipti Ranjan (2014) for 1992 - 2012, who estimated with the help of least squares regression analysis which led to less precise coefficient estimates and could not used and taken in to consideration tests for time series data analysis which might bias the outcome. Moreover, Getinet and Hiruts' (2006), Amanuel (2014) and Dipti Ranjan (2014), outcomes are with controversies as well as data did not include the years beyond 2001, 2011 and 2012 respectively. Therefore, this study differs from those mentioned above in several ways. It constructed a detailed empirical and analytical narrative to display the existing phenomena of the FDI flows into the country post 1991 using time series econometric procedures, and emphasized on the macroeconomic potential factors affecting FDI flows to the country exhaustively. And moreover, give insights for the major features of earlier studies on Ethiopia in investigating the relationships between the time-series data of FDI and its determinants.

## METHODOLOGY, DATA AND MODEL

**Data Type and Sources:** This study used time series data covering the years 1992 - 2016. We obtained data from World Bank, World Development Indicator (WDI); UN Comtrade; United Nations Commission for Trade and Development (UNCTAD) data bases; and checked for its consistency by the data obtained from the Economic Freedom of the World Database, the Ministry of Investment of Ethiopia, and National Bank of Ethiopia (NBE) yearly reports as well (see Appendix A for summary of variables description and data sources).

**Model Specifications:** This study used a quantitative methodology to analyze and explain the determinants of FDI inflows to Ethiopia. It employed a multiple regression model with VECM to estimate causal factors that affect FDI flows into Ethiopia. Since this study covers the period 1992-2016 and the variables discussed in the previous section constitute time series information, the right modeling strategy is one involving time series analysis. Based on earlier works, in this study, we followed Soumyanada (2009) model, but in a modified version and chose log-linear (or "semi-log") functional form that fitted most appropriate.

This study therefore, attempted to investigate the validity of the following modified semi-log model:

$$lnFDI = f(EXR, INR, Trade, CCrup, GGDP, TS) \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

An important consideration to be made in relation to estimating the model given in equation (1) above is to deal with the existence of spurious regression. We dealt with the first issue by choosing lag lengths that reflect the best fit to the variables. Granger and Newbold (1974) cited in Getinet and Hirut, 2006 have shown that results based on models such as the one given in equation (1) above may give rise to 'spurious regressions'. Spurious regressions occur when results from the model show promising diagnostic test statistics even where the regression analysis has no meaning (Gugarati, 2003 cited in Getinet and Hirut, 2006). Because of this problem, in the first step we tested for the stationarity of variables. Appropriate tests of stationarity and co-integration was conducted to rule out 'spurious regression' in our study (see Appendix G and I).

The stationarity and cointegration tests we conducted suggest that variables in model 1 above are not stationary in

| Their levels, but stationary in differences (i.e., I(1)) | | | | Δ | | Δ | |
|---|---|---|---|---|---|---|---|
| Δ | | Δ | | | | | |
| Δ | yt = β11 | Δ | yt-1 + β12 | xt-1 | + vt | Δ | y |
| | xt = β21 | | yt-1 + β22 | Δxt-1 + vt | | | x |

Then the above system of equations is modified and estimated by introducing the co-integrating relationship which leads to a model as vector error correction (VEC) model.

$$lnFDIt = \beta 0 + \beta 1EXRt + \beta 2INRt + \beta 3lnTradet + \beta 4CCrut + \beta 5GGDPt + \beta 6AElt + \mathcal{E}t \ldots\ldots\ldots\ldots\ldots (2)$$

where:

FDI = Foreign direct investment, net inflows (% of GDP)

EXR = exchange rate of the host country's currency per US$, period average INR = inflation rate, consumer prices (annual %)

Trade = Ratio of Export and Import to GDP, which is the average share of exports and imports of goods and services in the GDP

CCru = Control of Corruption: Percentile Rank

GGDP = GDP growth (annual %), to take into account economic growth

Transport services = Transport services (% of service exports, BoP)

Here, we expected and hypothesized that FDI inflows to be positively related to the host country's Trade with the rest of the world, GGDP, control of corruption, transport services while EXR and INR are expected to be negatively related to FDI inflows. The summary of description and the data sources of variables are provided in Appendix A.

**Techniques of Analysis:** We estimated the determinants of FDI by means of a VECM (Vector Error Correction Model) of time series econometric analysis. When estimating the equations time series properties of the data are accounted for to avoid for spurious regression. As Gujarati (2004) cited in Getinet and Hirut, 2006 put, regression on non stationary data may lead to a spurious regression if the variables are not co-integrated. Specifically, Unit Root test, Co-integration and Error Correction Model (ECM) were used in analyzing the variables. This is with a view to establishing possible relationship between or among our variables, correct anomalies that may affect regression results and provide long-run relationship between variables. Moreover, we tasted for serial auto correlation of variables (see Appendix C and D) and employed regressions on a level (ordinary least squares), and at first difference to check for the robustness of the VECM (see Appendix E and F). Standard errors of OLS tend to lead to overconfidence. The validity of VECM estimation is assured if the coefficients of variables, lies between the estimations of OLS and first difference. Therefore, the results of using OLS (at level) and first difference estimations are also reported (see Appendix E and F).

***Unit Root Test:*** A unit root test is a statistical test for the proposition that in autoregressive statistical model of a time series, the autoregressive parameter is one. Unit roots technique is usually used to examine whether the series for two variables are stationary or not. Macroeconomic time series are usually not stationary. In most such series are made stationary by calculating logarithms or taking first or second differences. There are many tests used to determine stationarity but in this study, the stationary of the variables are tested by using Augmented Dickey-Fuller and Phillips-Perron unit root tests (see Appendix G).

***Co-integration Test and Error Correction Model:*** Cointegration is a statistical property of time series variables. In a situation where two or more series are individually integrated (in the time series sense) but some linear combination of them has a lower order of integration, then the series are said to be cointegrated. For estimation of the cointegrating relationship to be undertaken, it requires that all the time series variables in the model be integrated of order one I (1). The next step after recognizing the order of integration of the variables as I(1) or above is to test whether the variables in question can co-integrate or not". Considering that all the variables are non-stationary and integration of order one. In this study, sophisticated econometrics techniques like Vector Error Correction Model (VECM) which is used for empirical investigation of the determinant of FDI in short and long run would be used.

## EMPIRICAL RESULTS

In this part, the data set is tested for presence of time series data problems, presented and analyzed. Additionally, in each sub-section brief interpretations are enclosed to explain the results obtained. Details of all the test results and estimates are provided in Appendices. Moreover, we tasted for serial auto correlation of variables (see Appendix C and D) and employed regressions on a level (ordinary least squares), and at first difference to check for the robustness of the VECM (see Appendix E and F). In addition, the graph of the Eigen values showed that none of the remaining Eigen values appears close to the unit circle (see Appendix J). The stability check does not indicate that our model is misspecified (see Appendix I).

**Unit root test:** We performed unit root tests at levels for all our variables which are FDI inflows, exchange rate, inflation rate, trade, control of corruption, GDP growth and access to electricity. The study used Augmented Dickey-Fuller (ADF) and Phillips-Perron tests and the result revealed that variables are non stationary at level, there was existence of unit roots. The computed absolute value of tau statistic does not exceed the critical tau value. On the other hand, variables found stationary at first difference since the computed absolute value of tau statistic exceeds the critical ADF tau value as well as Phillips-Perron test, and then we conclude that variables at first difference are stationary (see Appendix G).

**Co-integration Test:** After establishing that variables are non-stationary at level and stationary at first difference, we estimated the co-integration test, using Johansen Co-integration test. In Johansen test we specified the relevant order of lags (*p*). Johansen Co-integration test result in our study followed the similar procedure as in unit root test. It should be noted that, under co-integration test we estimated co-integrating regression residual obtained in equation (2) and we employed Augmented Dickey-Fuller tests. Based on the result of Johansen Co-integration, we rejected the null hypothesis of non stationary and accept alternative hypothesis that is variables are stationary. From our computation the empirical result revealed that, at computed Eigen value statistic (0.65190) at trace statistics value of 26.9405 at 5 per cent level of significance, we rejected the null hypothesis, this implies that residual is stationary and variables are co-integrated (see Appendix I). Co-integrating VECMs are also used to produce impulse response functions for VECMs (see Appendix K).

**Vector Error Correction Model:** This study estimated a Vector error correction model (VECM) in order to determine the short-run behaviors and deviations of the variables from long-run relationships. Normally variables are adjusted to the long-run equilibrium. Error correction model provides the speed of adjustment of the variables in short-run dynamics behavior to the long-run equilibrium. We obtained the expected sign of the error term coefficient (-0.8993499). This signifies that the variables in the model are adjusting faster from the short-run to the long-run equilibrium as such this result suggests a high speed of convergence to long-run relationship (equilibrium) amongst variables (see Appendix

H). The estimation of the short-run co-integrating vector indicates that variables like exchange rate, control of corruption, growth of GDP and transport services had expected signs. The following regression output equation is representing long run relationship amongst the variables since the regression residual is co-integrated. The empirical results revealed that exchange rate, inflation rate and transport services significantly determined FDI inflows to Ethiopian economy (see Appendix H).

lnFDI = -0.0795675 – 0.5279994EXR + 0.0333401INR – 0.4732019lnTrade + 0.011708CCru + 0.003507GGDP + 0.0237016TS – 0.8993499ce1

Specifically, the findings of this study are summarized as follows:

- Two FDI determinants (exchange rate and trade) had negative relationships but trade had insignificant impact on Foreign Direct Investment flows into the Ethiopian economy post 1991.
- Four FDI determinants (inflation rate, control of corruption, GGDP and transport services) had positive relationships, while except inflation rate and transport services the rest had insignificant impact (weak determinants) on foreign direct investment flows into Ethiopia post 1991.

In our study, the official exchange rate was found with a negative sign as expected (-0.5279994) and statistically significant at 1 per cent level. This indicates that depreciation of the local currency would attract FDI inflows to the country. Therefore, depreciation of domestic currency by one unit increases FDI inflows to Ethiopia by about 52.80 per cent. The significant exchange rate result is similar with other studies in Ethiopia like Dipti Ranjan (2014) but with dissimilar relationships. One seemingly contradictory result is the positive sign, which is (0.0333401) and statistically significant effect of inflation rate on FDI flows, and seems counterintuitive. The insignificant result is in line with Getinet and Hirut (2006), but contradict in relationships with both Dipti Ranjan (2014) and Getinet and Hirut, (2006) study to the country. They found that stable and low inflation rate promotes FDI inflows. The implication is that at higher level of inflation investors are not enabling to invest because they fear that their assets are losing value. In general this finding also revealed that though inflation rate had a significant effect on FDI flows to the country, there should be a stable price level in the country in order to make investors interested to invest more. One seemingly contradictory result is trade with the rest of the world, was found with a negative sign (-0.4732019) and statistically insignificant. This is an indication that most of the FDI flows to the country are tariff jumping types that is seeking local markets. This output is contrary with Dipti Ranjan (2014), Chakrabarti (2001), Amanuel (2014), and Woo (2009). Their evidence supports the theoretical argument in favor of favorable government policies and liberal trade regimes as important determinants of FDI. Control of corruption was found with a positive sign which is (0.011708) and it is statistically insignificant or weak determinant of FDI flows to the country. This result is in line with Aseidu (2006) and Woo (2009). We found GDP growth with a positive sign (0.003507) and was found to be a weak determinant of FDI flows to the country. The insignificant effect is contradicting with the hypothesis that a growing economy attracts more FDI. This is because the countries with higher economic growth are assumed to be more attractive to investors. It is not statistically significant, although it has the right sign suggesting that, the prevailing growth in economy is less attractive to foreign investors. The positive and insignificant effect of GDP growth is in line with Dipti Ranjan (2014) and contradicts in significance effect with Getinet and Hirut (2006) which are in favor of the market size (measured in GDP) is the major determinants of FDI flows into the country. Finally transport services, which is used to proxy infrastructure situation of the country, on FDI flows and it is statistically significant. It was found with a positive sign (0.0237016) and it is statistically significant at 10 per cent level. This result may be explained by the better transport services coverage which is detrimental to FDI inflows to the country. This result is in line with Getinet H. and Hirut A.(2006) and Dipti Ranjan (2014), which used telephone lines per 1000 people and transport services to proxy infrastructure situations in the country respectively.

**Checks for Robustness:** We undertook robustness checks to examine the sensitivity of our findings. We used the OLS and first difference estimations, the results do not alter the signs but displayed variations in significance level of the variables. The magnitudes of the estimated coefficients are also almost similar. But compared with the first difference estimates, standard errors of OLS estimates were found over confidence. The significance level of variables also showed variations on variables under study. Therefore, OLS tends to overestimate and first difference underestimates (see Appendix E and F).

## CONCLUSION AND POLICY REMARKS

By employing a vector error correction model, this paper empirically investigated the determinants of foreign direct investment flows into Ethiopia during 1992-2016. This study departs both in scope and methodology of analysis from earlier literatures on Ethiopia that employed least square econometric technique in investigating the existing relationships between the time series data of FDI flows and its determinants. Thus, it may mislead the policy conclusions. The error correction term in our model was found with expected negative sign (-0.8993499) and statistically significant at 1 per cent level. This implies that variables adjust to long-run equilibrium at the speed of 89.9 per cent per annum confirming the validity of the long-run equilibrium relationships with a high speed of adjustment amongst the variables. Empirical results suggest that exchange rate, inflation rate and transport services are significant determinants of foreign direct investment inflows to Ethiopia. But trade, control of corruption, and GDP growth are weak determinants of foreign direct investment flows into Ethiopia post 1991. This signifies that the Ethiopian government should have to give much more attention and emphasis on the above mentioned significantly affecting factors of FDI inflows to the country in the short-run amongst other variables. Therefore, Ethiopia should have a strong policy on exchange rate that would help the manufacturing sector in using local inputs of the country. In doing this, in the long run, birr would gain value against the other currencies and gain stability. Moreover, when government embark on devaluation of the national currency to attract more FDI inflows to Ethiopia taking into account that depreciating domestic currency without exporting more becomes a burden to the economy of a country. The government should strengthen Ethiopia's comparative advantage especially in labor intensive stages of production by facilitating trade with

the rest of the world while diversifying its export capacities towards more technologically advanced products as well as encourage reinvestment of profits rather than outright repatriation of earnings and dependence on loans and overdraft facilities for business activities. The presence of corruption will make foreign investors conduct business less effectively and less attractive. Thus, corruption impacts the country's efforts to attract more FDI. The prevailing high and sustained GDP growth performance increases the FDI flows to the country weakly. It is obviously understood that foreign investors who want to maximize their profit from investment find fast growing economies more attractive. In this regard, furthering the growth performance of the economy by creating investment-friendly environment through the creation of favorable macroeconomic environment that specially enhance the domestic capacity of its citizens by aiming at attracting specific types of FDI that are able to contribute and generate spillover effects, developing infrastructure facilities, ensuring the quality of institutions in finding out which areas provide opportunities for corruption and launching anti-corruption purge to reduce opportunities for corrupt behavior, rules and regulations should be written clearly and in detail, so that there is not much room for government officials to interpret according to their own judgment are some of the important insights essential to attract more FDIs to Ethiopia. There should also be a concerted effort to upgrade the country's poor infrastructure particularly in relation to transport infrastructure.

The following directions are put forward for future studies:

- Aside the six determinants of foreign direct investment inflows used in this study, there are other determinants such as economic policy coherence, democracy level of a country, labor effects and investment incentives. Thus future studies should consider all these determinants of foreign direct investment flows into Ethiopia for wider discussion on FDI determinants to the country.
- The scope of this study was for the period 1992 - 2016 (post EPRDF regime), for further studies, it is recommended to use the structural break and interaction effects that the scope could be expanded.
- For proper analysis of FDI determinants in the country, it would be interesting for further study of FDI determinants in Ethiopia to focus on what attracts FDI in each of the cities and states in the country (2 city administrations and 9 regional states).

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# APPENDICES

**Appendix A. Summary of Variables Description and Data Sources**

| Variables | Indicator Name | Abbreviations | Data Sources |
|---|---|---|---|
| Foreign Direct Investment inflows | Log of Foreign direct investment, net inflows (% of GDP) | lnFDI | UNCTAD, 2017; EPRDF, Ministry of Investment |
| Exchange rate | Official exchange rate (LCU per US$, period average) | EXR | WB, WDI, 2017 |
| Inflation rate | Inflation, consumer prices (annual %) | INR | WB, WDI, 2017, National Bank of Ethiopia, 2016 |
| Trade | Log Ratio of Export and Import to GDP (current US$ % of GDP) | lnTrade | WB, WDI, 2017; UNComtrade, 2017 |
| Control of Corruption | Control of Corruption: Percentile Rank | CCru | WB, WDI, 2017 |
| Growth of GDP | GDP growth (annual %) | GGDP | WB, WDI, 2017 |
| Transport services | Transport services (% of service exports, BoP) | TS | WB, WDI, 2017 |

**Appendix B. Summary statistics (1992 – 2016)**

| Variables | Observations | Mean | Standard Dev. | Minimum | Maximum |
|---|---|---|---|---|---|
| lnFDI | 25 | 0.0192597 | 0.8021285 | -2.79045 | 0.741275 |
| EXR | 25 | 10.69062 | 5.394444 | 2.8025 | 21.73155 |
| INR | 25 | 9.675411 | 11.36951 | -8.484249 | 44.39128 |
| lnTrade | 25 | 1.4168 | 0.1456228 | 0.9909867 | 1.562607 |
| CCru | 25 | 27.55873 | 10.84572 | 8.70488 | 43 |
| GGDP | 25 | 7.328951 | 5.680667 | -8.67248 | 13.5726 |
| TS | 25 | 56.98505 | 12.52466 | 36.58327 | 76.38883 |

**Source: STATA Computer Outputs**

**Appendix C. Tests for Serial Correlation at Level**

| Durbin-Watson | F-Statistic | 1 | Prob. F(7, 25) | 1.971182 |
|---|---|---|---|---|
| Breusch-Godfrey LM test for autocorrelation | Chi2 | 0.549 | Prob. > Chi2 | 0.4589 |
| Durbin's alternative test for autocorrelation | | | | 0.5368 |

**Ho: No serial correlation**

**Appendix D. Tests for Serial Correlation at First Difference**

| Durbin-Watson | F-Statistic | 1 | Prob. F(7, 24) | 2.077929 |
|---|---|---|---|---|
| Breusch-Godfrey LM test for autocorrelation | Chi2 | 0.797 | Prob. > Chi2 | 0.3720 |
| Durbin's alternative test for autocorrelation | Chi2 | 0.550 | Prob. > Chi2 | 0.4585 |

Ho: No serial correlation

## Appendix E. Results of OLS

| Variables | OLS |
|---|---|
| EXR | -0.0259 |
| | (0.0304) |
| INR | -0.0177** |
| | (0.00649) |
| lnTrade | 4.031*** |
| | (0.951) |
| CCru | 0.0271** |
| | (0.0118) |
| GGDP | 0.00266 |
| | (0.0146) |
| TS | -0.00663 |
| | (0.00901) |
| Constant | -5.634*** |
| | (1.436) |
| Observations | 25 |
| R-squared | 0.871 |

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

## Appendix G. Summary of Tests for Unit Root

| | Level | | | | First Difference | | | |
|---|---|---|---|---|---|---|---|---|
| List of Variables | ADF Test Statistics | P - Value for z(t) | Phillips-Perron Test Statistics (Z(rho)) | P - Value for z(t) | ADF Test Statistics | P - Value for z(t) | Phillips-Perron Test Statistics (Z(rho)) | P - Value for z(t) |
| lnFDI Inflow | -3.158(1) | 0.0225 | -11.270 | 0.0021 | -5.233 | 0.0000 | -21.255 | 0.0001 |
| Exchange Rate | 1.148(2) | 0.9786 | -2.146 | 0.9656 | -2.364 | 0.1520 | -12.921 | 0.0745 |
| Inflation Rate | -3.476(0) | 0.0086 | -20.910 | 0.0088 | -6.638 | 0.0000 | -31.039 | 0.0000 |
| lnTrade | -4.239(1) | 0.0006 | -10.071 | 0.0305 | -5.380 | 0.0000 | -24.178 | 0.0007 |
| Control of Corrupt | -1.726(1) | 0.4178 | -7.202 | 0.6261 | -3.483 | 0.0084 | -22.070 | 0.0031 |
| GGDP | -1.492(3) | 0.5376 | -9.117 | 0.0164 | -4.410 | 0.0003 | -22.305 | 0.0007 |
| TS | -2.193(2) | 0.2087 | -4.031 | 0.8477 | -3.192 | 0.0204 | -18.978 | 0.0101 |

Note: -3.750, -3.00 and -2.630 are critical values at 1% , 5% and 10% significance level respectively for ADF test and -22.5, -17.9 and -15.6 are critical values at 1% , 5% and 10% significance level respectively for Philips-Perron test .

## Appendix H: Results of VECM

| Variables | Coefficient |
|---|---|
| D_EXRd1 | -0.5279994*** |
| | (0.2003397) |
| D_INRd1 | 0.0333401*** |
| | (0.0087799) |
| D_lnTraded1 | -0.4732019 (1.092157) |
| D_CCrud1 | 0.011708 |
| | (0.0192821) |
| D_GGDPd1 | 0.003507 |
| | (0.0106113) |
| D_TSd1 | 0.0237016* |
| | (0.0135826) |
| Log likelihood | -180.1371 |
| AIC | 22.64882 |
| HQIC | 23.45492 |
| SBIC | 26.07073 |
| ce1 | -0.8993499*** |

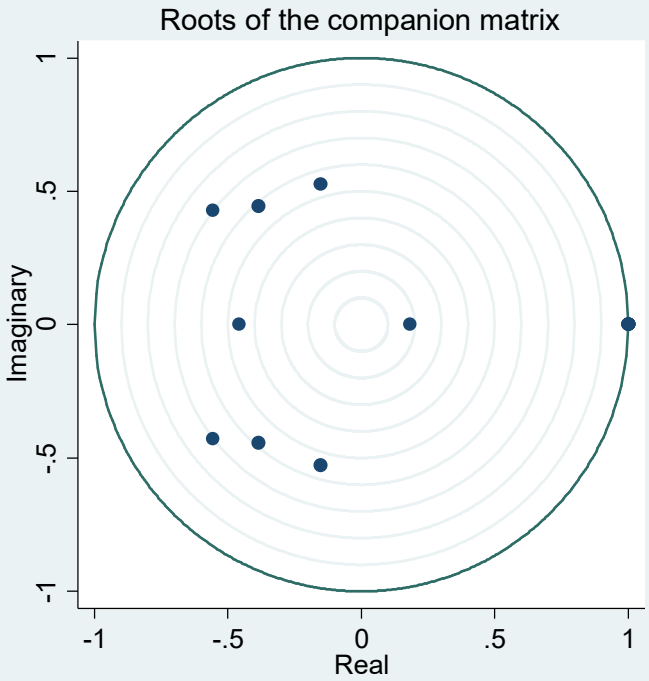
Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

## Appendix I. Johansen Tests for Co-integration

| Hypothesized No. of EEs | Eigen Values | Trace Statistics | 5 per cent Critical Value |
|---|---|---|---|
| None* | - | 203.2173 | 124.24 |
| At most 1* | 0.93245 | 141.2338 | 94.15 |
| At most 2* | 0.90273 | 87.6370 | 68.52 |
| At most 3* | 0.79479 | 51.2117 | 47.21 |
| At most 4 | 0.65190 | 26.9405 | 29.68 |
| At most 5 | 0.50559 | 10.7394 | 15.41 |
| At most 6 | 0.29246 | 2.7824 | 3.76 |

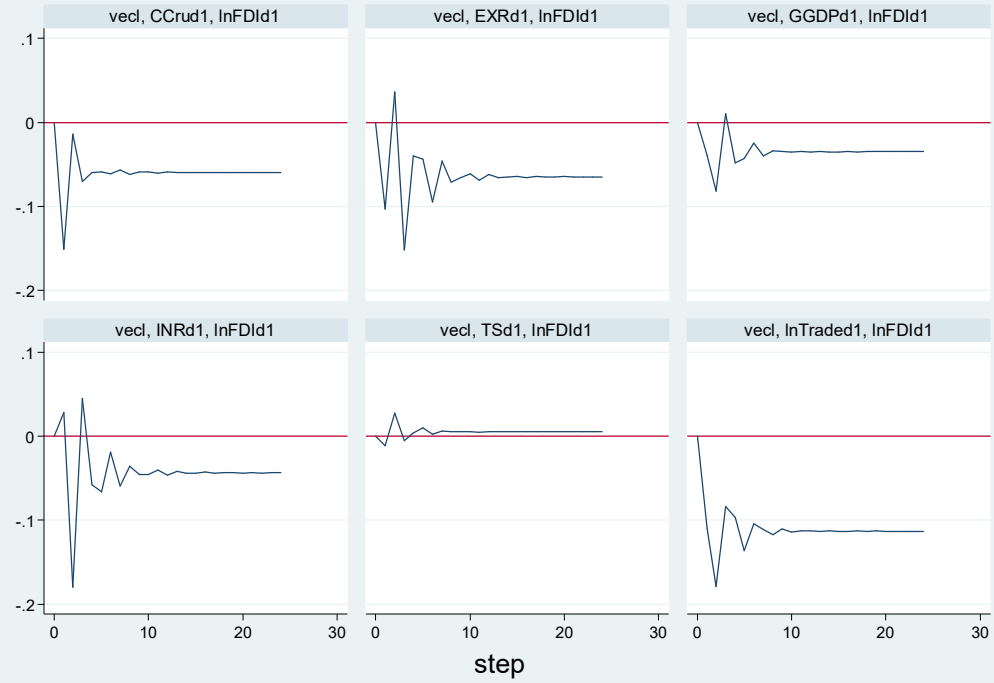
* Denotes rejection of the hypothesis at 5% significance level

**Appendix J. VEC Stable Graph**




The VECM specification imposes 6 unit moduli

**Appendix K. Impulse Response Graph**




Graphs by irfname, impulse variable, and response variable

*******