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The openness hypothesis in the context of economic development in Sub-Saharan Africa: The moderating role of trade dynamics on FDI

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The Openness Hypothesis in the Context of Economic Development in Sub-Saharan Africa: The Moderating Role of Trade Dynamics on FDI ¹

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The Openness Hypothesis in the Context of Economic Development in Sub-Saharan Africa: The Moderating Role of Trade Dynamics on FDI**Simplice A. Asongu, Joseph Nnanna & Paul N. Acha-Anyi**

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Abstract

This study investigates the simultaneous openness hypothesis by assessing the importance of trade openness in modulating the effect of foreign direct investment (FDI) on economic dynamics of gross domestic product (GDP) growth, real GDP and GDP per capita. The focus of the study is on 25 countries in Sub-Saharan Africa over the period spanning from 1980 to 2014. First, trade imports modulate FDI to induce net positive effects on GDP growth and GDP per capita. Second, trade exports moderate FDI to generate overall positive impacts on GDP growth, real GDP and GDP per capita. Implications of the study are discussed, inter alia: (i) both FDI and trade infrastructures are necessary for FDI-focused measures to engender positive economic development outcomes in host communities and countries. (ii) Macroeconomic conditions that are relevant for promoting economic development are necessary for the interactions between trade openness and FDI to generate favorable outcomes in terms of GDP growth, real GDP and GDP per capita.

JEL Classification: E23; F21; F30; L96; O55

Keywords: Economic Output; Foreign Investment; Sub-Saharan Africa

I. Introduction

The study revisits the simultaneous openness hypothesis in Sub-Saharan Africa (SSA) within the framework of economic growth dynamics in terms of gross domestic product (GDP) growth, real GDP, and GDP per capita. Rajan and Zingales (2003), in the simultaneous openness hypothesis, postulated that the concurrent opening of capital and trade accounts will engender economic growth. The positioning of the study is motivated by: (i) debates on the role of globalization in development outcomes; and (ii) gaps in the attendant literature.

First, in accordance with a bulk of the empirical literature that is founded on robust theoretical underpinnings, there are conflicting scholarship tendencies on the rewards of globalization in outcomes of economic prosperity (Asonguand Nwachukwu 2017a). In line with the attendant literature, whereas a strand of studies posit that globalization (especially financial openness) provides avenues of international risk-sharing (Henry 2007; Kose et al. 2006; Kose, Prasad, and Taylor 2011; Price and Elu 2014), another body of the literature supports the perspective that globalization (e.g., financial openness) is growingly leading to financial instability and cross-country economic crises (Bhagwati 1998; Rodrik 1998; Fischer 1998; Summers 2000; Stiglitz 2007; Asongu 2014a).

From a perspective of principle, the globalization phenomenon claims to promote economic development in the light of the narrative that it remains a historical, lusty, and ineluctable process that is indispensable for the prosperity of nations in the 20th and 21st centuries (Asongu 2013). The author maintains that a country that does not align its economic development policies in accordance with the benefits and challenges of globalization can do so only at the risk of endangering the prosperity of its citizens. However, another strand of the debate fundamentally posits that the phenomenon of globalization promotes self-interest and the victory of “market capitalism” over government actions and altruistic endeavors. Hence, it is unsurprising that public support for the phenomenon is declining in both developed and developing countries where scholars and elements of civil society are requesting and proposing alternative paradigms of economic development that put environmental sustainability and inclusive human development at the center of economic prosperity (Stiglitz 2007; Kenneth and Himes 2008; Asongu and Nwachukwu 2017b). In spite of the ongoing debate, to the best of our knowledge, the contemporary scholarship on the relevance of simultaneous openness of the capital and trade accounts on economic development is sparse. Moreover, the positioning of this study is also motivated by an observed gap in the literature.

Second, as clarified in Section 3, Data, the extant contemporary foreign direct investment (FDI)- and “economic growth”-centric scholarship has failed to engage the

problem statement motivating this study. In Section 3, Data, the corresponding literature is discussed in two main categories before emphasis is provided on how the positioning of this study departs from Sakyi and Egyir (2017), which is closest to this research in the literature.

The rest of the research is organized in the following manner. The theoretical underpinnings are covered in Section 2, while the data and methodology are disclosed in Section 3. Section 4 presents the empirical findings, while the research concludes in Section 5 with implications and future research directions.

II. Theoretical underpinnings and literature review

Globalization and economic development

According to Tsai (2006) and Asongu and Nwachukwu (2017a), two principal theoretical perspectives elicit the nexus between openness and economic development, notably neoliberal and hegemonic schools. First, the hegemonic school is of the position that the phenomenon of globalization is fundamentally a hidden agenda for the establishment of a new world organization that is managed by more technically-advanced countries and multinational financial institutions. According to this school, encouraging cross-country market transactions, capital accumulation, and exploitation of cheap labor opportunities in poorer countries are fundamental motivations of neoliberalism and capitalism (Petras and Veltmeyer 2001). In light of the growing evidence that the evolving liberalization over the past decades has benefited the rich at the expense of the poor, authors of this narrative predict “*a worldwide crisis of living standards for labor*” in light of evidence that “*technological change and economic reconversion endemic to capitalist development has generated an enormous growing pool of surplus labor, an industrial reserve army with incomes at or below the level of subsistence*” (Petras and Veltmeyer 2001, 24).

The hegemonic school also sustains that the globalization paradigm is characterized by modes of production that devalue the mechanisms of redistribution proposed by Keynesian social democracy (Asongu and Nwachukwu 2017a). This is essentially because globalization offers avenues for the propagation of self-interest and disregards economic inclusion (Smart 2003; Tsai 2006). Moreover, Scholte (2000) posited that the rewards from globalization are fundamentally skewed to the benefit of richer factions of society while Sirgy et al. (2004) are largely sympathetic to the negative consequences of globalization.

According to the neoliberal school, the phenomenon of globalization represents a force of “creative destruction” from the perspective that global trade, technological progress, and cross-border capital flows improve economic development and efficient allocation of human

and capital resources (Asongu 2014b). Despite jobs' substitution and a drop in workers' wages (especially those employed in the unskilled sector), globalization compensates for the shortfall by providing workers who have lost their jobs with opportunities of acquiring new skills in view of improving their competitive advantages in the labor market. Grennes (2003) is broadly consistent with this narrative because the author argues that the benefits of globalization are also traceable to the labor market within the framework of supply of and demand for labor.

FDI and economic growth

Consistent with the attendant literature (Toone 2013; Gammoudi, Cherif and Asongu 2016), three main theoretical underpinnings can be used to motivate the linkage between FDI and economic growth, notably the middle path theory, classical theory, and dependency theory.

From the extreme angle, the dependency theory is underpinned by the tenets of Marxism which conceive globalization as the propagation of market capitalism and use of less expensive sources of labor in less developed countries in exchange for technologies that are obsolete. According to advocates of this theory, FDI is negatively related to domestic economic development for three main reasons: (i) The rewards from FDI are not equally distributed between domestic governments and multinational corporations because such rewards are skewed in favor of the latter. According to the narrative, local assets that are relevant in financing domestic development are absorbed by foreign capital which exploits economic development opportunities in less developed countries and repatriates profits to host countries and tax havens (Jensen 2008); (ii) Multinational companies can be the origin of the distortions within the domestic economy by, *inter alia*: undermining local culture, changing consumers' tastes, damaging the distribution of wealth, using capital-intensive technologies that are inappropriate, and crowding-out domestic investment (Taylor and Thirft 2013); and (iii) Some potential alliance between the local elite and foreign investors can be apparent such that each of these actors leverages on its power to influence idiosyncratic benefits instead of the general wellbeing of society. According to this narrative, because the citizens in domestic economies are largely excluded from such an alliance, they end-up suffering significantly from political distortions in the system (Jensen 2008).

The second underpinning pertaining to the classical theory maintains the position that FDI is relevant to the economic prosperity of domestic economies via a plethora of mechanisms, *inter alia*: balance of payments improvements; capital transfers; usage of improved technological skills and equipment; opportunities for employment; foreign

exchange earnings via FDI-oriented export; the development of infrastructure; and integration of the domestic economy with global markets (Gammoudi *et al.* 2016; Toone 2013). These scholarly views are also apparent in the substantially documented literature related to “spillovers”: a phenomenon that is realized “*when the entry or presence of multinational corporation increases productivity of domestic firms in the host country and themultinationals do not fully internalize the value of these benefits*” (Javorcik 2004, 607). The origins of spillovers are many and some include: working methods; technological usage; and skills in management that can eventually boost output and productivity.

The third paradigm underpinned in the “middle path” school integrates the rewards of FDI within the framework of the classical theory with some caution on potential unfavorable ramifications purported by the dependency theory. According to these theoretical insights, a juxtaposition of regulation (i.e., intervention) and openness is important in addressing the concerns pertaining to foreign investment as well as the underlying cautions associated with the negative consequences of openness. Within this narrative, the purpose of the domestic economy is to tailor host policies such that they attract foreign investment which benefits the host communities. Accordingly, governments of host countries have the leverage to tailor FDI to given geographical areas and selected sectors in order to hedge against disadvantages of foreign investment to host communities such as adverse consequences on balance of payments as well as overall development efforts of communities.

In light of the above theoretical insights, this study argues that FDI, which is tailored by trade-oriented strategies, has an overall positive effect on growth dynamics in the host country. The corresponding testable research hypothesis is the following.

Hypothesis 1: Trade openness modulates FDI to induce overall positive net effects on economic growth dynamics such as GDP growth, real GDP, and GDP per capita.

Literature review

To the best of our knowledge, the contemporary FDI- and “economic growth”-centric scholarship has failed to engage the problem statement underlying this study. The attendant scholarship can be expanded into two main categories. The first category on economic growth has been concerned with, among others: connections between finance and economic prosperity (Adam, Musah, and Ibrahim 2017; Assefa and Mollick 2017); country-oriented instances of inflation dynamics and economic output (Bonga-Bonga and Simo-Kengne 2018); linkages between volatility in development assistance, development assistance, and prosperity

in economic sectors (Kumi, Muazu, and Yeboah 2017); connections between volatility in economic prosperity and financial progress (Muazu and Alagidede 2017); and relationships between innovation and volatility in economic growth (Yaya and Cabral 2017). In the second category focusing on FDI: Okafor, Piesse, and Webster (2017) are concerned with drivers of FDI in North Africa, the Middle East, and SSA; Boamah (2017) investigates how sectoral portfolios in Africa are contingent on influences of global sectors; Dunne and Masiyandima (2017) focus on regional income catch-up and FDI while Fedderke and Mengisteab (2017) articulate linkages between potential economic growth and estimation of output gaps; and Meniago and Asongu (2019) are concerned with the relevance of value chains in modulating the effect of FDI on economic growth and productivity while Fanta and Makina (2017) assess connections between institutional debts, bonds, equity, and economic growth.

The present exposition complements the underlying literature by assessing how trade dynamics (i.e., imports and exports) modulate the effect of FDI on economic growth dynamics (i.e., GDP growth, real GDP, and GDP per capita). Hence, the corresponding research question that the study aims to answer is the following: How do trade openness dynamics modulate the impact of FDI on economic growth dynamics in SSA?

The closest research in the literature to this study is Sakyi and Egyir (2017) which assessed the impact of FDI and trade on economic growth in Africa. Accordingly, the authors investigate the hypothesis that growth-enhancing ramifications are traceable to interactions between FDI and exports in a panel of 45 African countries during the period of 1990 to 2014 using the generalized method of moments (GMM). The findings support the underlying hypothesis. This research departs from Sakyi and Egyir (2017) on many fronts. First, from a methodological standpoint, the GMM approach with forward orthogonal deviations is employed in place of a system GMM approach because the adopted GMM option employed in this study has been documented to provide more efficient estimates because it, *inter alia*: avoids the proliferation of instruments which can substantially bias the estimated model (Meniago and Asongu 2018; Tchamyu 2020; Tchamyu, Erreygers and Cassimon 2019). For instance, it is difficult to ascertain whether the estimated models in Sakyi and Egyir (2017) are robust because the authors do not disclose the number of instruments in the information criteria used to assess the validity of findings. Second, this research does not exclusively focus on economic growth because three main outcome variables are taken on board in order to increase the policy relevance of the study, namely: GDP growth, real GDP, and GDP per capita. Third, the overall incidence of constitutive elements in the interactive regressions are assessed based on net effects on the outcome variable, contrary to marginal effects as

underlined by Sakyi and Egyir (2017). Accordingly, as cautioned by Brambor, Clark and Golder (2006) on the pitfalls of interactive regressions, both the unconditional and conditional (or marginal) effects should be considered in the assessment of the relevance of the moderating variable in the effect of the independent variable of interest on the outcome variable. Accordingly, researchers are increasingly adopting net effects in interactive regressions (Tchamyou and Asongu 2017; Tchamyou 2019; Agoba et al. 2020).

III. Data and methodology

Data

The focus of this research is on 25 countries in SSA with data from 1980 to 2014.²The geographical and temporal scopes of the research agenda are contingent on constraints in data availability at the time the study was being carried out. Moreover, given that the GMM empirical strategy is the estimation approach adopted in this study, the dataset is structured such that the $N > T$ condition that is relevant for the employment of the strategy is met. Accordingly, data averages are employed to reduce T in the light of the current $N=25$, $T=35$ framework. For this purpose, the research computes five seven-year and seven five-year non-overlapping intervals. Upon a preliminary analysis, it is apparent that only the former set of non-overlapping intervals generates estimated coefficients that avoid instrument proliferation, even when the option of collapsing instruments is employed in the empirical approach. The adopted five seven-year intervals are: 1980 to 1986; 1987 to 1993; 1994 to 2000; 2001 to 2007; and 2008 to 2014. Furthermore, as argued by Islam (1995), the use of non-overlapping intervals mitigates business cycle disturbances that are relevant for convergence associated with FDI-related theories. This convergence is essential because of diminishing marginal returns to capital. In essence, according to theoretical insights, developing countries are expected to grow at a more proportionate rate compared to developed countries because foreign investors are motivated by higher returns of capital in developing countries (Asongu and Odhiambo 2018a).

In light of the motivation of this study as well as specifics underlying the hypothesis to be tested, three economic growth dynamics are sourced from the World Development Indicators (WDI) of the World Bank, notably GDP growth, real GDP, and GDP per capita. The last-two GDP indicators are normalized with logarithms in order for the mean or average

²The countries, selected on data availability, are: Benin; Botswana; Burkina Faso; Burundi; Cameroon; Central African Republic; Cote d'Ivoire; Gabon; Kenya; Lesotho; Mauritania; Mauritius; Mozambique; Namibia; Niger; Nigeria; Rwanda; Senegal; Sierra Leone; South Africa; Sudan; Swaziland; Tanzania; Togo; and Zimbabwe.

values of the adopted variables to be comparable (Asongu and Odhiambo 2020a, 2020b). Accordingly, in empirical studies, in order for significant effects to be established, it is worthwhile that the average values are comparable from the perspective of mean observations. This is essentially because billions of units cannot be feasibly compared with tens of units or units in decimal places.

The FDI indicator is obtained from the United Nations Conference on Trade and Development (UNCTAD) database, and it is defined in terms of FDI inflows as a percentage of GDP. Given the testable hypothesis motivating the study, trade is assessed from two perspectives: imports as a percentage of GDP and exports as a percentage of GDP. Consistent with the attendant output and productivity literature, four elements in the conditioning information set are adopted in order to account for variable omission bias, notably inclusive education, government expenditure, inflation, and population (Barro 2003; Sahoo, Dash, and Nataraj 2010; Elu and Price 2010; Anyanwu 2011; Asongu 2015; Fosu 2015; Nyasha and Odhiambo 2015a, 2015b; Tchamyou 2017; Elu and Price 2017; Maryam and Jehan 2018; Meniago and Asongu 2018; Kreuser and Newman 2018). In light of the literature covered in the introduction, these elements in the conditioning information set have been documented in the literature to be determinant in boosting economic prosperity and output. Accordingly, with the exception of inflation that is expected to reduce economic prosperity, the remaining control variables are anticipated to boost economic growth. The justifications for the expected signs are elaborated in the following passages.

First, high inflation is not conducive for economic development because it translates to an atmosphere of ambiguity that is not favorable for trade and FDI. Accordingly, investors have been established to be less interested in economic investments that are characterized with ambiguity and uncertainty (Kelsey and le Roux 2017, 2018). Second, conversely, the population has been established to be positively linked to economic activity and output (Becker, Laeser, and Murphy 1999; Heady and Hodge 2009). Third, expenditure from the government is normally tailored to promote investment, employment, economic prosperity, output, and productivity. Fourth, in light of the theoretical insights and contemporary SSA-centric literature (Ssozi and Asongu 2016a, 2016b), human capital and education are essential in the promotion of economic growth and productivity. Moreover, the relevance of gender-parity education at the primary and secondary schooling levels is essential in promoting economic prosperity (Asongu and Odhiambo 2018b). It is also worthwhile to articulate that preference to lower levels of education when compared to the highest level of education is motivated by the documented importance of such levels of education in driving socio-

economic development when countries are at the beginning stages of industrialization (Petrakis and Stamatakis 2002; Asiedu 2014; Asongu and Odhiambo 2019; Tchamyou 2020).³

The definitions and sources of variables are disclosed in Appendix 1⁴, while the summary statistics and correlation matrix are, respectively, provided in Appendix 2 and Appendix 3 online. From the mean values in the summary statistics, it is apparent that the variables are comparable in terms of average values. Moreover, in light of the corresponding variations observed from the standard deviations, it is obvious that reasonable estimated linkages can be derived from the estimations. The purpose of the correlation matrix is to avoid concerns of multicollinearity that can substantially bias estimated coefficients.

Methodology

Specification

The empirical strategy is underpinned by three main elements that are in line with contemporary GMM-oriented research (Asongu, le Roux, and Biekpe 2017; Efobi, Tanankem, and Asongu, 2018; Tchamyou 2019; Tchamyou, Erreygers, and Cassimon 2019). First, upon restructuring the dataset through data averages, the T<N condition that is imperative for the employment of the GMM estimation strategy is adopted because each cross section entails five periods (i.e.,consisting of seven-year non-overlapping intervals) and 25 countries. Second, owing to the panel data structure, cross-country variations are taken on board in the estimation exercise. Third, endogeneity, which is vital for a robust empirical strategy,is accommodated by the study on two fronts, notably: (i) simultaneity is addressed by means of internal instruments while (ii) the unobserved heterogeneity is taken on board with the employment of time invariant omitted indicators.

The following level (1) and first difference (2) equations summarize the standard system GMM estimation procedure for assessing the role of trade dynamics in moderating the impact of FDI on economic growth dynamics.

$$EG_{i,t} = \sigma_0 + \sigma_1 EG_{i,t-\tau} + \sigma_2 F_{i,t} + \sigma_3 T_{i,t} + \sigma_4 FT_{i,t} + \sum_{h=1}^4 \delta_h W_{h,i,t-\tau} + \eta_i + \xi_t + \varepsilon_{i,t} \quad (1)$$

$$EG_{i,t} - EG_{i,t-\tau} = \sigma_1 (EG_{i,t-\tau} - EG_{i,t-2\tau}) + \sigma_2 (F_{i,t} - F_{i,t-\tau}) + \sigma_3 (T_{i,t} - T_{i,t-\tau}) + \sigma_4 (FT_{i,t} - FT_{i,t-\tau}) + \sum_{h=1}^4 \delta_h (W_{h,i,t-\tau} - W_{h,i,t-2\tau}) + (\xi_t - \xi_{t-\tau}) + (\varepsilon_{i,t} + \varepsilon_{i,t-\tau}), \quad (2)$$

³The adopted education proxy is primary and secondary (gross), gender parity index (GPI).

⁴The appendix can be found online at www.tandfonline.com/uitj.

where $EG_{i,t}$ is an economic growth dynamic (i.e., GDP growth, real GDP, or GDP per capita) variable of country i in period t ; F represents foreign direct investment; T denotes trade dynamics (i.e., imports or exports of commodities); FT is the interaction between FDI and trade dynamics; σ_0 is a constant; τ is the degree of auto-regression which is a seven-year lag (i.e., represented by one in the equation) because such a lag comprehensively captures past information; W is the vector of control variables (*population, inflation, government expenditure, and education*); η_i is the country-specific effect; ξ_t is the time-specific constant; and $\varepsilon_{i,t}$ is the error term.

Within the framework of this research, the GMM-centric strategy employed is an improved version of Roodman (2009) by Arellano and Bover (1995). The adoption of this improved framework fundamentally builds on the documented comparative relevance of the approach in providing more efficient estimates compared to the traditional *difference* and *system* GMM estimators (Love and Zicchino 2006; Tchamyou, Asongu, and Nwachukwu 2018; Boateng et al. 2018). Compared to the *one-step* option, the *two-step* approach is preferred because it accounts for heteroscedasticity.

In order to ascertain that the empirical analysis is not influenced by spurious results owing to concerns of “non-stationarity,” as apparent in Appendix 4, unit root tests are used to confirm that the variables are largely stationary. Accordingly, in light of the Fisher-type test (Choi 2001) in the table, the variables are substantially stationary. Other tests which require a balanced panel dataset could not be performed. These include the Harris–Tzavalis (1999), Breitung (2000), Hadri (2000), Levin, Lin, and Chu (2002), and Breitung and Das (2005) tests. Furthermore, owing to insufficient observations, the Im, Pesaran, and Shin (2003) test is not performed.

Identification, simultaneity, and exclusion restrictions

The process of identification entails the definition of three sets of variables, notably the outcome, predetermined, and strictly exogenous variables. The outcome variables are growth dynamics, the endogenous explaining or predetermined variables are the independent variables of interest (FDI and trade dynamics), and elements in the conditioning information set while the strictly exogenous variables are years. The choice of the latest as strictly exogenous variables is consistent with Roodman (2009) in the perspective that years are not likely to be endogenous after a first difference. The overall identification strategy is in line with contemporary GMM-centric scholarship (Tchamyou and Asongu 2017; Asongu and

Odhiambo 2020c; Tchamyou, Erreygers, and Cassimon 2019). Furthermore, the validation of the exclusion restriction assumption involves the confirmation of the position that the identified strictly exogenous variables influence the outcome variables exclusively through exogenous components of the predetermined variables.

Building on the above insights, the GMM specification is tailored such that instrumental variables (*iv* or *ivstyle*) capture variables that are strictly exogenous while the corresponding *gmmstyle* reflects the endogenous explaining variables. Still consistent with the GMM-oriented literature, in the results that are presented in the following section, the information criterion used to assess the validity of the exclusion restrictions assumption is the difference-in-Hansen test (DHT) for the exogeneity of instruments. According to this test, the alternative hypothesis should be rejected in order for the identified strictly exogenous variables to elicit the outcome variables exclusively through the exogenous mechanisms of the predetermined variables.

IV. Empirical results

This section discloses the empirical findings in Tables 1 through 3. Nexuses between FDI, trade dynamics, and GDP growth are presented in Table 1 while connections between FDI, trade dynamics, and real GDP are provided in Table 2. The section is completed with Table 3 which discloses the results pertaining to interactions between FDI, trade, and GDP per capita. Each table discloses the findings in two main sections: the left-hand side and the right-hand side, respectively, report import- and export-oriented findings.

Given the apparent concerns of instrument proliferation covered in the data section, the issues relevant to instrument proliferation are avoided in every specification by ensuring that every specification is characterized exclusively by only one variable in the conditioning information set. Accordingly, the first of the five sets of specifications does not involve any control variable. The absence of a control variable in the first specification is not uncommon in the scholarly literature because such is tolerated provided that the objective of doing so is to avoid instrument proliferation that substantially biases estimated coefficients. Examples of GMM-centric studies that have not included elements in the conditioning information set in order to avoid instrument proliferation and post-estimation bias of the estimated models are, *inter alia*: Osabuohien and Efofi (2013) and Asongu and Nwachukwu (2017c).

In order to evaluate the validity of the estimated coefficients and corresponding models, four fundamental criteria are used.⁵ In light of these criteria, the models estimated are overwhelmingly valid, with the exception of the following models in: (i) Column 4 of Table 1; (ii) Columns 2, 5, and 6 of Table 2; and (iii) Column 6 of Table 3. In Table 1, the model is invalid because the null hypothesis of the Hansen test is rejected while in Tables 2 and 3, the alternative hypotheses of the second order auto-correlation test in difference are not rejected.

In light of the hypothesis to be tested in this research, in order to assess the relevance of trade openness in modulating the incidence of FDI on economic growth dynamics, net effects are computed following contemporary interactive regression literature (Tchamyou and Asongu 2017; Agoba et al. 2020). Accordingly, these net effects are computed from both the unconditional impacts of FDI on economic growth and the conditional impacts underlying the interaction between trade dynamics (i.e., imports or exports) and FDI. For instance, the overall incidence pertaining to the testable hypothesis in the second column of Table 1 is 0.344 ($[40.422 \times -0.013] + [0.870]$). In this calculation, the average value of trade imports is 40.422, and the unconditional incidence of FDI on GDP growth is 0.870 while the conditional effect from the interaction between trade imports and FDI is -0.013.

“Insert Table 1 here”

Given the above criteria for the validity of the models, corresponding net effects, and the testable hypothesis being investigated, the following findings are apparent from Tables 1 through 3. First, trade imports modulate FDI to induce net positive effects on GDP growth and GDP per capita. Second, trade exports moderate FDI to generate overall positive impacts on GDP growth, real GDP, and GDP per capita.

“Insert Table 2 here”

Third, the significant control variables consistently have the expected signs. Accordingly, as anticipated, inflation negatively reduces economic growth while the remaining control variables (i.e., population, government expenditure, and inclusive education) have the

⁵ “First, the null hypothesis of the second-order Arellano and Bond autocorrelation test (AR (2)) in difference for the absence of autocorrelation in the residuals should not be rejected. Second the Sargan and Hansen over-identification restrictions (OIR) tests should not be significant because their null hypotheses are the positions that instruments are valid or not correlated with the error terms. In essence, while the Sargan OIR test is not robust but not weakened by instruments, the Hansen OIR is robust but weakened by instruments. In order to restrict identification or limit the proliferation of instruments, we have ensured that instruments are lower than the number of cross-sections in most specifications. Third, the Difference in Hansen Test (DHT) for exogeneity of instruments is also employed to assess the validity of results from the Hansen OIR test. Fourth, a Fisher test for the joint validity of estimated coefficients is also provided” (Asongu and De Moor 2017, 200).

opposite effect. It is relevant to articulate that while low and stable inflation is conducive for economic growth, high inflation (as apparent in the summary statistics) is not favorable for economic prosperity.

“Insert Table 3 here”

V. Concluding implications and future research directions

This study investigates the simultaneous openness hypothesis by assessing the importance of trade openness in modulating the effect of foreign direct investment (FDI) on the economic dynamics of GDP growth, real GDP, and GDP per capita. The focus of the study is on 25 countries in Sub-Saharan Africa over the period spanning from 1980 to 2014. The empirical evidence is based on the generalized method of moments. First, trade imports modulate FDI to induce net positive effects on GDP growth and GDP per capita. Second, trade exports moderate FDI to generate overall positive impacts on GDP growth, real GDP, and GDP per capita. Contrary to Sakyi and Egyir (2017) motivating this study, we have established that the simultaneous hypothesis should not be assessed based on marginal effects because when such marginal effects are negative, as we have established, the overall net effects can be positive. This caution on interactive regressions is consistent with Brambor, Clark and Golder (2006) and insights from contemporary literature on interactive specifications (Agobaet al. 2020; Tchamyou 2019). Implications are discussed in the following passages.

The fact that trade openness is relevant in modulating FDI to engender overall positive net effects on economic development is important for policymakers who need to understand not only the factors that attract FDI, but also features that complement FDI in meeting the targets of host countries such as GDP growth, improvements in real GDP, and enhancement of GDP per capita. All of these economic outcomes are positively relevant for economic development in the host countries. This study has shown, from the perspective of complementing FDI and trade openness policies, that the simultaneous hypothesis of trade and financial openness withstands empirical scrutiny in SSA within the scope of the sampled countries and considered periodicity. Hence, governments can now compete in attracting more foreign investment by effectively tailoring such investments to boost domestic economic development and enhance living standards by means of adopting trade openness policies concurrently with policies designed to attract FDI. It follows that both FDI and trade infrastructure are necessary for FDI-focused measures to engender positive economic development outcomes in host communities and countries.

Beyond the framework of complementarity discussed in the preceding paragraph, other conditions are important for FDI to garner desired economic outcomes in host countries, *inter alia*: low and stable inflation, population growth, government expenditure, and inclusive education. The variables in the conditioning information set which overwhelmingly have the expected signs are a further indication that in the real world, FDI and trade do not interact in isolation to influence macroeconomic outcomes, but are contingent on other initial macroeconomic conditions which have been incorporated into the conditioning information set in the modeling exercise. Accordingly, contrary to unconditional GMM modeling which does not involve control variables, the adoption of control variables in a GMM modeling framework is also known as conditional modeling such that the interpretation of the outcomes is contingent on the elements adopted in the conditioning information set for the modeling exercise. In summary, the resultant policy implication is that macroeconomic conditions that are relevant for promoting economic development are necessary for the interactions between trade openness and FDI to generate favorable outcomes in terms of GDP growth, real GDP, and GDP per capita.

In light of the above, multinational corporations can play an important role in driving economic development in SSA if appropriate policies are put in place, among which are the conditions discussed in the previous paragraph. Policy makers can also enhance political strategies and measures of corporate taxation by reconsidering the structure of taxes and investing in both large and small scale local productions. Given the concerns about sustainable development clearly articulated in the United Nations' Sustainable Development Goals, tailoring these policies to favor green economies and inclusive development is particularly worthwhile.

The findings in this research obviously leave avenues for future research, especially when it pertains to alternative policy instruments that complement FDI to boost economic development in SSA. Hence, considering alternative frameworks such as institutions and information and communication technology can be relevant in advancing scholarship within the premise of simultaneous and/or complementary policies that enhance economic development in developing countries.

Table 1: FDI, Trade Dynamics, and GDP growth

	Dependent variable: GDP growth									
	Trade Imports (Imports)					Trade Exports (Exports)				
GDP growth (-1)	0.030 (0.643)	0.031 (0.513)	0.036 (0.575)	-0.036 (0.569)	0.045 (0.387)	-0.005 (0.949)	-0.103** (0.026)	-0.047 (0.438)	-0.094 (0.244)	0.009 (0.878)
FDI	0.870*** (0.001)	0.537*** (0.000)	1.323*** (0.000)	1.104*** (0.000)	1.172*** (0.000)	1.448*** (0.000)	0.887*** (0.000)	1.553*** (0.000)	1.077*** (0.000)	1.034*** (0.000)
Imports	0.033* (0.077)	0.043*** (0.000)	0.071*** (0.000)	0.059*** (0.000)	0.020 (0.346)	---	---	---	---	---
Exports	---	---	---	---	---	0.127*** (0.001)	0.117*** (0.000)	0.126*** (0.000)	0.077*** (0.004)	0.041 (0.149)
FDI× Imports	- 0.013*** (0.005)	- 0.008*** (0.000)	- 0.022*** (0.000)	- 0.018*** (0.000)	- 0.019*** (0.000)	---	---	---	---	---
FDI× Exports	---	---	---	---	---	- 0.045*** (0.000)	- 0.024*** (0.000)	- 0.047*** (0.000)	- 0.028*** (0.000)	- 0.029*** (0.001)
Population	---	1.821*** (0.000)	---	---	---	---	1.729*** (0.000)	---	---	---
Inflation	---	---	-0.002 (0.000)	---	---	---	---	0.003*** (0.000)	---	---
Education	---	---	---	-0.290 (0.853)	---	---	---	---	0.053 (0.975)	---
Gov't Expenditure	---	---	---	---	0.141*** (0.008)	---	---	---	---	0.118* (0.089)
Time Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Net Effects	0.344	0.213	nsa	0.376	0.403	0.167	0.203	0.215	0.280	0.208
AR(1)	(0.033)	(0.027)	(0.024)	(0.132)	(0.025)	(0.048)	(0.091)	(0.044)	(0.146)	(0.047)
AR(2)	(0.614)	(0.155)	(0.982)	(0.318)	(0.917)	(0.176)	(0.796)	(0.245)	(0.109)	(0.768)
Sargan OIR	(0.262)	(0.660)	(0.041)	(0.475)	(0.251)	(0.236)	(0.545)	(0.084)	(0.262)	(0.380)
Hansen OIR	(0.302)	(0.364)	(0.078)	(0.133)	(0.209)	(0.382)	(0.618)	(0.458)	(0.374)	(0.440)
DHT for instruments										
(a) Instruments in levels										
H excluding group	(0.085)	(0.213)	(0.022)	(0.094)	(0.186)	(0.117)	(0.191)	(0.131)	(0.237)	(0.107)
Dif(null, H=exogenous)	(0.479)	(0.447)	(0.307)	(0.244)	(0.269)	(0.529)	(0.766)	(0.662)	(0.439)	(0.682)
(b) IV (years, eq(diff))										
H excluding group	(0.360)	(0.210)	(0.563)	(0.237)	(0.290)	(0.184)	(0.429)	(0.282)	(0.419)	(0.500)
Dif(null, H=exogenous)	(0.260)	(0.767)	(0.010)	(0.122)	(0.187)	(0.797)	(0.802)	(0.787)	(0.295)	(0.296)
Fisher	92.24***	58.69***	23543.65***	35.25***	654.47***	145.33***	179.41***	105001***	432.44***	2625.97***
Instruments	18	22	22	22	22	18	22	22	22	22
Countries	24	24	24	24	24	24	24	24	24	24
Observations	92	92	90	80	90	92	92	90	80	90

Notes: ***, **, and *: significance levels at 1%, 5%, and 10%, respectively. DHT: Difference-in-Hansen test for exogeneity of instruments subsets. Dif: Difference. OIR: Over-identifying restrictions test. The significance of bold values is twofold: 1) The significance of estimated coefficients and the Wald statistics; and 2) The failure to reject the null hypotheses of: a) no autocorrelation in the AR(1) and AR(2) tests and b) the validity of the instruments in the Sargan and Hansen OIR tests. Gov't: Government. nsa: not specifically applicable because the estimated model is not valid. na: not applicable because at least one estimated coefficient required for the computation of net effects is not significant. The mean value of imports is 40.422 while the mean value of exports is 28.459. Constants are included in all regressions.

Table 2: FDI, Trade Dynamics, and real GDP

	Dependent variable: real GDP growth(lnRGDP)									
	Trade Imports (Imports)					Trade Exports (Exports)				
lnRGDP(-1)	0.995***	0.980**	0.931***	0.816***	0.968***	0.988***	0.986**	0.924***	0.868***	0.803***
	(0.149)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
FDI	0.062	0.020	0.042	0.067**	0.040	0.086**	0.047*	0.087**	0.116***	0.057
	(0.149)	(0.230)	(0.281)	(0.024)	(0.396)	(0.025)	(0.070)	(0.015)	(0.001)	(0.126)
Imports	0.004	0.002	0.002	-0.002	0.0004	---	---	---	---	---
	(0.133)	(0.180)	(0.471)	(0.342)	(0.879)	---	---	---	---	---
Exports	---	---	---	---	---	0.012***	0.008**	0.011***	0.018***	0.004
	---	---	---	---	---	(0.000)	(0.010)	(0.000)	(0.000)	(0.165)
FDI× Imports	-0.001	-0.0003	-0.0008	-	-0.0007	---	---	---	---	---
	(0.155)	(0.298)	(0.230)	0.001**	(0.422)	---	---	---	---	---
FDI× Exports	---	---	---	---	---	-0.003**	-0.001**	-	-	-0.002**
	---	---	---	---	---	(0.015)	(0.036)	(0.009)	(0.000)	(0.042)
Population	---	0.070**	---	---	---	---	0.055	---	---	---
	---	(0.016)	---	---	---	---	(0.136)	---	---	---
Inflation	---	---	-0.0002	---	---	---	---	-0.0002	---	---
	---	---	***	---	---	---	---	***	---	---
	---	---	(0.000)	---	---	---	---	(0.000)	---	---
Education	---	---	---	1.421***	---	---	---	---	0.180	---
	---	---	---	(0.000)	---	---	---	---	(0.199)	---
Gov't Expenditure	---	---	---	---	0.009	---	---	---	---	0.004
	---	---	---	---	(0.316)	---	---	---	---	(0.560)
Time Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Net Effects	nsa	na	na	nsa	nsa	0.0006	0.018	0.001	0.002	na
AR(1)	(0.939)	(0.768)	(0.684)	(0.889)	(0.948)	(0.520)	(0.531)	(0.698)	(0.522)	(0.569)
	(0.097)	(0.108)	(0.231)	(0.088)	(0.071)	(0.116)	(0.149)	(0.364)	(0.166)	(0.158)
Sargan OIR	(0.003)	(0.001)	(0.002)	(0.072)	(0.013)	(0.029)	(0.004)	(0.016)	(0.156)	(0.036)
Hansen OIR	(0.280)	(0.588)	(0.440)	(0.317)	(0.328)	(0.306)	(0.193)	(0.643)	(0.423)	(0.160)
DHT for instruments										
(a) Instruments in levels										
H excluding group	(0.018)	(0.029)	(0.050)	(0.124)	(0.028)	(0.025)	(0.059)	(0.128)	(0.219)	(0.123)
Dif(null, H=exogenous)	(0.759)	(0.986)	(0.831)	(0.487)	(0.801)	(0.734)	(0.427)	(0.863)	(0.513)	(0.254)
(b) IV (years, eq(diff))										
H excluding group	(0.107)	(0.339)	(0.292)	(0.253)	(0.159)	(0.526)	(0.074)	(0.605)	(0.499)	(0.338)
Dif(null, H=exogenous)	(0.862)	(0.955)	(0.703)	(0.478)	(0.881)	(0.152)	(0.932)	(0.495)	(0.273)	(0.091)
Fisher	36099.89	863.82	606.29	33927.15	66973.77	188.02	378.00	337.79	13711.42	90728.12
	***	***	***	***	***	***	***	***	***	***
Instruments	18	22	22	22	22	18	22	22	22	22
Countries	24	24	24	24	24	24	24	24	24	24
Observations	93	93	91	81	91	93	93	91	81	91

Notes: ***, **, and *: significance levels at 1%, 5%, and 10%, respectively. DHT: Difference-in-Hansen test for exogeneity of instruments subsets. Dif: Difference. OIR: Over-identifying restrictions test. The significance of bold values is twofold: 1) The significance of estimated coefficients and the Wald statistics; and 2) The failure to reject the null hypotheses of: a) no autocorrelation in the AR(1) and AR(2) tests and b) the validity of the instruments in the Sargan and Hansen OIR tests. Gov't: Government. nsa: not specifically applicable because the estimated model is not valid. na: not applicable because at least one estimated coefficient required for the computation of net effects is not significant. The mean value of imports is 40.422 while the mean value of exports is 28.459. Constants are included in all regressions.

Table 3: FDI, Trade Dynamics, and GDP per capita

	Dependent variable: GDP per capita growth (lnGDPpc)									
	Trade Imports (Imports)					Trade Exports (Exports)				
lnGDPpc(-1)	1.154*** (0.000)	1.128*** (0.000)	1.079*** (0.000)	1.121*** (0.000)	1.035*** (0.000)	1.059*** (0.000)	1.078*** (0.000)	1.002*** (0.000)	0.947*** (0.000)	1.069*** (0.000)
FDI	0.079*** (0.001)	0.035** (0.026)	0.051*** (0.001)	0.089*** (0.001)	0.068*** (0.008)	0.083** (0.020)	0.038* (0.067)	0.070** (0.014)	0.086*** (0.000)	0.102** (0.000)
Imports	0.005*** (0.000)	0.004*** (0.000)	0.005*** (0.000)	0.005** (0.015)	0.002 (0.175)	---	---	---	---	---
Exports	---	---	---	---	---	0.011*** (0.007)	0.006** (0.031)	0.012*** (0.002)	0.021*** (0.000)	0.004 (0.132)
FDI× Imports	- 0.001*** (0.000)	-0.0007 *** (0.001)	- 0.001*** (0.000)	- 0.001*** (0.001)	- 0.001*** (0.007)	---	---	---	---	---
FDI× Exports	---	---	---	---	---	- 0.003*** (0.005)	- 0.001*** (0.007)	- 0.002*** (0.005)	- 0.003*** (0.000)	- 0.003*** (0.000)
Population	---	0.070 (0.111)	---	---	---	---	0.041 (0.232)	---	---	---
Inflation	---	---	-0.0002 *** (0.000)	---	---	---	---	-0.0002 *** (0.000)	---	---
Education	---	---	---	0.010 (0.971)	---	---	---	---	0.012 (0.926)	---
Gov't Expenditure	---	---	---	---	0.025*** (0.000)	---	---	---	---	0.024*** (0.000)
Time Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Net Effects	0.038	0.006	0.010	0.048	nsa	-0.002	0.009	0.013	0.0006	0.016
AR(1)	(0.728)	(0.981)	(0.480)	(0.975)	(0.974)	(0.561)	(0.738)	(0.845)	(0.609)	(0.409)
AR(2)	(0.111)	(0.145)	(0.201)	(0.173)	(0.087)	(0.142)	(0.152)	(0.281)	(0.137)	(0.187)
Sargan OIR	(0.335)	(0.221)	(0.198)	(0.611)	(0.182)	(0.415)	(0.299)	(0.341)	(0.528)	(0.248)
Hansen OIR	(0.315)	(0.263)	(0.331)	(0.602)	(0.406)	(0.211)	(0.250)	(0.408)	(0.504)	(0.140)
DHT for instruments										
(a) Instruments in levels										
H excluding group	(0.109)	(0.141)	(0.144)	(0.343)	(0.054)	(0.178)	(0.248)	(0.339)	(0.338)	(0.115)
Dif(null, H=exogenous)	(0.453)	(0.387)	(0.478)	(0.629)	(0.777)	(0.251)	(0.282)	(0.413)	(0.522)	(0.231)
(b) IV (years, eq(diff))										
H excluding group	(0.139)	(0.288)	(0.203)	(0.372)	(0.351)	(0.168)	(0.110)	(0.582)	(0.565)	(0.283)
Dif(null, H=exogenous)	(0.802)	(0.285)	(0.688)	(0.907)	(0.465)	(0.383)	(0.884)	(0.183)	(0.313)	(0.098)
Fisher	633.18 ***	4396.12 ***	6257.78 ***	256295 ***	447.50 ***	35327 ***	40880 ***	2.46e+07 ***	1228.20 ***	527.53 ***
Instruments	18	22	22	22	22	18	22	22	22	22
Countries	24	24	24	24	24	24	24	24	24	24
Observations	91	91	89	79	89	91	91	89	79	89

Notes: ***, **, and *: significance levels at 1%, 5%, and 10%, respectively. DHT: Difference-in-Hansen test for exogeneity of instruments subsets. Dif: Difference. OIR: Over-identifying restrictions test. The significance of bold values is twofold: 1) The significance of estimated coefficients and the Wald statistics; and 2) The failure to reject the null hypotheses of: a) no autocorrelation in the AR(1) and AR(2) tests and b) the validity of the instruments in the Sargan and Hansen OIR tests. Gov't: Government. nsa: not specifically applicable because the estimated model is not valid. na: not applicable because at least one estimated coefficient required for the computation of net effects is not significant. The mean value of imports is 40.422 while the mean value of exports is 28.459. Constants are included in all regressions.

Appendices

Appendix 1: Definitions and sources of variables

Variables	Signs	Definition of Variables (Measurements)	Sources
Growth 1	GDPgrowth	GDP growth (annual %)	WDI
Growth 2	lnRGDP	Logarithm of Real GDP: Output-side real GDP at chained PPPs (in mil. 2011US\$)	WDI
Growth 3	lnGDPPc	Logarithm of GDP per capita	WDI
Foreign Direct Investment	FDI	Foreign Direct Investment Inflows (% of GDP)	UNCTAD
Commodity Imports	Imports	Import of Goods and Services (% of GDP)	WDI
Commodity Exports	Exports	Export of Goods and Services (% of GDP)	WDI
Population	Population	Logarithm of Population (in millions)	WDI
Inflation	Inflation	Consumer Price Index (annual %)	WDI
Education	Education	SEPSGPI: School enrollment, primary and secondary (gross), gender parity index (GPI)	WDI
Government Expenditure	Gov't Expenditure	Governments final consumption expenditure (% of GDP)	WDI

Notes: WDI: World Development Indicators. GDP: Gross domestic product. UNCTAD: United Nations Conference on Trade and Development. FDS: Financial Development and Structure Database.

Appendix 2: Summary statistics

	Mean	SD	Minimum	Maximum	Observations
Gross Domestic Product (GDP) growth	3.569	2.953	-6.154	10.109	124
Real GDP (log)	9.527	1.104	7.670	13.638	120
GDP per capita (log)	7.657	0.838	6.255	9.702	119
Foreign Direct Investment	1.903	2.795	-3.440	22.118	124
Imports	40.422	26.980	6.664	163.198	116
Exports	28.459	16.635	3.199	66.722	116
Population	2.515	0.818	-0.242	4.165	125
Inflation	42.868	347.967	-3.601	3820.096	120
Education	0.854	0.177	0.465	1.341	107
Government Expenditure	16.066	5.358	6.085	36.155	122

Note: S.D: Standard Deviation.

Appendix 3: Correlation matrix (uniform sample size: 124)

Growth Dynamics			Trade Dynamics			Control variables				
GDPg	lnRGDP	lnGDPPc	FDI	Imports	Exports	Pop	Inflation	Education	Gov. Ex	
1.000	0.117	0.051	0.385	0.142	-0.100	0.111	-0.350	0.331	0.177	GDPg
	1.000	0.226	0.062	-0.378	-0.084	0.764	0.035	0.205	-0.269	lnRGDP
		1.000	-0.009	0.272	0.764	-0.094	-0.037	0.481	0.165	lnGDPPc
			1.000	0.278	0.181	0.045	-0.051	0.219	0.134	FDI
				1.000	0.550	-0.338	0.005	0.460	0.527	Imports
					1.000	-0.227	0.041	0.373	0.306	Exports
						1.000	-0.004	0.024	-0.323	Pop
							1.000	0.069	-0.041	Inflation
								1.000	0.296	Education
									1.000	Gov. Ex

Note: GDPg: GDP growth. lnRGDP: Logarithm of real GDP. lnGDPPc: Logarithm of GDP per capita. FDI: Foreign direct investment. Imports: Import of goods and services. Exports: Export of goods and services. Pop: population. Gov. Ex: Government Expenditure.

Appendix 4: Fisher-type unit root tests

		Constant	Constant and Trend
Gross Domestic Product(GDP) growth	P	107.437***	263.040***
	Z	-5.690***	-5.200***
	L ^o	-5.467***	-11.807***
	Pm	5.743***	21.304***
Real GDP (log)	P	60.047	27.758
	Z	-0.204	3.835
	L ^o	-0.431	3.885
	Pm	1.229	-2.065
GDP per capita (log)	P	82.979***	61.587*
	Z	-3.331***	3.825
	L ^o	-3.298***	2.326
	Pm	3.855***	1.386*
Foreign Direct Investment	P	65.562*	307.830***
	Z	-1.379*	-6.956***
	L ^o	-1.345*	-15.735***
	Pm	1.556*	25.783***
Imports	P	87.923***	361.408***
	Z	-3.652***	-7.602***
	L ^o	-3.692***	-18.650***
	Pm	4.370***	32.883***
Exports	P	92.885***	152.392***
	Z	-4.261***	-1.529*
	L ^o	-4.341***	-4.109***
	Pm	4.888***	11.092***
Population	P	97.679***	190.722***
	Z	-4.884***	0.713
	L ^o	-4.679***	-4.288***
	Pm	4.768***	14.072***
Inflation	P	126.054***	200.216***
	Z	-6.710***	-8.342***
	L ^o	-6.839***	-10.998***
	Pm	8.346***	16.078***
Education	P	43.115*	116.180***
	Z	-1.608*	-3.518***
	L ^o	-1.682**	-7.570***
	Pm	1.693**	7.316***
Government Expenditure	P	127.065***	198.459***
	Z	-6.315***	-2.560***
	L ^o	-6.521***	-7.558***
	Pm	8.069***	15.356***

Notes: ** and ***: significance levels of 5% and 1%, respectively. c:constant. ct: constant and trend. ADF: Augmented Dickey-Fuller. The lag difference length is one. P: Inverse chi-squared. Z: Inverse normal. L^o: Inverse logit t. Pm: Modified inv. chi-squared.

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