# The role of value added across economic sectors in modulating the effects of FDI on TFP and economic growth dynamics

Asongu, Simplice and Meniago, Christelle and Salahodjaev, Raufhon

January 2021

# A G D I Working Paper

WP/21/088

## The role of value added across economic sectors in modulating the effects of FDI on TFP and economic growth dynamics

**Simplice A. Asongu**
African Governance and Development Institute,
P. O. Box 8413, Yaoundé
E-mails: asongusimplice@yahoo.com /
asongus@afridev.org

**Christelle Meniago**
School of Economics and Management Sciences,
Sol Plaatje University, South Africa
E-mail: meniagochristelle@yahoo.com

**Raufhon Salahodjaev**
Tashkent State University Of Economics,
Tashkent, Uzbekistan
E-mail: salahodjaev@gmail.com

2021 African Governance and Development Institute WP/21/088

Research Department

# The role of value added across economic sectors in modulating the effects of FDI on TFP and economic growth dynamics

**Simplice A. Asongu, Christelle Meniago & Raufhon Salahodjaev**

January 2021

## Abstract

This study investigates: (i) the effect of foreign direct investment (FDI) on total factor productivity (TFP) and economic growth dynamics, and (ii) the relevance of value added from three economic sectors in modulating the established effect of FDI on TFP and economic growth dynamics. The geographical and temporal scopes are respectively 25 Sub-Saharan African countries and the period 1980–2014. The empirical evidence is based on non-interactive and interactive Generalised Method of Moments. The following main findings are established. First, FDI has a positive effect on GDP growth, GDP per capita and welfare real TFP. Second, the effect of FDI is negative on real GDP and TFP, while the impact is insignificant on real TFP growth and welfare TFP. Third, values added to the three economic sectors largely modulate FDI to produce negative net effects on TFP and growth dynamics. Policy implications are discussed with particular emphasis on the need to complement added value across various economic sectors in order to leverage on the benefits of FDI in TFP and economic growth. To the best of knowledge, this is the first study to assess how value added from various economic sectors affect the relevance of FDI on macroeconomic outcomes.

*JEL Classification*: E23; F21; F30; F43; O55

*Keywords*: Economic output, total factor productivity, foreign investment, agricultural sector, manufacturing sector, service sector, sub-Saharan Africa

## 1. Introduction

The study is motivated by two major factors in scholarly and policy-making circles: (i) debates and (ii) gaps in the literature. The points are substantiated in chronological order. First, whereas aggregate productivity has been documented to be critical in Africa's development, there is yet no consensus in the literature on mechanisms by which such productivity can be achieved and enhanced (Tchamyou, 2017; Baliamoune, 2009; Ssozi & Asongu, 2016a; Baliamoune-Lutz, 2011; Cheruiyot, 2017; Elu & Price, 2010)[1]. Consistent with the underlying literature, a notable debate has centred on factor accumulation and total factor productivity (hence TFP). For instance, in one strand of the literature, according to Young (1995) on a study focusing on East Asian economies, compared to TFP, factor accumulation has played a more relevant role in boosting economic development. Conversely, another strand on the literature supports the perspective that cross-country variations in TFP elucidate cross-country differences in economic development (Abramovitz, 1986; Romer, 1986, 1993; Temple, 1999; Nelson & Pack, 1999; Klenow & Rodriguez-Clare, 1997; Durlauf, Johnson & Temple, 2005; Easterly & Levine, 2001). According to Devarajan, Easterly and Pack (2003), Africa's dismal economic growth is more traceable to low productivity as opposed to investment levels. Building on the narrative, in order to promote economic growth, it will be premature to advocate for higher levels of investment in Africa without a good mastery of sources of low productivity. The positioning of this study responds to the underlying concerns by assessing how added values in different economic sectors modulate the effect of foreign investment on TFP and economic growth in Sub-Saharan Africa (SSA). Such a positioning is of relevance owing to gaps in contemporary attendant literature.

Second, the contemporary literature pertaining to the positioning of this study can be discussed in three main strands: (i) studies on TFP have fundamentally focused on the supply of labour and gender disparities in SSA (Elu & Price, 2017); the relationship between exporting and manufacturing (Cisse, 2017); characteristics of schooling and child labour intensity (Ahouakan & Diene, 2017); understanding of TFP and manufacturing firms within the framework of examining variations in the levels and growth productivity within the context manufacturing sectors (Kreuser & Newman, 2018) and the role of the diffusion of technology in TFP convergence (Maryan & Jehan, 2018).

[1] This study considers value added across economic sectors as such channels.

(ii) Recent papers on economic growth have focused on country-specific evidence on inflation and output dynamics (Bonga-Bonga & Simo-Kengne, 2018); nexuses between financial development and economic growth (Adam, Musah & Ibrahim, 2017; Assefa & Mollick, 2017); linkages between aid, aid volatility and sector growth (Kumi, Ibrahim & Yeboah, 2017); FDI drivers in SSA and Middle East and North African countries (Okafor, Piesse & Webster, 2017); innovation and economic growth volatility (Yaya & Cabral, 2017); financial development and economic growth volatility (Ibrahim & Alagidede, 2017).

(iii) Studies of FDI have been oriented towards FDI and regional income convergence (Dunne & Masiyandima, 2017); the role of global sector influence on sector portfolios in Africa (Boamah, 2017); connections among bonds, equity, institutional debt and economic development (Fanta & Makina, 2017); and estimation of output gap and future economic growth (Fedderke & Mengisteab, 2017).

Noticeably, the engaged literature has failed to explore the relevance of added values from economic sectors in driving FDI for TFP and economic prosperity. This study improves the extant strand of literature by examining how hitherto unexplored mechanisms affect the investigated relationships. The mechanisms include value added from the three economic sectors (i.e. agricultural, manufacturing and services sectors). We argue that the substantially documented relevance of FDI on macroeconomic outcomes (notably, TFP and economic output) can be influenced by the state of development of these main economic sectors. Accordingly, with the introduction of hitherto unexplored channels through which the role of FDI on TFP and economic growth can be modulated, the contribution to the literature is relevant to both direct and indirect effects of FDI. On the direct effect front, we argue that nexuses between FDI and macroeconomic outcomes have less policy relevance unless they are complemented with policy variables such as mechanisms through which FDI can be consolidated. On the indirect effect, the contemporary African literature pertaining to linkages under investigation have failed to engage the three main economic sectors[2].

In order to complement this attendant literature, we argue that understanding how the three main economic sectors influence the effect of FDI on macroeconomic outcomes

[2] For instance, Ssozi and Asongu (2016a) have investigated the education or schooling mechanism in the FDI-TFP nexus while Gui-Diby (2014) has examined the relevance of human resources on the impact of FDI on economic growth.

provides a comprehensive picture of how added values from the underlying sectors can be used to influence FDI for development outcomes.

Departing from the highlighted literature, which has largely focused on one measurement of TFP and economic development, the present study argues that in the sustainable development goals (SDGs) era, where concerns pertaining to sustainable development are articulated in scholarly and policy circles, it is relevant to articulate sustainable development by complementing extant productivity measurements with welfare productivity outcomes that put more emphasis on sustainable development. In this light, the present study employs seven proxies for TFP and economic development: TFP, GDP growth, real GDP, GDP per capita, real TFP, welfare TFP and real welfare TFP.

The theoretical underpinnings surrounding the role of FDI on TFP and economic growth have been substantially documented in the literature. Recent examples of models of TFP and technological gains can be found in Ssozi and Asongu (2016a). For brevity and lack of space, instead of recycling this prior theoretical exposition that is well known, the study devotes more space to discussing the intuition motivating the directions being investigated. In essence, as argued above, the intuition for this study is simple to follow: (i) FDI is invested in three main economic sectors in an economy, and (ii) the relevance of the underlying FDI in TFP and economic growth is contingent on the value added produced by these economic sectors. Hence the main research question motivating this study is as follows: what is the role of value added across economic sectors in modulating the effects of FDI on TFP and economic growth dynamics in Sub-Saharan Africa? The focus of the attendant research question clearly departs from a study by Elu and Price (2010), which has focused on assessing whether China transfers productivity enhancing technology to Sub-Saharan Africa within the framework of manufacturing firms.

The rest of the paper is organized as follows. The next section presents the theoretical underpinnings and a brief literature review, while section 3 discusses the data and empirical methodology for the analysis. Section 4 covers the results, while section 5 presents some concluding remarks.

## 2. Data and methodology

### 2.1 Data

The present study investigates a panel of 25 countries[3] in SSA using annual data for the period 1980 to 2014. The selection of countries is due to data availability constraints. The data on Foreign Direct Investment (FDI) are from the United Nations Conference on Trade and Development (UNCTAD) FDI database. FDI is measured in terms of FDI inflows as a percentage of Gross Domestic Product (GDP). While the TFP estimates are from the Penn World Table database, the remaining explanatory variables are from the World Development Indicators (WDI) and the Financial Development and Structure Database (FDSD) of the World Bank.

Three economic growth and four TFP variables are used in order to increase room for robustness. The former set of variables from WDI includes Gross Domestic Product (GDP) growth, real GDP and GDP per capita. The last-two variables are log-normalised in order to ensure that the variables are comparable. The latter set of TFP dynamics includes TFP, real TFP, welfare TFP and real welfare TFP. In the light of the motivation of the study, these variables capture both productivity and welfare related to attendant productivity**.** Economic development within the scope of this research entails GDP growth, real GDP and GDP per capita. It is important to lay more emphasis on the engaged welfare-relevant TFP measures in order to further substantiate the reasoning underpinning their adoption. According to the attendant literature, with the welfare of a country's representative consumer being summarized by capital stock per capita and TFP to a first order, to calculate the underlying welfare-relevant TFP, a measure of real domestic absorption, which includes investment and consumption, is required (Basu et al., 2014). The choice of the underlying GDP and TFP indicators is motivated by recent economic growth (Asongu & Odhiambo, 2020) and TFP (Basu et al., 2014; Asongu, 2020) literature.

In order to increase the policy relevance of the study, FDI is modulated with value-added indicators from the three economic sectors, namely, the agricultural, manufacturing and service sectors. Consistent with the research question motivating the present study, the choice of these channels is motivated by the need to assess how the relevance of FDI in economic

[3]The 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.

development and TFP can be boosted by policy measures from the three main economic sectors. The selection of the three main economic sectors (agriculture, manufacturing and service) is informed by contemporary African-centric literature on value added across economic sub-sectors (Asongu & Odhiambo, 2021a).

Consistent with recent literature on determinants of economic output, economic growth and TFP, six main control variables are adopted for the study: population, inflation, government expenditure, education, remittances and private domestic credit (Barro, 2003; Sahoo *et al*., 2010; Basu *et al*., 2014; Ssozi & Asongu, 2016a, 2016b; Vu & Asongu, 2020). The expected signs are discussed in chronological order. First, it is widely accepted in the literature that positive demographic change promotes output and economic activity. Some studies supporting this perspective include Becker et al. (1999) and Heady and Hodge (2009). Second, intuitively, inflation is negatively connected with the examined outcome variables given that investors have been documented to respond negatively to economic environments that are characterised by a substantial degree of ambiguity, such as inflation. Kelsey and le Roux (2017, 2018) are examples of studies supporting the underlying view. Third, from intuition, government expenditure is expected to be positively associated with productivity and economic output. However, this anticipated sign is contingent on the degree of corruption and mismanagement associated with such expenditure. Fourth, while Ssozi and Asongu (2016a) have established that education in SSA promotes TFP, the choice of a proxy of education that encompasses both secondary and primary enrollments is premised on the studies arguing for the importance of these education levels in development outcomes, especially when attendant countries are at early stages of industrialisation (Petrakis & Stamatakis, 2002; Asiedu, 2014; Tchamyou, 2020)[4]. Fifth, remittances have been established to be positively associated with economic output and TFP in SSA (Ssozi & Asongu, 2016b). However, the overall effect could also be contingent on how remittances affect other dynamics, such as income-inequality. For instance, remittances have been recently documented to increase inequality in SSA (Anyanwu, 2011; Meniago & Asongu, 2018; Tchamyou et al., 2019a), and such income inequality is negatively associated with economic

[4]The adopted education proxy is primary and secondary (gross), gender parity index (GPI). School enrollment is used in place of educational attainment for the fundamental reason that skills needed for productivity and economic development can be acquired through school enrollment even if the school enrollment is not sanctioned by a level of completed education. Accordingly, for a certificate of educational attainment that entails five years of schooling, a student can succeed in all classes and only fail the final year exam. The fact that the student does not end up with a certificate does not imply that he/she did not acquire some learning via education.

output (Fosu, 2015). The relevance of private domestic credit in productivity and economic growth is in accordance with the extant literature (Asongu, 2015; Nyasha & Odhiambo, 2015a, 2015b).

The definitions of variables and corresponding sources, the summary statistics and correlation matrix are presented in Appendix 1, Appendix 2 and Appendix 3, respectively. From the summary statistics, it is apparent that the variables can be compared based on their mean values. Moreover, the variations in the corresponding standard deviations are indications that significant linkages will be derived from the estimations. The purpose of the correlation matrix is to ensure that variables with a high degree of substitution are not adopted in the conditioning information set. Beside the expected high correlation among the outcome variables, some correlations among independent variables merit more clarification. For instance, (i) education and GDP growth on the one hand and on the other, education and value added in the agricultural sector exhibit high correlations, and (ii) it is also apparent that the value added to the agricultural sector and value added to the manufacturing sector are negatively associated with FDI. The underlying concerns are clarified in what follows.

(i) The correlation between education and GDPg should not be an issue because GDPg is an outcome variable and education is a control variable. Accordingly, the procedure for choosing control variables is tailored such that they should influence the outcome variable and thus are expected to be correlated with the outcome variable.

(ii) The correlation between education and value added to the agricultural sector does not influence the findings and corresponding policy implications because in interactive regressions, the concern of multicollinearity is not taken into account given that estimated coefficients are not interpreted as in linear additive models (Brambor et al., 2006). This is why both the unconditional impact and conditional estimated effect (from variables that are highly correlated) are used in the computation of net effects as we have done in the study.

(iii) The explanation in (ii) above extends to clarifying the perspective that values added to the agricultural and manufacturing sectors were negatively associated with FDI, not least, because the overall/net effects were not exclusively based on this negative association, which is reflected by the interactive terms. Accordingly, the overall/net effect is the sum of the interactive effect and the unconditional effect of FDI. Hence, the unconditional effect of FDI

can still outweigh the apparent underlying negative correlations to produce positive overall/net effects. This is the reason an empirical analysis is worthwhile to assess if the perspective of initial correlations withstands empirical scrutiny when assessed within the framework of net/overall effects pertaining to interactive regressions.

The data is tailored to be consistent with the adoption of the estimation strategy, which is the Generalised Method of Moments (GMM). Accordingly, the estimation approach is designed for a dataset in which the number of countries is higher than the number of periods in each country. Hence, in order to meet this condition, the dataset is disaggregated in terms of averages or seven-year non-overlapping intervals. Hence, the study retains five data points, which correspond to the following intervals: 2008-2014; 2001-2007; 1994-2000; 1987-1993; and 1980-1986. It is important to note that at least five data points are required for the application of the GMM approach. During the data exploration exercise, we also derived seven five-year non-overlapping intervals. Unfortunately, this latter set of data averages produced findings that did not pass the post-estimation diagnostic instrument proliferation test. Hence, the study retained the former set of data averages or seven-year non-overlapping intervals. The use of non-overlapping intervals also has the advantage of reducing disturbances from business cycles that can substantially persist (Islam, 1995).

## 2.2 Methodology

## 2.2 Empirical Model and Estimation Procedure

### *2.2.1 Specification*

The empirical strategy is designed to respond to two fundamental questions motivating the study: (i) the effect of FDI on TFP and economic output, and (ii) the relevance of values added from the three economic sectors in modulating the established effect. In order to make these assessments, both non-interactive and interactive regressions are employed to address the concerns in (i) and (ii) respectively. Accordingly, to address the first question, TFP and economic growth dynamics are regressed on FDI contingent on variables in the conditioning information set or control variables, while to address the second question, TFP and economic growth dynamics are regressed on FDI, which are interacted with or modulated by the value added across economic sectors proxies, contingent on control variables.

The adopted GMM approach is motivated by five main reasons. The first-two are required for the approach whereas the last three represent advantages that are related to the empirical strategy (Tchamyou, 2020; Tchamyou *et al*., 2019b).

(i) Persistence is exhibited by majority of the outcome variables because the correlation between an outcome variable and its first lags is higher than 0.800, which the rule of thumb required for a variable to be characterised by persistence (Asongu, Nnanna & Acha-Anyi, 2020; Asongu, Nting & Nnanna, 2020).

(ii) The number of data points in each country (i.e. T=5) is lower than the total of number countries (i.e. N=25).

(iii) Some aspects of endogeneity are taken on board given that the estimation approach is tailored to employ instrumental variables to address suspected simultaneity in the regressors. Furthermore, the unobserved heterogeneity is controlled with time-invariant omitted variables that are used to control for cross sectional dependence.

(iv) Potential biases in the difference estimator are tackled using the system estimator.

(v) Cross-country differences are considered in the specifications.

Moreover, the GMM estimator has been widely used in extant cross-country research to assess the drivers of economic growth (Doytch & Uctum, 2011; Siddiqui & Ahmed, 2013) and TFP (Asongu, Nnanna & Acha-Anyi, 2020b; Di Liberto et al., 2011).

The following equations in levels (1) and first difference (2) summarize the estimation procedure for TFP and economic development (i.e., GDP growth, real GDP and GDP per capita).

$$TFP_{i,t} = \sigma_0 + \sigma_1 TFP_{i,t-\tau} + \sigma_2 FDI_{i,t} + \sigma_3 VA_{i,t} + \sigma_4 Inter_{i,t} + \sum_{h=1}^{6} \delta_h W_{h,i,t-\tau} + \eta_i + \xi_t + \varepsilon_{i,t} \quad (1)$$

$$\begin{aligned} TFP_{i,t} - TFP_{i,t-\tau} = {} & \sigma_1 (TFP_{i,t-\tau} - TFP_{i,t-2\tau}) + \sigma_2 (FDI_{i,t} - FDI_{i,t-\tau}) + \sigma_3 (VA_{i,t} - VA_{i,t-\tau}) \\ & + \sigma_4 (Inter_{i,t} - Inter_{i,t-\tau}) + \sum_{h=1}^{6} \delta_h (W_{h,i,t-\tau} - W_{h,i,t-2\tau}) + (\xi_t - \xi_{t-\tau}) + (\varepsilon_{i,t} + \varepsilon_{i,t-\tau}) \end{aligned}, \quad (2)$$

where $TFP_{i,t}$ is total factor productivity of country $i$ in period $t$; $FDI$ is foreign direct investment; $VA$ is value added from an economic sector (i.e. agricultural, manufacturing and service sectors); $Inter$ is the interaction between FDI and the value added from an economic sector; $\sigma_0$ is a constant; $\tau$ is the degree of auto-regression which is one because a lag of seven years is enough to capture past information; $W$ is the vector of control variables (*population, inflation, government expenditure, education, remittances and private domestic credit)*, $\eta_i$ is the country-specific effect, $\xi_t$ is the time-specific constant and $\varepsilon_{i,t}$ the error term. Equations (1) and (2) are replicated for the remaining six dependent variables: GDP growth, real GDP, GDP per capita, real TFP, welfare TFP and real welfare TFP.

This study adopts the Roodman (2009) extension of Arellano and Bover (1995) because it has been documented to limit the proliferation of instruments (Love & Zicchino, 2006; Boateng et al., 2018). Moreover, a two-step instead of a one-step estimation procedure is adopted because it corrects for heteroscedasticity.

*2.2.2 Identification, simultaneity and exclusion restrictions*

The specification of the GMM will not be robust unless some discussion on identification, simultaneity and exclusion restrictions is engaged. In what follows, the three elements are covered in the same order of presentation. For the purpose of conceptual clarification: (i) *identification* consists of selecting three main sets of variables: (a) the outcome variables, (b) the endogenous explaining variables consisting of the independent variables of interest and control and (c) the strictly exogenous variables, which also double as the main instruments. (ii) *Simultaneity* is the process through which the concern of reverse causality is addressed. (iii) *Exclusion restriction* refers to the procedure by which the assumption that the adopted strictly exogenous variables influence the outcome variable exclusively via the exogenous components of the explaining variables is confirmed.

First, regarding the identification strategy, the study is consistent with recent empirical literature on GMM application in defining time invariant variables are strictly exogenous while all independent variables are acknowledged as endogenous explaining or suspected endogenous (Tchamyou & Asongu, 2017; Meniago & Asongu, 2018; Tchamyou et al., 2019b). The procedure of identification is also in accordance with Roodman (2009) who has argued that years are appropriate strictly exogenous instruments because it is unfeasible for

years to become endogenous after a first difference. Building on these insights, the GMM equation is specified such that the time invariant variables are within the instrumental variables (iv or *ivstyle*) framework (i.e. 'iv (propositions, years, eq(diff))'. Hence, the corresponding procedure for assessing the endogenous explaining variables is the *gmmstyle.* The underpinning exclusion restriction assumption is that, the adopted strictly exogenous variables influence the outcome variables exclusively via the proposed mechanisms or endogenous explaining variables.

Secondly, in order to address the concern of simultaneity or reverse causality, forward differenced variables are used as instrumental variables, contrary to the employment of lagged explanatory variables in the standard differenced GMM approach. To this end, Helmert transformations are employed to remove fixed effects, which can potentially bias estimated coefficients because such fixed effects are correlated with the error terms. Such an approach to the purging of fixed effects is consistent with the extant literature (Arellano & Bover 1995; Love & Zicchino, 2006). Note should be taken of the fact that such an instrumentation process is quite distinct from the standard process of subtracting non-contemporary observations from associated contemporary observations. In other words, in place of first differences, forward mean-differences are used (Roodman, 2009). These transformations are conducive for orthogonal or parallel conditions between, the lagged and forward-differenced observations.

Thirdly, concerning exclusion restrictions, the Difference in Hansen Test (DHT) for instrument exogeneity is used to assess whether the adopted strictly exogenous instruments influence the outcome variables exclusively through the investigated channels. The null hypothesis of this test is the position that the strictly exogenous instruments are valid.

## 3. Empirical results

The empirical findings are presented in Tables 1-4. Whereas the first-two tables are focused on non-interactive regressions, the last-two tables reflect findings pertaining to interactive estimations. Table 1 and Table 3 (Table 2 and Table 4) focus on GDP-related (TFP-oriented) estimations. There are consistently three main specifications, notably: a first specification in which FDI is the main independent variable of interest; a second specification with the first set of three control variables and a third specification with the second set of three control variables. The use of variables from the conditioning information set in two distinct specifications is to mitigate concerns of instrument proliferation when more control variables

are employed. For all the tables, the information criteria discussed in Section 3 is used to examine the validity of the GMM models[5].

The following findings can be established from Tables 1-2. First, FDI has a positive effect on GDP growth, GDP per capita and welfare real TFP. Second, the effect of FDI is negative on real GDP and TFP while the impact is insignificant on real TFP growth and welfare TFP. The negative magnitude of the FDI effects on the outcome variables is substantially low when compared with the corresponding positive magnitude of FDI on the outcome variables. This may imply that for the established negative effects, FDI is a necessary but not a sufficient condition for positive outcomes in the engaged dependent variables. The significant control variables have the expected signs for the most part.

[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 Fischer test for the joint validity of estimated coefficients is also provided*" (Asongu & De Moor, 2017, p.200).

**Table 1: Non-interactive Growth-oriented regressions**

| | Dependent variables: Economic growth dynamics | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | GDP growth | | | lnRGDP | | | lnGDPpc | | |
| Constant | **2.561*** (0.001)** | **-6.155** (0.017)** | **2.212** (0.025)** | **5.775*** (0.009)** | -0.085 (0.893) | **1.107** (0.037)** | **-1.869*** (0.000)** | **-0.974*** (0.004)** | **-0.511*** (0.005)** |
| GDP growth(-1) | 0.144 (0.282) | -0.056 (0.348) | **0.242*** (0.000)** | --- | --- | --- | --- | --- | --- |
| lnRGDP(-1) | --- | --- | --- | **0.446** (0.039)** | **0.868*** (0.000)** | **0.941*** (0.000)** | --- | --- | --- |
| lnGDPpc(-1) | --- | --- | --- | --- | --- | --- | **1.263*** (0.000)** | **1.040*** (0.000)** | **1.067*** (0.000)** |
| FDI | **0.213*** (0.001)** | **0.215*** (0.000)** | **0.168*** (0.000)** | -0.008 (0.716) | **-0.007* (0.060)** | -0.007 (0.370) | **0.009* (0.062)** | 0.001 (0.602) | -0.001 (0.687) |
| Population | --- | **1.473*** (0.000)** | --- | --- | **0.132** (0.028)** | --- | --- | 0.035 (0.407) | --- |
| Inflation | --- | **-0.002*** (0.000)** | --- | --- | **-0.0002*** (0.000)** | --- | --- | **-0.0002*** (0.000)** | --- |
| Education | --- | **6.877*** (0.005)** | --- | --- | **1.545*** (0.000)** | --- | --- | **0.791** (0.010)** | --- |
| Gov't Exp. | --- | --- | 0.072 (0.182) | --- | --- | -0.008 (0.374) | --- | --- | -0.003 (0.560) |
| Remittances | --- | --- | **-0.075** (0.016)** | --- | --- | -0.0006 (0.908) | --- | --- | 0.002 (0.439) |
| Private Credit | --- | --- | **-0.016* (0.084)** | --- | --- | 0.001 (0.351) | --- | --- | -0.0002 (0.842) |
| Time Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| AR(1) | (0.042) | **(0.166)** | (0.034) | **(0.745)** | **(0.835)** | **(0.665)** | **(0.626)** | **(0.642)** | **(0.465)** |
| AR(2) | **(0.730)** | **(0.815)** | (0.065) | **(0.357)** | **(0.343)** | **(0.180)** | **(0.126)** | **(0.296)** | **(0.224)** |
| Sargan OIR | **(0.414)** | **(0.189)** | (0.047) | (0.000) | **(0.142)** | (0.026) | **(0.640)** | **(0.806)** | **(0.241)** |
| Hansen OIR | **(0.489)** | **(0.644)** | **(0.291)** | (0.032) | **(0.538)** | **(0.570)** | **(0.751)** | **(0.757)** | **(0.857)** |
| DHT for instruments (a)Instruments in levels | | | | | | | | | |
| H excluding group | **(0.515)** | **(0.274)** | **(0.062)** | **(0.315)** | **(0.529)** | **(0.641)** | **(0.787)** | **(0.980)** | **(0.661)** |
| Dif(null, H=exogenous) | **(0.391)** | **(0.792)** | **(0.708)** | **(0.023)** | **(0.466)** | **(0.440)** | **(0.605)** | **(0.457)** | **(0.800)** |
| (b) IV (years, eq(diff)) | | | | | | | | | |
| H excluding group | **(0.226)** | **(0.401)** | **(0.237)** | **(0.035)** | **(0.553)** | **(0.738)** | **(0.309)** | **(0.712)** | **(0.849)** |
| Dif(null, H=exogenous) | **(0.580)** | **(0.987)** | **(0.476)** | **(0.105)** | **(0.378)** | **(0.201)** | **(0.830)** | **(0.557)** | **(0.529)** |
| Fisher | **14.16*** | **1311.28*** | **106.21*** | **57.88*** | **103.00*** | **544.96*** | **285.29*** | **903.08*** | **4453.62*** |
| Instruments | 10 | 22 | 22 | 10 | 22 | 22 | 10 | 22 | 22 |
| Countries | 25 | 25 | 24 | 24 | 24 | 24 | 24 | 24 | 24 |
| Observations | 99 | 83 | 83 | 96 | 80 | 83 | 94 | 78 | 81 |

***,**,*: 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 Fisher statistics. 2) The failure to reject the null hypotheses of: a) no autocorrelation in the AR(1) & AR(2) tests and; b) the validity of the instruments in the Sargan and Hansen OIR tests. The total number of countries in all specifications is not 25 because of missing data for South Africa.

In order to investigate the relevance of added values from economic sectors in the effect of FDI on TFP and economic growth dynamics, net effects are computed in Table 3 and Table 4. In both tables, Panel A, Panel B and Panel C are focused respectively, on the

modulating roles of the agricultural sector, the manufacturing sector and service sector. Like with the previous two tables, there are consistently three sets of specifications, notably: a first specification with the FDI and modulating policy variables; a second specification with the first set of three control variables and a third specification with the second set of three control variables. The use of variables in the conditioning information set in two distinct specifications is also motivated by the need to mitigate concerns of instrument proliferation when more control variables are employed. For lack of space, estimated coefficients corresponding to the control variables are not disclosed. For all the tables, the information criteria discussed in Section 3 is used to examine the validity of the GMM models.

**Table 2: Non-interactive TFP-related regressions**

| | **Panel A: Total Factor Productivity Regressions** | | | | | |
|---|---|---|---|---|---|---|
| | **Total Factor Productivity (TFP)** | | | **Real Total Factor Productivity Growth (RTFPg)** | | |
| Constant | 0.071 | **-0.189**** | **0.078***** | **0.305***** | **0.440***** | **0.335***** |
| | (0.186) | **(0.019)** | **(0.003)** | **(0.002)** | **(0.000)** | **(0.000)** |
| TFP(-1) | **0.758***** | **0.619***** | **0.792***** | --- | --- | --- |
| | **(0.000)** | **(0.000)** | **(0.000)** | | | |
| RTFP(-1) | --- | --- | --- | **0.729***** | **0.600***** | **0.657***** |
| | | | | **(0.000)** | **(0.000)** | **(0.000)** |
| FDI | 0.0004 | -0.001 | **-0.002***** | 0.0003 | -0.00005 | 0.0001 |
| | (0.801) | (0.212) | **(0.003)** | (0.830) | (0.969) | (0.958) |
| Population | --- | -0.003 | --- | --- | -0.006 | --- |
| | | (0.728) | | | (0.428) | |
| Inflation | --- | **-0.00007***** | --- | --- | **-0.00009***** | --- |
| | | **(0.000)** | | | **(0.000)** | |
| Education | --- | **0.441***** | --- | --- | -0.061 | --- |
| | | **(0.000)** | | | (0.341) | |
| Gov't Exp | --- | --- | -0.001 | --- | --- | 0.003 |
| | | | (0.516) | | | (0.101) |
| Remittance | --- | --- | **0.001**** | --- | --- | -0.001 |
| | | | **(0.030)** | | | (0.219) |
| Private Credit | --- | --- | 0.0005 | --- | --- | -0.0003 |
| | | | (0.290) | | | (0.647) |
| Time Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| AR(1) | **(0.771)** | **(0.953)** | **(0.508)** | **(0.067)** | **(0.809)** | **(0.142)** |
| AR(2) | **(0.959)** | **(0.260)** | **(0.928)** | **(0.109)** | **(0.246)** | (0.087) |
| Sargan OIR | **(0.365)** | **(0.752)** | (0.051) | (0.074) | (0.014) | **(0.112)** |
| Hansen OIR | **(0.546)** | **(0.539)** | **(0.438)** | **(0.396)** | **(0.174)** | **(0.119)** |
| DHT for instruments | | | | | | |
| (a)Instruments in levels | | | | | | |
| H excluding group | **(0.346)** | **(0.616)** | **(0.163)** | **(0.631)** | **(0.570)** | (0.047) |
| Dif(null, H=exogenous) | **(0.535)** | **(0.419)** | **(0.678)** | **(0.279)** | **(0.101)** | **(0.394)** |
| (b) IV (years, eq(diff)) | | | | | | |
| H excluding group | **(0.866)** | **(0.416)** | **(0.590)** | **(0.260)** | **(0.496)** | (0.049) |
| Dif(null, H=exogenous) | **(0.385)** | **(0.666)** | **(0.192)** | **(0.422)** | (0.042) | **(0.863)** |
| Fisher | **61.63***** | **253.53***** | **2413.12***** | **18.43***** | **2392.58***** | **65.33***** |
| Instruments | 10 | 22 | 22 | 10 | 22 | 22 |
| Countries | 25 | 25 | 24 | 25 | 25 | 24 |
| Observations | 100 | 84 | 83 | 100 | 84 | 83 |

| | Panel B: Welfare Total Factor Productivity Regressions | | | | | |
|---|---|---|---|---|---|---|
| | Welfare Total Factor Productivity (WTFP) | | | Welfare Real Total Factor Productivity (WRTFP) | | |
| Constant | **0.110**** | **-0.133**** | **0.052**** | **0.438***** | **0.268**** | **0.414***** |
| | **(0.040)** | **(0.043)** | **(0.011)** | **(0.000)** | **(0.013)** | **(0.000)** |
| WTFP(-1) | **0.721***** | **0.598***** | **0.760***** | --- | --- | --- |
| | **(0.000)** | **(0.000)** | **(0.000)** | | | |
| WRTFP(-1) | --- | --- | --- | **0.606***** | **0.477***** | **0.622***** |
| | | | | **(0.000)** | **(0.000)** | **(0.000)** |
| FDI | 0.001 | 0.001 | -0.0002 | **0.003*** | **0.001**** | 0.002 |
| | (0.456) | (0.100) | (0.560) | **(0.087)** | **(0.015)** | (0.147) |
| Population | --- | -0.011 | **0.001*** | --- | 0.008 | --- |
| | | (0.177) | **(0.079)** | | (0.250) | |
| Inflation | --- | **-0.00006***** | -0.001 | --- | **-0.00008***** | --- |
| | | **(0.000)** | (0.174) | | **(0.000)** | |
| Education | --- | **0.386***** | **0.001***** | --- | **0.159*** | --- |
| | | **(0.000)** | **(0.003)** | | **(0.067)** | |
| Gov't Exp. | --- | --- | --- | --- | --- | 0.003 |
| | | | | | | (0.131) |
| Remittance | --- | --- | --- | --- | --- | **-0.004*** |
| | | | | | | **(0.067)** |
| Private Credit | --- | --- | --- | --- | --- | **-0.001**** |
| | | | | | | **(0.020)** |
| Time Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| AR(1) | **(0.601)** | **(0.824)** | **(0.800)** | (0.015) | **(0.171)** | (0.061) |
| AR(2) | **(0.323)** | **(0.329)** | **(0.425)** | **(0.302)** | **(0.287)** | **(0.192)** |
| Sargan OIR | **(0.361)** | **(0.891)** | **(0.163)** | **(0.354)** | (0.030) | (0.092) |
| Hansen OIR | **(0.381)** | **(0.491)** | **(0.597)** | **(0.678)** | **(0.275)** | **(0.407)** |
| DHT for instruments | | | | | | |
| (a)Instruments in levels | | | | | | |
| H excluding group | **(0.462)** | **(0.333)** | **(0.285)** | **(0.437)** | **(0.352)** | **(0.360)** |
| Dif(null, H=exogenous) | **(0.302)** | **(0.547)** | **(0.726)** | **(0.635)** | **(0.268)** | **(0.420)** |
| (b) IV (years, eq(diff)) | | | | | | |
| H excluding group | **(0.843)** | **(0.502)** | **(0.635)** | **(0.276)** | **(0.238)** | **(0.248)** |
| Dif(null, H=exogenous) | **(0.245)** | **(0.372)** | **(0.359)** | **(0.771)** | **(0.428)** | **(0.811)** |
| Fisher | **44.24***** | **250.69***** | **672.71***** | **13.20***** | **6435.19***** | **56.11***** |
| Instruments | 10 | 22 | 22 | 10 | 22 | 22 |
| Countries | 25 | 25 | 24 | 25 | 25 | 24 |
| Observations | 100 | 84 | 83 | 100 | 84 | 83 |

***,**,*: 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 Fisher statistics. 2) The failure to reject the null hypotheses of: a) no autocorrelation in the AR(1) & AR(2) tests and; b) the validity of the instruments in the Sargan and Hansen OIR tests. The total number of countries in all specifications is not 25 because of missing data for South Africa.

The computation of net effects (i.e. in order to assess the overall effect of the policy relevance of the modulating variables on the outcome variables) is consistent with recent African development literature (Tchamyou, 2019, 2020; Asongu et al., 2017). For instance, in the fourth column of Table 3, the net effect of the role of added value from the agricultural sector in modulating the effect on FDI on GDP growth is 0.071([0.020 × 26.673] + [-0.462]), where: the mean value of added value from the agricultural sector is 26.673, the unconditional impact of FDI is -0.462 whereas the conditional impact from the interaction between FDI and added value from the agricultural sector is 0.020.

The following main findings can be established from the interactive regressions: value added from the three economic sectors largely modulate FDI to produce negative net effects on TFP and growth dynamics.

**Table 3: Interactive TFP-related regressions**

| | **Dependent variable: Economic growth dynamics** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **Panel A: Agricultural value added** | | | | | | | | |
| | GDP growth | | | lnRGDP | | | lnGDPpc | | |
| Constant | **5.846*** ** | -11.130 | **4.380*** | **3.570*** ** | **-0.933*** | **1.462** ** | **1.208** ** | 0.373 | **1.369*** |
| | **(0.002)** | (0.070) | **(0.053)** | **(0.000)** | **(0.056)** | **(0.021)** | **(0.020)** | (0.625) | **(0.061)** |
| Growth(-1) | 0.040 | -0.096 | 0.038 | **0.708*** ** | **0.991*** ** | **0.913*** ** | **0.912*** ** | **0.885*** ** | **0.886*** ** |
| | (0.627) | (0.203) | (0.637) | **(0.000)** | **(0.000)** | **(0.000)** | **(0.000)** | **(0.000)** | **(0.000)** |
| FDI | -0.295 | 0.331 | **-0.462*** ** | -0.049 | -0.005 | **-0.043** ** | **-0.058*** | -0.031 | 0.002 |
| | (0.211) | (0.149) | **(0.000)** | (0.158) | (0.811) | **(0.018)** | **(0.072)** | (0.174) | (0.923) |
| Agriculture(Agri) | **-0.085*** | 0.063 | -0.108** | **-0.015*** ** | 0.0005 | **-0.012** ** | **-0.019*** ** | -0.008 | **-0.009*** |
| | **(0.077)** | (0.378) | (0.020) | **(0.000)** | (0.922) | **(0.021)** | **(0.008)** | (0.189) | **(0.099)** |
| FDI×Agri | **0.016** ** | -0.004 | **0.020*** ** | **0.001*** | 0.0003 | **0.001** ** | **0.001*** | 0.001 | 0.00001 |
| | **(0.037)** | (0.526) | **(0.000)** | **(0.053)** | (0.631) | **(0.015)** | **(0.061)** | (0.155) | (0.981) |
| Net effects | na | na | 0.071 | na | na | -0.016 | -0.031 | na | na |
| Control variables | No | Yes | Yes | No | Yes | Yes | No | Yes | Yes |
| Time Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Validity Post-estimation diagnostic tests | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| | **Panel B: Manufacturing value added** | | | | | | | | |
| Constant | 0.315 | **1.208** ** | 1.030 | 0.457 | -0.608 | 0.308 | **-1.543*** ** | **-2.297*** ** | 0.080 |
| | (0.472) | **(0.020)** | (0.178) | (0.214) | (0.221) | (0.616) | **(0.000)** | **(0.000)** | (0.853) |
| Growth(-1) | 0.084 | **0.912*** ** | **0.100** ** | **0.916*** ** | **0.959*** ** | **0.938*** ** | **1.181*** ** | **1.110*** ** | **0.907*** ** |
| | (0.188) | **(0.000)** | **(0.014)** | **(0.000)** | **(0.000)** | **(0.000)** | **(0.000)** | **(0.000)** | **(0.000)** |
| FDI | **0.597*** ** | **-0.058*** | **0.523*** ** | **0.056*** ** | **0.034*** ** | **0.042*** ** | **0.057*** ** | **0.055*** ** | **0.028** ** |
| | **(0.000)** | **(0.072)** | **(0.000)** | **(0.009)** | **(0.001)** | **(0.004)** | **(0.005)** | **(0.001)** | **(0.018)** |
| Manufacturing(Manu) | **0.159*** ** | **-0.019*** ** | **0.091** ** | **0.032*** ** | **0.022*** ** | **0.031*** ** | **0.031*** ** | **0.034*** ** | **0.028*** ** |
| | **(0.000)** | **(0.008)** | **(0.012)** | **(0.000)** | **(0.002)** | **(0.000)** | **(0.001)** | **(0.005)** | **(0.000)** |
| FDI×Manu | **-0.046*** ** | **0.001*** | **-0.036*** ** | **-0.006*** ** | **-0.003*** ** | **-0.005*** ** | **-0.006*** ** | **-0.005*** ** | **-0.004*** ** |
| | **(0.000)** | **(0.061)** | **(0.000)** | **(0.000)** | **(0.001)** | **(0.003)** | **(0.000)** | **(0.001)** | **(0.000)** |
| Net effects | 0.003 | -0.045 | 0.058 | -0.021 | -0.005 | -0.022 | -0.020 | -0.009 | -0.023 |
| Control variables | No | Yes | Yes | No | Yes | Yes | No | Yes | Yes |
| Time Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Validity Post-estimation diagnostic tests | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| | **Panel C: Services Added Value** | | | | | | | | |
| Constant | -0.070 | **-9.031*** ** | 2.468 | 0.590 | 0.185 | 0.236 | **-2.010*** ** | -0.755 | **-1.037*** ** |
| | (0.979) | **(0.001)** | (0.156) | (0.767) | (0.805) | (0.467) | **(0.000)** | (0.136) | **(0.000)** |
| Growth(-1) | **0.171*** | -0.057 | **0.236*** ** | **0.903*** ** | **0.843*** ** | **0.998*** ** | **1.265*** ** | **0.996*** ** | **1.120*** ** |
| | **(0.074)** | (0.342) | **(0.000)** | **(0.000)** | **(0.000)** | **(0.000)** | **(0.000)** | **(0.000)** | **(0.000)** |
| FDI | **0.718** ** | **0.770*** | **0.961*** ** | 0.020 | -0.050 | 0.013 | 0.044 | -0.085** | -0.008 |
| | **(0.021)** | **(0.080)** | **(0.003)** | (0.817) | (0.165) | (0.739) | (0.137) | (0.047) | (0.585) |
| Service | 0.130 | 0.112 | -0.012 | **0.022*** ** | -0.002 | **0.005** ** | 0.005 | **-0.018** ** | 0.002 |
| | (0.294) | (0.280) | (0.869) | **(0.007)** | (0.750) | **(0.018)** | (0.472) | **(0.012)** | (0.303) |
| FDI×Service | -0.023 | -0.023 | -0.032 | -0.0006 | 0.001 | -0.0006 | -0.001 | 0.003** | 0.0003 |
| | (0.109) | (0.179) | (0.013) | (0.836) | (0.229) | (0.702) | (0.232) | (0.034) | (0.625) |
| Net Effects | na | na | na | na | na | na | na | -0.026 | na |
| Control variables | No | Yes | Yes | No | Yes | Yes | No | Yes | Yes |
| Time Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Validity Post-estimation diagnostic tests | Yes | Yes | No | Yes | Yes | Yes | Yes | Yes | Yes |

***,**,*: 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 Fisher statistics. 2) The failure to reject the null hypotheses of: a) no autocorrelation in the AR(1) & AR(2) tests and; b) the validity of the instruments in the Sargan and Hansen OIR tests. Mean value of agriculture value added: 26.673. Mean value of manufacturing value added: 12.916. Mean service value added: 19.339.

## Table 4: Interactive TFP-related regressions

**Dependent variable: Total Factor Productivity (TFP) Dynamics**

**Panel A: Agricultural value added**

| | Total Factor Productivity (TFP) | | | Real Total Factor Productivity Growth (RTFPg) | | | Welfare Total Factor Productivity (WTFP) | | | Welfare Real Total Factor Productivity (WRTFP) | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Constant | **0.386**** | 0.145 | **0.342**** | **0.497**** | **0.636**** | **0.662**** | **0.337**** | 0.110 | **0.376**** | **0.592**** | **0.698**** | **0.702**** |
| | **(0.000)** | (0.466) | **(0.000)** | **(0.000)** | **(0.002)** | **(0.000)** | **(0.000)** | (0.346) | **(0.001)** | **(0.000)** | **(0.000)** | **(0.000)** |
| TFP(-1) | **0.548**** | **0.613**** | **0.550**** | **0.650**** | **0.657**** | **0.509**** | **0.532**** | **0.583**** | **0.512**** | **0.560**** | **0.419**** | **0.541**** |
| | **(0.000)** | **(0.000)** | **(0.000)** | **(0.000)** | **(0.000)** | **(0.000)** | **(0.000)** | **(0.000)** | **(0.000)** | **(0.000)** | **(0.000)** | **(0.000)** |
| FDI | **-0.028**** | **-0.019**** | **-0.022**** | **-0.025**** | **-0.023**** | **-0.032**** | **-0.007**** | -0.003 | **-0.013**** | -0.009 | -0.006 | **-0.018**** |
| | **(0.007)** | **(0.006)** | **(0.001)** | **(0.000)** | **(0.000)** | **(0.000)** | **(0.036)** | (0.304) | **(0.000)** | (0.184) | (0.428) | **(0.000)** |
| Agriculture(Agri) | **-0.007**** | **-0.003*** | **-0.006**** | **-0.004**** | **-0.004**** | **-0.006**** | **-0.005**** | **-0.002*** | **-0.006**** | **-0.004**** | **-0.004*** | **-0.009**** |
| | **(0.000)** | **(0.087)** | **(0.002)** | **(0.001)** | **(0.016)** | **(0.000)** | **(0.000)** | **(0.064)** | **(0.000)** | **(0.002)** | **(0.067)** | **(0.000)** |
| FDI ×Agri | **0.0008**** | **0.0005**** | **0.0007**** | **0.0008**** | **0.0008**** | **0.001**** | **0.0002**** | 0.0001 | **0.0004**** | **0.0004**** | 0.0003 | **0.0007**** |
| | **(0.003)** | **(0.006)** | **(0.000)** | **(0.000)** | **(0.000)** | **(0.000)** | **(0.015)** | (0.161) | **(0.000)** | **(0.037)** | (0.249) | **(0.000)** |
| Nett Effects | -0.006 | -0.005 | -0.003 | -0.003 | -0.001 | -0.005 | -0.001 | na | -0.002 | na | na | 0.006 |
| Control variables | No | Yes | Yes | No | Yes | Yes | No | Yes | Yes | No | Yes | Yes |
| Time Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Post-estimation diagnostic tests | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | No |

**Panel B: Manufacturing value added**

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Constant | **-0.114**** | **-0.339**** | **-0.199**** | **0.206**** | 0.125 | 0.109 | **-0.090*** | **-0.252**** | **-0.230**** | **0.220**** | **0.214*** | 0.122 |
| | **(0.037)** | **(0.016)** | **(0.000)** | **(0.008)** | (0.417) | (0.234) | **(0.060)** | **(0.006)** | **(0.000)** | **(0.009)** | **(0.053)** | (0.208) |
| TFP(-1) | **0.721**** | **0.783**** | **0.842**** | **0.679**** | **0.650**** | **0.700**** | **0.682**** | **0.708**** | **0.851**** | **0.541**** | **0.440**** | **0.624**** |
| | **(0.000)** | **(0.000)** | **(0.000)** | **(0.000)** | **(0.000)** | **(0.000)** | **(0.000)** | **(0.000)** | **(0.000)** | **(0.000)** | **(0.000)** | **(0.000)** |
| FDI | **0.022**** | **0.010**** | **0.021**** | **0.011**** | **0.005** | **0.011**** | **0.017**** | **0.008**** | **0.018**** | **0.014**** | **0.009**** | **0.012**** |
| | **(0.000)** | **(0.001)** | **(0.000)** | **(0.001)** | **(0.135)** | **(0.038)** | **(0.000)** | **(0.008)** | **(0.000)** | **(0.003)** | **(0.025)** | **(0.002)** |
| Manufacturing(Manu) | **0.016**** | **0.006**** | **0.014**** | **0.004**** | **0.004**** | 0.003 | **0.013**** | **0.006**** | **0.009**** | **0.010**** | **0.008**** | **0.008**** |
| | **(0.000)** | **(0.002)** | **(0.000)** | **(0.023)** | **(0.018)** | (0.226) | **(0.000)** | **(0.013)** | **(0.001)** | **(0.000)** | **(0.001)** | **(0.000)** |
| FDI×Manu | **-0.002**** | **-0.001**** | **-0.002**** | **-0.0008**** | **-0.0006*** | -0.0009 | **-0.001**** | **-0.0008**** | **-0.002**** | **-0.001**** | **-0.001**** | **-0.001**** |
| | **(0.000)** | **(0.000)** | **(0.000)** | **(0.010)** | **(0.064)** | (0.109) | **(0.000)** | **(0.009)** | **(0.000)** | **(0.005)** | **(0.024)** | **(0.003)** |
| Net Effects | -0.003 | -0.003 | 0.010 | 0.006 | na | na | 0.004 | -0.002 | -0.008 | 0.001 | -0.004 | -0.001 |
| Control variables | No | Yes | Yes | No | Yes | Yes | No | Yes | Yes | No | Yes | Yes |
| Time Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Post-estimation diagnostic tests | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |

**Panel C: Services Added Value**

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Constant | 0.056 | **-0.300**** | -0.071 | **0.372**** | **0.570**** | **0.539**** | 0.072 | -0.199** | -0.009 | **0.460**** | **0.545**** | **0.507**** |
| | (0.292) | **(0.012)** | (0.287) | **(0.000)** | **(0.002)** | **(0.002)** | (0.172) | (0.014) | (0.820) | **(0.000)** | **(0.000)** | **(0.000)** |
| TFP(-1) | 0.835**** | **0.705**** | **0.821**** | **0.665**** | **0.585**** | **0.568**** | **0.878**** | **0.710**** | **0.824**** | **0.610**** | **0.416**** | **0.601**** |
| | (0.000) | **(0.000)** | **(0.000)** | **(0.000)** | **(0.000)** | **(0.000)** | **(0.000)** | **(0.000)** | **(0.000)** | **(0.000)** | **(0.000)** | **(0.000)** |
| FDI | 0.008 | -0.019 | 0.023* | -0.007 | -0.021 | -0.005 | 0.006 | -0.003 | **0.017**** | 0.001 | **-0.021**** | -0.010 |
| | (0.319) | (0.190) | (0.061) | (0.411) | (0.184) | (0.729) | (0.481) | (0.511) | **(0.037)** | (0.885) | **(0.000)** | (0.197) |
| Service | -0.001 | **-0.005**** | **0.003*** | 0.0003 | -0.001 | -0.003 | -0.001 | -0.001 | 0.001 | -0.001 | -0.003 | -0.001 |
| | (0.392) | **(0.017)** | **(0.065)** | (0.910) | (0.616) | (0.198) | (0.392) | (0.244) | (0.224) | (0.690) | (0.153) | (0.303) |
| FDI ×Service | -0.0003 | 0.0007 | **-0.001**** | 0.0003 | 0.0009 | 0.0003 | -0.0001 | 0.0002 | **-0.0007**** | 0.0001 | **0.0009**** | 0.0005 |
| | (0.324) | (0.193) | **(0.041)** | (0.397) | (0.165) | (0.654) | (0.627) | (0.314) | **(0.031)** | (0.758) | **(0.000)** | (0.114) |
| Control variables | No | Yes | Yes | No | Yes | Yes | No | Yes | Yes | No | Yes | Yes |
| Net effects | na | na | 0.003 | na | na | na | na | na | 0.003 | na | -0.003 | na |
| Time Effects | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Post-estimation diagnostic tests | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |

***,**,*: 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 Fisher statistics. 2) The failure to reject the null hypotheses of: a) no autocorrelation in the AR(1) & AR(2) tests and; b) the validity of the instruments in the Sargan and Hansen OIR tests. Mean value of agriculture value added: 26.673. Mean value of manufacturing value added: 12.916. Mean service value added: 19.339.

Concerning the negative net effects related to the interactive regressions, it implies that other complementary variables are needed to complement the investigated nexus in order to engender the positive effects on some of the outcome variables. Overall, while some of the findings are unexpected, they are informative because they provide policy makers and scholars with insights into which nexuses need to be completed with other variables in order to achieve the desired macroeconomic outcomes. Hence, complementary FDI policies are needed for some development outcomes.

## 4. Concluding remarks, implications and future research directions

This study has investigated: (i) the effect of foreign direct investment (FDI) on total factor productivity (TFP) and economic growth dynamics and (ii) the relevance of value added from three economic sectors in modulating the established effect of FDI on TFP and economic growth dynamics. The geographical and temporal scopes are respectively 25 sub-Saharan African countries and the period 1980-2014. The empirical evidence is based on non-interactive and interactive Generalised Method of Moments. The following main findings are established. First, FDI has a positive effect on GDP growth, GDP per capita and welfare real TFP. Second, the effect of FDI is negative on real GDP, TFP while the impact is insignificant on real TFP growth and welfare TFP. Third, values added to the three economic sectors largely modulate FDI to produce negative net effects on TFP and growth dynamics. Policy implications are discussed with particular emphasis on the need to complement added value across various economic sectors in order to leverage on the benefits of FDI on TFP and economic growth.

To put the above into more specific context, while some of the findings are unexpected, they are informative because they provide policy makers and scholars with insights into which nexuses need to be complemented with other variables in order to achieve the desired macroeconomic outcomes. Hence, complementary FDI policies are needed for some development outcomes. Such additional policies include complementing value added across economic sectors with other policy measures in order to enhance their complementarities with FDI and ultimately engender the desired positive effects on the outcomes variables[6]. The corresponding policy implications are tailored to discuss measures

[6] It empirical literature, when some findings are unexpected, especially within the framework of interactive regressions, it can be established that the investigated channels are necessary but not sufficient conditions for the enhancement of the outcome variable and by extension, complementary policies based on other proxies can be

that can be used to enhance such value added across economic sectors. Hence, given that these are proposed complementary measures, they connect with the findings from a policy standpoint.

First, in order to improve value added to the agricultural sector, it is imperative for sampled countries to develop policies and tools that can be used to boost the agrifood industry and simulate the development of the food value chains. This should entail inclusion and support of smallholder farmers, especially food enterprises in rural communities. The main concerns to be addressed should centre on, *inter alia*: (i) inclusive contract on farming and capacity building for enhanced market access that encompass support for knowledge dissemination, advocacy and field projects; (ii) the development of sustained food value chains as a comprehensive consolidation of the performance of food systems, structural transformation and integration of sustainability concepts; (iii) initiating private-public innovation partnerships which have the potential of mitigating doing business risks in the agricultural sector and involves society, government and agribusiness actors; (iv) attracting transformative investments in the sector by creating special economic zones, economic corridors, agro-based clusters and agro-industrial parks; (v) promoting innovation, entrepreneurship and agribusiness start-ups via agribusiness incubators and inclusive business models and (v) organising programmes for institutional procurement through which governments of sampled countries can award public tenders to address the needs of the state's procurement as well as associated economic, environmental and social issues. The recommendations are consistent with the FAO (2017) on value added to the agricultural sector.

Second, the development of value added in the manufacturing and service sectors is also crucially worthwhile. Some policies in this direction include: (i) providing conducive employment and immigration measures that enable skilled workers to freely move across regions; (ii) making sure that policies on trade should not be exclusively restricted to local services such that the underlying services should not only be limited to specific countries but extended to serve other countries as well as benefit from the support systems of these countries; (iii) the adoption of investment regimes that are of continental scope and offer better prospects for the enhancement of qualifications that can be mutually recognized; (iv)

---

suggested. Examples of contemporary interactive regression studies focusing on policy thresholds and thresholds for complementary policies as applied in this study are Asongu and Odhiambo (2021b, 2021c).

constructing service hubs of excellence such as high-tech parks (v) boosting regulations in transport, insurance, banking and telecoms that are pro-competition and (vi) involving services that are enshrined in the African Continental Free Trade Agreement.

Overall, global value chains (GVCs) provide a valuable perspective for the development of Africa. This is essentially because, as wages begin to rise on Southeast and East Asia, new platforms of production may provide opportunities to attract FDI into Africa. However, our findings have shown that value added in the three main economic sectors need to be improved in order for African countries to leverage on the benefits of FDI in TFP and economic growth. In order for African countries to benefit from these potential shifts, *inter alia*: (i) the reduction of trade costs and policy reforms are needed to enhance investment and trade and (ii) improvement in governance in order to support efficient and effective social and environmental regulation.

Future studies can focus on country-specific cases in order to assess whether the established findings withstand empirical scrutiny. Such is relevant for more targeted implications. This recommendation is motivated by the fact that country-specific effects are theoretically and practically eliminated from the adopted GMM approach in order to control for some dimensions of endogeneity. Moreover, engaging a comparative study to provide lessons of benchmark countries to their less technically-developed counterparts in terms of value added across economic sectors is worthwhile. While the focus of this study on unexplored mechanisms by means of value added to the agriculture, manufacturing and service sectors, is based on constraints in data availability at the time of the study, in future studies, other dimensions such as value added from sectors such as mining could be considered contingent on data availability. This recommendation for future research is premised on the fact that there are several countries in the dataset where mining or drilling contributes more towards GDP.

# Appendices

## Appendix 1: Definitions and sources of variables

| Variables | Signs | Definitions 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 |
| TFP1 | TFP | Total Factor Productivity (TFP) | Penn World Table database |
| TFP2 | RTFP | Real Total Factor Productivity Growth (RTFPg) | Penn World Table database |
| TFP3 | WTFP | Welfare Total Factor Productivity (WTFP) | Penn World Table database |
| TFP4 | WRTFP | Welfare Real Total Factor Productivity (WRTFP) | Penn World Table database |
| Foreign Direct Investment | FDI | Foreign Direct Investment Inflows(% of GDP) | UNCTAD |
| Agriculture value added | Agri | Agricval: Agriculture, hunting, forestry, fishing (% of GDP) (ISIC A-B)Value added is the net output of a sector after adding up all outputs and subtracting intermediate inputs. | WDI |
| Manufacturing value added | Manu | Manufacturing value added (% of GDP) (ISIC D). Value added is the net output of a sector after adding up all outputs and subtracting intermediate inputs. | UNCTAD |
| Service value added | Service | Service, value added (% of GDP).Value added is the net output of a sector after adding up all outputs and subtracting intermediate inputs. | 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 |
| Remittances | Remittances | Personal remittances, received (% of GDP) | WDI |
| Credit Access | Private credit | Domestic credit to private sector (% of GDP) | FDSD |

WDI: World Development Indicators. GDP: Gross Domestic Product.UNCTAD: United Nations Conference on Trade and Development. FDSD: 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 |
| Total Factor Productivity | 0.539 | 0.310 | 0.121 | 1.884 | 125 |
| Real Total Factor Productivity Growth | 0.539 | 0.276 | 0.123 | 1.381 | 125 |
| Welfare Total Factor Productivity | 0.984 | 0.189 | 0.605 | 1.664 | 125 |
| Welfare Real Total Factor Productivity | 0.927 | 0.190 | 0.456 | 1.785 | 125 |
| Foreign Direct Investment | 1.903 | 2.795 | -3.440 | 22.118 | 124 |
| Agriculture value added | 26.673 | 13.910 | 2.527 | 56.751 | 116 |
| Manufacturing value added | 12.916 | 6.933 | 2.152 | 36.895 | 116 |
| Service value added | 19.339 | 7.015 | 0.000 | 32.825 | 120 |
| 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 |
| Remittances | 4.768 | 12.917 | 0.003 | 89.354 | 107 |
| Credit Access | 21.009 | 22.256 | 2.238 | 144.397 | 121 |

S.D: Standard Deviation.

## Appendix 3: Correlation matrix

| | GDPg | lnRGDP | lnGDPpc | TFP | RTFP | WTFP | WRTFP | FDI | Agri | Manu | Service | Pop | Inflation | Education | Gov. Ex | Remit | Credit |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| GDPg | 1.000 | | | | | | | | | | | | | | | | |
| lnRGDP | 0.107 | 1.000 | | | | | | | | | | | | | | | |
| lnGDPpc | -0.010 | 0.241 | 1.000 | | | | | | | | | | | | | | |
| TFP | -0.138 | 0.177 | 0.729 | 1.000 | | | | | | | | | | | | | |
| RTFP | -0.042 | -0.052 | 0.309 | 0.278 | 1.000 | | | | | | | | | | | | |
| WTFP | -0.130 | 0.109 | 0.725 | 0.953 | 0.299 | 1.000 | | | | | | | | | | | |
| WRTFP | -0.120 | 0.037 | 0.244 | 0.148 | 0.578 | 0.148 | 1.000 | | | | | | | | | | |
| FDI | 0.413 | 0.063 | -0.005 | -0.140 | -0.013 | -0.101 | 0.080 | 1.000 | | | | | | | | | |
| Agri | -0.075 | -0.243 | -0.796 | -0.624 | -0.170 | -0.627 | -0.169 | -0.056 | 1.000 | | | | | | | | |
| Manu | -0.071 | 0.002 | 0.262 | 0.076 | -0.063 | 0.209 | 0.026 | -0.049 | -0.386 | 1.000 | | | | | | | |
| Service | 0.015 | 0.506 | 0.076 | 0.039 | -0.129 | 0.053 | 0.066 | 0.112 | -0.266 | 0.220 | 1.000 | | | | | | |
| Pop | 0.089 | 0.044 | -0.454 | -0.196 | 0.143 | -0.249 | 0.116 | -0.053 | 0.380 | -0.246 | -0.105 | 1.0000 | | | | | |
| Inflation | -0.082 | 0.081 | -0.126 | 0.210 | 0.040 | 0.254 | -0.271 | -0.123 | 0.098 | -0.104 | 0.161 | -0.169 | 1.000 | | | | |
| Education | 0.363 | 0.201 | 0.475 | 0.237 | -0.080 | 0.244 | -0.083 | 0.235 | -0.528 | 0.062 | -0.114 | -0.377 | -0.035 | 1.000 | | | |
| Gov. Ex | 0.129 | -0.327 | 0.167 | 0.067 | 0.053 | 0.162 | -0.033 | 0.126 | -0.316 | 0.099 | -0.453 | -0.111 | -0.197 | 0.276 | 1.000 | | |
| Remit | -0.008 | -0.225 | -0.034 | -0.154 | -0.274 | -0.070 | -0.087 | 0.038 | -0.117 | -0.004 | -0.161 | -0.186 | -0.019 | 0.379 | 0.306 | 1.000 | |
| Credit | -0.089 | 0.140 | 0.511 | 0.211 | 0.114 | 0.258 | 0.239 | 0.039 | -0.391 | 0.214 | 0.228 | -0.327 | -0.195 | 0.144 | 0.105 | -0.075 | 1.000 |

GDPg: Growth growth. lnRGDP: Logarithm of Real GDP. lnGDPpc: Logarithm of GDP per capita. TFP: Total Factor Productivity. RTFP: WTFP: Welfare Total Factor Productivity. WRTFP: Welfare Real Total Factor Productivity. FDI: Foreign Direct Investment. Agri: Agricultural value added. Manu: Manufacturing value added. Service: Service value added. Pop: population. Gov. Ex: Government Expenditure. Remit: Remittance. Credit: access to credit

**References**

Abramovitz, M. (1986). "Catching up, forging ahead, and falling behind". *The Journal of Economic History*, 46(02), pp. 385-406.

Adam, I. O., Musah, A., & Ibrahim, M., (2017). "Putting the Cart before the Horse? Re-Examining the Relationship between Domestic Savings and Economic Growth in Selected Sub-Saharan African Countries", *Journal of African Business*, 18(1), pp. 102-123.

Ahouakan, E. W. V., & Diene, M., (2017). "Does School Quality Matter? Primary Schools Characteristics and Child Labour Intensity in Senegal," *Journal of African Development*, 19(1), pp. 113-131.

Anyanwu, J.C., (2011). "International Remittances and Income Inequality in Africa."*African Development Bank Working Paper* No. 135, Tunis.

Arellano, M., & Bond, S., (1991). "Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations". *The Review of Economic Studies*, 58(2), pp. 277-297.

Arellano, M., & Bover, O. (1995). "Another look at the instrumental variable estimation of errorcomponents models". *Journal of Econometrics,* 68(1), pp. 29–52.

Asiedu, E., (2014). "Does Foreign Aid in Education Promote Economic Growth? Evidence From Sub-Saharan Africa", *Journal of African Development*, 16(1), pp. 37-59.

Asongu, S. A., (2015). "Finance and growth: New evidence from Meta-analysis", *Managerial Finance*, 41(6), pp. 615-639.

Asongu, S. A., (2020). "Financial Access and Productivity Dynamics in Sub-Saharan Africa", *International Journal of Public Administrtion*, 43(12), pp. 1029-1041.

Asongu, S. A, & De Moor, L., (2017). "Financial Globalisation Dynamic Thresholds for Financial Development: Evidence from Africa", *European Journal of Development Research*, 29(1), pp.192-212.

Asongu, S. A., le Roux, S, & Biekpe, N., (2017). "Environmental Degradation, ICT and Inclusive Development in Sub-Saharan Africa", *Energy Policy*, 111(December), pp.353-361.

Asongu, S. A., Nnanna, J., & Acha-Anyi, P. N. (2020a). "Inequality and gender economic inclusion: The moderating role of financial access in Sub-Saharan Africa". Economic Analysis and Policy, 65, pp. 173–185.

Asongu, S. A., Nnanna, J., & Acha-Anyi, P. N. (2020b). "On the simultaneous openness hypothesis: FDI, trade and TFP dynamics in Sub-Saharan Africa". *Journal of Economic Structures*, *9*(1), 5.

Asongu, S.A., Nting, R.T., & Nnanna, J. (2020). "Linkages between Globalization, Carbon Dioxide Emissions and Governance in Sub-Saharan Africa". International Journal of Public Administration, 43(11), pp. 949-963

Asongu, S. A., & Odhiambo, N. M. (2020). "Foreign direct investment, information technology and economic growth dynamics in Sub-Saharan Africa", *Telecommunications Policy*, 44(1), 101838.

Asongu, S. A., & Odhiambo, N. M. (2021a). "Remittances and Value Added across Economic sub-sectors in Sub-Saharan Africa", *Quality & Quantity*. DOI: 10.1007/s11135-021-01110-0.

Asongu, S. A., &Odhiambo, N. M., (2021b). "The green economy and inequality in Sub-Saharan Africa: Avoidable thresholds and thresholds for complementary policies", *Energy Exploration & Exploitation*, 39(3), 838-852.

Asongu, S. A., &Odhiambo, N. M., (2021c). Mobile technology supply factors and mobile money innovation: thresholds for complementary policies", *Journal of Banking Regulation*, DOI: 10.1057/s41261-021-00167-z.

Assefa, T. A., & Mollick, A. V., (2017). "Financial Development and Economic Growth in Africa", *Journal of African Business*, 18(3), pp. 320-339.

Baliamoune, M. (2009). "Openness, Growth and Convergence in Africa: Evidence from 1980-1999 Data". *Journal of African Development*, 11(1), pp. 109-126.

Baliamoune-Lutz, M. (2011). "Growth by Destination (Where You Export Matters): Trade with China and Growth in African Countries". *African Development Review*, *23*(2), pp. 202-218.

Barro, J. R., (2003). "Determinants of Economic Growth in a Panel of Countries", *Annals of Economics and Finance*, 4(2), pp. 231-274.

Basu, S., Pascali, L., Schiantarelli, F., & Serven, L., (2014). "Productivity and the Welfare of Nations." *National Bureau of Economic Research Working Paper* No. 17971, Cambridge.

Beck, T., Demirgüç-Kunt, A., &Levine, R. (2003)."Law and Finance: Why Does Legal Origin Matter?"*Journal of Comparative Economics*, 31(4), pp. 653–675.

Becker, G. S., Laeser, E. L., & Murphy, K. M. (1999). "Population and economic growth". *American Economic Review*, 89(2), pp. 145-149.

Blundell, R., & Bond, S., (1998). "Initial conditions and moment restrictions in dynamic panel data models". *Journal of Econometrics*, 87(1), pp. 115-143.

Boamah, N. A. (2017). "The relevance of global sector influence in African sector portfolios," *African Journal of Economic and Management Studies*, 8(2), pp. 205-220.

Boateng, A., Asongu, S. A., Akamavi, R., & Tchamyou, V. S., (2018). "Information Asymmetry and Market Power in the African Banking Industry", *Journal of Multinational Financial Management,* 44(March), pp. 69-83.

Bond, S., Hoeffler, A., & Tample, J., (2001). "GMM Estimation of Empirical Growth Models", University of Oxford, Oxford.

Bonga-Bonga, L., & Simo-Kengne, B. D., (2018). "Inflation and Output Growth Dynamics in South Africa: Evidence from the Markov Switching Vector Autoregressive Model", *Journal of African Business*, 19(1), pp. 143-154.

Brambor, T., Clark, W. M., and Golder, M., (2006). "Understanding Interaction Models: Improving Empirical Analyses", *Political Analysis*, 14 (1), pp. 63-82.

Cheruiyot, K. J., (2017). "Determinants of Technical Efficiency in Kenyan Manufacturing Sector", *African Development Review*, 29(1), pp. 44-55.

Cisse, F., (2017). "Do Firms Learn by Exporting or Learn to Export? Evidence from Senegalese Manufacturing Firms," *Journal of African Development*, 19(1), pp. 133-160.

Devarajan,S., Easterly, W.R., & Pack, H., (2003). "Low Investment Is Not the Constraint on African Development", *Economic Development and Cultural Change*, 51 (3), pp. 547-571.

Di Liberto, A., Pigliaru, F., & Chelucci, P. (2011). "International TFP dynamics and human capital stocks: a panel data analysis, 1960–2003". *Review of Income and Wealth*, *57*(1), pp. 156-182.

Doytch, N., &Uctum, M. (2011). "Does the worldwide shift of FDI from manufacturing to services accelerate economic growth? A GMM estimation study". *Journal of International Money and Finance*, *30*(3), pp. 410-427.

Dunne, J. P., & Nicholas Masiyandima, N., (2017). "Bilateral FDI from South Africa and Income Convergence in SADC," *African Development Review*, 29(3), pp. 403-415.

Durlauf, S., Johnson, P. & Temple, J. (2005). "Growth econometrics", in Aghion, P. and Durlauf, S. (Eds.), Handbook of Economic Growth, Elsevier, North Holland.

Easterly, W., & Levine, R. (2001). "It's Not Factor Accumulation: Stylized Facts and Growth Models". *World Bank Economic Review*,15(2), pp. 177–220.

Elu, J.U. & Price, G.N., (2010). "Does China Transfer Productivity Enhancing Technology to Sub-Saharan Africa? Evidence from Manufacturing Firms", *African Development Review*, 22(S1), pp. 587–598.

Elu, J. U., & Price, G. N., (2017). "Science Labor Supply in Sub-Saharan Africa: Is There a Gender Disparity in Preferences?," *African Development Review*, 29(3), pp. 367-375,

Fanta,, A. B & Makina, D., (2017). "Equity, Bonds, Institutional Debt and Economic Growth: Evidence from South Africa," South African Journal of Economics, 85(1), pp. 86-97.

FAO (2017). "Agribusiness and value chains", Food and Agricultural Organisation of the United Nations. http://www.fao.org/3/a-i6811e.pdf (Accessed: 27/07/2018).

Fedderke, J. W., & Mengisteab, D. K., (2017). "Estimating South Africa's Output Gap and Potential Growth Rate," *South African Journal of Economics*, 85(2), pp.161-177.

Fosu, A. K., (2015). "Growth, Inequality and Poverty in Sub-Saharan Africa: Recent Progress in a Global Context", *Oxford Development Studies*, 43(1), pp.44-59.

Gui-Diby, S . L., (2018). "Impact of foreign direct investments on economic growth in Africa: Evidence from three decades of panel data analyses", *Research in Economics*, 68(3), pp. 248-256.

Heady, D. D., & Hodge, A. (2009). "The effect of population growth on economic growth: A meta-regression analysis of the macroeconomic literature". *Population and Development Review*, 35(2), pp. 221-248.

Islam, N., (1995). "Growth Empirics: A Panel Data Approach", *The Quarterly Journal of Economics*, 110(4), pp. 1127-1170.

Kelsey, D. & Le Roux, S., (2018). "Strategic Ambiguity and Decision-making: An Experimental Study", Theory & Decision, 84(3), pp. 387-404.

Kelsey D & Le Roux, S., (2017). "Dragon Slaying with Ambiguity: Theory and Experiments", *Journal of Public Economic Theory*, 19(1), pp.178–197.

Klenow P.J. & Rodriguez-Clare, A., (1997). "The Neoclassical Revival in Growth Economics: Has It Gone Too Far?".*NBER Macroeconomics Annual,* 73–114.

Kreuser, C. F., & Newman, C., (2018). "Total Factor Productivity in South African Manufacturing Firms," *South African Journal of Economics*, 86(S1), pp. 40-78.

Kumi, E., & Ibrahim, M., & Yeboah, T., (2017). "Aid, Aid Volatility and Sectoral Growth in Sub-Saharan Africa: Does Finance Matter?," *Journal of African Business*, 18(4), pages 435-456.

Love, I., &Zicchino, L. (2006). "Financial Development and Dynamic Investment Behaviour: Evidence from Panel VAR".*The Quarterly Review of Economics andFinance*, 46(2), pp. 190–210.

Maryam, K., & Jehan, Z., (2018). "Total Factor Productivity Convergence in Developing Countries: Role of Technology Diffusion," *South African Journal of Economics*, 86(2), pp. 247-262.

Meniago, C., & Asongu, S. A., (2018). "Revisiting the Finance-Inequality Nexus in a Panel of African Countries", *Research in International Business and Finance*, 46 (December), pp. 399-419.

Ibrahim, M., & Alagidede, P., (2017). "Financial Development, Growth Volatility and Information Asymmetry in Sub-Saharan Africa: Does Law Matter?," *South African Journal of Economics*, 85(4), pp. 570-588.

Nelson, R.R. & Howard Pack, H. (1999). "The Asian Growth Miracle and Modern Growth Theory". *Economic Journal* 109(457), pp. 416–36.

Nyasha, S., & Odhiambo, N. M. (2015a). “Do banks and stock market spur economic growth? Kenya’s experience”, *International Journal of Sustainable Economy*, 7(1), pp. 54-65.

Nyasha, S., & Odhiambo, N. M. (2015b). “The Impact of Banks and Stock Market Development on Economic Growth in South Africa: An ARDL-bounds Testing Approach”, *Contemporary Economics*, 9(1), pp. 93-108.

Okafor, G., Piesse, J., & Webster, A., (2017). “FDI Determinants in Least Recipient Regions: The Case of Subâ€ Saharan Africa and MENA,” *African Development Review*, 29(4), pp. 589-600.

Petrakis, P. E., & Stamatakis, D., (2002). “Growth and educational levels: a comparative analysis”, *Economics of Education Review*, 21(2), pp.513-521.

Romer, P. M., (1986). “Increasing returns and Long-run growth”. *Journal of Political Economy*, 94(5), pp. 1002-1037.

Romer, P., (1993). “Idea gaps and object gaps in economic development”. *Journal of monetary economics*, 32(3), pp. 543-573.

Roodman, D. (2009). “How to Do Xtabond2: An Introduction to Difference and System GMM in Stata”.*Stata Journal*, 9(1), pp. 86–136.

Sahoo, P., Dash, R. K., & Nataraj, G., (2010). “Infrastructure Development and Economic Growth in China”, *IDE Discussion Paper* No. 261, Chiba.

Siddiqui, D. A., & Ahmed, Q. M. (2013). “The effect of institutions on economic growth: A global analysis based on GMM dynamic panel estimation”. *Structural Change and Economic Dynamics*, *24*, pp. 18-33.

Ssozi, J., & Asongu, S. A., (2016a). “The Comparative Economics of Catch-up in Output per Worker, Total Factor Productivity and Technological Gain in Sub-Saharan Africa”, *African Development Review*, 28(2), pp. 215-228.

Ssozi, J., & Asongu, S. A., (2016b). “The Effects of Remittances on Output per Worker in Sub-Saharan Africa: A Production Function Approach”, *South African Journal of Economics*, 84(3), pp. 400-421.

Tchamyou, S. A., (2017). “The Role of Knowledge Economy in African Business”, *Journal of the Knowledge Economy*, 8(4), pp. 1189–1228.

Tchamyou, V. S., (2019). “The role of Information sharing in modulating the effect of financial access on inequality”. *Journal of African Business*, 20(3), pp. 317-338.

Tchamyou, V. S., (2020). “Education, Lifelong learning, Inequality and Financial access: Evidence from African countries”, *Contemporary Social Science*, 15(1), pp. 7-25.

Tchamyou, V. S., & Asongu, S. A. (2017). “Information Sharing and Financial Sector Development inAfrica”. *Journal of African Business*, 18(7), pp. 24–49.

Tchamyou, V. S., Asongu, S. A., & Nwachukwu, J. C., (2018). "Effects of asymmetric information on market timing in the mutual fund industry", *International Journal of Managerial Finance*, 14(5), pp. 542-557.

Tchamyou, V.S., Erreygers, G., & Cassimon, D., (2019a). "Inequality, ICT and Financial Access in Africa", *Technological Forecasting and Social Change*,139(February), pp. 169-184.

Tchamyou, V. S., Asongu, S. A., & Odhiambo, N. M., (2019b). "The Role of ICT in Modulating the Effect of Education and Lifelong Learning on Income Inequality and Economic Growth in Africa", *African Development Review*, 31(3), pp. 261-274

Temple, J. (1999). "The New Growth Evidence". *Journal of Economic Literature*, 37(1), pp. 112-156.

Vu, K. M., & Asongu, S. A., (2020). "Backwardness advantage and economic growth in the information age: A cross-country empirical study", *Technological Forecasting and Social Change*, 159(October), 120197.

Yaya K. Y., & Cabral, F. J., (2017). "Innovation and Volatility of the GDP Growth Rate: Case of the Economies of Sub-Saharan Africa," *Journal of African Development*, 19(1), pp. 88-112.