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Effects of Trade Openness and International Financial Inflows on Africa's Productive Capacity: A Study of the Moderating Role of Governance Institutions

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Abstract

We investigate the effects of trade openness and international financial inflows (including foreign direct investment, remittances and foreign aid inflows) on Africa's productive capacity and how governance institutions are moderating these effects. We adopt the dynamic system GMM modelling framework and the Bun and Carree (2005) bias-corrected least square dummy variable estimator with a panel of 43 African economies. We also use the Driscoll and Kraay (1998) standard error fixed effect estimation, which controls for cross-sectional dependence to provide robustness check. We find that trade openness and the various components of international financial inflows are significant drivers of productive capacity in Africa, and that governance institutions are moderating and enhancing their effects. We also find that renewable energy consumption, human capital development and infrastructure development are promoting Africa's productive capacity. We highlight the policy implications of these findings, which among others, encourage policymakers and leaders in Africa to focus on policies that can enhance cross border trade, attract international financial inflows and entrench high-quality institutions.

Keywords: Trade openness, international financial inflows, governance institutions, productive capacity, system GMM regression

JEL Classification: F40, L83, N20, O14, C23

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1. Introduction

Recent trends in globalization have led to the realization that sustainable growth and development depend on a country's ability to effectively combine productive resources, entrepreneurial competencies and production links (UNCTAD, 2020). Given this realization, enhancing the productive capacities of economies, particularly in developing countries, has become a major focus of recent global development policy debates. Indeed, productive capacities and structural economic transformations are critical to achieving economic growth and development. A review of some recent studies indicates that, when compared to highly sophisticated economies, developing economies generally have lower productive capacities as well as fewer resources and limited capabilities for expanding their production capacities (Xu and Li, 2019; UNCTAD, 2020). Figure 1 shows that unlike leading economies in other regions of the world, African economies on average generally recorded a productive capacities index below 30% over the period 2000–2018, which is quite low. This means that African economies may not have been benefiting much from increased productive capacities, since recent studies have highlighted the benefits of enhancing productive capacities across different economic sectors, such as increased job creation, enhanced levels of investment and increased diversification of the economy, among others (Williams *et al*., 2016; Osaulenko *et al*., 2020). Thus, despite Africa's increasing economic growth, which averaged 6.9% in 2021, suggesting a strong recovery following the contraction of 1.6% in 2020 due to the COVID-19 pandemic, the region has only shown limited progress in transforming and diversifying its economies. Furthermore, as rightly observed by UNTAD (2020), structural change in the region is largely characterized by very limited industrialization and a high level of informality. Consequently, there is a need to examine the possible factors that may influence productive capacity in Africa.

The emerging literature has underscored the imperative of integrating national and international development approaches in order to increase the productive capacities of economies around the world (Isaychev *et al*., 2020; Ramakrishnan *et al*., 2022). Interestingly, recent studies and several development conferences (*e.g.*, the Istanbul Programme of Action for the LDCs 2011–2020) have identified openness to trade and international financial flows between world economies as some of the upsides of the ongoing globalization process (UNCTAD, 2019; WB, 2020). Firstly, international financial inflows are needed in Africa to bridge the savings-investment gap in order to achieve sustainable investments and increase economic growth (Ikpesu, 2019). Secondly, economic benefits from trade openness and international financial flows are transmitted through enhancement of human capital, creation of jobs, improvement of economic productivity and expansion of capital investment, which are elements that enable the expansion of a country's productive capacity (Fite, 2020). However, when compared to leading economies in other regions

of the world, Figures 2 and 3 indicate that African economies received lower *FDI* inflows[1] and recorded lower levels of trade since 2000. However, despite the relatively low levels of productive capacities, trade and *FDI* inflows in Africa, the scatter plots in Figure 4 indicate that the relationship between productive capacity and various forms of international financial inflows in Africa is positive. Figure 4 also shows a positive relationship between productive capacity and trade in Africa. This suggests that trade openness and international financial inflows may be important in explaining the dynamics of Africa's productive capacity.

Apart from *FDI* inflows, foreign aid is another component of international financial inflows that may enhance the productive capacities of economies (Pal *et al*., 2022; Aslam *et al*., 2022). Indeed, several empirical studies have buttressed the importance of foreign aid in the economic growth process (Addison *et al*., 2005; Ogbonna *et al*., 2021). This is because foreign aid in the form of official development assistance (*ODA*) has been an important source of financing for most African countries. Globally, the majority of foreign aid is directed to investment projects such as infrastructure construction, social service expansion and research financing (Chatterjee *et al*., 2022). This means that infrastructure development and improvement in human capital can be viewed as important channels through which foreign aid may affect the productive capacity of an economy. Interestingly, statistics from the OECD (2018) indicate that the annual average value of total *ODA* received by African economies increased from USD 47.31 billion in 2012 to USD 49.88 billion in 2016. It further increased from USD 50.7 billion in 2019 to USD 64.8 billion in 2020. The major reason for this rise was that in 2005, several donor countries on the Development Assistance Committee agreed to increase the amount of aid to developing countries around the world following the resolution reached at the G8 summit.

Studies such as Qamruzzaman and Jianguo (2020) have also shown that the inflow of remittances, which is another component of international financial inflows in Africa, constitutes a major source of income and accounts for over 20% of GDP in many developing economies. Remittances to Sub-Saharan Africa (SSA) rose from USD 1.9 billion in 1990 to USD 48 billion in 2019 and declined to USD 37 billion in 2020 due to the COVID-19 pandemic. As of 2020, Egypt, Nigeria, Ghana, Angola and South Africa accounted for 60% of remittances to SSA (WB, 2020; African Development Bank, 2021). In terms of contribution to GDP, the WB (2019) indicates that remittances contributed 1.6% to GDP in SSA in 2006, which increased to 2.16% in 2015 and 2.59% in 2018. It has been shown that in developing economies, increases in remittances reduce poverty, allow greater investment in physical assets, education and health, and enable access

1 The top five *FDI* recipients in Africa in 2021 were Egypt (USD 5.9 billion), the Republic of Congo (USD 4.0 billion), South Africa (USD 3.1 billion), Ethiopia (USD 2.4 billion) and Nigeria (USD 2.4 billion). When these figures are put together, the total *FDI* inflow to African countries was USD 83 billion in 2021 (UNCTAD, 2022).

to a larger pool of knowledge (Qamruzzaman and Jianguo, 2020). This also indicates that in developing economies, including African economies, enhancements in physical and human capital could serve as channels through which remittances may influence and enhance the productive capacities of the economies.

Furthermore, the importance of trade openness in enhancing the productive capacities of economies has been highlighted in the existing literature (Tiwari *et al*., 2022). Trade openness potentially expands the demand for domestic products and brings opportunities for industrial and technological advancement and fast income growth (WB, 2019; IMF, 2019). Studies have also shown that trade openness can bring about enhancements in economic productivity, capital investment, economic sophistication and human capital development (Liu *et al*., 2022; Ekeocha *et al*., 2021; Wiredu *et al*., 2020). In 2000, trade as a percentage of GDP in Africa averaged 58.5% and declined to 52.5% in 2002. However, it rose to 56.3% in 2006 and 66.5% in 2008 before plummeting to 56.2% in 2014. It decreased further to 49.5% in 2017 before rising marginally to 52.8% in 2018. It was 51.9% in 2019 and 58.1% in 2020 (WB, 2022a). As noted by the 2022 Economic Outlook Report, Africa's economic recovery following the COVID-19 pandemic was strongly supported by rising commodity prices and improved global trade, especially with its major trading partners such as China, the euro area and the United States (African Development Bank, 2021).

This study also considers the role of governance institutions in promoting Africa's productive capacity. According to Vu (2022), high-quality governance institutions promote economic activities by supporting innovative entrepreneurship, encouraging human capital development and facilitating the acquisition of productive capabilities. Thus, expanding productive capacity requires an active and strong role for the state. The state plays a pivotal role as the primary economic and political entity in the majority of national economies. It serves as the institution responsible for implementing the business, regulatory and legal frameworks necessary for development. It is noteworthy that the level of economic sophistication is influenced by governmental policies and the effectiveness of regulatory frameworks (Acemoglu and Robinson, 2010). The formulation and implementation of sound economic policies by governance institutions are crucial for efficient mobilization and allocation of resources within the economy (North, 1990; WB, 2020). Thus, the role of governance institutions in enhancing the productive capacities of African economies for the attainment of higher economic performance cannot be overemphasized. However, African economies have predominantly been reporting poor institutional quality performance in recent decades. For instance, the high level of corruption and misappropriation of public resources and the recurrent problem of extra-budgetary spending in Nigeria have been widely attributed to the prevalence of weak institutions in the country, as illustrated in Table 1. Indeed, statistical records from the World Governance Indicators generally indicate that in recent years, African economies predominantly performed poorly in all six institutional quality indicators, including

government effectiveness, regulatory quality, control of corruption, rule of law, political stability and absence of violence or terrorism, and voice and accountability (WB, 2022b). Interestingly, Figure 5 shows that despite the predominance of weak governance institutions in Africa, there is a positive relationship between the productive capacity measure and the various measures of institutional quality in Africa. This suggests that governance institutions may not only be important in influencing Africa's productive capacity but also in moderating or enhancing the effects of trade openness and international financial inflows on Africa's productive capacity.

Table 1: Average institutional quality indicators (2002–2021)

Indicators	Nigeria	China	Germany	USA	Brazil
Control of corruption	–1.15071	–0.39221	1.82010	1.38838	–0.18550
Government effectiveness	–1.04720	0.20921	1.54261	1.52525	–0.21553
Political stability and absence of violence/terrorism	–1.92444	–0.46419	0.79346	0.34111	–0.23326
Regulatory quality	–0.90151	–0.29232	1.60468	1.45583	0.01660
Rule of law	–1.10803	–0.41657	1.66340	1.55074	–0.22254
Voice and accountability	–0.62576	–1.61221	1.39407	1.11183	0.44714

Note: Countries in this table are selected because they recorded the highest nominal GDP in their respective regions in 2021. That is, Nigeria, China, Germany, USA and Brazil are included because they recorded the highest nominal GDP in Africa, Asia, Europe, North America and South America, respectively.
Source: Authors' own calculations, with data from WB (2022b)

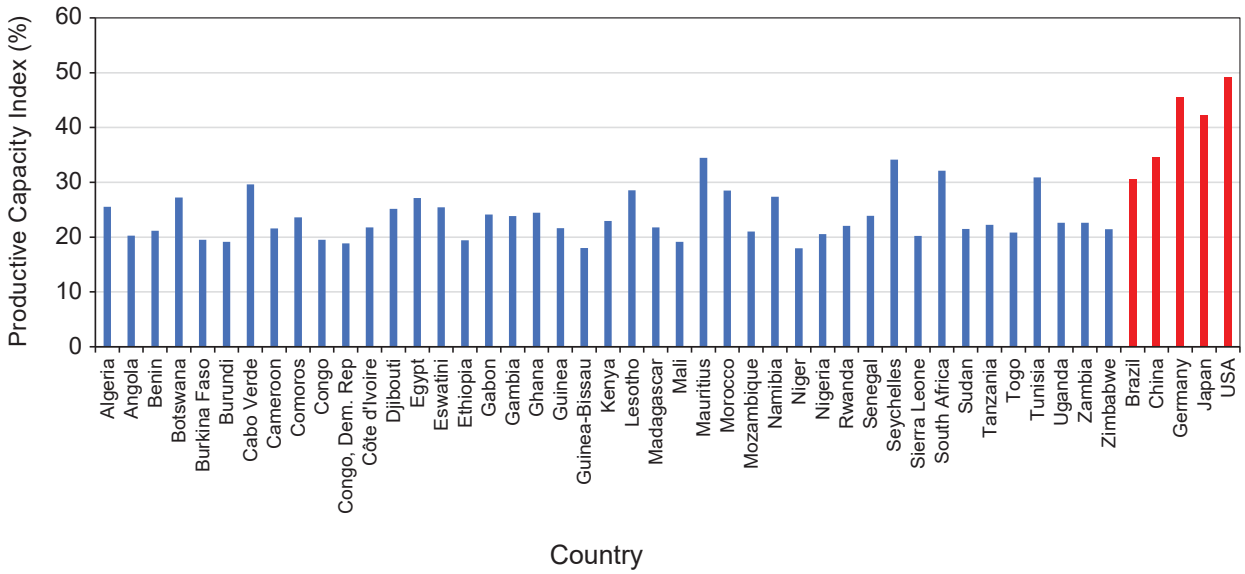
From the foregoing background, a number of stylized facts can be deduced. Firstly, Africa has generally recorded lower levels of productive capacity, trade and *FDI* inflows in recent decades relative to other regions of the world. Secondly, Africa also has a predominance of weak governance institutions compared to other parts of the world. Thirdly, the productive capacities index for African economies has a positive correlation with measures of trade, international financial inflows and governance institutions. Thus, in spite of the challenges of relatively low productive capacity, trade and *FDI* inflows in Africa and the prevalence of weak institutions on the continent, trade openness, international financial inflows and governance institutions may be quite relevant in explaining Africa's productive capacity. Unfortunately, these relationships have yet to receive attention in the literature. A bulk of the extant literature has generally focused on the effects of trade openness, international financial inflows and governance institutions on overall economic growth (Abendin and Duan, 2021; Doğan *et al*., 2020; Zamani and Tayebi, 2022; Wei *et al*., 2022;

Adeseye, 2021; Adjei *et al*., 2020; Girma and Tilahun, 2022; Younsi *et al*., 2021; Ogbonna *et al*., 2021, 2022). However, there is a distinction between productive capacity and economic growth. While productive capacity refers to the maximum potential output that an economy can achieve, economic growth refers to actual increase in output over time. Although economic growth can be influenced by factors that drive productive capacity, such as trade openness, financial inflows and governance institutions, there is an apparent lack of empirical evidence supporting these factors as important drivers of productive capacity in Africa. We address this gap in the literature in order for policymakers to not only understand the dynamics of these relationships in Africa but also formulate evidence-based economic policies that will address the challenges observed in the foregoing paragraphs.

Consequently, this study raises three important questions. Firstly, how do trade openness and international financial flows (foreign direct investment, foreign aid and remittances) influence Africa's productive capacity? Secondly, how are governance institutions moderating the effects of trade and international financial flows on Africa's productive capacity? Thirdly, what are the other significant macroeconomic drivers of productive capacity in Africa? To answer these questions, this study adopts two different dynamic panel estimation techniques. The first is the dynamic panel system generalized method of moments (system GMM) modelling framework, which enables us to avoid the potential problem of endogeneity, and the second is the Bun and Carree (2005) bias-corrected least squares dummy variable dynamic estimator, which has better small-sample properties than GMM, as noted by Bruno (2005). For a robustness check, we adopt the Driscoll and Kraay (1998) standard error fixed effect estimation, which controls for serial correlation, group-wise heteroskedasticity and cross-sectional dependence. A panel of 43 African countries over the period 2005–2018 is used. The choice of this period is mainly driven by data availability for most of the countries. The results indicate that trade openness and international financial inflows (*i.e.*, *FDI* inflow, remittances and foreign aid inflow) are significant drivers of productive capacity in Africa. We also establish that even though the individual effect of the governance institution indicators is mainly negative, they are nonetheless moderating and enhancing the effects of trade openness and international financial inflows on Africa's productive capacity. Furthermore, other macroeconomic factors significantly influencing Africa's productive capacity include renewable energy consumption, human capital development and infrastructure development, while the role of labour force participation remains mainly negative.

The remainder of the paper is structured as follows. Section 2 provides a review of the relevant literature, while Section 3 presents the data and methodology. Section 4 reports and discusses the empirical results, while section 5 concludes the study with some policy recommendations.

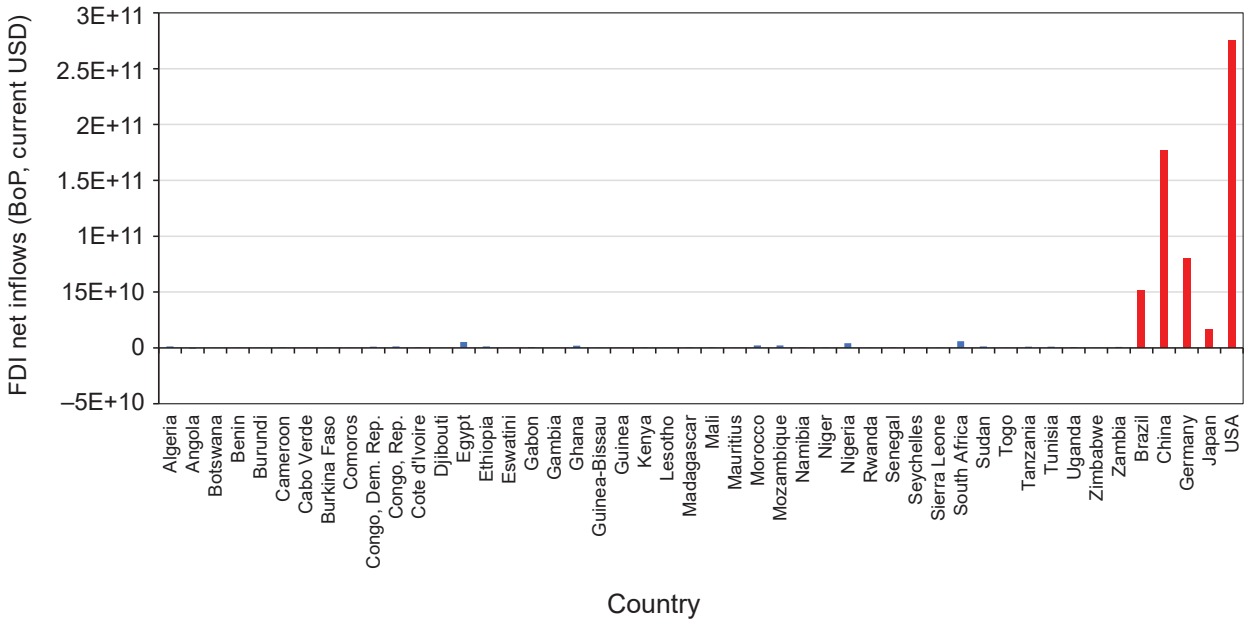
Figure 1: Average productive capacities index of selected countries, 2000–2018



Notes: Plots for countries outside Africa are highlighted in red. The evolution of the productive capacities index of the countries over time is shown in Appendix 1.

Source: Authors' own elaboration, with data from UNCTAD (2023)

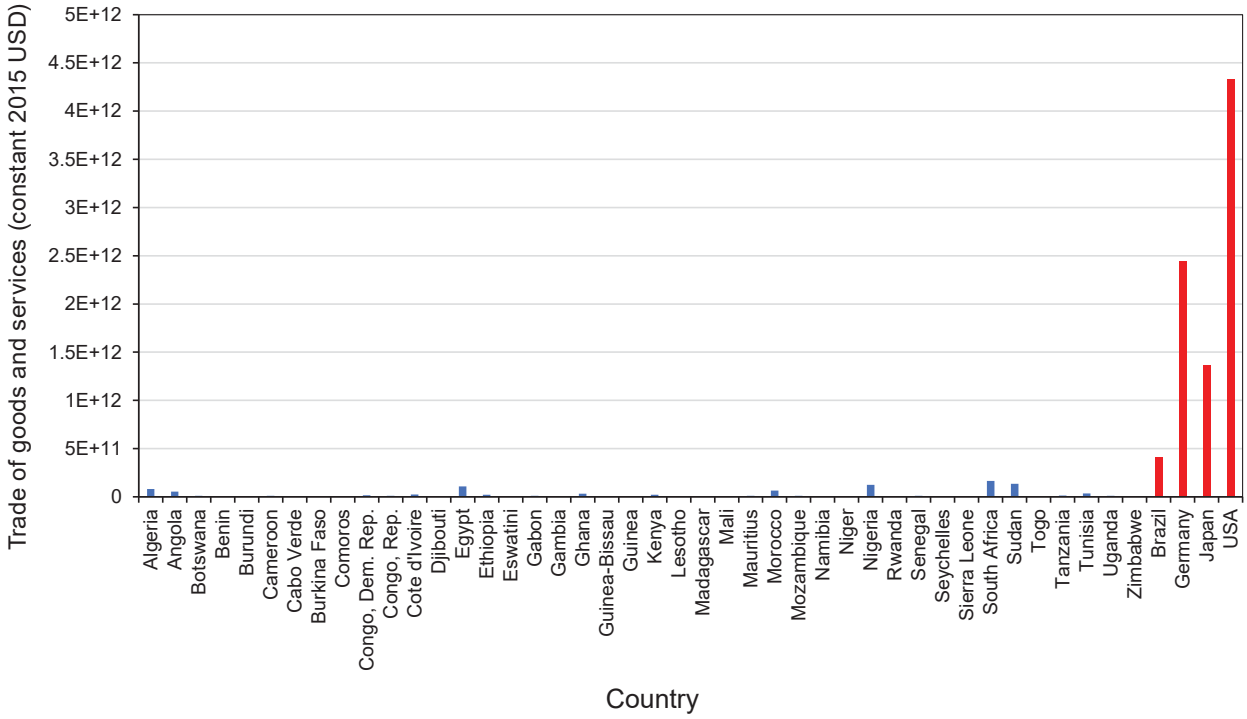
Figure 2: Average *FDI* net inflows (BoP, current USD) for selected countries, 2000–2021



Notes: Plots for countries outside Africa are highlighted in red. The evolution of *FDI* net inflows of the countries over time is shown in Appendix 2.

Source: Authors' own elaboration, with data from WB (2022a)

Figure 3: Average trade of goods and services (constant 2015 USD) for selected countries, 2000–2021



Note: Plots for countries outside Africa are highlighted in red. The evolution of trade of goods and services of the countries over time is shown in Appendix 3.

Source: Authors' own elaboration, with data from WB (2022a)

Figure 4: Scatter plots of productive capacity, trade openness and international financial inflows in Africa

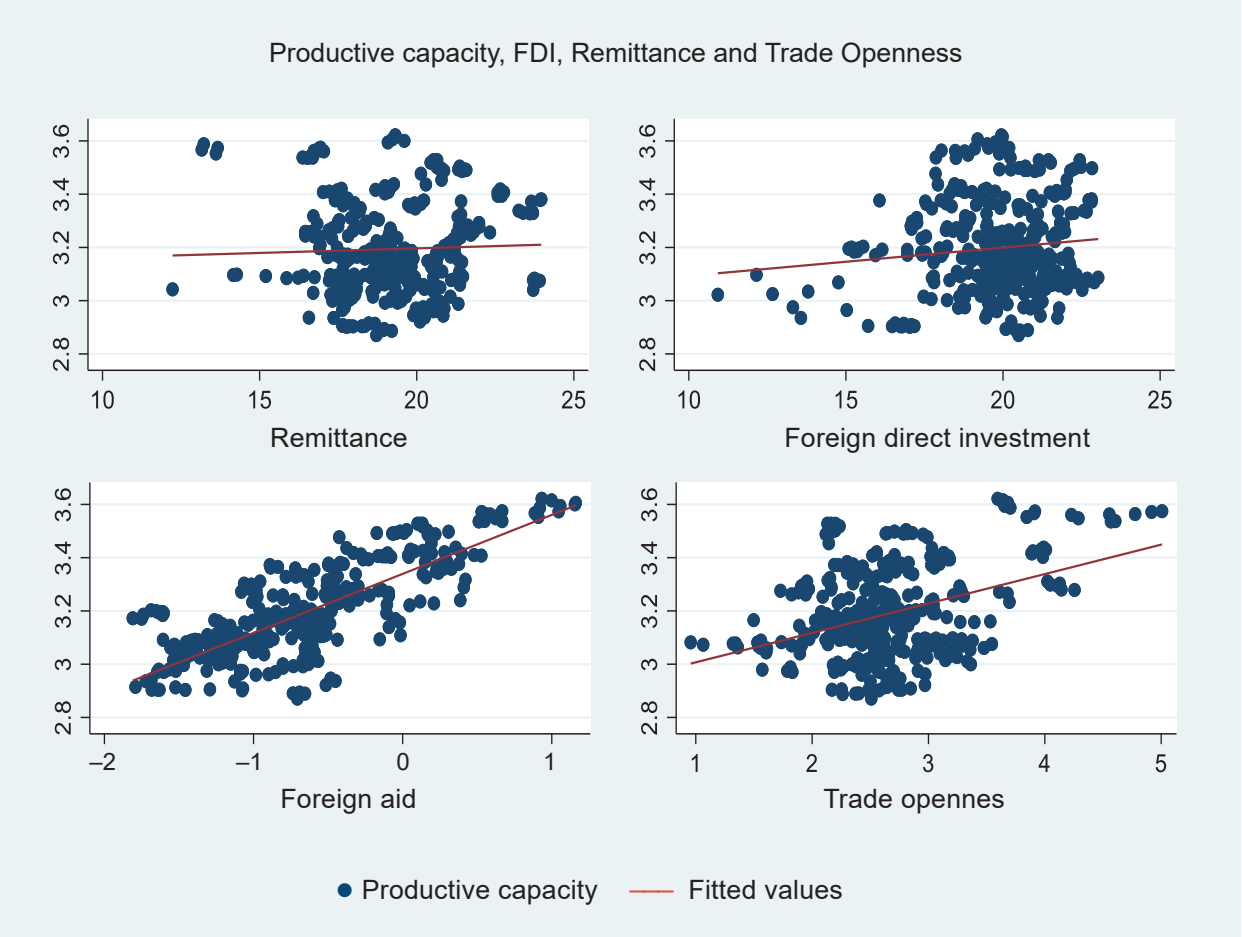
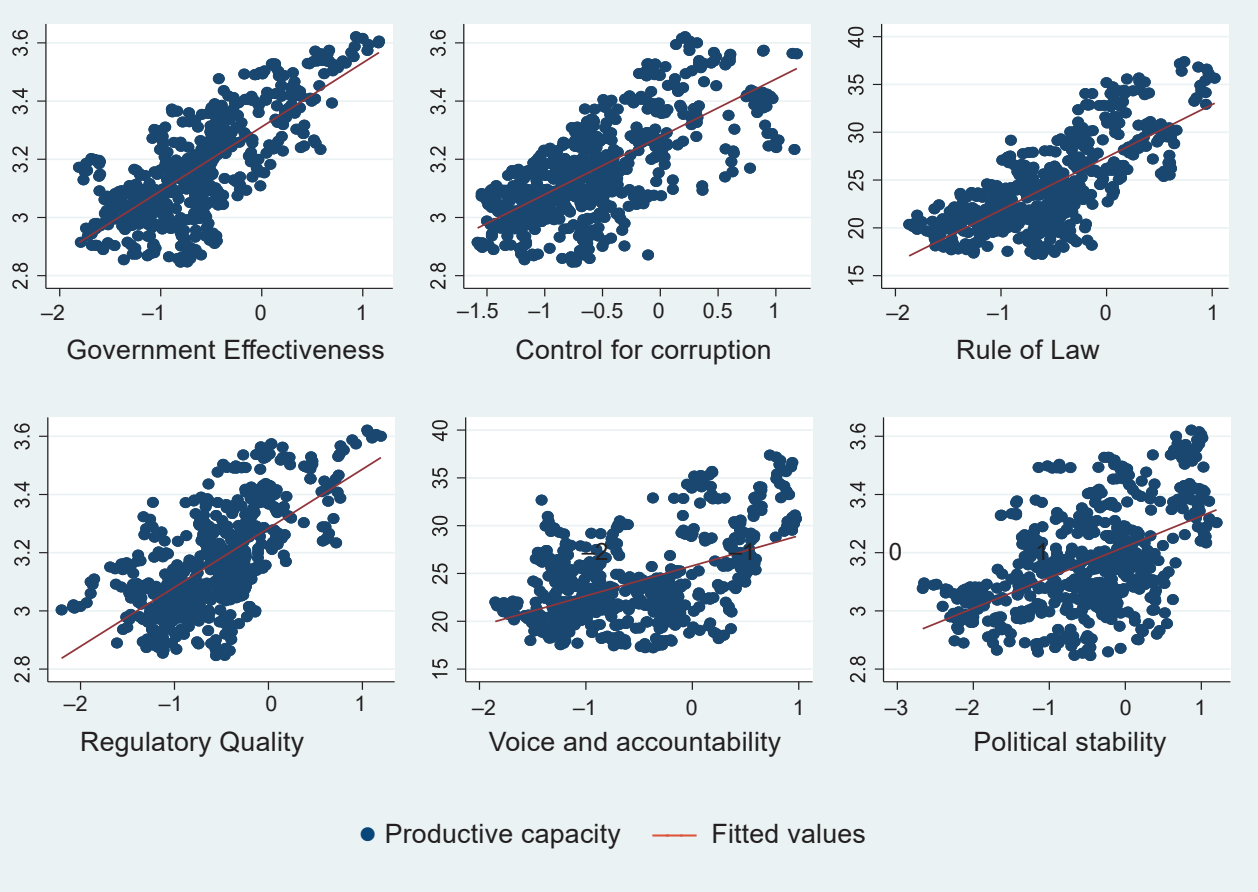


Figure 5: Scatter plots of productive capacity and institutional quality indicators



Source: Authors' own elaboration, with data from WB (2022b) and UNCTAD (2023)

2. Literature Review

2.1 Theoretical literature

The significance of physical and human capital, along with policy and institutional factors, in fostering economic growth was emphasized by endogenous growth theory (Romer, 1990). This theory emerged in response to the limitations of Solow's growth theory (Solow, 1956). In the endogenous growth theory, technological progress is considered to be endogenous, in contrast to the exogenous assumption of Solow's theory. A significant conclusion of the endogenous growth theory is its emphasis on the contributions of human and physical capital, institutions and technological progress in enhancing the productive capacity and overall growth of an economy. The present study is anchored in this theory and explores the factors influencing Africa's productive capacity, with a specific focus on trade openness, international financial flows and the moderating effects of governance institutions.

2.2 Evidence of linkage between trade openness and productive capacity

A growing body of literature has emerged in support of the significant role of trade openness in enhancing the productive capacities of economies towards generating more sophisticated products and improving overall economic growth. For instance, using diverse panel data methodologies, various studies have shown that trade openness is an important driver of economic growth in various regions (Abendin and Duan, 2021; Doan *et al*., 2020; Doan, 2019). Similarly, trade openness has been shown to be important for economic sophistication or economic complexity in various regions, which signals the capacities of these regions to competitively produce and export diverse products to other regions of the world (Nguea *et al*., 2022; Caglar *et al*., 2022; Tabash *et al*., 2022). While Irshad and Qayed (2022) confirmed that restrictive trade policies should not be encouraged since trade openness contributes positively to economic sophistication, Khan *et al*. (2020) demonstrated that trade openness positively influences economic sophistication. Ejike *et al*. (2018) confirmed that exports have a positive and statistically significant impact on economic growth. Indeed, the extant literature suggests that there are various channels through which trade openness may influence the productive capacities of economies. For instance, trade openness can potentially expand the demand for domestic products, engender industrial and technological advancement, trigger higher economic productivity and fast income growth, as well as improve capital investment, economic sophistication and knowledge transfer (Liu *et al*., 2022; Ekeocha *et al*., 2021; Wiredu *et al*., 2020; WB, 2019; IMF, 2019).

2.3 Linking foreign direct investment and productive capacity

Some studies in the extant literature have also found evidence in support of the role of foreign direct investment (*FDI*) towards improving the productive capacities of economies in order to attain higher levels of economic sophistication and growth. In a panel study of 30 host economies, Ranjbar and Rassekh (2022) demonstrated that economic sophistication influences the growth effect of *FDI* on the host countries and that countries ranking relatively high in economic complexity benefit from *FDI*, while countries ranking very low may be adversely affected. This finding suggests that African economies may not benefit much from the growth effect of *FDI* since they have relatively low levels of economic sophistication. Nonetheless, Nguea *et al*. (2022) examined a panel of 27 African economies using the GMM method and established that *FDI* enhances economic sophistication. Other recent studies have also found evidence in support of the positive effect of *FDI* on economic sophistication (Yimer, 2022; Khan *et al*., 2020; Khan *et al*., 2020). These studies generally affirm that the inflow of *FDI* allows the host economy to access new technologies, skills and international capital markets, among others. Such benefits from *FDI* inflow indicate that *FDI* inflow could be an important factor in explaining the improvements in the productive capacities of economies. Besides, other studies have also shown that *FDI* inflow considerably drives growth (Zamani and Tayebi, 2022; Wei *et al*., 2022; Doğan *et al*., 2020).

2.4 Linkage between remittances and productive capacity

An emerging body of literature has now acknowledged the importance of remittances in stimulating productive capacities for the benefit of overall economic sophistication, growth and development. In a panel study of five SADC economies (Zimbabwe, Mozambique, Lesotho, Eswatini and DR Congo), Mlambo and Kapingura (2020) used fixed effects, random effects and GMM models to establish that remittances have a positive effect on economic sophistication, which is good for stimulating productive capacities and growth. Saadi (2020) also found that remittances used for investment purposes are positively associated with export complexity, while a panel data study of 15 Asian countries by Liu *et al*. (2022), using quantile regression and augmented mean group methods, also found a positive relationship between remittances and economic complexity. In addition, evidence of the positive effect of remittances on economic growth has been established in the literature (Adeseye, 2021; Adjei *et al*., 2020). Some studies have also shown that remittances promote domestic savings and investment (Issifu, 2018; Dash, 2020), indicating that the channels through which remittances may affect the productive capacities of economies are similar to those of *FDI* inflows.

2.5 Evidence of linkage between foreign aid (ODA) and productive capacity

A review of the extant literature shows that there is mixed evidence regarding the role of foreign aid in stimulating the productive capacities of economies towards achieving higher levels of overall economic sophistication, growth and development. Kamguia *et al*. (2022) studied 78 developing countries over the period 1990–2017 and found that foreign aid reduces economic sophistication in countries with lower levels of economic complexity. Unfortunately, most African economies have low levels of economic complexity, suggesting that they will most likely not benefit much from inflows of foreign aid. However, contrary to this finding, some recent empirical evidence has shown that foreign aid is significantly contributing towards enhancing economic growth (Girma and Tilahun, 2022; Younsi *et al*., 2021). In a study of 42 African economies, Ogbonna *et al*. (2021) demonstrated that beyond certain institutional thresholds, foreign aid would contribute meaningfully to economic growth in Africa. Azam and Feng (2022) also investigated 37 developing countries disaggregated into low-income, lower-middle-income and upper-middle-income countries and established that foreign aid enhances economic growth. Dash (2021) also obtained similar evidence for South Asian countries. Interestingly, foreign aid has been an important source of financing in most African economies and has been generally deployed towards investment projects such as infrastructure construction, social service expansion and research financing (Chatterjee *et al*., 2022). This indicates that the channels through which foreign aid can influence the productive capacities of African economies are similar to those of *FDI* inflows and remittances.

Overall, our review of the literature as shown above indicates that the roles of trade openness and international financial flows as drivers of economic growth have been acknowledged by some recent studies. However, there is an apparent paucity of empirical evidence on the effects of trade openness and international financial flows on Africa's productive capacity as well as the role of institutional quality not only in moderating these relationships but also in enhancing the productive capacities of African economies towards achieving higher economic performance. This study addresses this gap in the literature in order to support evidence-based policymaking towards enhancing Africa's productive capacity through trade and financial policies as well as governance and institutional reforms. It should be noted that while the literature reviewed in the foregoing paragraphs indicates that trade openness and international financial inflows enhance economic growth, there is a distinction between productive capacity and economic growth. Productive capacity refers to the maximum potential output that an economy can achieve, while economic growth refers to actual increase in output over time. While economic growth can be influenced by factors that can drive productive capacity, such as trade openness and international financial inflows, there is an apparent lack of empirical evidence supporting these factors as important drivers of productive

capacity in Africa. This study addresses this gap in the literature by providing empirical evidence on the effects of trade openness and international financial inflows on Africa's productive capacity and how governance institutions are moderating these effects.

3. Data and Methodology

3.1 Data

This study uses a panel of 43 African countries and covers the period 2005–2018. The countries included in the study are listed in Table 2. The selection of these countries and the period covered by the study are mainly based on data availability. The current data for the productive capacities index developed by the United Nations Conference on Trade and Development (UNCTAD) ended in 2018. We use the existing data since the updated version is being awaited. Hence, our sample ends in 2018. However, the period covered by the study also enables us to account for the dynamics of the relationships up to the 2007–2009 Global Financial Crisis as well as the period after this crisis. The main idea here is that the knowledge gained before and after the crisis will be beneficial to development policymaking during the post-pandemic era[2].

Table 3 shows the variables included in the study, their measurement and the data sources. The productive capacities index (*PCI*) is used as the dependent variable. Productive capacity refers to the maximum possible output of an economy. The productive capacities index (*PCI*) is a multidimensional index that provides country-specific insights into and diagnostics of productive capacity development. The core independent variables for this study are trade openness (*TOP*) and international financial inflows, including foreign direct investment inflow (*FDI*), remittances received (*REM*) and foreign aid inflow (*ODA*). It is expected that increase in trade and international financial inflows to Africa will boost the productive capacities of economies in the region through economic benefits such as technological transfers, human capital enhancement, job creation, economic productivity and capital investment (Liu *et al*., 2022; Ekeocha *et al*., 2021; Fite, 2020; Wiredu *et al*., 2020).

2 By accounting for these distinct periods, we were able to monitor the presumed relationships from the beginning of our sample up to the period of the Global Financial Crisis (GFC) and after the crisis, thereby providing empirical evidence for informed policymaking and planning. Our analyses from the beginning of our sample up to the period of the crisis were based on data from 2005 to 2009, and the results are presented in Tables 18, 19 and 20. For the post-GFC period, we used data from 2010 to 2018, and the results are presented in Tables 21, 22 and 23. Interestingly, we find that in both sub-sample periods, trade openness and international financial inflows were potent drivers of Africa's productive capacity. The period before the crisis, 2005 to 2006, was too short to achieve a meaningful estimation; hence, we combined it with the crisis period, 2007 to 2009, in our first sub-sample estimations from 2005 to 2009.

Table 2: List of countries included in study

No.	Country	No.	Country	No.	Country	No.	Country
1	Algeria	**12**	Cote d'Ivoire	**23**	Lesotho	**34**	Seychelles
2	Angola	**13**	Djibouti	**24**	Madagascar	**35**	Sierra Leone
3	Benin	**14**	Egypt	**25**	Mali	**36**	South Africa
4	Botswana	**15**	Eswatini	**26**	Mauritius	**37**	Sudan
5	Burkina Faso	**16**	Ethiopia	**27**	Morocco	**38**	Tanzania
6	Burundi	**17**	Gabon	**28**	Mozambique	**39**	Togo
7	Cabo Verde	**18**	Gambia	**29**	Namibia	**40**	Tunisia
8	Cameroon	**19**	Ghana	**30**	Niger	**41**	Uganda
9	Comoros	**20**	Guinea	**31**	Nigeria	**42**	Zambia
10	Congo Dem. Rep.	**21**	Guinea Bissau	**32**	Rwanda	**43**	Zimbabwe
11	Congo Republic	**22**	Kenya	**33**	Senegal		

Source: Authors' own elaboration

Other control variables included in this study are human capital development (*HCAP*), renewable energy consumption (*REC*), infrastructure development (*INFR*), labour force participation (*LFP*) and governance institutional quality variables. The inclusion of these variables in our models is generally supported by economic theory and empirical evidence. For instance, the endogenous growth theory considers human capital to be the major determinant of economic growth and, by extension, productive capacity (Romer, 1990). The inclusion of renewable energy consumption (*REC*) is due to its many positive economic impacts as a driver of productive capacity. For instance, renewable energy use can stimulate trade, reduce the costs of fuel imports and inspire capital investment (Chen *et al*., 2022). Another control variable included in this study is infrastructure development (*INFR*). Some studies in Africa have highlighted the fact that infrastructure, especially telecommunications infrastructure, significantly increases productivity and economic growth (Ekeocha *et al*., 2022). Following Owusu-Manu *et al*. (2019), we use mobile cellular subscriptions (per 100 people) as a proxy for infrastructure development.

Table 3: Description of variables and data sources

Variables	Measurement	Sources of data
Productive capacity (*PCI*)	Productive Capacities Index	UNCTAD (2023)
Foreign direct investment inflow (*FDI*)	Net foreign direct investment inflows (% of GDP)	WB (2022a)
Remittance inflow (*REM*)	Remittances received (% of GDP)	
Foreign aid inflow (*ODA*)	Foreign aid is measured as net official development assistance (*ODA*) received (% of GNI)	
Trade openness (*TOP*)	Trade (% of GDP)	
Labor force participation (*LFP*)	Labor force participation rate, total (% of total population ages 15 – 64 years, modelled EX+ estimate)	
Renewable energy consumption (*REC*)	Renewable energy consumption (% of total final energy consumption)	
Infrastructure development (*INFR*)	Infrastructure development is measured using mobile cellular subscriptions (per 100 people)	
Human capital (*HCAP*)	Human capital index	WB (2021).
Government effectiveness (*GE*)	Government effectiveness	WB (2022b)
Voice and accountability (*VC*)	Voice and accountability	
Regulatory quality (*RQ*)	Regulatory quality	
Rule of law (*RL*)	Rule of law	
Control of corruption (*CC*)	Control of corruption	
Political stability and absence of violence/terrorism (*POLS*)	Political stability and absence of violence/terrorism	
Principal component analysis (*PCA*)	A single governance institutions indicator generated using the technique of principal component analysis	

Source: Authors' own elaboration

This study also includes total labour force participation (*LFP*) as a control variable. It is expected that increased participation of the populace in the economy should have positive implications for the overall productive capacity of the economy (Iheonu and Ichoku, 2022). Furthermore, we include governance institutional quality indicators in the study since recent empirical studies have shown that the roles of institutions in Africa's economic activities can no longer be called unimportant (Ogbonna *et al*., 2021, 2022; Liu *et al*., 2022). The institutional quality indicators included in this study are government effectiveness (*GE*), voice and accountability (*VC*), regula-

tory quality (*RQ*), rule of law (*RL*), control of corruption (*CC*) and political stability and absence of violence or terrorism (*POLS*). In addition, the study also uses single governance institution indicators generated using the technique of principal component analysis (*PCA*) in order to capture the overall effect of governance institutions on Africa's productive capacity.

The descriptive statistics of the variables are reported in Table 4. Notice that each individual governance institutional quality indicator shows a negative mean value, which aptly reflects the weak institutions on the continent. Furthermore, all the variables exhibit some variations as shown by the standard deviations. The correlation matrix is presented in Table 5, showing that the governance institutional quality variables are highly correlated. According to Gujarati and Porter (2003), a problem of collinearity exists when the values are up to or exceed ±0.80. Thus, to avoid the problem of collinearity, we included these institutional variables in separate regressions. We have followed recent literature in this regard (*e.g.*, Ogbonna *et al*., 2022; Ekeocha *et al*., 2021; Ogbonna *et al*., 2021).

Table 4: Descriptive statistics of variables

Variables	Observations	Mean	Std. dev.	Minimum	Maximum
Productive capacity (*PCI*)	602	3.16873	0.17436	2.84637	3.62137
Trade openness (*TOP*)	602	4.15383	0.57598	0.25855	5.85219
Foreign direct investment (*FDI*)	602	19.6274	1.93691	10.3607	23.1723
Remittances (*REM*)	602	19.0879	2.07317	9.34757	23.9625
Foreign aid (*ODA*)	602	19.9594	1.31761	15.5734	23.1597
Renewable energy (*REC*)	602	3.74332	0.57598	–2.81347	4.57903
Human capital (*HCAP*)	602	21.8401	1.68439	17.8215	25.1846
Labor force (*LFP*)	602	15.1741	1.50765	11.5129	17.9878
Infrastructure (*INFR*)	602	2.81860	0.83043	–5.16728	4.54673
Government effectiveness (*GE*)	602	–0.64831	0.60043	–1.80961	1.16092
Rule of law (*RL*)	602	–0.58597	0.58940	–1.87002	1.02395
Regulatory quality (*RQ*)	602	–0.56775	0.55943	–2.20154	1.19694
Voice & accountability (*VC*)	602	–0.52367	0.68597	–1.85100	0.97418
Control for corruption (*CC*)	602	–0.54788	0.61709	–1.58113	1.18163
Political stability (*POLS*)	602	–0.48775	0.84558	–2.66527	1.20101
PCA	602	6.47009	2.18019	–4.14611	5.63005

Note: *PCA* is the composite institutional quality indicator obtained through principal component analysis.
Source: Authors' own calculations

Table 5: Correlation matrix of variables

	PCI	*FDI*	*REM*	*ODA*	*TOP*	*REC*	*HCAP*	*LFP*	*INFR*	*GE*	*RL*	*RQ*	*VC*	*CC*	*POLS*	*PCA*
PCI	1															
FDI	0.2377	1														
REM	0.1667	0.4591	1													
ODA	0.2377	0.4682	0.5036	1												
TOP	0.3417	0.0471	−0.1916	−0.3218	1											
REC	−0.5813	−0.2900	−0.1941	0.1703	−0.1727	1										
HCAP	0.2909	0.5066	0.5315	0.5525	−0.1402	−0.4217	1									
LFP	−0.2144	0.5813	0.5368	0.6475	−0.3790	−0.0397	0.6422	1								
INFR	0.6562	0.1454	0.1753	−0.2336	0.2736	−0.5754	0.2412	−0.1727	1							
GE	0.7446	0.2780	0.0238	−0.0746	0.3083	−0.4482	0.2921	−0.0808	0.5400	1						
RL	0.7248	0.1720	−0.0171	−0.1476	0.2770	−0.3312	0.1417	−0.2213	0.4868	0.9088	1					
RQ	0.6447	0.2015	−0.0031	−0.0713	0.2881	−0.2463	0.1856	−0.1090	0.4495	0.8905	0.8872	1				
VC	0.4505	0.0372	−0.0673	−0.0621	0.2509	−0.1456	0.0115	−0.1686	0.2830	0.6244	0.7219	0.6684	1			
CC	0.6742	0.0593	−0.0436	−0.2141	0.3621	−0.3288	0.0262	−0.3186	0.4480	0.8328	0.8894	0.7853	0.6593	1		
POLS	0.4803	−0.0758	−0.3178	−0.4260	0.4524	−0.1194	−0.2394	−0.5454	0.3158	0.6140	0.7158	0.6283	0.6922	0.6966	1	
PCA	0.7046	0.3599	0.1339	−0.0718	−0.1806	−0.3106	0.0896	−0.2622	0.4789	0.9221	0.9667	0.9187	0.7996	0.9173	0.7928	1

Source: Authors' own calculations

3.2 Model specification

To examine how Africa's productive capacity (*PCI*) is responding to trade openness (*TOP*) and international financial inflows, such as *FDI* inflow, remittances (*REM*) and foreign aid (*ODA*), and how governance institutions are moderating these relationships, this study follows Ekeocha *et al*. (2021, 2022), Nguea *et al*. (2022), Ogbonna *et al*. (2021, 2022) and Yalta and Yalta (2021) by specifying a dynamic panel data model of the form:

$$PCI_{i,t} = \alpha_i + \psi PCI_{i,t-1} + \delta_1 TOP_{i,t} + \delta_2 FDI_{i,t} + \delta_3 REC_{i,t} + \delta_4 HCAP_{i,t} + \delta_5 LFP_{i,t} + \\ + \delta_6 INFR_{i,t} + \delta_7 INSTQ_{i,t} + \delta_8 INSTQ \times FDI_{i,t} + \delta_9 INSTQ \times TOP_{i,t} + \pi_{i,t} \quad (1)$$

$$PCI_{i,t} = \alpha_i + \psi PCI_{i,t-1} + \delta_1 TOP_{i,t} + \delta_2 REM_{i,t} + \delta_3 REC_{i,t} + \delta_4 HCAP_{i,t} + \delta_5 LFP_{i,t} + \\ + \delta_6 INFR_{i,t} + \delta_7 INSTQ_{i,t} + \delta_8 INSTQ \times REM_{i,t} + \delta_9 INSTQ \times TOP_{i,t} + \pi_{i,t} \quad (2)$$

$$PCI_{i,t} = \alpha_i + \psi PCI_{i,t-1} + \delta_1 TOP_{i,t} + \delta_2 ODA_{i,t} + \delta_3 REC_{i,t} + \delta_4 HCAP_{i,t} + \delta_5 LFP_{i,t} + \\ + \delta_6 INFR_{i,t} + \delta_7 INSTQ_{i,t} + \delta_8 INSTQ \times ODA_{i,t} + \delta_9 INSTQ \times TOP_{i,t} + \pi_{i,t} \quad (3)$$

$$PCI_{i,t} = \alpha_i + \psi PCI_{i,t-1} + \delta_1 TOP_{i,t} + \delta_2 FDI_{i,t} + \delta_3 REM_{i,t} + \delta_4 ODA_{i,t} + \delta_5 REC_{i,t} + \\ + \delta_6 HCAP_{i,t} + \delta_7 LFP_{i,t} + \delta_8 INFR_{i,t} + \delta_9 INSTQ_{i,t} + \delta_{10} INSTQ \times FDI_{i,t} + \\ + \delta_{11} INSTQ \times REM_{i,t} + \delta_{12} INSTQ \times ODA_{i,t} + \delta_{13} INSTQ \times TOP_{i,t} + \pi_{i,t} \quad (4)$$

where the variables are as defined in Table 3; $\pi_{i,t} = \mu_i + \varepsilon_{i,t}$, where μ_i is the country-specific effect; and the error term, $\varepsilon_{i,t} \sim iidN(0, \sigma_\varepsilon^2)$, shows no serial correlation, $E[\varepsilon'_{i,t} \ \varepsilon_{i,s}] = 0$. The countries are cross-sectional units so that $i = 1, 2, \ldots, 43$; while the time period, $t = 1, 2, \ldots, 14$. Notice that in Equations (1), (2) and (3), the international financial inflow variables are included in separate estimations, while in Equation (4), we allowed these financial inflow variables to enter the model at the same time, since they are not highly correlated as shown in Table 5. This estimation procedure enabled us to provide a robustness check on the results. Our robustness check technique recognizes that the impacts of international financial inflow variables are typically experienced concurrently in the economy. Also, the institutional quality variables are included in separate estimations to avoid the problem of collinearity, since the correlation matrix in Table 5 indicates that they are predominantly highly correlated.

This study adopts the system GMM estimator in estimating Equations (1), (2), (3) and (4). This estimator is preferred to the pooled OLS and fixed-effect estimators because it addresses the issues of unobservable heterogeneity and estimation of time-invariant factors. In addition, it tackles endogeneity problems that may arise, especially from reverse causality due to feedback effect from the endogenous regressors (Arellano and Bond, 1991; Arellano and Bover, 1995; Blundell and Bond, 1998). For instance, the problem of endogeneity arises in the underlying model due to reverse causality, since there exists a possibility that trade openness and international financial flows are endogenous, leading to a feedback effect whereby productive capacity influences trade openness and international financial flows and these variables in turn influence productive capacity. This suggests that the regressors are possibly endogenous. In addition, the presence of omitted variables is another potential source of the endogeneity problem. For example, geographical and cultural factors such as climatic variables, natural resource endowment, tourism development, religious beliefs and social norms, are not accounted for in our models, but these may be vital determinants of productivity in Africa. Besides, the endogeneity problem could also arise from measurement errors, which cannot be said to be completely absent from various macroeconomic data, especially in African countries. However, by employing the system generalized method of moments (GMM) estimation technique, this study tackles the issue of endogeneity of the regressors. Following studies such as Kamguia *et al*. (2022) and Kamguia *et al*. (2023),

all the independent variables are treated as endogenous variables. Furthermore, we utilize one lag of the right-hand side variables, *i.e.*, the independent variables as instrumental variables following some studies in the literature (*e.g.*, Kamguia *et al*., 2022; Ekeocha *et al*., 2021, 2022; Ogbonna *et al*., 2021, 2022).

Furthermore, for panels with a large number of cross-sections (*N*) and a small number of time periods (*T*), the system GMM estimator yields consistent and asymptotically efficient estimates. According to Blundell and Bond (2000), the system GMM estimator also improves precision and minimizes the finite sample bias associated with the difference GMM estimator. Nonetheless, this study conducted the Bond (2002) test in order to ensure that the choice of the system GMM estimator instead of the difference GMM estimator is not arbitrary. The results showed that the system GMM estimator is preferred to the difference GMM estimator in all the cases. Apart from the Bond (2002) test, this study also tested for cross-sectional dependence (CD) using the Pesaran (2021) CD test. This is because testing for cross-sectional dependence is important to avoid inefficient and misleading estimates for dynamic panels in which the number of cross-sectional units is higher than the number of time periods ($N > T$); (Sarafidis and Robertson, 2009; Dong *et al*., 2018). The results showed the presence of cross-sectional dependence in our panel. To address this issue, we introduced time effects into our models following Tchamyou *et al*. (2019), Asongu and Nting (2021) and Ogbonna *et al*. (2022)[3]. To conserve space, we do not report the Bond (2002) test and the Pesaran (2021) CD test results explicitly here, but they are available on request. In applying the system GMM estimator, we also incorporated the Windmeijer finite-sample correction for standard errors that produces more efficient estimates (Windmeijer, 2005).

The study also considered the issues of identification, simultaneity and exclusion restrictions, all of which are important within the framework of the system GMM approach. In this context, identification pertains to the selection of the dependent, endogenous explanatory and strictly exogenous variables (Tchamyou *et al*., 2019). Following the work of Asongu and Acha-Anyi (2019) and Asongu and Odhiambo (2020), all explanatory variables in our underlying equations are taken to be endogenous, while exclusively the time-invariant indicators serve as strictly exogenous variables. This identification strategy, which aligns with Roodman (2009), is grounded

3 Apart from incorporating the time effect into the system GMM, our study also adopts the Driscoll and Kraay (1998) standard error fixed effect estimation, which controls for serial correlation, group-wise heteroskedasticity and cross-sectional dependence. The reason for our adoption of the bias-corrected least square dummy variable (LSDV) estimator is that it is a dynamic panel data estimator, which has better small-sample properties than GMM as noted by Bruno (2005). The results obtained from the Driscoll and Kraay (1998) standard errors are presented in Tables 12, 13 and 14, while those of the LSDV estimator are presented in Tables 21, 22 and 23. Interestingly, regardless of the estimation technique adopted, our findings consistently reveal that Africa's productive capacity responds positively to trade openness and international financial inflows.

in the notion that time-invariant variables are unlikely to remain endogenous after undergoing the first difference. On the issue of exclusion restrictions, and in accordance with the identification process, the time-invariant variables exert an influence on productive capacity through their presumed impact on endogenous variables. The statistical validity of this exclusion restriction is evaluated through the application of the difference-in-Hansen test (DHT) to assess instrument exogeneity. As per Asongu *et al*. (2017), for the exclusion restriction hypothesis to be upheld, the null hypothesis of the DHT must not be rejected. In this study, our exclusion restrictions are validated based on this criterion, as demonstrated in Tables 6, 7, 8 and 9, using the conventional 5% level of significance. In what follows, the system GMM regression results of the study are presented and discussed.

4. Empirical Results

The results of our system GMM regressions are presented in Tables 6, 7 and 8. In each table, one proxy for international financial inflows is included. Hence, *FDI* is included in the models reported in Table 6, while remittance inflow (*REM*) and foreign aid inflow (*ODA*) are included in the models reported in Tables 7 and 8, respectively. Furthermore, each table consists of six panels, since we included the six institutional quality indicator variables in separate regressions to avoid the problem of collinearity. In all the tables, the Arellano-Bond tests for second-order serial correlation AR (2) indicate that all the models are free from the serial correlation problem. In addition, the Hansen (1982) tests of over-identifying restrictions indicate that the hypothesis of jointly valid instruments cannot be rejected in all the cases, implying that the set of instruments employed in the estimations satisfies the exogeneity condition required for obtaining valid regression estimates. Thus, there are valid over-identifying restrictions in all the cases and our models are adequate to inform policy. For a robustness check, we included all the international financial inflow variables in the models reported in Table 9, since these variables operate in the economy concurrently.

To begin, let us focus on Table 6, which includes *FDI* as the proxy for international financial inflows. The results in Table 6 indicate that *FDI* inflow generally affects productive capacity in Africa positively and significantly. This is consistent with the results in Tables 7 and 8, which indicate that remittances and foreign aid (*ODA*) mainly affect productive capacity in Africa. This finding shows that international financial inflows (*i.e.*, *FDI* inflow, remittances and foreign aid inflow) are significant drivers of productive capacity in Africa. This finding is consistent with some studies in the literature that have also established that international financial inflows such as *FDI* inflow, remittances and foreign aid enhance overall economic growth in the recipient countries (Zamani and Tayebi, 2022; Wei *et al*., 2022; Girma and Tilahun, 2022; Azam and Feng, 2022; Adeseye, 2021; Adjei *et al*., 2020). The finding is also consistent with the strand of empirical

literature that indicates that international financial inflows such as *FDI* inflow, remittances and foreign aid are positive drivers of economic sophistication (Yimer, 2022; Nguea *et al*., 2022; Mlambo and Kapingura, 2020; Saadi, 2020). Our finding is also consistent with economic expectations because, economically, international financial inflows such as *FDI* inflows, remittances and foreign aid are expected to bring about various economic benefits such as technological transfer, human capital enhancement, increased productivity and capital investment, thereby enhancing the capacity of the domestic economy to achieve higher productivity, more product diversity and better competitiveness.

Interestingly, we also find that the impact of trade openness on Africa's productive capacity is overwhelmingly positive and significant, not only in Table 6, but also in Tables 7 and 8. This finding indicates that trade openness is an important driver of productive capacities in African economies, which is consistent with economic expectations and some studies in the literature that have demonstrated the significant role of trade openness in promoting both economic sophistication and growth (Caglar *et al*., 2022; Irshad and Qayed, 2022; Nguea *et al*., 2022; Abendin and Duan, 2021; Doğan *et al*., 2020). Economically, this finding indicates that as African economies increasingly become more open to international trade, they are also exposed to increased production of a variety of sophisticated products and opportunities for industrial and technological advancement. Other benefits from international trade include increased economic productivity, improved capital investment, enhanced demand for domestic products and increased income growth. Indeed, our results indicate that the trade channel is quite potent in driving productive capacities in Africa, which is consistent with these economic expectations.

The results in Table 6 also indicate that infrastructure development predominantly affects Africa's productive capacity positively and significantly. This finding is also consistent with the results in Tables 7 and 8, showing that infrastructure development is an important driver of productive capacity in Africa. This finding is also in line with economic expectations. Ekeocha *et al*. (2022) also found that infrastructure development plays an important role in Africa's overall economic performance, which is attributed to recent investments in infrastructure across the continent, especially in telecommunications infrastructure. The results in Table 6 also indicate that the effect of human capital development on Africa's productive capacity is mainly positive and significant. This is consistent with Tables 7 and 8. This finding is also in line with economic expectations as postulated by the endogenous growth theory, which emphasizes the role of human capital in the economic growth process (Romer, 1990).

Contrary to economic expectations, the results in Tables 6, 7 and 8 indicate that the effect of labour force participation on Africa's productive capacity is mainly negative and significant. This finding may be due to the high levels of unemployment in most African economies. In fact, the high unemployment rate has remained one of the major economic problems facing African

economies in recent years. For instance, data from Nigeria's National Bureau of Statistics (National Bureau of Statistics, Nigeria, 2023) indicates that Nigeria's unemployment rate has been on a steady increase from 7.5% in 2015Q1 to 33.30% as of 2020Q4. South Africa's Quarterly Labour Force Survey (Statistics South Africa, 2022) shows an unemployment rate of 34.5% in 2022Q1. Many other African economies, such as Angola, Botswana, Gabon, Ethiopia, Sudan and Zimbabwe, among others, have also reported a similar trend in unemployment rates. Recent studies have also established that unemployment impedes growth, which is consistent with the negative effect of labour force participation in our results (Hlongwane and Daw, 2021).

Furthermore, in line with economic expectations, the results in Tables 6, 7 and 8 indicate that renewable energy consumption mainly affects Africa's productive capacity positively and significantly. This finding agrees with some studies in the literature (Khan *et al*., 2022; Wang *et al*., 2022; Das *et al*., 2022). Our finding reflects how important it is for Africa to embrace the global shift towards renewable energy use. For instance, Anser *et al*. (2021) demonstrated that biomass, geothermal and wind power sources of energy have a positive and significant impact on the economic advancement of Asian economies. Thus, our finding suggests that there is a need for more efforts towards encouraging the use of renewable energy in Africa, since doing so has benefits for both the environment and the economic conditions of African economies. Economically, it is expected that renewable energy consumption will stimulate trade, reduce the costs of fuel imports and inspire capital investment, thereby enhancing the productive capacity of an economy. Our finding is consistent with this economic expectation.

Regarding the role of governance institutions as drivers of productive capacities in Africa, the results in Tables 6, 7 and 8 indicate that the effects of governance institutional quality indicators on Africa's productive capacity remained mainly negative and significant throughout. This finding is contrary to Vu (2022) and Khan *et al*. (2019), who demonstrated the positive effect of institutional quality on economic complexity. In other words, our study has not found evidence to support the hypothesis that governance institutions promote Africa's productive capacity. Our finding reflects the low level of institutional quality in Africa, as shown by the negative mean values of the governance institutional quality indicators in Table 4, which report the descriptive statistics of the variables in this study. Interestingly, our results across all the tables indicate that interacting the governance institutional quality variables with trade openness and international financial inflow variables predominantly yielded positive and significant coefficients. This indicates that governance institutions are significantly moderating and enhancing the effects of trade openness and international financial inflows on Africa's productive capacity. This finding is consistent with Ogbonna *et al*. (2021), who also found that institutional quality can moderate the effect of foreign aid in Africa. Other recent studies have also emphasized the moderating role of institutional quality in Africa (Ogbuabor *et al*., 2019, 2020; Anthony-Orji *et al*., 2019). The results also

indicate that the lag of the dependent variable predominantly affects the current level positively and significantly. In other words, the previous level of productive capacity significantly influences the current productive capacity in Africa.

We subjected the foregoing baseline findings to various robustness checks. Interestingly, the results of the various robustness estimations generally remained consistent with the foregoing findings. Firstly, the robustness estimations in Table 9 included all the international financial inflow variables in the model at the same time, since these variables affect productive capacity simultaneously in the real economy. The only minor difference between our established findings and the results in Table 9 is that in the latter, the impact of infrastructure development is seen to be negative and insignificant. Secondly, to further address the problem of cross-sectional dependence in our panel, we employed the Driscoll and Kraay (1998) standard error fixed effect estimator, which controls for serial correlation, group-wise heteroskedasticity and cross-sectional dependence. The results are reported in Tables 10, 11 and 12. The minor differences between these results and our established findings are that in the former, the effect of foreign aid is insignificant, the effect of renewable energy consumption is negative, the effect of labour force participation is now positive and significant in line with economic expectation, and the individual effects of the institutional quality indicators are mainly insignificant. Thirdly, we estimated the underlying model with the composite institutional quality indicator generated from principal component analysis using both the system GMM and the Driscoll and Kraay (1998) estimators, and the results are reported in Tables 13 and 14, respectively. The adoption of the Driscoll and Kraay (1998) estimator arose from the existence of cross-sectional dependence in our panel. However, the results are still consistent with the established findings, except that in Table 14, the individual effects of the international financial inflow variables are seen to be insignificant in Panels 1, 2 and 3, the effect of renewable energy consumption is mainly negative, while that of labour force participation is positive. The consistency of these robustness estimations with our baseline findings indicate that our results are not just a happenstance.

We also subjected our established findings to an additional robustness check using the bias-corrected least square dummy variable (LSDV) estimator, which has better small-sample properties than GMM as noted by Bruno (2005). The results as reported in Tables 15, 16 and 17 are generally consistent with our established findings in terms of the direction of impact of the regressors. The main differences are that the effects of the regressors are now mainly statistically insignificant at the 5% level, except labour force participation and the lag of productive capacity, and the effect of labour force participation is now positive, while that of renewable energy consumption is negative. Furthermore, to understand how the presumed relationships in this study evolved from the beginning of our sample in 2005 up to the period of the 2007–2009 Global Financial Crisis as well as after the crisis, we disaggregated the analysis into two sub-sample periods. Thus, we

estimated the underlying models from the beginning of our sample up to the crisis period (2005–2009), and the results are reported in Tables 18, 19 and 20, while the results for the post-crisis period (2010–2018) are reported in Tables 21, 22 and 23. For the period up to the crisis, the results are consistent with our established findings, except that in Tables 18 and 19, the effects of trade openness, human capital development, remittances and the institutional variables are mainly insignificant, while the effect of labour force participation is positive. Similarly, for the period after the crisis, the results are also predominantly consistent with our established findings, except that the effect of infrastructure development is generally seen to be insignificant, the effect of trade openness is mainly insignificant in Tables 22 and 23, while the effect of labour force participation is insignificant in Table 21.

5. Concluding Remarks and Policy Recommendations

Following the paucity of empirical evidence on the effects of trade openness and international financial inflows on productive capacity in Africa as well as the moderating role of governance institutions on these relationships, this study raised three important questions. First, how do trade openness and international financial inflows (such as foreign direct investment inflows, remittances and foreign aid inflows) affect Africa's productive capacity? Secondly, how are governance institutions moderating the effects of trade openness and international financial inflows on Africa's productive capacity? Thirdly, what are the other significant macroeconomic drivers of productive capacity in Africa? To answer these questions, we adopted the dynamic panel system GMM modelling framework and used a panel of 43 African countries from 2005 to 2018. The findings are quite interesting and we summarize them as follows. Firstly, we found that trade openness and international financial inflows (*i.e.*, *FDI* inflow, remittances and foreign aid inflow) are significant drivers of productive capacity in Africa. Secondly, we found that even though the individual effect of the governance institution indicators is significantly negative, they are nonetheless moderating and enhancing the effects of trade openness and international financial inflows on Africa's productive capacity. Lastly, we found that other macroeconomic factors significantly influencing Africa's productive capacity include renewable energy consumption, human capital development and infrastructure development. The role of labour force participation remained mainly negative.

The foregoing findings have some policy implications. Given the important roles of trade openness and international financial flows (*i.e.*, *FDI* inflow, remittances and foreign aid inflow) in promoting Africa's productive capacity, it is imperative for policymakers and leaders on the continent to create an enabling environment that will not only enhance cross-border trade and attract international financial inflows but also prevent existing investors and businesses from exiting the region. This can be achieved by continuously improving the quality of governance

institutions through institutional reforms that will minimize corruption and ensure the entrenchment of the rule of law, political stability, voice and accountability, government effectiveness and regulatory quality. This recommendation is particularly important given the adverse effects of individual institutional quality variables on Africa's productive capacity. Indeed, policymakers and leaders in Africa can no longer continue to pay lip service to the building of strong institutions on the continent. This is because reversing the adverse effect of governance institutions on Africa's productive capacity requires that these leaders collaborate to address the problem of weak institutions bedevilling the region. In addition, Africa needs high-quality institutions that will support its transition to increased renewable energy use. This is vital because our results have shown that renewable energy consumption is an important driver of productive capacity in Africa. Another policy option for creating an enabling environment to promote trade and international financial inflows as a means of enhancing Africa's productive capacity is investing more in infrastructure development. Policymakers and leaders in Africa can collaborate at the level of the African Union to prioritize this and implement it through their respective national budgets.

Furthermore, since trade openness significantly enhances Africa's productive capacity, this study recommends that the African Continental Free Trade Agreement and other initiatives aimed at liberalizing and improving cross-border trade on the continent be vigorously implemented. In addition, the adverse effect of labour force participation on Africa's productive capacity suggests that there is a need to address the problem of unemployment in the region. Efforts should be made to ensure that the huge youth population on the continent is engaged in productive activities rather than allowing them to either migrate abroad in search of greener pastures or engage in illicit activities. Moreover, the positive role of human capital development as a driver of productive capacity in Africa, as shown in our results, aptly serves as a wakeup call for African leaders to invest more in developing the huge human resources that abound on the continent. In terms of future research, we recommend that a comparative study of these relationships be undertaken between Africa and other regions of the world such as Asia, Europe and the Americas. This will help towards a more comprehensive understanding of the drivers of productive capacity globally. Country-specific studies will also help enrich national economic policies.

Table 6: System GMM estimation results with *FDI* (dependent variable is *PCI*)

Regressors	Panel 1	Panel 2	Panel 3	Panel 4	Panel 5	Panel 6
One lag of productive capacity (*LPCI*)	0.9460*** (0.000)	0.9516*** (0.000)	0.9582*** (0.000)	0.9028*** (0.000)	0.9275*** (0.000)	1.0069*** (0.000)
Foreign direct investment inflow (*FDI*)	0.0053** (0.049)	0.0072** (0.012)	0.0042* (0.096)	0.0064** (0.053)	0.0043** (0.012)	0.0034** (0.010)
Trade openness (*TOP*)	0.0120** (0.013)	0.0090* (0.074)	0.0147** (0.027)	0.0079 (0.436)	0.0161*** (0.000)	0.0011 (0.684)
Renewable energy consumption (*REC*)	0.0020*** (0.001)	0.0012* (0.073)	0.0011* (0.098)	0.0025** (0.025)	0.0030*** (0.000)	0.0021*** (0.000)
Human capital development (*HCAP*)	0.0020** (0.049)	0.0005* (0.064)	0.0025** (0.036)	0.0001* (0.055)	0.0020** (0.026)	0.0022* (0.075)
Labor force participation (*LFP*)	−0.0028** (0.010)	−0.0031*** (0.006)	−0.0018** (0.013)	−0.0034** (0.051)	−0.0014* (0.062)	−0.0030*** (0.005)
Infrastructure development (*INFR*)	0.0003* (0.087)	0.0003* (0.090)	0.0026** (0.029)	0.0142* (0.057)	0.0073*** (0.006)	0.0059*** (0.009)
Government effectiveness (*GE*)	−0.0783*** (0.002)					
GE* × *FDI	0.0026*** (0.003)					
GE* × *LTOP	0.0076** (0.012)					
Rule of law (*RL*)		−0.0949*** (0.007)				
RL* × *FDI		0.0035*** (0.002)				
RL* × *TOP		0.0072** (0.059)				
Regulatory quality (*RQ*)			−0.0973*** (0.001)			
RQ* × *FDI			0.0033*** (0.001)			
RQ* × *TOP			0.0088** (0.035)			
Voice and accountability (*VC*)				−0.0426** (0.032)		
VC* × *FDI				0.0012** (0.050)		
VC* × *TOP				0.0057 (0.378)		
Control of corruption (*CC*)					−0.0853*** (0.001)	

Table 6: continuation

CC* × *FDI					0.0022*** (0.009)	
CC* × *TOP					0.0115*** (0.000)	
Political stability and absence of violence/ terrorism (*POLS*)						−0.0361*** (0.001)
POLS* × *FDI						0.0019*** (0.000)
POLS* × *TOP						0.0010 (0.589)
Constant	0.0174 (0.652)	0.0120 (0.818)	−0.0265 (0.546)	0.1563** (0.035)	0.0328 (0.248)	−0.0802*** (0.002)
Countries	43	43	43	43	43	43
AR(1) *p*-value	0.001***	0.000***	0.000***	0.000***	0.000***	0.000***
AR(2) *p*-value	0.239	0.242	0.253	0.205	0.226	0.276
Hansen *p*-value	0.293	0.222	0.304	0.247	0.366	0.212
No. of instruments	25	32	33	25	25	25
Observations	449	449	449	449	449	449
Time Effect	YES	YES	YES	YES	YES	YES
(a) Instruments in levels						
H excluding group	0.865	0.891	0.1114	0.416	0.828	0.838
Dif (0, H = exogenous)	0.078	0.267	0.107	0.354	0.296	0.121
(b) IV (years, eq(diff))						
H excluding group	0.772	0.777	0.252	0.554	0.793	0.736
Dif (0, H = exogenous)	0.517	0.786	0.474	0.247	0.598	0.587

Notes: Estimated coefficients are reported while the *p*-values are in parentheses; ***, **, and * show 1%, 5% and 10% significance levels.

Source: Authors' own calculations

Table 7: System GMM estimation results with *REM* (dependent variable is *PCI*)

Regressors	Panel 1	Panel 2	Panel 3	Panel 4	Panel 5	Panel 6
One lag of productive capacity (*LPCI*)	0.8735*** (0.000)	0.8774*** (0.000)	0.9179*** (0.000)	0.8936*** (0.000)	0.9555*** (0.000)	0.8829*** (0.000)
Remittance inflow (*REM*)	0.00294* (0.063)	0.0029** (0.052)	0.0031*** (0.003)	0.0004* (0.056)	0.0008** (0.017)	0.0021 (0.223)
Trade openness (*TOP*)	0.0263** (0.024)	0.0280** (0.027)	0.0158** (0.010)	0.0099 (0.256)	0.0150** (0.011)	0.0277** (0.010)
Renewable energy consumption (*REC*)	0.0037*** (0.003)	0.0022** (0.014)	0.0001* (0.059)	0.0006 (0.561)	0.0022*** (0.000)	0.0056*** (0.005)
Human capital development (*HCAP*)	0.0042*** (0.001)	0.0062*** (0.000)	0.0043*** (0.000)	0.0072*** (0.000)	0.0030*** (0.000)	0.0022*** (0.003)
Labor force participation (*LFP*)	−0.0013 (0.479)	−0.0027* (0.092)	−0.0036** (0.010)	−0.0050** (0.017)	−0.0002* (0.085)	−0.0042** (0.027)
Infrastructure development (*INFR*)	0.0127** (0.012)	0.0086** (0.036)	0.0011* (0.074)	0.0056 (0.398)	0.0031** (0.041)	0.0065 (0.213)
Government effectiveness (*GE*)	−0.1566** (0.025)					
GE* × *REM	0.0047** (0.017)					
GE* × *LTOP	0.0188** (0.029)					
Rule of law (*RL*)		−0.1826** (0.036)				
RL* × *REM		0.0050** (0.033)				
RL* × *TOP		0.0236** (0.034)				
Regulatory quality (*RQ*)			−0.0901*** (0.008)			
RQ* × *REM			0.0030*** (0.002)			
RQ* × *TOP			0.0110** (0.021)			
Voice and accountability (*VC*)				−0.0295 (0.531)		
VC* × *REM				0.0008** (0.047)		
VC* × *TOP				0.0072** (0.025)		
Control of corruption (*CC*)					−0.0187 (0.533)	

Table 7: continuation

CC* × *REM					−0.0007** (0.040)	
CC* × *TOP					0.0089** (0.040)	
Political stability and absence of violence/ terrorism (*POLS*)						−0.1072* (0.063)
POLS* × *REM						0.0006* (0.070)
POLS* × *TOP						0.0271*** (0.002)
Constant	0.1287* (0.073)	0.1019 (0.255)	0.1048** (0.032)	0.2032*** (0.002)	0.0245 (0.254)	0.2151*** (0.000)
Countries	43	43	43	43	43	43
AR(1) *p*-value	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***
AR(2) *p*-value	0.223	0.245	0.240	0.222	0.207	0.150
Hansen *p*-value	0.275	0.303	0.380	0.421	0.247	0.383
No. of instruments	29	29	30	29	29	29
Observations	456	456	456	456	456	493
Time Effect	YES	YES	YES	YES	YES	YES
(a) Instruments in levels						
H excluding group	0.622	0.663	0.440	0.353	0.512	0.093
Dif (0, H = exogenous)	0.165	0.682	0.845	0.221	0.603	0.567
(b) IV (years, eq(diff))						
H excluding group	0.376	0.999	0.247	0.136	0.520	0.289
Dif (0, H = exogenous)	0.530	0.649	0.540	0.215	0.523	0.117

Notes: Estimated coefficients are reported while the *p*-values are in parentheses; ***, **, and * show 1%, 5% and 10% significance levels.

Source: Authors' own calculations

Table 8: System GMM estimation results with *ODA* (dependent variable is *PCI*)

Regressors	Panel 1	Panel 2	Panel 3	Panel 4	Panel 5	Panel 6
One lag of productive capacity (*LPCI*)	0.9253*** (0.000)	0.9387*** (0.000)	0.9403*** (0.000)	0.9696*** (0.000)	0.9319*** (0.000)	0.9546*** (0.000)
Foreign aid inflow (*ODA*)	0.0039*** (0.004)	0.0043*** (0.003)	0.0025** (0.032)	0.0014 (0.351)	0.0004* (0.080)	0.0020 (0.176)
Trade openness (*TOP*)	0.0270*** (0.000)	0.0258*** (0.001)	0.0222*** (0.001)	0.0022* (0.071)	0.0212*** (0.001)	0.0076** (0.052)
Renewable energy consumption (*REC*)	0.0035*** (0.000)	0.0012* (0.074)	0.0013** (0.027)	0.0008 (0.347)	0.0027*** (0.007)	0.0014** (0.021)
Human capital development (*HCAP*)	0.0035*** (0.000)	0.0043*** (0.000)	0.0026*** (0.001)	0.0046*** (0.000)	0.0040*** (0.000)	0.0037*** (0.000)
labour force participation (*LFP*)	−0.0002 (0.895)	−0.0030* (0.098)	−0.0010* (0.061)	−0.0058*** (0.009)	−0.0000* (0.095)	−0.0024* (0.066)
Infrastructure development (*INFR*)	0.0045** (0.013)	0.0021** (0.042)	0.0037** (0.010)	0.0016* (0.071)	0.0057** (0.017)	0.0024 (0.360)
Government effectiveness (*GE*)	−0.1791*** (0.000)					
GE* × *ODA	0.0056*** (0.000)					
GE* × *LTOP	0.0181*** (0.000)					
Rule of law (*RL*)		−0.1189** (0.014)				
RL* × *ODA		0.0019** (0.020)				
RL* × *TOP		0.0198*** (0.002)				
Regulatory quality (*RQ*)			−0.0673 (0.117)			
RQ* × *ODA			0.0006** (0.052)			
RQ* × *TOP			0.0141*** (0.004)			
Voice and accountability (*VC*)				−0.0764* (0.095)		
VC* × *ODA				0.0033*** (0.008)		
VC* × *TOP				0.0020 (0.705)		
Control of corruption (*CC*)					−0.06991* (0.095)	

Table 8: continuation

CC* × *ODA					0.0010** (0.045)	
CC* × *TOP					0.0133*** (0.006)	
Political stability and absence of violence/ terrorism (*POLS*)						−0.0110 (0.592)
POLS* × *ODA						0.0001* (0.085)
POLS* × *TOP						0.0030** (0.021)
Constant	−0.0373 (0.225)	−0.0501 (0.201)	−0.0016 (0.954)	0.0553 (0.366)	0.0150 (0.698)	0.02390 (0.408)
Countries	43	43	43	43	43	43
AR(1) *p*-value	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
AR(2) *p*-value	0.249	0.210	0.229	0.199	0.230	0.214
Hansen *p*-value	0.432	0.205	0.179	0.309	0.229	0.166
No. of instruments	30	30	30	30	30	30
Observations	497	461	461	461	461	497
Time Effect	YES	YES	YES	YES	YES	YES
(a) Instruments in levels						
H excluding group	0.706	0.592	0.807	0.401	0.623	0.690
Dif (0, H = exogenous)	0.306	0.554	0.348	0.132	0.343	0.214
(b) IV (years, eq(diff))						
H excluding group	0.603	0.700	0.821	0.265	0.658	0.644
Dif (0, H = exogenous)	0.656	0.367	0.510	0.463	0.426	0.503

Notes: Estimated coefficients are reported while the *p*-values are in parentheses; ***, **, and * show 1%, 5% and 10% significance levels.

Source: Authors' own calculations

Table 9: System GMM regression results with all financial inflow variables (dependent variable is *PCI*)

Regressors	Panel 1	Panel 2	Panel 3	Panel 4	Panel 5	Panel 6
One lag of productive capacity (*LPCI*)	0.8918*** (0.000)	0.8793*** (0.000)	0.9438*** (0.000)	1.0201*** (0.000)	1.0208*** (0.000)	0.9709*** (0.000)
Foreign direct investment inflow (*FDI*)	0.0116 (0.198)	0.2732*** (0.002)	0.0018 (0.760)	0.0001* (0.097)	0.0084** (0.037)	0.0177*** (0.002)
Remittance inflow (*REM*)	0.0049 (0.267)	0.0037* (0.095)	0.0012 (0.581)	0.0010** (0.040)	0.0008* (0.056)	0.0065* (0.089)
Foreign aid inflow (*ODA*)	0.0049 (0.336)	0.0110*** (0.007)	0.0008* (0.073)	0.0050* (0.091)	0.0044* (0.088)	0.0017* (0.064)
Trade openness (*TOP*)	0.0043* (0.081)	0.0356* (0.068)	0.0241 (0.113)	0.0076 (0.294)	0.0076* (0.048)	0.0168*** (0.010)
Renewable energy consumption (*REC*)	0.0034** (0.020)	−0.0023 (0.319)	0.0026 (0.186)	0.0033*** (0.006)	0.0012 (0.338)	−0.0027 (0.323)
Human capital development (*HCAP*)	0.0080** (0.042)	0.0042 (0.437)	0.0023 (0.608)	0.0032** (0.040)	0.0023*** (0.042)	0.0041* (0.098)
Labour force participation (*LFP*)	−0.0131 (0.189)	−0.0206*** (0.005)	−0.0004 (0.943)	−0.0019* (0.058)	−0.0038 (0.402)	−0.0143** (0.039)
Infrastructure development (*INFR*)	0.0001* (0.097)	0.0008* (0.090)	−0.0011 (0.850)	−0.0083 (0.190)	0.0125** (0.059)	−0.0173 (0.196)
Government effectiveness (*GE*)	−0.0378 (0.720)					
GE* × *REM	0.0051 (0.273)					
GE* × *FDI	0.0114* (0.081)					
GE* × *ODA	0.0142** (0.022)					
GE* × *TOP	0.0021 (0.869)					
Rule of law (*RL*)		0.1659 (0.256)				
RL* × *REM		0.0055 (0.178)				
RL* × *FDI		0.0230*** (0.000)				
RL* × *ODA		0.0295*** (0.003)				
RL* × *TOP		0.0300* (0.080)				
Regulatory quality (*RQ*)			−0.1409 (0.167)			
RQ* × *LREM			0.0006* (0.086)			
RQ* × *LFDI			0.0039** (0.048)			
RQ* × *ODA			0.0049 (0.430)			
RQ* × *TOP			0.0147* (0.096)			
Voice and accountability (*VC*)				−0.1469*** (0.004)		

Table 9: continuation

VC* × *REM				0.0041** (0.035)		
VC* × *FDI				0.0035* (0.095)		
VC* × *ODA				0.0106*** (0.000)		
VC* × *TOP				0.0020 (0.710)		
Control of corruption (*CC*)					−0.1312 (0.130)	
CC* × *REM					0.0033 (0.296)	
CC* × *FDI					0.0092** (0.017)	
CC* × *ODA					0.0088** (0.022)	
CC* × *TOP					0.0015* (0.069)	
Political stability and absence of violence/terrorism (*POLS*)						0.1117 (0.223)
POLS* × *REM						0.0058* (0.089)
POLS* × *FDI						0.0152** (0.014)
POLS* × *ODA						0.0089 (0.168)
POLS* × *TOP						−0.0121 (0.127)
Constant	0.1207 (0.477)	0.3824** (0.037)	−0.0384 (0.713)	0.1992 (0.341)	0.1893* (0.079)	0.1014 (0.466)
Countries	43	43	43	43	43	43
AR(1) *p*-value	0.000***	0.001***	0.001***	0.001***	0.000***	0.001***
AR(2) *p*-value	0.193	0.319	0.266	0.220	0.377	0.758
Hansen *p*-value	0.130	0.306	0.430	0.439	0.313	0.651
No. of instruments	29	29	34	30	27	27
Observations	444	444	444	444	444	444
Time Effect	YES	YES	YES	YES	YES	YES
DHT for instruments						
(a) Instruments in levels						
H excluding group	0.846	0.886	0.930	0.923	0.874	0.894
Dif (0, H = exogenous)	0.881	0.806	0.598	0.627	0.727	0.260
(b) IV (years, eq(diff))						
H excluding group	0.886	0.792	0.895	0.731	0.717	0.886
Dif (0, H = exogenous)	0.578	0.854	0.782	0.975	0.915	0.571

Notes: Estimated coefficients are reported while the *p*-values are in parentheses; ***, **, and * show 1%, 5% and 10% significance levels.

Source: Authors' own calculations

Table 10: Driscoll and Kraay estimation results with *FDI* (dependent variable is *PCI*)

Regressors	Panel 1	Panel 2	Panel 3	Panel 4	Panel 5	Panel 6
Foreign direct investment inflow (*FDI*)	0.0024** (0.024)	0.0026** (0.031)	0.0009* (0.079)	0.0001 (0.930)	0.0045** (0.011)	−0.0005 (0.739)
Trade openness (*TOP*)	0.0233 (0.115)	0.0229* (0.096)	0.0266** (0.025)	0.0104* (0.071)	0.0162** (0.019)	0.0117* (0.062)
Renewable energy consumption (*REC*)	−0.0193*** (0.003)	−0.0238*** (0.000)	−0.0275*** (0.000)	−0.0176*** (0.001)	−0.0217*** (0.000)	−0.0208*** (0.001)
Human capital development (*HCAP*)	0.0240*** (0.000)	0.0215*** (0.000)	0.0240*** (0.000)	0.0255*** (0.000)	0.0238*** (0.000)	0.0259*** (0.000)
Labour force participation (*LFP*)	0.2766*** (0.000)	0.2707*** (0.000)	0.2762*** (0.000)	0.2649*** (0.000)	0.2710*** (0.000)	0.2677*** (0.000)
Infrastructure development (*INFR*)	0.0113 (0.103)	0.0111** (0.049)	0.0069** (0.024)	0.0092 (0.125)	0.0109* (0.061)	0.0107* (0.083)
Government effectiveness (*GE*)	0.0222 (0.790)					
GE* × *FDI	0.0008* (0.075)					
GE* × *LTOP	0.0086** (0.040)					
Rule of law (*RL*)		0.0346 (0.618)				
RL* × *FDI		0.0013* (0.063)				
RL* × *TOP		0.0087** (0.024)				
Regulatory quality (*RQ*)			−0.0621 (0.454)			
RQ* × *FDI			0.0064 (0.854)			
RQ* × *TOP			0.0179* (0.093)			
Voice and accountability (*VC*)				0.0229 (0.495)		
VC* × *FDI				0.0001 (0.929)		
VC* × *TOP				0.0006* (0.094)		
Control of corruption (*CC*)					0.1037 (0.204)	
CC* × *FDI					0.0041** (0.058)	
CC* × *TOP					0.0032 (0.812)	
Political stability and absence of violence/terrorism (*POLS*)						−0.0004 (0.985)
POLS* × *FDI						0.0002* (0.074)
POLS* × *TOP						0.0000* (0.092)
Constant	−1.5391*** (0.000)	−1.3721*** (0.000)	−1.5456*** (0.000)	−1.3984*** (0.000)	−1.3782*** (0.000)	−1.4524*** (0.000)
Countries	43	43	43	43	43	43
R^2	0.6915	0.6965	0.6847	0.6860	0.6918	0.6769
Observations	494	494	494	494	494	494

Notes: Estimated coefficients are reported while the *p*-values are in parentheses; ***, **, and * show 1%, 5% and 10% significance levels.

Source: Authors' own calculations

Table 11: Driscoll and Kraay estimation results with *REM* (dependent variable is *PCI*)

Regressors	Panel 1	Panel 2	Panel 3	Panel 4	Panel 5	Panel 6
Remittance inflow (*REM*)	0.0001* (0.089)	0.0008** (0.052)	0.0011** (0.041)	0.0009** (0.040)	0.0023** (0.048)	0.0006 (0.642)
Trade openness (*TOP*)	0.0275* (0.060)	0.0309** (0.031)	0.0246** (0.055)	0.0144** (0.056)	0.0217 (0.102)	0.0163*** (0.001)
Renewable energy consumption (*REC*)	−0.0280*** (0.001)	−0.0330*** (0.000)	−0.3978*** (0.000)	−0.0296*** (0.000)	−0.0280*** (0.000)	−0.0326*** (0.000)
Human capital development (*HCAP*)	0.0277*** (0.000)	0.0213*** (0.002)	0.0237*** (0.000)	0.0248*** (0.001)	0.0228*** (0.001)	0.0242*** (0.001)
Labour force participation (*LFP*)	0.2940*** (0.000)	0.2810*** (0.000)	0.2876*** (0.000)	0.2728*** (0.000)	0.2876*** (0.000)	0.2848*** (0.000)
Infrastructure development (*INFR*)	0.0109 (0.120)	0.0102** (0.052)	0.0069** (0.025)	0.0082 (0.103)	0.0101* (0.077)	0.0091 (0.100)
Government effectiveness (*GE*)	−0.0818 (0.160)					
GE* × *REM	0.0041*** (0.001)					
GE* × *LTOP	0.0097** (0.052)					
Rule of law (*RL*)		−0.0982 (0.102)				
RL* × *REM		0.0041*** (0.004)				
RL* × *TOP		0.0147** (0.024)				
Regulatory quality (*RQ*)			−0.0951** (0.042)			
RQ* × *REM			0.0030** (0.012)			
RQ* × *TOP			0.0146 (0.283)			
Voice and accountability (*VC*)				−0.0292 (0.562)		
VC* × *REM				0.0022 (0.202)		
VC* × *TOP				0.0018* (0.094)		
Control of corruption (*CC*)					−0.0937* (0.059)	
CC* × *REM					0.0058*** (0.001)	
CC* × *TOP					0.0050* (0.090)	
Political stability and absence of violence/terrorism (*POLS*)						−0.0655** (0.051)
POLS* × *REM						0.0028*** (0.000)
POLS* × *TOP						0.0033** (0.053)
Constant	−1.8146*** (0.000)	−1.5964*** (0.000)	−1.6628*** (0.000)	−1.4665*** (0.000)	−1.7421*** (0.000)	−1.6507*** (0.000)
Countries	43	43	43	43	43	43
R^2	0.6862	0.6887	0.6765	0.6762	0.6867	0.6705
Observations	502	502	502	502	502	502

Notes: Estimated coefficients are reported while the *p*-values are in parentheses; ***, **, and * show 1%, 5% and 10% significance levels.

Source: Authors' own calculations

Table 12: Driscoll and Kraay estimation results with *ODA* (dependent variable is *PCI*)

Regressors	Panel 1	Panel 2	Panel 3	Panel 4	Panel 5	Panel 6
Foreign aid inflow (*ODA*)	−0.0001 (0.971)	−0.0020 (0.700)	0.0017 (0.754)	−0.0012 (0.811)	0.0002 (0.964)	−0.0026 (0.532)
Trade openness (*TOP*)	0.0253 (0.110)	0.0266* (0.066)	0.0277** (0.022)	0.0147** (0.035)	0.0177 (0.261)	0.0143** (0.019)
Renewable energy consumption (*REC*)	−0.0278*** (0.000)	−0.0322*** (0.000)	−0.0346*** (0.000)	−0.0254*** (0.001)	−0.0284*** (0.000)	−0.0298*** (0.000)
Human capital development (*HCAP*)	0.0226*** (0.000)	0.0208*** (0.000)	0.0223*** (0.000)	0.0250*** (0.000)	0.0234*** (0.000)	0.0247*** (0.000)
Labour force participation (*LFP*)	0.2763*** (0.000)	0.2694*** (0.000)	0.2772*** (0.000)	0.2683*** (0.000)	0.2755*** (0.000)	0.2694*** (0.000)
Infrastructure development (*INFR*)	0.0114 (0.102)	0.0112** (0.044)	0.0072 (0.223)	0.0084 (0.128)	0.0105* (0.056)	0.0102* (0.071)
Government effectiveness (*GE*)	−0.0340 (0.793)					
GE* × *ODA	0.0016* (0.074)					
GE* × *TOP	0.0094** (0.052)					
Rule of law (*RL*)		0.0012 (0.991)				
RL* × *ODA		0.0001* (0.094)				
RL* × *TOP		0.0109*** (0.046)				
Regulatory quality (*RQ*)			−0.1414 (0.225)			
RQ* × *ODA			0.0046* (0.078)			
RQ* × *TOP			0.0180*** (0.015)			
Voice and accountability (*VC*)				−0.0308 (0.730)		
VC* × *ODA				0.0022 (0.643)		
VC* × *TOP				0.0025 (0.710)		
Control of corruption (*CC*)					−0.0624 (0.644)	
CC* × *ODA					0.0042 (0.463)	
CC* × *TOP					0.0034 (0.799)	
Political stability and absence of violence/terrorism (*POLS*)						0.0330 (0.485)
POLS* × *ODA						−0.0017 (0.444)
POLS* × *TOP						0.0018 (0.733)
Constant	−1.5346*** (0.000)	−1.3394*** (0.000)	−1.5638*** (0.000)	−1.4149*** (0.000)	−1.5160*** (0.000)	−1.3935*** (0.000)
Countries	43	43	43	43	43	43
R^2	0.6988	0.7028	0.6937	0.6954	0.6999	0.6857
Observations	515	515	515	515	515	515

Notes: Estimated coefficients are reported while the *p*-values are in parentheses; ***, **, and * show 1%, 5% and 10% significance levels.

Source: Authors' own calculations

Table 13: System GMM regression results using composite institutional quality indicator (dependent variable is *PCI*)

Regressors	Panel 1	Panel 2	Panel 3	Panel 4
One lag of productive capacity (*LPCI*)	0.9498*** (0.000)	0.9075*** (0.000)	0.9256*** (0.000)	0.9334*** (0.000)
Foreign direct investment inflow (*FDI*)	0.0028* (0.084)			0.0043** (0.023)
Remittance inflow (*REM*)		0.0010*** (0.008)		0.0037*** (0.004)
Foreign aid inflow (*ODA*)			0.0005* (0.073)	0.0028** (0.039)
Trade openness (*TOP*)	0.0063** (0.059)	0.0100*** (0.000)	0.0146*** (0.001)	0.0082 (0.333)
Renewable energy consumption (*REC*)	0.0019*** (0.001)	0.0023*** (0.000)	0.0026*** (0.001)	−0.0014 (0.468)
Human capital development (*HCAP*)	0.0018 (0.435)	0.0044*** (0.000)	0.0032*** (0.000)	0.0070** (0.036)
Labour force participation (*LFP*)	−0.0019** (0.050)	−0.0022** (0.048)	−0.0000 (0.972)	−0.0152** (0.027)
Infrastructure development (*INFR*)	0.0018 (0.452)	0.0071** (0.045)	0.0077** (0.012)	−0.0110 (0.106)
Composite institutional quality indicator (*PCA*)	−0.0172** (0.012)	−0.0231*** (0.005)	−0.0426*** (0.001)	0.0310 (0.340)
PCA* × *FDI	0.0006*** (0.003)			0.0024*** (0.002)
PCA* × *TOP	0.0014*** (0.000)			0.0031 (0.300)
PCA* × *REM		0.0008*** (0.001)		0.0014 (0.217)
PCA* × *TOP		0.0026** (0.019)		0.0031 (0.300)
PCA* × *ODA			0.0014*** (0.001)	0.0046* (0.084)
PCA* × *TOP			0.0039*** (0.004)	0.0031 (0.300)
Constant	0.0623* (0.063)	0.14662*** (0.000)	0.0685** (0.031)	0.1503* (0.067)

Table 13: continuation

Countries	43	43	43	43
AR(1) *p*-value	0.000***	0.001***	0.000***	0.000***
AR(2) *p*-value	0.236	0.231	0.250	0.274
Hansen *p*-value	0.216	0.390	0.293	0.504
No. of instruments	30	30	30	30
Observations	449	449	449	449
Time effect	YES	YES	YES	YES
(a) Instruments in levels				
H excluding group	0.690	0.879	0.590	0.882
Dif (0, H = exogenous)	0.214	0.175	0.187	0.996
(b) IV (years, eq(diff))				
H excluding group	0.644	0.802	0.684	0.877
Dif (0, H = exogenous)	0.503	0.640	0.197	0.700

Notes: Estimated coefficients are reported while the *p*-values are in parentheses; ***, **, and * show 1%, 5% and 10% significance levels. Panels 1 to 3 used only one international financial inflow variable, while Panel 4 used all the financial inflow variables at the same time. *PCA* is the composite institutional quality indicator generated using principal component analysis.

Source: Authors' own calculations

Table 14: Driscoll and Kraay regression results using composite institutional quality indicator (dependent variable is *PCI*)

Regressors	Panel 1	Panel 2	Panel 3	Panel 4
Foreign direct investment inflow (*FDI*)	0.0033 (0.207)			0.0014** (0.058)
Remittance inflow (*REM*)		0.0008 (0.481)		0.0023 (0.107)
Foreign aid inflow (*ODA*)			0.0016 (0.800)	0.0015** (0.052)
Trade openness (*TOP*)	0.0348** (0.013)	0.0394** (0.049)	0.0386** (0.048)	0.0197** (0.011)
Renewable energy consumption (*REC*)	−0.0511*** (0.006)	−0.0462** (0.016)	−0.0508*** (0.005)	−0.0215*** (0.000)
Human capital development (*HCAP*)	0.0127** (0.054)	0.0089 (0.140)	0.0082** (0.013)	0.0236*** (0.000)
Labour force participation (*LFP*)	0.2923*** (0.000)	0.3101*** (0.000)	0.3095*** (0.000)	0.2930*** (0.000)
Infrastructure development (*INFR*)	0.0305** (0.016)	0.0293** (0.019)	0.0298** (0.015)	0.0092* (0.078)
Composite institutional quality indicator (*PCA*)	−0.0135 (0.673)	−0.0067 (0.864)	−0.0080 (0.823)	−0.0300 (0.406)
PCA* × *FDI	0.0001** (0.039)			0.0005 (0.427)
PCA* × *TOP	0.0048** (0.054)			0.0027 (0.396)
PCA* × *REM		0.0002** (0.032)		0.0013*** (0.000)
PCA* × *TOP		0.0034*** (0.006)		0.0027* (0.096)
PCA* × *ODA			0.0002 (0.296)	0.0008* (0.057)
PCA* × *TOP			0.0035 (0.671)	0.0027* (0.096)
Constant	1.4043*** (0.005)	1.7061*** (0.006)	1.6759*** (0.006)	1.7216*** (0.000)
Countries	43	43	43	43
R^2	0.7273	0.7313	0.7368	0.6886
***F*-stat**	154.73*** (0.0000)	588.70*** (0.000)	395.56*** (0.000)	6591.859*** (0.000)

Notes: Estimated coefficients are reported while the *p*-values are in parentheses; ***, **, and * show 1%, 5% and 10% significance levels. Panels 1 to 3 used only one international financial inflow variable, while Panel 4 used all the financial inflow variables at the same time. *PCA* is the composite institutional quality indicator generated using principal component analysis.

Source: Authors' own calculations

Table 15: LSDV estimation results with *FDI* (dependent variable is *PCI*)

Regressors	Panel 1	Panel 2	Panel 3	Panel 4	Panel 5	Panel 6
One lag of productive capacity (*LPCI*)	0.7147*** (0.000)	0.7286*** (0.000)	0.7270*** (0.000)	0.7193*** (0.000)	0.7078*** (0.000)	0.7197*** (0.000)
Foreign direct investment inflow (*FDI*)	0.0005* (0.064)	0.0012* (0.067)	0.0042 (0.203)	0.0025** (0.031)	0.0003* (0.088)	−0.0020 (0.397)
Trade openness (*TOP*)	0.0177 (0.207)	0.0080 (0.590)	0.0122 (0.275)	0.0171 (0.178)	0.0108 (0.401)	0.0115 (0.315)
Renewable energy consumption (*REC*)	−0.0246 (0.157)	−0.0243 (0.155)	−0.0253 (0.137)	−0.0264 (0.129)	−0.0238 (0.160)	−0.0255 (0.131)
Human capital development (*HCAP*)	0.0049 (0.433)	0.0048 (0.447)	0.0067 (0.286)	0.0061 (0.307)	0.0035 ().554)	0.0029 (0.629)
Labour force participation (*LFP*)	0.0695** (0.030)	0.0581* (0.066)	0.0547* (0.084)	0.0679** (0.046)	0.0675** (0.037)	0.0705** (0.024)
Infrastructure development (*INFR*)	0.0015 (0.721)	0.0029 (0.441)	0.0006 (0.894)	−0.0013 (0.804)	0.0036 (0.438)	0.0000 (0.998)
Government effectiveness (*GE*)	−0.0449 (0.426)					
GE* × *FDI	0.0007* (0.085)					
GE* × *LTOP	0.0135* (0.085)					
Rule of law (*RL*)		−0.0217 (0.713)				
RL* × *FDI		0.0014* (0.070)				
RL* × *TOP		0.0060 (0.675)				
Regulatory quality (*RQ*)			−0.0459 (0.378)			
RQ* × *FDI			0.0053* (0.078)			
RQ* × *TOP			0.0113 (0.335)			
Voice and accountability (*VC*)				−0.0676 (0.132)		
VC* × *FDI				0.0033 (0.126)		
VC* × *TOP				0.0153* (0.086)		
Control of corruption (*CC*)					0.0017 (0.973)	
CC* × *FDI					0.0008 (0.747)	
CC* × *TOP					0.0052* (0.063)	
Political stability and absence of violence/terrorism (*POLS*)						0.0289 (0.226)
POLS* × *FDI						0.0021 (0.199)
POLS* × *TOP						0.0088 (0.132)

Notes: Estimated coefficients are reported while the *p*-values are in parentheses; ***, **, and * show 1%, 5% and 10% significance levels.

Source: Authors' own calculations

Table 16: LSDV estimation results with *REM* (dependent variable is *PCI*)

Regressors	Panel 1	Panel 2	Panel 3	Panel 4	Panel 5	Panel 6
One lag of productive capacity (*LPCI*)	0.7211*** (0.000)	0.7311*** (0.000)	0.7396*** (0.000)	0.7305*** (0.000)	0.7101*** (0.000)	0.7287*** (0.000)
Remittance inflow (*REM*)	0.0012** (0.048)	0.0013** (0.023)	0.0011 (0.471)	0.0014* (0.079)	0.0015 (0.377)	0.0012 (0.424)
Trade openness (*TOP*)	0.0184 (0.204)	0.0064 (0.610)	0.0087 (0.427)	0.0137 (0.207)	0.0107 (0.371)	0.0089 (0.365)
Renewable energy consumption (*REC*)	−0.0132 (0.307)	−0.0125 (0.349)	−0.0128 (0.333)	−0.0127 (0.340)	−0.0121 (0.353)	−0.0132 (0.318)
Human capital development (*HCAP*)	0.0061 (0.173)	0.0054 (0.241)	0.0062 (0.187)	0.0057 (0.208)	0.0043 (0.329)	0.0039 (0.352)
Labour force participation (*LFP*)	0.0652** (0.015)	0.0557** (0.039)	0.0539** (0.057)	0.0643** (0.019)	0.0647** (0.016)	0.0664** (0.011)
Infrastructure development (*INFR*)	0.0017 (0.676)	0.0036 (0.377)	0.0016 (0.688)	0.0004 (0.919)	0.0042 (0.306)	0.0015 (0.703)
Government effectiveness (*GE*)	0.0491* (0.044)					
GE* × *REM	0.0000* (0.097)					
GE* × *LTOP	0.0141 (0.220)					
Rule of law (*RL*)		−0.0033 (0.946)				
RL* × *REM		0.0004* (0.078)				
RL* × *TOP		0.0037* (0.072)				
Regulatory quality (*RQ*)			−0.0257 (0.642)			
RQ* × *REM			0.0006* (0.072)			
RQ* × *TOP			0.0076** (0.041)			
Voice and accountability (*VC*)				−0.0268 (0.569)		
VC* × *REM				0.0012* (0.094)		
VC* × *TOP				0.0115 (0.207)		
Control of corruption (*CC*)					0.0057 (0.927)	
CC* × *REM					0.0001* (0.094)	
CC* × *TOP					0.0044 (0.648)	
Political stability and absence of violence/terrorism (*POLS*)						0.0102* (0.082)
POLS* × *REM						0.0004 (0.752)
POLS* × *TOP						0.0060 (0.221)

Notes: Estimated coefficients are reported while the *p*-values are in parentheses; ***, **, and * show 1%, 5% and 10% significance levels.

Source: Authors' own calculations

Table 17: LSDV estimation results with *ODA* (dependent variable is *PCI*)

Regressors	Panel 1	Panel 2	Panel 3	Panel 4	Panel 5	Panel 6
One lag of productive capacity (*LPCI*)	0.7237*** (0.000)	0.7286*** (0.000)	0.7406*** (0.000)	0.7298*** (0.000)	0.7115*** (0.000)	0.7287*** (0.000)
Foreign aid inflow (*ODA*)	0.0021** (0.052)	0.0011* (0.093)	0.0021 (0.516)	0.0024* (0.091)	0.0003* (0.091)	0.0036 (0.289)
Trade openness (*TOP*)	0.0185 (0.197)	0.0061 (0.629)	0.0089 (0.419)	0.0140 (0.184)	0.0103 (0.384)	0.0090 (0.353)
Renewable energy consumption (*REC*)	−0.1434 (0.249)	−0.0133 (0.291)	−0.0140 (0.256)	−0.0142 (0.259)	−0.0138 (0.261)	−0.0140 (0.258)
Human capital development (*HCAP*)	0.0067 (0.146)	0.0061 (0.198)	0.0071 (0.133)	0.0070 (0.130)	0.0047 (0.279)	0.0047 (0.268)
Labour force participation (*LFP*)	0.0655** (0.013)	0.0584** (0.026)	0.0548** (0.053)	0.0652** (0.015)	0.0656** (0.012)	0.0671*** (0.008)
Infrastructure development (*INFR*)	0.0014 (0.734)	0.0034 (0.390)	0.0009 (0.813)	0.0003 (0.938)	0.0039 (0.320)	0.0010 (0.790)
Government effectiveness (*GE*)	0.0594 (0.513)					
GE* × *ODA	0.0004 (0.903)					
GE* × *LTOP	0.0141 (0.220)					
Rule of law (*RL*)		0.0615* (0.086)				
RL* × *ODA		0.0025* (0.070)				
RL* × *TOP		0.0026 (0.803)				
Regulatory quality (*RQ*)			0.0641 (0.402)			
RQ* × *ODA			0.0011* (0.074)			
RQ* × *TOP			0.0080* (0.095)			
Voice and accountability (*VC*)				0.0462** (0.053)		
VC* × *ODA				0.0001 (0.969)		
VC* × *TOP				0.0108 (0.222)		
Control of corruption (*CC*)					0.0745** (0.051)	
CC* × *ODA					0.0039 (0.378)	
CC* × *TOP					0.0036* (0.099)	
Political stability and absence of violence/terrorism (*POLS*)						0.0023 (0.966)
POLS* × *ODA						0.0010** (0.052)
POLS* × *TOP						0.0061*** (0.003)

Notes: Estimated coefficients are reported while the *p*-values are in parentheses; ***, **, and * show 1%, 5% and 10% significance levels.

Source: Authors' own calculations

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Table 18: System GMM estimation results with *FDI* (dependent variable is *PCI*), 2005–2009

Regressors	Panel 1	Panel 2	Panel 3	Panel 4	Panel 5	Panel 6	Panel 7
One lag of productive capacity (*LPCI*)	0.9121*** (0.000)	0.9003*** (0.000)	0.9087*** (0.000)	0.9532*** (0.000)	0.9442*** (0.000)	0.9461*** (0.000)	0.9346*** (0.000)
Foreign direct investment inflow (*FDI*)	0.0070** (0.047)	0.0054* (0.089)	0.0062** (0.021)	0.0048** (0.027)	0.0071** (0.015)	0.0050** (0.057)	0.0032*** (0.007)
Trade openness (*TOP*)	0.0056 (0.294)	0.0049 (0.435)	0.0010 (0.887)	0.0017 (0.718)	0.0054 (0.466)	0.0018 (0.700)	0.0014 (0.682)
Renewable energy consumption (*REC*)	0.0022*** (0.001)	0.0022*** (0.001)	0.0016*** (0.025)	0.0029*** (0.006)	0.0029*** (0.000)	0.0024*** (0.001)	0.0026*** (0.000)
Human capital development (*HCAP*)	−0.0006 (0.544)	−0.0004 (0.714)	−0.0005 (0.562)	−0.00005 (0.960)	−0.0002 (0.875)	−0.0028** (0.027)	−0.0011 (0.237)
Labour force participation (*LFP*)	0.0038*** (0.016)	0.0040*** (0.007)	0.00288** (0.026)	0.0024** (0.052)	0.0027 (0.120)	0.0057*** (0.001)	0.0046*** (0.000)
Infrastructure development (*INFR*)	0.0137*** (0.000)	0.0165*** (0.000)	0.0138*** (0.000)	0.0129** (0.016)	0.0140** (0.015)	0.0172*** (0.000)	0.0156*** (0.000)
Government effectiveness (*GE*)	−0.0300 (0.212)						
GE* × *FDI	0.0067* (0.075)						
GE* × *TOP	0.0080 (0.208)						
Rule of law (*RL*)		−0.0166 (0.539)					
RL* × *FDI		−0.0166 (0.539)					
RL* × *TOP		0.0051* (0.068)					
Regulatory quality (*RQ*)			0.0036 (0.918)				
RQ* × *FDI			0.0071** (0.038)				
RQ* × *TOP			0.0006 (0.943)				
Voice and accountability (*VC*)				−0.0372 (0.159)			
VC* × *FDI				0.0047* (0.095)			

Table 18: continuation

VC* × *TOP				0.0078 (0.241)			
Control of corruption (*CC*)					0.0131 (0.673)		
CC* × *FDI					0.0072** (0.044)		
CC* × *TOP					0.0038 (0.647)		
Political stability and absence of violence/ terrorism (*POLS*)						−0.0444** (0.012)	
POLS* × *FDI						0.0028 (0.274)	
POLS* × *TOP						0.0100** (0.044)	
Composite institutional quality indicator (*PCA*)							−0.0071 (0.373)
PCA* × *FDI							0.0015 (0.115)
PCA* × *TOP							0.0016 (0.431)
Constant	0.1740*** (0.000)	0.1998*** (0.000)	0.2201*** (0.000)	0.0794* (0.090)	0.1197*** (0.001)	0.0872** (0.045)	0.1220*** (0.003)
Countries	43	43	43	43	43	43	43
AR(1) *p*-value	0.026**	0.026**	0.021**	0.027**	0.028**	0.030**	0.025**
AR(2) *p*-value	0.115	0.199	0.182	0.104	0.102	0.152	0.173
Hansen *p*-value	0.317	0.262	0.378	0.292	0.285	0.374	0.273
No. of Instruments	30	29	31	31	31	31	30
Observations	449	449	449	449	449	449	449
Time Effect	YES	YES	YES	YES	YES	YES	YES
(a) Instruments in levels							
H excluding group	0.522	0.463	0.440	0.353	0.512	0.293	0.193
Dif (0, H = exogenous)	0.765	0.582	0.845	0.221	0.603	0.567	0.567
(b) IV (years, eq(diff))							
H excluding group	0.376	0.999	0.247	0.136	0.520	0.289	0.789
Dif (0, H = exogenous)	0.530	0.649	0.540	0.245	0.523	0.317	0.427

Notes: Estimated coefficients are reported while the *p*-values are in parentheses; ***, **, and * show 1%, 5% and 10% significance levels.

Source: Authors' own calculations

Table 19: System GMM estimation results with *REM* (dependent variable is *PCI*), 2005–2009

Regressors	Panel 1	Panel 2	Panel 3	Panel 4	Panel 5	Panel 6	Panel 7
One lag of productive capacity (*LPCI*)	0.8751*** (0.000)	0.8547*** (0.000)	0.8722*** (0.000)	0.8714*** (0.000)	0.9028*** (0.000)	0.9951*** (0.000)	0.8871*** (0.000)
Remittance inflow (*REM*)	0.0013 (0.233)	0.0011 (0.446)	0.0011 (0.257)	0.0004 (0.763)	0.0024** (0.043)	0.0020 (0.112)	0.0006 (0.290)
Trade openness (*TOP*)	0.0223*** (0.009)	0.0158 (0.183)	0.0221** (0.032)	0.0060 (0.508)	0.0072 (0.350)	−0.0029 (0.617)	0.0074* (0.076)
Renewable energy consumption (*REC*)	0.0021*** (0.002)	0.0022* (0.075)	0.0017 (0.105)	0.0027** (0.046)	0.0021** (0.013)	0.0058** (0.017)	0.0023*** (0.000)
Human capital development (*HCAP*)	−0.008 (0.562)	−0.0018 (0.410)	−0.0026 (0.233)	−0.0021 (0.282)	−0.0047*** (0.000)	−0.0014 (0.484)	−0.0010 (0.404)
Labour force participation (*LFP*)	0.0031** (0.013)	0.0004*** (0.008)	0.0040** (0.031)	0.0038** (0.051)	0.0054*** (0.000)	0.0041** (0.017)	0.0047*** (0.001)
Infrastructure development (*INFR*)	0.0160*** (0.000)	0.0232*** (0.003)	0.0209*** (0.006)	0.0264*** (0.008)	0.0213*** (0.001)	0.0127** (0.012)	0.0202*** (0.000)
Government effectiveness (*GE*)	−0.0974** (0.042)						
GE* × *REM	0.0007 (0.497)						
GE* × *TOP	0.0232*** (0.002)						
Rule of law (*RL*)		−0.0344 (0.731)					
RL* × *REM		0.0001* (0.090)					
RL* × *TOP		0.0113* (0.071)					
Regulatory quality (*RQ*)			−0.3986 (0.568)				
RQ* × *REM			0.0014 (0.310)				
RQ* × *TOP			0.0188 (0.129)				
Voice and accountability (*VC*)				0.1236 (0.108)			
VC* × *REM				0.0034* (0.096)			
VC* × *TOP				0.0121 (0.251)			

Table 19: continuation

Control of corruption (*CC*)					0.2300*** (0.000)		
CC* × *REM					0.0057*** (0.000)		
CC* × *TOP					0.0277*** (0.002)		
Political stability and absence of violence/ terrorism (*POLS*)						0.1141 (0.152)	
POLS* × *REM						0.0016 (0.144)	
POLS* × *TOP						0.0205 (0.183)	
Composite institutional quality indicator (*PCA*)							0.0304** (0.041)
PCA* × *REM							0.0003 (0.320)
PCA* × *TOP							0.0065** (0.005)
Constant	0.2136*** (0.001)	0.2956*** (0.001)	0.2380*** (0.006)	0.3091*** (0.003)	0.3576*** (0.000)	−0.0069 (0.935)	0.2083*** (0.000)
Countries	43	43	43	43	43	43	43
AR(1) *p*-value	0.034**	0.050**	0.055*	0.065*	0.076*	0.042**	0.041**
AR(2) *p*-value	0.306	0.275	0.405	0.255	0.272	0.300	0.238
Hansen *p*-value	0.318	0.238	0.203	0.141	0.506	0.180	0.294
No. of Instruments	30	24	24	23	27	23	30
Observations	456	456	456	456	456	493	493
Time Effect	YES	YES	YES	YES	YES	YE	YES
(a) Instruments in levels							
H excluding group	0.622	0.663	0.440	0.353	0.512	0.393	0.173
Dif (0, H = exogenous)	0.165	0.682	0.845	0.221	0.603	0.567	0.557
(b) IV (years, eq(diff))							
H excluding group	0.376	0.999	0.247	0.146	0.520	0.289	0.989
Dif (0, H = exogenous)	0.530	0.649	0.540	0.215	0.523	0.117	0.827

Notes: Estimated coefficients are reported while the *p*-values are in parentheses; ***, **, and * show 1%, 5% and 10% significance levels.

Source: Authors' own calculations

Table 20: System GMM estimation results with *ODA* (dependent variable is *PCI*), 2005–2009

Regressors	Panel 1	Panel 2	Panel 3	Panel 4	Panel 5	Panel 6	Panel 7
One lag of productive capacity (*LPCI*)	0.8886*** (0.000)	0.8887*** (0.000)	0.8872*** (0.000)	0.9325*** (0.000)	0.9075*** (0.000)	0.9182*** (0.000)	0.9081*** (0.000)
Foreign aid inflow (*ODA*)	0.0073** (0.011)	0.0077** (0.026)	0.0101*** (0.001)	0.0127*** (0.002)	0.0075** (0.032)	0.0098*** (0.001)	0.0077*** (0.004)
Trade openness (*TOP*)	0.0232*** (0.002)	0.0162** (0.027)	0.0286*** (0.000)	0.0151** (0.048)	0.0071 (0.159)	0.0065* (0.080)	0.0062** (0.024)
Renewable energy consumption (*REC*)	0.0015** (0.030)	0.0012* (0.077)	0.0004 (0.394)	0.0011 (0.490)	0.0014* (0.073)	0.0001 (0.853)	0.0011* (0.097)
Human capital development (*HCAP*)	0.0004** (0.053)	0.00006** (0.038)	0.0010* (0.056)	0.0019** (0.038)	0.0009** (0.036)	0.0005* (0.082)	0.00003* (0.066)
Labour force participation (*LFP*)	−0.0006 (0.757)	−0.0014 (0.617)	−0.0008 (0.620)	−0.0061* (0.083)	−0.0037 (0.201)	−0.0036 (0.250)	−0.0010 (0.668)
Infrastructure development (*INFR*)	0.0150*** (0.000)	0.0189*** (0.000)	0.0170*** (0.000)	0.0124** (0.025)	0.0175*** (0.000)	0.0167*** (0.000)	0.0165*** (0.000)
Government effectiveness (*GE*)	−0.1360*** (0.005)						
GE* × *ODA	0.0022 (0.162)						
GE* × *TOP	0.0244*** (0.000)						
Rule of law (*RL*)		−0.0610 (0.323)					
RL* × *ODA		0.0055* (0.087)					
RL* × *TOP		0.0136** (0.020)					
Regulatory quality (*RQ*)			−0.1590*** (0.000)				
RQ* × *ODA			0.0030** (0.029)				
RQ* × *TOP			0.0259*** (0.000)				
Voice and accountability (*VC*)				−0.2253* (0.059)			
VC* × *ODA				0.0060* (0.083)			
VC* × *TOP				0.0242* (0.071)			

Table 20: continuation

Control of corruption (*CC*)					0.0130 (0.844)		
CC* × *ODA					0.0018* (0.071)		
CC* × *TOP					0.0065* (0.064)		
Political stability and absence of violence/ terrorism (*POLS*)						0.0104 (0.778)	
POLS* × *ODA						0.0015** (0.012)	
POLS* × *TOP						0.0054** (0.050)	
Composite institutional quality indicator (*PCA*)							−0.0317* (0.057)
PCA* × *ODA							0.0004 (0.462)
PCA* × *TOP							0.0059*** (0.000)
Constant	0.0776 (0.211)	0.1056 (0.145)	0.0356 (0.565)	−0.0840 (0.321)	0.1057 (0.146)	0.0658 (0.143)	0.0860* (0.075)
Countries	43	43	43	43	43	43	43
AR(1) *p*-value	0.025**	0.032**	0.027**	0.027**	0.035**	0.035**	0.029**
AR(2) *p*-value	0.253	0.246	0.322	0.276	0.264	0.225	0.255
Hansen *p*-value	0.369	0.190	0.348	0.299	0.146	0.208	0.219
No. of Instruments	30	30	31	24	30	30	30
Observations	497	461	461	461	461	461	461
Time Effect	YES	YES	YES	YES	YES	yes	YES
(a) Instruments in levels							
H excluding group	0.522	0.663	0.640	0.353	0.512	0.193	0.693
Dif (0, H = exogenous)	0.565	0.682	0.745	0.221	0.603	0.667	0.767
(b) IV (years, eq(diff))							
H excluding group	0.576	0.999	0.647	0.136	0.520	0.289	0.389
Dif (0, H = exogenous)	0.530	0.649	0.530	0.215	0.523	0.157	0.147

Notes: Estimated coefficients are reported while the *p*-values are in parentheses; ***, **, and * show 1%, 5% and 10% significance levels.

Source: Authors' own calculations

Sub-Sample Estimations after Global Financial Crisis, 2010–2018

Table 21: System GMM estimation results with *FDI* (dependent variable is *PCI*), 2010–2018

Regressors	Panel 1	Panel 2	Panel 3	Panel 4	Panel 5	Panel 6	Panel 7
One lag of productive capacity (*LPCI*)	0.9686*** (0.000)	0.9591*** (0.000)	0.9845*** (0.000)	1.0271*** (0.000)	0.9540*** (0.000)	1.0181*** (0.000)	0.9429*** (0.000)
Foreign direct investment inflow (*FDI*)	0.0059*** (0.000)	0.0069*** (0.000)	0.0036*** (0.004)	0.0007* (0.070)	0.0061*** (0.002)	0.0029*** (0.003)	0.0028** (0.011)
Trade openness (*TOP*)	0.0038 (0.268)	0.0094** (0.029)	0.0088*** (0.004)	0.0075 (0.184)	0.0093* (0.091)	0.0047 (0.110)	0.0051* (0.084)
Renewable energy consumption (*REC*)	0.0025*** (0.000)	0.0013*** (0.000)	0.0011* (0.077)	0.0028*** (0.000)	0.0024*** (0.000)	0.0021*** (0.000)	0.0013*** (0.005)
Human capital development (*HCAP*)	0.0023*** (0.004)	0.0026*** (0.000)	0.0029*** (0.000)	0.0023*** (0.000)	0.0018*** (0.000)	0.0032*** (0.001)	0.0026*** (0.003)
Labour force participation (*LFP*)	−0.0014 (0.113)	−0.0011* (0.074)	−0.0007 (0.271)	−0.0004 (0.526)	0.0001 (0.733)	−0.0014 (0.111)	−0.0010 (0.197)
Infrastructure development (*INFR*)	−0.0023 (0.357)	−0.0019 (0.442)	−0.0045* (0.096)	−0.0077 (0.152)	0.0024 (0.521)	0.0099*** (0.005)	0.0009 (0.780)
Government effectiveness (*GE*)	0.0053 (0.562)						
GE* × *FDI	0.0050*** (0.002)						
GE* × *TOP	0.0018** (0.042)						
Rule of law (*RL*)		−0.0162 (0.248)					
RL* × *FDI		0.0063*** (0.000)					
RL* × *TOP		0.0074** (0.043)					
Regulatory quality (*RQ*)			−0.0106 (0.263)				
RQ* × *FDI			0.0041** (0.038)				
RQ* × *TOP			0.0042** (0.047)				
Voice and accountability (*VC*)				−0.0115 (0.409)			
VC* × *FDI				0.0017 (0.430)			

Table 21: continuation

VC* × *TOP				0.0015 (0.695)			
Control of corruption (*CC*)					−0.0122 (0.430)		
CC* × *FDI					0.0066*** (0.000)		
CC* × *TOP					0.0063** (0.018)		
Political stability and absence of violence/ terrorism (*POLS*)						0.0035 (0.653)	
POLS* × *FDI						0.0003** (0.046)	
POLS* × *TOP						0.0010*** (0.010)	
Composite institutional quality indicator (*PCA*)							−0.0018 (0.513)
PCA* × *FDI							0.0015*** (0.000)
PCA* × *TOP							0.0014* (0.059)
Constant	0.0710* (0.078)	0.0711** (0.019)	−0.0034 (0.913)	−0.1452** (0.020)	0.0660** (0.019)	0.0943*** (0.000)	0.1222*** (0.000)
Countries	43	43	43	43	43	43	43
AR(1) *p*-value	0.005***	0.004***	0.004***	0.004***	0.004***	0.004***	0.004***
AR(2) *p*-value	0.127	0.139	0.107	0.110	0.168	0.190	0.128
Hansen *p*-value	0.694	0.579	0.252	0.293	0.338	0.497	0.526
No. of instruments	38	37	39	39	39	39	38
Time effect	YES	YES	YES	YES	YES	YES	YES
(a) Instruments in levels							
H excluding group	0.622	0.163	0.440	0.353	0.512	0.593	0.193
Dif (0, H = exogenous)	0.165	0.482	0.845	0.221	0.503	0.567	0.467
(b) IV (years, eq(diff))							
H excluding group	0.376	0.679	0.247	0.136	0.520	0.259	0.389
Dif (0, H = exogenous)	0.530	0.629	0.540	0.215	0.523	0.117	0.127

Notes: Estimated coefficients are reported while the *p*-values are in parentheses; ***, **, and * show 1%, 5% and 10% significance levels.

Source: Authors' own calculations

Table 22: System GMM estimation results with *REM* (dependent variable is *PCI*), 2010–2018

Regressors	Panel 1	Panel 2	Panel 3	Panel 4	Panel 5	Panel 6	Panel 7
One lag of productive capacity (*LPCI*)	0.9575*** (0.000)	0.9054*** (0.000)	0.9038*** (0.000)	0.9277*** (0.000)	0.9842*** (0.000)	0.9652*** (0.000)	0.9626*** (0.000)
Remittance inflow (*REM*)	0.0003 (0.734)	0.0019 (0.253)	0.0011 (0.389)	0.0041*** (0.008)	0.0023*** (0.000)	0.0001 (0.818)	0.0007*** (0.005)
Trade openness (*TOP*)	0.0017 (0.732)	0.0034 (0.688)	0.0049 (0.508)	0.0043 (0.434)	0.0054 (0.367)	0.0047 (0.425)	0.0032 (0.187)
Renewable energy consumption (*REC*)	0.0021*** (0.000)	0.0001 (0.867)	0.00001 (0.981)	0.0012 (0.229)	0.0015*** (0.006)	0.0011 (0.171)	0.0018*** (0.000)
Human capital development (*HCAP*)	0.0033*** (0.000)	0.0061*** (0.000)	0.0059*** (0.000)	0.0065*** (0.000)	0.0018*** (0.000)	0.0031*** (0.002)	0.0031*** (0.000)
Labour force participation (*LFP*)	−0.0024*** (0.002)	−0.0035** (0.055)	−0.0039** (0.016)	−0.0038* (0.067)	0.0009 (0.494)	−0.0016 (0.241)	−0.0008 (0.183)
Infrastructure development (*INFR*)	−0.0012 (0.426)	0.0025 (0.701)	0.0045 (0.419)	0.0047 (0.566)	−0.0015 (0.698)	−0.0016 (0.822)	0.0006 (0.807)
Government effectiveness (*GE*)	−0.0029 (0.930)						
GE* × *REM	0.0005 (0.605)						
GE* × *LTOP	0.00004 (0.990)						
Rule of law (*RL*)		0.0332 (0.570)					
RL* × *REM		0.0010** (0.051)					
RL* × *TOP		0.0003* (0.069)					
Regulatory quality (*RQ*)			0.0052 (0.927)				
RQ* × *REM			0.0008* (0.063)				
RQ* × *TOP			0.0022*** (0.015)				
Voice and accountability (*VC*)				0.0706** (0.011)			
VC* × *REM				−0.0038*** (0.002)			
VC* × *TOP				0.0010 (0.768)			

Table 22: continuation

Control of corruption (*CC*)					0.0245 (0.476)		
CC* × *REM					−0.0016* (0.098)		
CC* × *TOP					0.0026 (0.575)		
Political stability and absence of violence/ terrorism (*POLS*)						0.0189 (0.578)	
POLS* × *REM						−0.0011 (0.341)	
POLS* × *TOP						0.0016 (0.673)	
Composite institutional quality indicator (*PCA*)							−0.0011 (0.887)
PCA* × *REM							0.00005 (0.836)
PCA* × *TRADE							0.0003 (0.617)
Constant	0.0944*** (0.010)	0.2513*** (0.006)	0.2398*** (0.000)	0.1985** (0.031)	0.0270 (0.460)	0.0604 (0.360)	0.0641 (0.116)
Countries	43	43	43	43	43	43	43
AR(1) *p*-value	0.004***	0.003***	0.004***	0.003***	0.004***	0.004***	0.004***
AR(2) *p*-value	0.131	0.153	0.135	0.101	0.114	0.124	0.127
Hansen *p*-value	0.583	0.500	0.515	0.337	0.498	0.216	0.476
No. of instruments	38	32	32	31	35	31	38
Time effect	YES	YES	YES	YES	YES	YES	YES
DHT for instruments							
(a) Instruments in levels							
H excluding group	0.622	0.663	0.440	0.353	0.512	0.293	0.193
Dif (0, H = exogenous)	0.165	0.682	0.845	0.221	0.603	0.567	0.467
(b) IV (years, eq(diff))							
H excluding group	0.376	0.999	0.247	0.136	0.520	0.289	0.389
Dif (0, H = exogenous)	0.530	0.649	0.540	0.215	0.523	0.117	0.127

Notes: Estimated coefficients are reported while the *p*-values are in parentheses; ***, **, and * show 1%, 5% and 10% significance levels.

Source: Authors' own calculations

Table 23: System GMM estimation results with *ODA* (dependent variable is *PCI*), 2010–2018

Regressors	Panel 1	Panel 2	Panel 3	Panel 4	Panel 5	Panel 6	Panel 7
One lag of productive capacity (*LPCI*)	0.9572*** (0.000)	0.9688*** (0.000)	0.9820*** (0.000)	0.9893*** (0.000)	0.9833*** (0.000)	0.9691*** (0.000)	0.9632*** (0.000)
Foreign aid inflow (*ODA*)	0.0007** (0.046)	0.0004 (0.653)	0.0005* (0.066)	0.0010 (0.552)	0.0017** (0.026)	0.0013** (0.035)	0.0006* (0.064)
Trade openness (*TOP*)	0.0026 (0.473)	0.0000* (0.069)	0.0040 (0.219)	0.0050 (0.137)	0.0022** (0.054)	0.0003* (0.096)	0.0011 (0.655)
Renewable energy consumption (*REC*)	0.0018*** (0.000)	0.0005 (0.392)	−0.0005 (0.556)	0.0018*** (0.009)	0.0014* (0.088)	−0.008 (0.298)	0.0011 (0.145)
Human capital development (*HCAP*)	0.0034*** (0.000)	0.0029*** (0.000)	0.0037*** (0.000)	0.0031*** (0.007)	0.0030*** (0.000)	0.0036*** (0.008)	0.0037*** (0.000)
Labour force participation (*LFP*)	−0.0026* (0.063)	−0.0030** (0.047)	−0.0048*** (0.006)	−0.0019 (0.338)	−0.0020 (0.336)	−0.0039* (0.097)	−0.0029* (0.097)
Infrastructure development (*INFR*)	−0.0017 (0.121)	−0.0027 (0.141)	−0.0065*** (0.001)	−0.0041 (0.397)	−0.0042 (0.274)	−0.0040 (0.351)	−0.0016 (0.539)
Government effectiveness (*GE*)	−0.0062 (0.859)						
GE* × *ODA	0.0006 (0.618)						
GE* × *LTOP	0.0005* (0.081)						
Rule of law (*RL*)		0.7832*** (0.001)					
RL* × *ODA		0.0030*** (0.000)					
RL* × *TOP		−0.0029 (0.225)					
Regulatory quality (*RQ*)			0.1143*** (0.000)				
RQ* × *ODA			0.0044*** (0.000)				
RQ* × *TOP			0.0054** (0.024)				
Voice and accountability (*VC*)				0.0763*** (0.004)			
VC* × *ODA				0.0039*** (0.001)			
VC* × *TOP				0.0001 (0.958)			

Table 23: continuation

Control of corruption (*CC*)					0.0785*** (0.001)		
CC* × *ODA					0.0029*** (0.001)		
CC* × *TOP					0.0036 (0.210)		
Political stability and absence of violence/ terrorism (*POLS*)						0.0888*** (0.000)	
POLS* × *ODA						0.0038*** (0.000)	
POLS* × *TOP						0.0016** (0.053)	
Composite institutional quality indicator (*PCA*)							0.0146 (0.158)
PCA* × *ODA							0.0005*** (0.027)
PCA* × *TOP							0.0004* (0.081)
Constant	0.8769** (0.025)	0.1114*** (0.007)	0.0954*** (0.005)	0.0090 (0.885)	0.0787** (0.017)	0.0761** (0.037)	0.0718 (0.118)
Countries	43	43	43	43	43	43	43
AR(1) *p*-value	0.005***	0.004***	0.005***	0.004***	0.004***	0.006***	0.004***
AR(2) *p*-value	0.121	0.130	0.125	0.132	0.139	0.177	0.128
Hansen *p*-value	0.572	0.516	0.363	0.265	0.507	0.571	0.506
No. of instruments	38	38	39	32	38	38	38
Time effect	YES	YES	YES	YES	YES	YES	YES
DHT for instruments							
(a) Instruments in levels							
H excluding group	0.622	0.663	0.440	0.353	0.512	0.393	0.593
Dif (0, H = exogenous)	0.165	0.682	0.845	0.221	0.603	0.567	0.567
(b) IV (years, eq(diff))							
H excluding group	0.376	0.999	0.247	0.136	0.520	0.289	0.289
Dif (0, H = exogenous)	0.530	0.649	0.540	0.215	0.523	0.117	0.117

Notes: Estimated coefficients are reported while the *p*-values are in parentheses; ***, **, and * show 1%, 5% and 10% significance levels.

Source: Authors' own calculations

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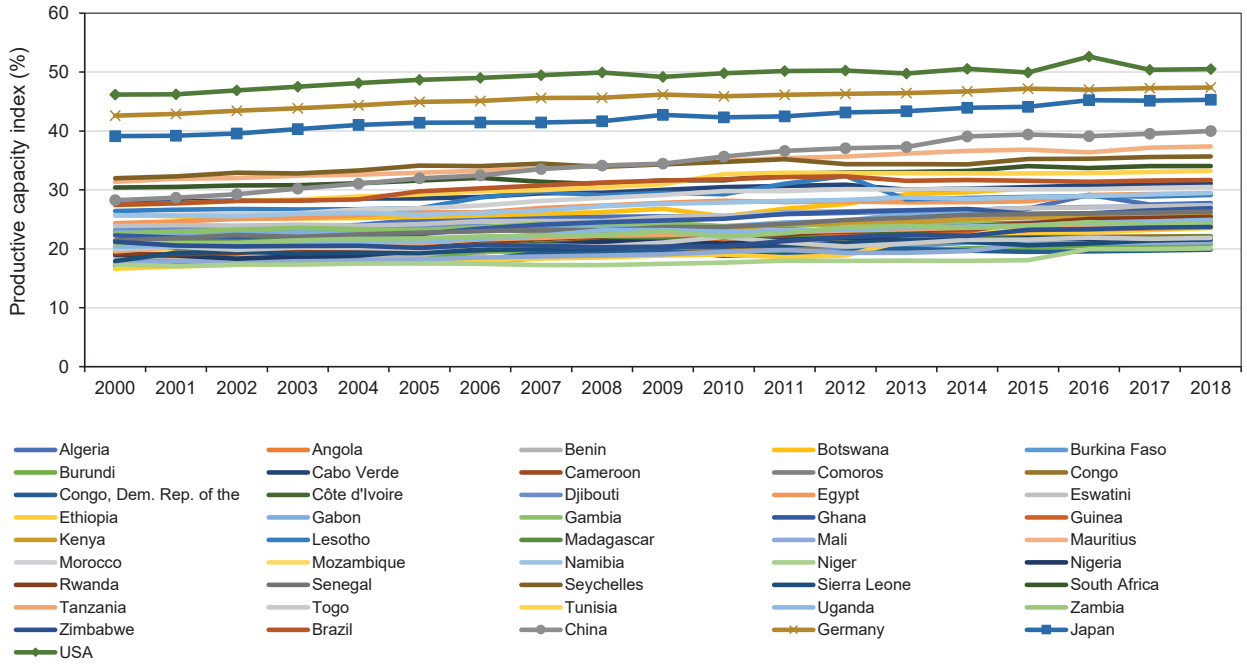
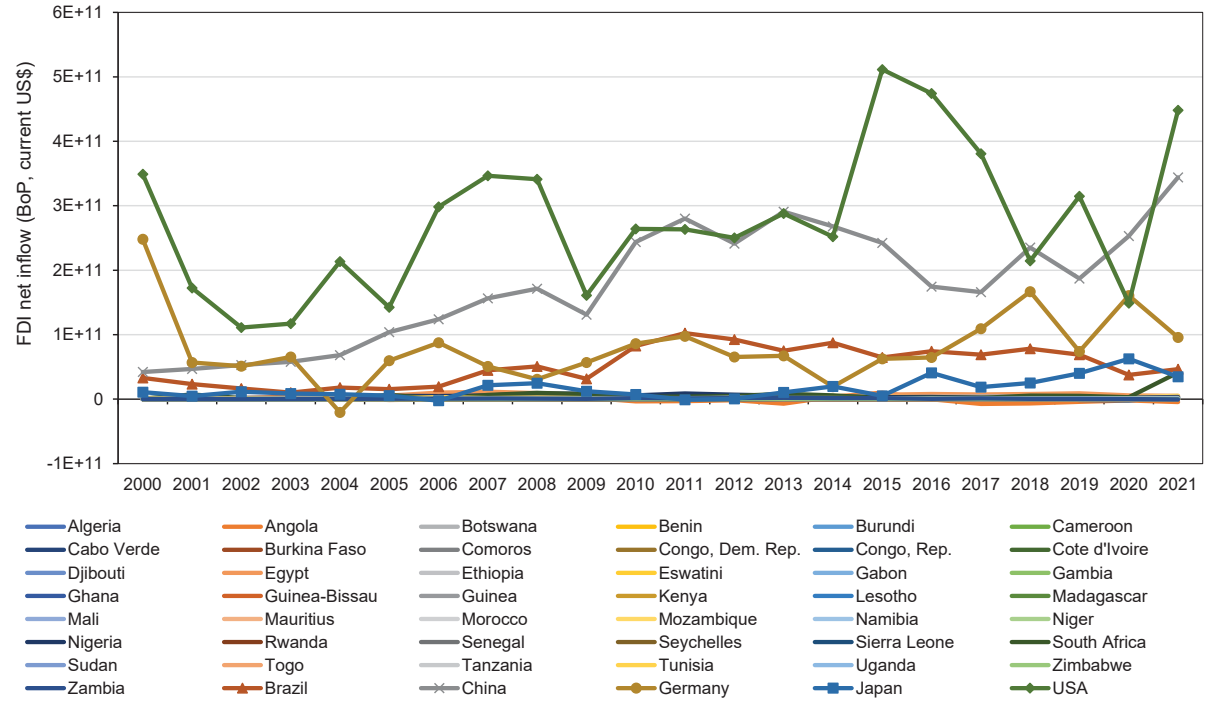
Appendix 1: Evolution of productive capacities index (*PCI*) for selected countries, 2000–2018



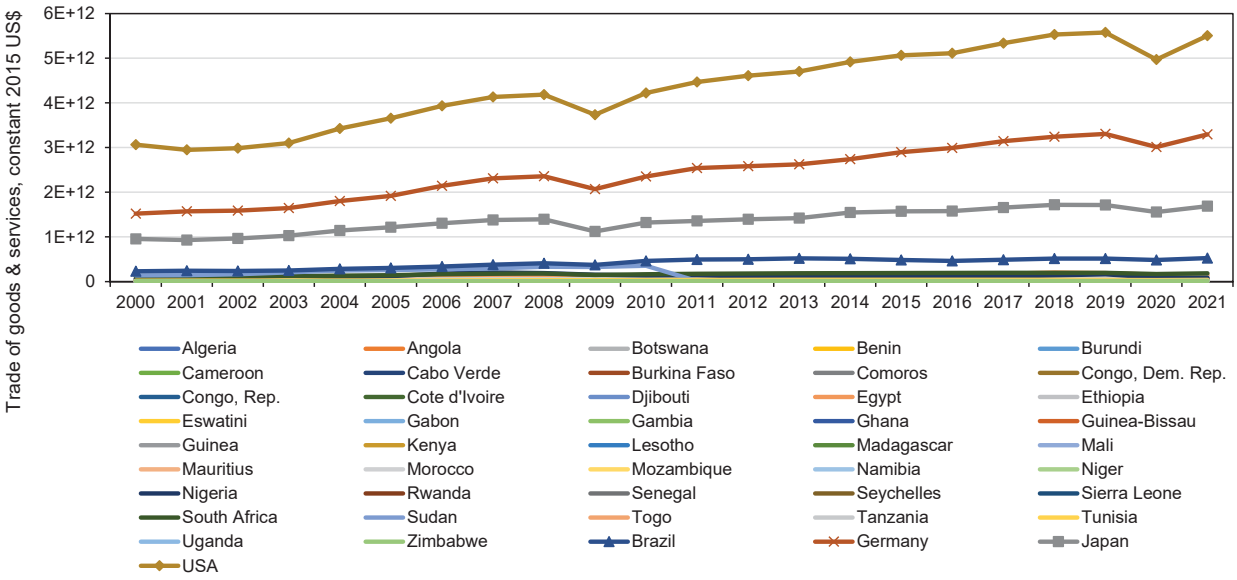
Note: Notice that the USA, Germany, Japan and China recorded higher *PCI* than the African economies.
Source: Authors' own elaboration, with data from UNCTAD (2023)

Appendix 2: Evolution of *FDI* net inflows (BoP, current USD) for selected countries, 2000–2021



Note: Notice that the USA, China, Germany, Japan and Brazil recorded higher *FDI* inflows compared to the African economies.
Source: Authors' own elaboration, with data from WB (2022a)

Appendix 3: Evolution of trade in goods and services (constant 2015 USD) for selected countries, 2000–2021



Note: Notice that the USA, Germany, Japan and Brazil recorded higher trade compared to the African economies.

Source: Authors' own elaboration, with data from WB (2022a)