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The “Africa Rising”: An Empirical Analysis of the Determinants of Per-Capita Growth

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Abstract

In developing economies, the race toward inclusive development has prompted researchers to reconsider the drivers of growth in view of achieving the Sustainable Development Goals (SDGs). This study aims to explore the determinants of African growth after analysing reference literature to select the explanatory variables.

The paper identifies the robust drivers of growth of 54 African countries over the period 2010-2019, where the data source is more complete.As a data source, the main international organisations (UN, WB, IMF) have been considered.

We employ a system dynamic panel estimator (GMM-sys) without and with added exogenous regressors for a robustness check. As far as we know, we have not found any studies analysing the determinants of growth in a panel of 54 African countries and/or using GMM estimators with data referring to the last decade. We have used the real per-capita GDP as a dependent variable.

Our findings indicate that, in addition to initial conditions of the per-capita GDP, different macroeconomic factors such as fixed investments, inflation, openness, productivity, unemployment, received remittance, external debt, and terms-of-trade such as imports and exports from or to HDCs, and imports from LMDCs in Southern-Asia are robustly correlated with African growth.We conclude that institutional and business environments are particularly important in explaining African growth.

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1. Introduction

Since the new millennium, Africa has had considerable GDP growth that has more than doubled. Over the last decade, six of the fastest-growing economies in the world were in Africa. “Africa rising” has prompted academics and analysts to reconsider the issue of African economic growth. This is affecting firms’ strategies, and those from developed countries are seeking to enter these emerging markets (Ferrucci et al., 2018; Scalamonti, 2022; Abdu et al., 2022).

African countries that gained independence from colonial rule in the sixties experienced their own model of cultural, social, and economic development. According to the theory of development, all societies advance through similar stages of development, and this means that underdeveloped countries today are in the same condition as developed countries were in the past (Marini, 2004; Schwab, 2014, 2015). This means that underdeveloped countries are not merely a primitive version of developed countries, but they are unique in their features and structures (De Jong, 2009; Hofstede et al., 2010).

Underdeveloped countries can accelerate their development, for instance, by implementing structural reforms, by attracting capital flows, and by enhancing technology transfers, as well as, they have increased the integration along global value chains.

Although the political and macroeconomic framework of African countries can be unstable, nonetheless, these emerging markets are often considered an opportunity, anyway with a given operative risk. In other words, labour markets may be inadequately regulated, the rule of law may be poor, and corruption may be high, logistical difficulties may depend on infrastructural deficiencies, or trade

may be difficult due to the absence of codes of conduct and best practices.

Can African markets grow and break with their colonial trading past? On the other hand, can Africa successfully integrate into the global economy as it has in other areas of the world?

Despite the difficulties, many African countries are encouraging drawing up action agendas and implementing structural reforms (Nafziger, 2012; Kuada, 2014; Mazrui and Wiafe-Amoako, 2015; Mol et al., 2017; Heshmati, 2017, 2018; Oluwatayo and Ojo, 2018; Wiafe-Amoako, 2021).

In the last decade, Africa has experimented with high levels of growth, but there are still governance weaknesses. This means that debate on the determinants of African growth is central for economists and scholars. Economies in transition, such as emerging and developing, are experiencing an evident socio-economic dynamism, and, in the near future, they will have to face the challenge of change, as much as developed countries will have to do (Dallago and Casagrande, 2023). Globalisation has broken the consolidated production paradigms, and new business opportunities have emerged around the world.

This has increased competition between firms to enter global value chains, and the pressure on emerging markets. Those African trade with developed countries primarily raw materials and commodities, while, if these are traded with developing countries, they are dutiable.

The state of crisis that began in 2008 has never stopped. Former, the sovereign debt crisis in the Eurozone, then, the uprisings in the Middle East and North Africa, and now, the global pandemic caused by Covid-19, the imbalances in the US-China relationship, and the Russia-Ukraine war are seriously damaging the world economy. Advanced economies are growing slowly, or risk a new recession, as they have begun to suffer from growing internal imbalances and income disparity risking compromising the long-run economic and social stability (IMF, 2020, 2021, 2022).

Interest in African emerging markets is growing at least for three reasons: (i) governance in developed and developing countries, especially in Eastern and Southern Asia, is concerned about ensuring the supply of strategic raw materials to manufacturing industries; (ii) the so-called “African lions” – Ethiopia, Ghana, Kenya, Mozambique, Nigeria, and South Africa – have experienced fast growth (IMF, 2019); (iii) it expects that the African Continental Free Trade Area Agreement-AfCFTA will increase income in countries by at least 9% by 2035 (World Bank, 2020, 2022). Multilateral and free trade agreements will be important for the success of African countries, as a consequence of the economic and geopolitical processes that are affecting the globalised world.

Therefore, the study aims to explore the determinants of African growth in a panel of 54 counties[1] after analysing reference literature to select the explanatory variables. The rest of the paper has been structured as follows: (i) the reference literature, (ii) the data analysis, (iii) the conclusions.

2. The reference literature

We have found the reference literature to select the explanatory variables of African growth from the online search engine *discovered.ed.ac.uk* developed by the University of Edinburgh, by inserting the following title key: *Africa growth*; filter: *gross domestic product*; time frame: *2011-2022*, articles’ type: *business and economics*. A clustering of the reference literature on African growth is shown at Table A.1 in the Appendix.

Development economists have produced many empirical studies about the drivers of growth, however, their findings can change over time and based on the considered countries. As a result, authors can differently explain growth, based on the specific research questions or analysis methods they adopt. From the reference literature, it emerges that differences in economic policy among countries can explain their gaps in economic growth.

Many empirical studies on growth have been influenced by the neoclassical model. These studies start from the initial income level and extend their analysis to include factors such as government policies related to human capital formation, technology diffusion, population growth, and the geographical location of countries. Despite the vast literature on growth, the mechanics of development remain central in the economic debate. While empirical works have identified a number of variables correlated with development, an important issue that remains open is the lack of an unequivocal theoretical framework about what the determinants of growth are with reasonable certainty. Starting from the model by Solow (1956, 1957) various reasons have emerged.

These are not necessarily mutually exclusive, and have not an order of importance. Therefore, given the existence of multiple and possible repressors, a specific approach to analyse the growth determinants could be to research robust empirical relations for African growth over the last decade.

Over the last decade, the debate on the primacy of human development is increase, however, empirical works focus on explaining why some countries have experienced rapid long-term growth rates in per-capita income, while others have not achieved the same performance. In the economic growth theory, relatively small differences in cross-country growth rates, when cumulated over one or more generations, can have significant consequences on countries’ living standards, and the role of governance and institutional environment on development is a widely debated research topic.

The relationship between the geographical localisation of countries and growth is also wide. The geographical factors can have little effect on growth after controlling for the country’s institutional framework. In other words, these effects can be indirectly grasped by the institutional and business environment variables. The experience of countries where institutional and business environment is weak, or where governance has collapsed, has shown that growth is significantly lower than otherwise.

In sum, the neoclassical economic theory considers capital accumulation as a driver of growth, but endogenous growth models have also highlighted the key role of employment, productivity, human capital formation, and technology, as a result, unemployment and low knowledge capital cause slow growth (Lucas, 1988; Romer, 1990; Grossman and Helpman, 1990, 1991; Barro and Sala-i-Martin, 1992,1997). Development can depend on public and private investments, foreign direct investments, and international aid. The latter, if granted on the basis of the level of development reached by the recipient countries, has proven to be better. Moreover, in a globalised world, a part of the trade is along global value chains. For example, African trade with China has intensified as a result of diplomatic actions in countries rich in natural resources.

The neoclassical economic models consist of a set of assumptions useful for analysing market behaviour with an adequate mathematical formalisation. Under its assumptions, the appropriate unit of analysis is the individual consumer or firm rationally choosing among available alternatives according to preferences, by maximizing the utility function or profit. Therefore, preferences are exogenous to models, transaction costs are null, and information is perfectly available as the theorem by Coase (1960) implies.

However, this can be deceptive, in that each individual or firm always knows the quality of offered goods and their prices. Nonetheless, the neoclassical framework is a fundament in economic analysis.

Alternatively, two main theories of economic development emerged in the second half of the XX century. On the one hand, there is the “modernisation theory” grasping from the cultural and

technological differences among countries the explanation of their underdevelopment (Sadik-Zada, 2021). The capitalistic way should be a solution for underdeveloped economies and technology is the most important factor in the development analysis, while cultural differences and traditionalist behaviours can be an obstacle to progress and innovation. On the other hand, there is the "dependency theory", suggesting that underdevelopment can be explained in part by the exploitation of poor countries by the rich ones, due to the globalisation that privileges some countries at the expense of others (Sadik-Zada, 2023). South countries rich in natural resources remain underdeveloped to the advantage of developed ones exporting cheaply raw materials, which are then processed in developed countries, and then sold in developing countries as manufacturing goods with a higher value-added. In most ex-colonised countries exists a dependency on trade with ex-colonising countries, properly traced to this past experience shaped the economic relations. In the past, import substitution policies with locally manufactured products and inter- and intra-regional trade agreements were adopted as solutions to this order of issues.

In conclusion, from our clustering over the reference literature, the most questioned variable in empirical studies is the governance climate. The institutional level reached by countries affects their business environment. In other words, there is a positive nexus between the quality of the institutional and business environment with growth, but it requires sound governance (Acemoglu and Robinson, 2012; Acemoglu et al., 2019; Babajide et al., 2021; Festré, 2021; Glegg et al., 2021; Lin, 2021; Razin, 2022). Indeed, studies suggest that productivity, innovation, and a stable macroeconomic framework can affect growth based on the quality of the institutional and business environment in the country.

A clustering on the reference literature has been useful to determine which explanatory variables to include in econometric models. We develop our models starting from the macroeconomic determinants of growth most frequently used in empirical studies, such as openness, inflation, unemployment, external debt, net-ODA, FDI inflows, received remittances, natural resource rent, urbanisation, public expenditure, fixed and human capital formation, innovation, productivity, and last but not least the governance climate. Furthermore, we want to consider how the global interdependencies across markets can contribute to explaining African growth (Cooper and Barro, 1997). In other words, growth can create the conditions for a country to have a competitive advantage in trade with other countries. Trade and growth can be dependent or independent, otherwise, when there is a negative relationship between them, this can depend on the imports being higher than exports.

As a result, it seems to us necessary to include in our framework of analysis proxy variables for African countries' merchandise trade across clusters of developed and developing countries as World Bank Group researchers have classified them.

Additionally, the academic and political debate on the possible trade-off between efficiency in resource allocation and public interventionism in the economy led us to separately consider in our models the explicative variables.

Finally, we have found studies analysing growth with the generalised method of moment (GMM), but as far as we know, there are no studies analysing growth with a panel of 54 African countries and/or using GMM estimators over the period 2010-2019.

3. The data analysis

3.1. Dataset and econometric models

We have used a set of explanatory variables extracted from the UN-dataset (UNCTAD and UNDP), and the WB-dataset (World Development Indicators-WDI and World Governance Indicators-WGI) over the period 2010-2019 for all 54 African countries. Time-series have been integrated, when necessary, for a few missing values (2%) with data from the IMF (World Economic Outlook-WEO), otherwise from secondary sources (CIA-World Factbook's country surveys). A panel-dataset allows us to explore not only the cross-sectional dimension but also the time-variant one. As a result, the reliability of our panel-dataset based on its completeness is at 98%. At Table A.2 in the Appendix, we show the main descriptive statistics and proxies for the variables used. An acceptable level of variability over the time dimension exists, while the cross-sectional dimension shows a higher level of this for some variables. In the Appendix always at Table A.3, we show the statistical associations between variables that are non-excessive for the dependent variables, particularly, and among the regressors, generally.

With panel data, unobserved heterogeneity needs to be addressed by applying the within transformation (or demeaning process), as in fixed effects models, otherwise by taking first differences, if the second dimension of the panel is a proper time-series. The ability of first differencing to remove unobserved heterogeneity also underlies the family of estimators that have been developed for dynamic panel data models. These models contain one or more lagged dependent variables allowing for the modelling of a partial adjustment mechanism.

A serious difficulty arises with the fixed effects model in the context of a dynamic panel data model particularly with "small T and large N" (Nickell, 1981). This arises because the demeaning process which subtracts the individual's mean value of y and each x from the respective variable creates a correlation between regressor and error. Therefore, the first difference transformation removes both the constant term and the individual effect. First-differencing the equation removes the unobserved individual effect and its associated omitted-variable bias.

To simultaneously address both omitted variable bias and issues of endogeneity, we have used the GMM estimator for panel data. Using a GMM to estimate growth models is certainly nothing new. Nevertheless, firstly, it corrects for the omitted variable bias, eliminating the need to make any probabilistic assumptions on the country effect, Secondly, it eliminates the inconsistency arising from the potential endogeneity of the regressors. Indeed, the GMM estimator addresses both estimation problems under the assumption that the lagged values of the regressors are valid instruments.

Finally, the GMM-system estimator exploiting additional moment restrictions has better properties in finite samples than the GMM-difference estimator (Blundell and Bond, 1998). In other words, the GMM estimator can provide consistent results in the presence of different sources of endogeneity, such as unobserved heterogeneity, simultaneity, dynamic endogeneity, and in finite samples. We have computed over the time-series 2010-2019 the average value every two years, thus having in mean-stationary time-series of five time-units.

The "two-step" GMM applies forward orthogonal deviations, which means that instead of subtracting the previous observations of a variable from its current value, the "two-step" GMM subtracts the average of all future available observations of a particular variable (Roodman, 2009a). By using a "two-step" GMM, researchers can prevent unnecessary data information loss. In the case of a balanced panel dataset, a "two-step" GMM provides more efficient and consistent estimates for the involved coefficients (Arellano and Bover, 1995). In other words, this estimator allows to correct endogeneity when using a panel-dataset with variables that are potentially endogenously determined (Bond et al., 2001). By using the orthogonality conditions, the GMM estimators allow efficient estimation even in the presence of heteroscedasticity of unknown form.

Therefore, we have adopted the "two-step" GMM-system estimator, as this procedure is more efficient than the differencing, especially for a panel dataset like ours, where N is greater than T. The GMM-sys extended the difference model by adding equations in levels to the regressions run in the first differences, and this allows the introduction of additional instruments.

Specifically, by using lagged levels as instruments for first difference equations and the lagged first differences as instruments for level equations. In other words, for endogenous variables in levels, their own lagged differences serve as instruments, thus the additional moment conditions efficiency is increased. This means the modelling also takes care of finite sample bias, if it exists an inverse causality issue, the variables are highly persistent and are used as weak instruments for the first differences. We have also used the finite sample bias correction by Windmeijer (2005) for robust standard errors in the models.

Finally, an unbiased GMM estimator depends on the validity of the instruments and maintaining the number of this below the number of groups is a good rule of thumb (Roodman, 2009 b). Instruments should be correlated with endogenous instrumented variables while conforming to the orthogonality condition to prevent errors (Baum, 2003). A high p-value for Sargan and Hansen is a confirmation of the correct specification of models under the null hypothesis of non-overidentification and instrumental validity.

On the one hand, Sargan relies on the assumption of homoscedastic errors, but this puts limitations on the strength of the test when the assumption is weak. On the other hand, the test is not exposed to the same instrumental proliferation weaknesses as the Hansen test.

Based on our heterogeneous dataset, there is a high probability of idiosyncratic shocks in each country, and there is a potential violation of the homoscedasticity assumption. To consider the Sargan test alone may be misleading, while considering both tests can be more convenient. However, the Hansen test is better for our case. The Sargan test is associated with not robust estimates, but is not weakened by many instruments, while, the Hansen test is associated with robust estimates, but can be weakened by the instrument proliferations.

To account for the possibility of the model's uncertainty bias, we adopt a univariate approach with the strictly exogenous regressor. The model uncertainty bias arises when the lack of clear theoretical guidance on the choice of likely regressors results in a wide set of possible model specifications. As a result, will be a high risk of incurring arbitrary model selection and eventually incorrect inference.

Therefore, as a robustness check, an instrumental approach with the z_i variables strictly exogenous has been used. As instrumental variables, the governance climate, ICT diffusion, and squared urban population have been used. Finally, an additional control for regressor exogeneity is also carried out using the difference-in-Sargan test with univariate 2SLS models. The instrumental variables above and the dependent variable with one order of lags on the right side of the equation have been used. The null-hypothesis is that the variable is exogenous. Briefly, the concept behind the difference-in-Sargan test is that one can test the marginal increase in the degree of overidentification that results when one or more instruments are added.

The dependent variable in the models is real per-capita GDP, and the dynamic specification is given by the presence of the dependent variable with one order of lags in the right side of equation. We have estimated models with regressors at time t, and t-1 to consider the eventual lagged effect of macroeconomic policies on variables, or the persistent effect on trade. The models have been estimated with the open-source statistical software gretl, as below [1]:

$$y_{i,t} = \alpha y_{i,t-1} + \beta x_{i,t} + \delta x_{i,t-1} + \theta_i + \lambda_t + \varepsilon_{i,t} \qquad [1]$$

where, $y_{,}$ is the dependent variable; $y_{,-1}$ is the dependent variable with one order of lags on the right side of the equation $x_{,}$ and $x_{,-1}$ are time-variant explanatory variables; θ is the constant in the equation grasping the fixed effects; λ is the idiosyncratic unobserved time-specific effects to prevent a contemporaneous correlation due to time-related shocks; finally, α, β, and δ are the coefficients that want to be estimated, $_{,}$ is the idiosyncratic individual and time-specific error terms in the regressions.

3.2. Findings and interpretation

Estimated models with the significant variables are shown in Table 1 (a, b) in the Appendix, as well as models for the robustness check (Table A.4 a, b). The real per-capita GDP with one order of lags is the significant variable with the highest magnitude in all models. It is expected of us coherently to the literature on growth. This is clear confirmation that the dynamic approach is suitable for capturing the effects of past policies on growth.

Inflation could be expected to negatively impact growth. In fact, it is not uncommon to find it associated with a more unstable economic system (Kagochi et al., 2013; Asongu, 2014; Walle, 2014).

However, its significance and positive magnitude for the variable with one order of lags can be affected by competitive devaluations in the related foreign exchange markets implemented by policymakers to encourage import-export, otherwise, it can be related to short-term assessments of labour market efficiency. As well, external debt has been found to be significant, which means that African countries have had a need to finance their growth recurring to founds of international organisation financing development (Mbate, 2013; Kedir et al., 2017; Mensah et al., 2019; Ehigiamusoe and Lean, 2020; Idun, 2021). By finding it significant, it may be a confirmation of debt overhang theories according to larger levels of accumulated debt stocks initially leading to lower growth, as captured by the variable with one order of lags. However, it should be highlighted that only in the neoclassical models, allowing for perfect capital mobility and the ability to borrow and lend capital without constraint, an excess of debt can lead to a positive effect on growth, but this may also be unrealistic due to several macroeconomic backlash effects.

Openness is significant and it is not uncommon for more liberalised economies to be better positioned along global value chains, for instance, benefiting from positive externalities on productivity by learning-by-doing in trade, or by collaborations and competition on international markets (Chang and Mendy, 2012; Elhiraika et al., 2014; Brueckner and Lederman, 2015; Koomson-Abekah and Nwaba, 2018; Osei et al., 2019; Udeagha and Ngepah, 2021; Abdu et al., 2021). However, a rapid openness can also damage development, if it does not occur in the appropriate way and at the right time, especially in developing countries, where they tend to specialise in traditional productions or in industries where innovation is not the core, thus, by becoming more vulnerable to external negative shocks. This means the openness effect on growth can be ambiguous in developing countries, and more openness can have a crowding-out effect on domestic growth and investments. Nonetheless, more openness can increase productivity, facilitate the manufacturing industry's upgrading, promote technological and institutional advancement, and finally, increase capital accumulation, as a result, intermediate manufacturing imports and goods exports rise.

Therefore, in line with our expectations, the gross fixed investments and also unemployment rate have been found significant (Seetanah and Rojid, 2011; Calderon and Boreux, 2016; Shittu et al., 2020). Gross fixed investment has been found with a positive magnitude, while the unemployment rate and it with one order of lags have been found with a negative and positive magnitude, respectively. Gross fixed investment and unemployment rate are variables related to income equation and labour market efficiency.

Remittances can have an effect on the economy to which they are directed through the Keynesian multiplier. Even if all the income is consumed by the households that received the remittances, this would indirectly stimulate the exogenous component of demand, as there will be a general increase in aggregate income. This suggests that migrant workers' earnings proxied by received remittance with one order of lags are positively contributing to African growth (Adusah-Poku, 2016).

Institutional quality and stability positively influence the countries' growth. Improvements in the institutional and business environment can produce spillover effects on growth. As a result, the

governance climate is an important indicator of the level of development reached by a country, and it has been found significant and with a positive sign.

The macroeconomic variables related to public spending, such as government, health and military expenditure have been also found significant (Seetanah and Rojid, 2011; Pinkovskiy and Sala-i-Martin, 2014). Government expenditure is a proxy for the governance's bureaucratic size, and it is often associated with a negative impact on growth due to the issue of available resource allocation (Arizala et al., 2020). The health expenditure and military one with one order of lags have been found significant and positively and negatively impacting growth, respectively, although the second without the lag has had a positive impact (Ahmed, 2012; Akhmat et al., 2014; Shaaba and Ngepah, 2018). However, assessing these impacts should be difficult, especially in economies with a permanent or semipermanent war and riots, or because they could be related to other unconsidered exogenous variables (Mijiyawa, 2013; Nsiah et al., 2016; Boreux and Calderon, 2016; Franses and Welz, 2022).

Finally, growth can be associated, among other determinants, with geographical and cultural factors, or with ethnic fragmentation grasped by constant in the equations. However, after controlling for instrumental variables, we have found less and non-significant direct effects of fixed effects in the sample of African countries. If we do not consider this approach, instead, it exists a significant relationship between country fixed effects and growth in the African sample. This result shows that geographical factors can have little effect on growth after controlling for other country factors.

In Table 1b, we show models with the proxy variables for African countries' merchandise trade across clusters of developed and developing countries as classified by World Bank Group researchers. The significant proxy variables of the African merchandise trade are the imports and exports from or to the cluster of HDCs lead by US economy, as well as the exports to the cluster of developing economies in Europe or Central-Asia, and Eastern-Asia or Pacific where the Russian and Chinese economy lead, respectively. In general, Russian and Chinese economic influence in Africa has increased over the past decade. Additionally, imports from developing economies in Southern Asia led by India, have been found significant. Other significant evidence has not been found for the remaining clusters.

We also point out that among the macroeconomic variables (Table 1a), natural resource rent, FDI inflows, human capital formation, urban population, net-ODA, and ICT diffusion have not been found significant.

Countries rich in natural resources are usually characterised by their high dependency on them, their low economic diversification, and the volatility of their commodity prices and revenues. As a result, a negative sign for the variable with one order of lags refers to a crowding-out effect, i.e., the Dutch disease due to an abundance of natural resources and raw materials.

In developing and emerging economies, FDI inflows can contribute to growth in a different way, but proofs of their effect can be contrasting (Poku, 2016; Shittu et al., 2020; Hagan and Amoah, 2020). We have found evidence that FDI inflows with one order of lags positively affect growth. Nevertheless, the magnitude of the estimated coefficients is very low. It can depend on the complementarity degree, or the substitution effect between FDIs and the other foreign capital – such as net-ODA and received remittance, or the countries' domestic policies on physical investments and human capital formation. Otherwise, it can be caused by increased competition in markets. As a result, their net effect can be positive even if the substitution effect has crowded-out domestic fixed investment.

Human capital formation is a proxy for more training, or a higher educational level usually associated with higher growth (Kagochi et al., 2013; Kayaoglu and Naval, 2017; Ibrahim, 2018; Anetor, 2020; Nwani, 2021). Nonetheless, their effects can have a direct and indirect impact on growth and can be positive, negative, or neutral.

The urban population growth may be related to the extension of urban areas, and the development of global cities following an increase in income (Bruckner, 2012; Onjala and K'Akumu, 2016; Oluwatayo and Ojo, 2018). The non-significance found for the urban population growth can be due to the neo-Malthusian theory suggesting that population growth can hinder development, as larger households have to spend more on public utilities, by eroding their savings or limiting investments. However, the impacts of demographic growth on development can vary considerably by country based on economic and institutional policies.

The effect of net-ODA comes with a negative sign. International aid can crowd out growth if it is not effectively directed by governance toward social and economic progress or poverty reduction (Alemu and Lee, 2015; Adusah-Poku, 2016; Cai et al., 2018). In other words, democracy and political rights promote growth, while the protectionism of the elite's interests depresses it (Gaibulloev and Sandler, 2011; Narayan et al., 2011; Bertocchi and Guerzoni, 2012; Jaunky, 2013; Fayissa and Nsiah, 2013; Ahlerup et al., 2016; Toh, 2016; Epaphra and Kombe, 2017; Ogbubor et al., 2020).

Although the use of new technologies such as the internet and mobile devices has been found significant in previous studies, this may depend on the variable used as a proxy (Batuo, 2015; Donou-Adonsou et al., 2016; David, 2019; David and Grobler, 2020; Ngameni et al., 2022). According to Haftu (2019), African societies still lag behind in the adoption of new information and communication technologies, however, we have found ICT diffusion with a positive sign.

The Sargan and Hansen tests, Wald tests on regressors and time-dummies, as well as respecting the rule of thumb to maintain the number of instruments less than the number of cross-sectional units, demonstrate the reliability of our estimations in models.

After a robustness check as shown in the Appendix at Table A.4 (a, b) our findings indicate that in addition to initial conditions of the per-capita GDP, the fixed investments, inflation, openness, productivity, unemployment, received remittance, external debt, and terms-of-trade such as imports and exports from or to HDCs, and imports from LMDCs in Southern-Asia are robustly correlated with African growth. However, the null-hypothesis that the variables in the models are exogenous cannot be rejected (Table A.5 in the Appendix). Therefore, it is evidence to support the univariate approach used for GMM estimates.

Finally, the productivity reflects the manufacturing industry's ability to add value to production inputs. The higher this is, the wider the implications for growth. However, the variable in the models shows a significant negative relationship, which may be influenced by the positioning of countries' manufacturing system along global value chains.

Table 1. GMM-sys with x_i strictly exogenous regressor. (a)

	Real per-capita GDP													
(a)	*Coeff.*	*Std.Err.*		Constant	Time Dummies	Standard Error	Regressors Wald-Test (p-value)	Time Dummies Wald-Test (p-value)	AR (2) Test (p-value)	Non-Observa-tions (%)	Observa-tions (%)	Sargan Test (p-value)	Hansen Test (p-value)	Instru-ments
Real per-capita GDP (t-1)	0.917	0.064	***											
FDI Inflows	-0.001	0.008												

FDI Inflows (t-1)	0.006	0.010												
				yes	yes	0.107	0.000	0.000	0.489	54 (20)	216 (80)	0.149	0.336	15
Real per-capita GDP (t-1)	0.890	0.057	***											
Inflation	-0.230	0.027	***											
Inflation (t-1)	0.340	0.042	***											
				yes	yes	0.099	0.000	0.000	0.175	54 (20)	216 (80)	0.191	0.626	15
Real per-capita GDP (t-1)	0.878	0.078	***											
Openness	-0.148	0.076	*											
Openness (t-1)	0.245	0.074	***											
				yes	yes	0.101	0.000	0.000	0.164	54 (20)	216 (80)	0.029	0.444	15
Real per-capita GDP (t-1)	0.948	0.041	***											
Natural Resources Rent	0.053	0.048												
Natural Resources Rent (t-1)	-0.072	0.047												
				yes	yes	0.106	0.000	0.000	0.611	54 (20)	216 (80)	0.264	0.301	15
Real per-capita GDP (t-1)	0.911	0.054	***											
Government Expenditure	-0.055	0.063												
Government Expenditure (t-1)	0.115	0.062	*											
				yes	yes	0.106	0.000	0.000	0.562	54 (20)	216 (80)	0.179	0.495	15
Real per-capita GDP (t-1)	0.925	0.057	***											
Productivity	-0.348	0.265												
Productivity (t-1)	-0.225	0.254												
				yes	yes	0.105	0.000	0.000	0.781	54 (20)	216 (80)	0.107	0.361	15
Real per-capita GDP (t-1)	0.879	0.055	***											
External Debt	-0.192	0.059	***											
External Debt (t-1)	0.179	0.056	***											
				yes	yes	0.094	0.000	0.000	0.698	54 (20)	216 (80)	0.070	0.325	15
Real per-capita GDP (t-1)	0.824	0.149	***											
Unemployment	-0.059	0.092												
Unemployment (t-1)	0.148	0.058	**											
				yes	yes	0.102	0.000	0.000	0.397	54 (20)	216 (80)	0.102	0.517	15
Real per-capita GDP (t-1)	0.874	0.075	***											
Military Expenditure	0.135	0.093												
Military Expenditure (t-1)	-0.179	0.100	*											
				yes	yes	0.104	0.000	0.000	0.186	54 (20)	216 (80)	0.054	0.374	15
Real per-capita GDP (t-1)	0.918	0.044	***											
Health Expenditure	0.065	0.039	*											
Health Expenditure (t-1)	0.008	0.049												
				yes	yes	0.106	0.000	0.000	0.524	54 (20)	216 (80)	0.083	0.359	15
Real per-capita GDP (t-1)	0.959	0.049	***											
Received Remittance	-0.010	0.006	*											
Received Remittance (t-1)	0.021	0.007	***											
				yes	yes	0.109	0.000	0.000	0.402	54 (20)	216 (80)	0.167	0.614	15
Real per-capita GDP (t-1)	0.920	0.058	***											
Net ODA	-0.033	0.046												
Net ODA (t-1)	-0.001	0.044												
				yes	yes	0.108	0.000	0.000	0.557	54 (20)	216 (80)	0.132	0.321	15
Real per-capita GDP (t-1)	0.861	0.157	***											
Urban Population^2	-0.114	0.123												
Urban Population^2 (t-1)	0.136	0.151												
				yes	yes	0.104	0.000	0.000	0.492	54 (20)	216 (80)	0.044	0.104	15
Real per-capita GDP (t-1)	0.898	0.054	***											
Human Capital Formation	-0.019	0.034												
Human Capital Formation (t-1)	-0.004	0.039												
				yes	yes	0.106	0.000	0.000	0.488	54 (20)	216 (80)	0.127	0.398	15
Real per-capita GDP (t-1)	0.895	0.069	***											
Gross Fixed Investment	-0.039	0.047												
Gross Fixed Investment (t-1)	0.107	0.051	**											
				yes	yes	0.105	0.000	0.000	0.493	54 (20)	216 (80)	0.081	0.296	15
Real per-capita GDP (t-1)	0.909	0.090	***											
ICT diffusion	0.095	0.092												
ICT diffusion (t-1)	-0.000	0.123												
				yes	yes	0.108	0.000	0.000	0.558	54 (20)	216 (80)	0.056	0.084	15
Real per-capita GDP (t-1)	0.942	0.040	***											
Governance Climate	0.172	0.085	**											
Governance Climate (t-1)	-0.104	0.100												

				yes	yes	0.109	0.000	0.000	0.553	54 (20)	216 (80)	0.103	0.347	15
Real per-capita GDP (t-1)	0.901	0.057	***											
Constant	0.804	0.410	**											
				-	yes	0.106	0.000	0.000	0.492	54 (20)	216 (80)	0.135	0.385	13

Table 1. GMM-sys with x_i strictly exogenous regressor. (b)

		Real per-capita GDP												
(b)	*Coeff.*	*Std.Err.*		Constant	Time Dummies	Standard Error	Regressors Wald-Test (p-value)	Time Dummies Wald-Test (p-value)	AR (2) Test (p-value)	Non-Observa-tions (%)	Observa-tions (%)	Sargan Test(p-value)	Hansen Test (p-value)	Instru-ments
Real per-capita GDP (t-1)	0.899	0.062	***											
Imports from HDCs	0.235	0.114	**											
Imports from HDCs (t-1)	-0.209	0.113	*											
				yes	yes	0.104	0.000	0.000	0.142	54 (20)	216 (80)	0.064	0.283	15
Real per-capita GDP (t-1)	0.901	0.065	***											
Exports to HDCs	-0.034	0.023												
Exports to HDCs (t-1)	0.056	0.019	***											
				yes	yes	0.103	0.000	0.000	0.451	54 (20)	216 (80)	0.080	0.332	15
Real per-capita GDP (t-1)	0.901	0.066	***											
Imports from LMDCs in Latin America or Caribbean	0.005	0.014												
Imports from LMDCs in Latin America or Caribbean (t-1)	-0.004	0.011												
				yes	yes	0.106	0.000	0.000	0.523	54 (20)	216 (80)	0.146	0.397	15
Real per-capita GDP (t-1)	0.919	0.049	***											
Exports to LMDCs in Latin America or Caribbean	0.006	0.012												
Exports to LMDCs in Latin America or Caribbean (t-1)	0.011	0.011												
				yes	yes	0.106	0.000	0.000	0.497	54 (20)	216 (80)	0.176	0.438	15
Real per-capita GDP (t-1)	0.895	0.058	***											
Imports from LMDCs in Europe or Central-Asia	0.011	0.016												
Imports from LMDCs in Europe or Central-Asia (t-1)	-0.019	0.017												
				yes	yes	0.105	0.000	0.000	0.426	54 (20)	216 (80)	0.100	0.363	15
Real per-capita GDP (t-1)	0.909	0.057	***											
Exports to LMDCs in Europe or Central-Asia	-0.010	0.006	*											
Exports to LMDCs in Europe or Central-Asia (t-1)	0.008	0.007												
				yes	yes	0.106	0.000	0.000	0.5125	54 (20)	216 (80)	0.129	0.396	15
Real per-capita GDP (t-1)	0.896	0.057	***											
Imports from LMDCs in Eastern-Asia or Pacific	0.024	0.056												
Imports from LMDCs in Eastern-Asia or Pacific (t-1)	-0.089	0.059												
				yes	yes	0.106	0.000	0.000	0.384	54 (20)	216 (80)	0.114	0.507	15
Real per-capita GDP (t-1)	0.924	0.053	***											
Exports to LMDCs in Eastern-Asia or Pacific	0.012	0.012												
Exports to LMDCs in Eastern-Asia or Pacific (t-1)	-0.025	0.013	*											
				yes	yes	0.105	0.000	0.000	0.629	54 (20)	216 (80)	0.072	0.337	15
Real per-capita GDP (t-1)	0.839	0.107	***											
Imports from LMDCs in Southern-Asia	-0.053	0.028	*											
Imports from LMDCs in Southern-Asia (t-1)	-0.008	0.030												
				yes	yes	0.102	0.000	0.000	0.361	54 (20)	216 (80)	0.124	0.394	15
Real per-capita GDP (t-1)	0.898	0.060	***											
Exports to LMDCs in Southern-Asia	0.004	0.015												
Exports to LMDCs in Southern-Asia (t-1)	-0.009	0.017												
				yes	yes	0.106	0.000	0.000	0.603	54 (20)	216 (80)	0.125	0.413	15
Real per-capita GDP (t-1)	0.899	0.059	***											
Imports from LMDCs in North Africa or Middle East	-0.019	0.022												
Imports from LMDCs in North Africa or Middle East (t-1)	0.006	0.022												
				yes	yes	0.106	0.000	0.000	0.485	54 (20)	216 (80)	0.093	0.361	15
Real per-capita GDP (t-1)	0.913	0.061	***											
Exports to LMDCs in North Africa or Middle East	-0.002	0.007												
Exports to LMDCs in North Africa or Middle East (t-1)	0.003	0.008												
				yes	yes	0.107	0.000	0.000	0.505	54 (20)	216 (80)	0.118	0.354	15
Real per-capita GDP (t-1)	0.889	0.073	***											
Imports from LMDCs in Sub-Saharan Africa	-0.016	0.037												
Imports from LMDCs in Sub-Saharan Africa (t-1)	0.002	0.037												
				yes	yes	0.105981	0.000	0.000	0.485	54 (20)	216 (80)	0.134	0.331	15
Real per-capita GDP (t-1)	0.895	0.069	***											
Exports to LMDCs in Sub-Saharan Africa	-0.006	0.019												
Exports to LMDCs in Sub-Saharan Africa (t-1)	0.004	0.020												
				yes	yes	0.106	0.000	0.000	0.497	54 (20)	216 (80)	0.125	0.350	15

*Note: *** significance for α = 0.01 ** significance for α = 0.05 * significance for α = 0.10.*
Source: our elaboration.

4. Conclusions

4.1. Concluding remarks

This study has analysed growth in a panel of 54 African countries using the generalised method of moment (GMM) estimators over the period 2010-2019. As far as we know, we have not found studies analysing growth with a panel of 54 African countries and/or using GMM-estimators over this period.

Moreover, we introduce a novelty element in the analysis, by considering African growth in relation to specific openness degrees as proxied by merchandise imports and exports for the clusters of developed and developing countries such as defined by the World Bank Group researchers. Therefore, based on the time-series data collected, and the estimation methodology used, our results show the determinants of African growth over the period 2010-2019.

Our findings indicate that in addition to initial conditions of the per-capita GDP, different macroeconomic factors such as fixed investments, inflation, openness, productivity, unemployment, received remittance, external debt, and terms-of-trade such as imports and exports from or to HDCs, and imports from LMDCs in Southern-Asia are robustly correlated with African growth.

Finally, over the question that we have highlighted in the introduction, where it asks whether Africa can break with its colonial commercial past, we have found proof of the existence of a trade dependency added to that with the cluster of developed countries, in which certainly the ex-colonising countries are situated. In fact, we have found evidence of a trade dependency with the cluster of developing countries in Southern Asia led by India.

A more developed institutional and business environment should lead to sustainable long-run African growth, but this depends on sound governance. Indeed, the governance climate has been found to be significant in models.

Generally, the significance found in import and export from or to LMDCs can depend on favourable linkages between developing economies that, for instance, have a similar institutional and business environment, or a similar technological gap with respect to developed countries. However, the significance found in the trade with HDCs highlights the linkage along global value chains between African markets and developed ones.

Therefore, both statistical significances can depend on the linkages found by the growth studies analysing the development in the North-South and South-South frameworks. This can explain the trade relationship existing along global value chains between African markets and developed and developing countries.

Global value chains have expanded in the new millennium, and low transport costs, low trade barriers, few embargoes, as well as technological and financial spillovers, have made this possible, but this has also meant greater uncertainty in the markets, which are then closely interconnected with each other (World Bank, 2020, 2022). This means that economies in transition have to face negative aspects related to globalisation. As a result, there is a trade-off between the lowering of trade barriers, and technological advancements deriving from an international specialisation of productions, and the exposure of countries and their firms to economic and political unbalances ad shocks (Togati and Visaggio, 2016).

Especially, in developing countries, trade in semi-finished products has intensified firms' activities along global value chains, however, these goods may escape from national accounting due to the absence of international accounting harmonisation (Wolf and Zedillo, 2015). It should be considered that the system of harmonisation of national accounts developed by the UN statistical commission is stuck in the fifth version since 2008 as an upgrade of the previous one released in the early Nineties. Therefore, causing trade intensification along the global value chains, products can transit from one developing country to another after they have had an increase in value at least equal to the labour cost, and in turn, they can return to developed countries, but without having been properly accounted for. This means that a "country-factory" can show macroeconomic structures characterised by only consumed income, for instance, as small economies focusing on import-export activities with a dominant manufacturing production.

4.2. Policy implications

In the future, African growth could depend more on sound governance, but countries should improve their institutional and business environments in order to achieve more inclusive and sustainable growth (Acemoglu et al., 2019; Lin, 2021). African governance could lead the growth, both by pursuing incentive policies on exports rather than imports or by improving the opportunities for firms (Glegg et al., 2021). Therefore, sound institutions and forward-looking policies can lead firms toward progress, technological specialisation, and wellbeing (Kurtishi-Kastrati, 2013; Collier, 2014; Trebilcock, 2015; Kim and Heshmati, 2019; Farahane and Heshmati, 2020; Babajide et al., 2021).

However, changes in institutional structures are generally burdened: (i) by a heavy inertial mass to change in defence of the elites' interests; and (ii) by the slowness of adaptive responses typified by many societies. As a result, the acceptance of a new techno-economic paradigm as well as a new socio-institutional system is a difficult process, as the country will have to bear a greater sunk-cost due to the specificity of its historical development path and the variety characterising the capitalistic system as an expression of the institutional structure (Acemoglu and Robinson, 2012; Granovetter, 2017).

The socio-economic and institutional transition processes will inevitably lead to internal contradictions within capitalism and to paradigmatic fluctuations. Recurring crises are showing that the governance of globalisation is an important issue related to capitalism (Dallago and Casagrande, 2023).

In the capitalist system, there will be a certain selfish impulse to capital accumulation, such that intrinsic instability is not its failure, but constitutes its vital impulse (Razin, 2022). Therefore, capitalism is changing by its nature, and its ability to self-production does not contribute to making the socio-economic system stable for too long.

In other words, it is the choices made by individuals and the occurrence of endogenous shocks to the socioeconomic system determining social progress and triggering a dynamic change process (Hallett et al., 2010). Change occurs for incremental improvements, and the proximity of the socioeconomic system to the Pareto-optimal points' frontier is the reason for the change. This making the steady-state achieved by the system to progress over time. In other words, the perturbations triggered by socioeconomic agents within the system push them towards the search for possible Nash equilibria defined no longer according to maximisation logics but rather according to sustainability choices (Festré, 2021).

The global pandemic and war in Eastern Europe are showing that global governance is an important issue at the current stage of globalisation (Cowling and Tomlinson, 2011; Autor et al., 2016; Eichengreen, 2018; Saccone, 2021). The evolution of the world economy has for too long been left solely to the regulatory automatisms of the markets, and this has increased social inequalities (Stiglitz, 2021).

The trajectory followed by globalisation is progressively abrading the stability and social cohesion in the advanced and emerging economies, as it is not consciously governed. Globalisation, on the other hand, can foster convergence between countries while also increasing economic and political competition between them by causing a disruption in global balances (Heshmati and Lee, 2010; Valli, 2018; Obstfeld, 2020; Marelli and Signorelli, 2022).

For instance, difficulties in multilateral trade negotiations within the World Trade Organisation-WTO have resulted in a generalised focus shift toward regional agreements, which have grown in number and complexity over the last decade. African countries' signatories to the AfCFTA agreement have accepted to limit their governance's unilateral action in order to jointly improve their attractiveness. The AfCFTA agreement may be the biggest trade area in the world, with which the African countries could enhance the position of their manufacturing systems along the global value chains and reach sustainable development in the direction of the SDGs. Nonetheless, the AfCFTA agreement is burdened by significant lags in its agenda.

Greater attention has then been given to the growth-wellbeing relationship in recent years. Two commonly adopted indicators are per-capita GDP and the Human Development Index-HDI by the United Nations. The first is widely used, and it is annually available for all countries, although it measures only the economic dimension of development and suffers from some methodological issues, it remains a reliable growth index. The second is better, but data may not be available for all countries.

In other words, HDI is a composite and synthetic indicator measuring, on average, the country's performance based on three aspects: life expectancy at birth, schooling, and income. However, another indicator that considers the social impacts also is the Social Progress Index-SPI, developed by Porter et al. (2014) starting from the works by Sen, North, and Stiglitz. This index measures society's ability to satisfy basic human needs and improve people's quality of life, so that everyone can aspire to achieve the best possible personal fulfilment. Therefore, the HDI and SPI-index are well-being indicators prioritising social progress over economic progress.

4.3. Limitations and future lines of research

One limitation of our analysis is that African countries cannot share the same growth functions, which cannot also be stable over time. In other words, growth can be the result of a different resource endowment and distinct stages of progress that could be separately considered (Marini, 2004; Schwab, 2014, 2015). Therefore, it can be more convenient to singularly deal with the specificities of each African country's development path (N'Zue, 2020). Failure to account for this heterogeneity can result in incorrect model specifications or misguided policy implications, as analyses may suffer from misleading inferences. For instance, it is important to recognise that a higher positive effect observed in one country can offset smaller negative effects in other countries within the panel. Nevertheless, a panel data analysis provides the advantage of constructing well-fitting models that may not be identifiable using cross-sectional or time-series data alone. Therefore, a general-to-particular approach can be recommended in the presence of competing explanatory theories.

Furthermore, it is known in the economic literature that structural reforms in a country need more time to manifest their effects on the socioeconomic system. As a result, this may explain why some lagged variables have not been found to be significant in this study. Moreover, it could be a need to include other explicative variables in models, for instance, related to demographic characteristics, such as fertility rate and life expectancy, or, related to the quality of the institutional and business environment, which literature has shown to be significant for growth. As a result, it has greater data completeness. In addition, starting a backward time-series reconstruction project to extend the time dimension can be necessary.

Finally, a clustering based on the country's level of income could also be necessary to have control in models with reference to it. Four clusters could be used: low-income, lower middle-income, upper middle-income, and high-income countries, as provided by World Bank Group researchers. For instance, the gross national income-GNI with Atlas correction to reduce the impact of exchange rate fluctuations in the cross-country comparison, and the Gini coefficient for the income inequality could alternatively be used.

Footnotes

[1] *Northern-Africa*: Algeria, Egypt, Libya, Morocco, Tunisia; *Western-Africa*: Benin, Burkina-Faso, Cabo Verde, Gambia, Ghana, Guinea, Guinea-Bissau, Mali, Mauritania, Niger, Nigeria, Senegal, Sierra Leone, Togo. *Central-Africa*: Burundi, Cameroon, Central African Rep., Chad, Congo Dem. Rep., Congo Rep., Equatorial Guinea, Gabon, Liberia, São Tomé and Principe*Eastern-Africa*: Comoros, Côte d'Ivoire, Djibouti, Eritrea, Ethiopia, Kenya, Madagascar, Mauritius, Rwanda, Seychelles, Somalia, South-Sudan, Sudan, Tanzania, Uganda. *Southern-Africa*: Angola, Botswana, Eswatini, Lesotho, Malawi, Mozambique, Namibia, South-Africa, Zambia, Zimbabwe. *Sub-Saharan Africa-SSA*: Western-, Central-, Eastern-, and Southern-Africa.

Annex

Table A.1. The clustering of the reference literature (2011-2022), authors, and summary.

Clusters	Authors	Summary
GOVERNANCE CLIMATE	Gaibulloev and Sandler (2011)	They have found the effects of domestic and transnational terrorism on the per-capita income growth of 51 African countries from 1970 to 2007 by accounting for the cross-sectional spatial dependence of conflicts. The findings suggest that transnational terrorism has a modest marginal impact on per-capita income growth and that domestic terrorist events, surprisingly, do not affect it. According to the authors, the modest impact of transnational terrorism on African growth indicates that developing economies are more resilient to terrorism than is commonly assumed.
	Narayan et al. (2011)	They examine the relationship between democracy and economic growth in 30 SSA countries, finding mixed support for the Lipset theory in the long run.
	Bertocchi and Guerzoni (2012)	They explore the empirical determinants of fragility in SSA over the period 1992-2007 by using a battery of development indicators and finding that institutions are the main cause of the fragility. The probability that a country will be fragile increases with the restrictions on civil liberties and with the increase in revolutions. In fact, the per-capita GDP growth and investments are significant explanatory variables, but the economic growth has an uncertain net impact as it reduces the country's fragility, while the investments increase it.
	Jaunky (2013)	He studies the linkage between democracy and economic development in 28 SSA countries over the period 1980–2005 using the GMM model. He has found that economic growth precedes democracy in the short run, while bi-directional causality is found in the long run. At last, the effects on growth are positive.
	Fayissa and Nsiah (2013)	They use fixed and random effects models, and GMM models for investigating the governance effect on African growth. They have found that governance contributes to the growth gap of African countries, which depends on the countries' income.
	Ahlerup et al. (2016)	They examine how an impartial government toward ethnic groups can improve the growth of 20 SSA countries beginning in the late Nineties. They have found that countries with a governance perceived as impartial have a better chance of growth.
	Akobeng	He investigates whether the linkage between growth and poverty reduction can be strengthened across the institutions in 41 SSA countries over the period 1991-2013 by using the GMM estimator. He finds that improvements in

	Akobeng (2016)	He investigates whether the linkage between growth and poverty reduction can be strengthened across the institutions in 41 SSA countries over the period 1981-2010 by using the GMM estimator. He finds that improvements in governance are significant for supporting the link between growth and poverty reduction in SSA.
	Toh (2016)	He investigates the long-run growth drivers of a group of SSA emerging economies. His findings indicate that the economies diverge more on economic characteristics, institutional quality, and governance than the slow-growth group.
	Epaphra and Kombe (2017)	They examine the impact of institutions on African growth using the GMM, fixed- and random-effects models over a sample of 48 countries from 1996 to 2016, discovering that political stability is the most important factor in explaining African per-capita GDP growth. Other significant explanatory variables are openness, gross fixed investments, human capital formation, and foreign direct investments.
	Ogbuabor et al. (2020)	They examine the impact of governance on economic growth in Western Africa after the global economic recession using a panel of 13 countries and find a negative relationship between governance and growth. Specifically, corruption, government ineffectiveness, political instability, the weakness of the rule of law, and the absence of accountability are the main obstacles to growth, while the per-capita GDP, gross fixed investments, employment, and foreign direct investment are the other significant drivers of growth in the region.
FINANCIAL DEVELOPMENT, DEBT AND PUBLIC EXPENDITURE	Ahmed (2012)	He explores the relationship between military expenditure, external debts, and growth in a sample of 25 SSA countries over the period 1988–2007, by finding that military expenditure has a positive impact on the external debt of African countries, and GDP growth negatively affects their total debt stock.
	Kagochi et al. (2013)	They investigate the relationship between financial development and growth in a sample of SSA countries and find that stock-market development has a positive effect on growth. Instead, the other financial development indicators have an uncertain impact on the growth, while the control variables such as capital formation, schooling, and life expectancy have a positive effect on the growth.
	Mbate (2013)	He investigates the impact of the domestic debt on growth and the private sector in 21 SSA countries over the period 1985-2010 by using GMM models. He has found that domestic debt crowds out the private sector and deters capital accumulation.
	Asongu (2014)	He uses a VAR approach to examine the effects of monetary policy on African growth from 1987 to 2010, testing whether monetary policy variables affect growth in the short and long run, but with inconclusive results.
	Walle (2014)	He examines the long-run relationship between the financial development and growth in 17 SSA countries over the period 1975-2005 by applying an error correction term based on the co-integration tests for considering the cross-sectional dependence between the countries. He has found that there is a long-run relationship between financial development and growth, although there is a weak reverse causal impact.
	Shaaba and Ngepah (2018)	On a panel of 35 African countries from 1990 to 2015, they analyse the relationship between military expenditure, industrialization, and growth, by finding that industrialisation and growth precede military expenditure in the short- and long run, but that military power can be used to achieve industrialisation and growth under given conditions.
	Mensah et al. (2019)	They used ADL models to exaggerate the impact of public debt on growth in 38 African countries from 1970 to 2015, discovering that public debt stifles growth when it exceeds 50% of the country's GDP.
	Arizala et al. (2020)	They investigate the effects of government expenditures and revenues on growth in SSA from 1990 to 2016. They discovered that cutting off public investments has a greater impact on growth than cutting off public consumption or increasing revenues. Attempts to consolidate public finances, on the other hand, have had a negative impact on short- and medium-term growth, which has been mitigated by financial adjustments.
	Ehigiamusoe and Lean (2020)	They examine the effects of public debt and deficit on growth in Western Africa by implementing empirical strategies that account for various econometric issues. They find that the impact of financial development on growth depends on the levels of debt and deficit. When debt and deficit levels exceed a certain threshold, the marginal effects of financial development on growth are negative.
	Idun (2021)	He believes that the use of technology in financial systems can contribute to African growth in the long run, provided that other growth drivers such as human capital formation, openness, and infrastructural capital are present in the countries. However, financial development produces divergent responses to growth within African country clusters. Financial innovation in COMESA and ECCAS causes growth, while that in ECOWAS and ARABMAG has been found to be dangerous to growth.
ICT ADVANCEMENT	Batuo (2015)	He finds that ICT infrastructures are positively related to the growth of a panel of 44 African countries over the period 1990-2010. A dynamic panel data approach has been employed. Findings show that additional ICT investments have a positive impact on growth.
	Donou-Adonsou et al. (2016)	They examine the impact of the ICT infrastructures on the growth of 47 SSA countries over the period 1993-2012, by finding the positive impact of internet adoption and mobile technology.
	David (2019)	Over the period 2000-2015, he investigated the impact of ICT infrastructure on growth as measured by the GDP and HDI index in 46 African countries. He uses a composite index as a proxy for the ICT depth finding and finds that it contributes to the growth.
	Haftu (2019)	Using GMM models with internet and mobile telephone penetration rates as proxies for ICT depth, he discovered that an increase in mobile telephone penetration rate contributes to growth while an increase in internet penetration rate does not, as the countries remain in a relatively immature state in terms of technology use.
	David and Grobler (2020)	They investigate the impact of ICT infrastructure on growth in African countries. They discovered that the depth of ICT has a positive impact on growth.
	Ngameni et al. (2022)	They study the impact of the ICT infrastructure on the growth-gap between China and 30 African countries over the period 2000-2016, by using internet penetration and ICT good exports as proxies. Their results suggest that the technological gap has a positive impact on African growth. The increase in Chinese ICT investments could benefit African economies through the positive externalities induced.
FOREIGN CAPITAL INFLOWS	Alemu and Lee (2015)	For a panel of 20 middle-income economies and one for 19 low-income economies over the period 1995-2010, they used GMM models that found a positive relationship between foreign aid and growth only in the low-income countries, while the growth is subordinated to foreign investments and oil-export revenues in the middle-income countries.
	Adusah-Poku (2016)	He investigates the impact of foreign capital inflows – foreign aid, foreign direct investments, and personal remittances – on SSA growth from 1990 to 2010, concluding that all three inflows have a positive and significant impact on growth in the long run, while personal remittances are significant only in the short run.
	Cai et al. (2018)	They investigate the effects of aid on African growth using panel data from 47 African countries from 1980 to 2013, discovering that international aid promotes growth, but its effectiveness is dependent on governance.
	Hagan and Amoah (2019)	Using an instrumental variable approach to panel data, they investigate whether the effect of foreign investments on African growth is dependent on the resilience of the financial system. They have found that when the financial markets are fragile, as they are in some African countries, the foreign investment inflows can have a small positive effect on growth.
	Kumar and Saleh (2021)	They use co-integrated vector autoregressive analysis to examine the output and prices of tradable and non-tradable sectors in SSA countries. They find that aids have a heterogeneous effect on sectoral output and prices.
HUMAN CAPITAL FORMATION	Anoruo and Elike (2015)	They analyse the causal relationship between human capital formation and growth in a panel of 29 African countries. The results show a bidirectional causality between the two variables and reinforce the nexus between education and growth.
	Kayaoglu and Naval (2017)	They simulate the trend for the formation of human capital, the urbanisation rate, and the per-capita GDP in African countries. They contend that in the short run, a low, or negative return on education investments can be attributed to systemic transitory adjustment or urbanisation costs.
	Ibrahim (2018)	He examines the effect of human capital formation on the financial depth and growth in 29 SSA countries over the period 1980-2014 by using GMM models. They discovered that human capital formation and financial depth both promote growth in the short and long run, with financial depth stimulating human capital formation.
	Anetor (2020)	He analyses the impact of human capital formation on foreign direct investment and growth in 28 SSA countries over the period 1999-2017. He finds that SSA countries do not have a sufficient, high-quality workforce for absorbing and transforming the FDI's spillover toward growth.
	Nwani (2021)	He examines the role of human capital formation in relation to foreign aid and growth in SSA countries from 1985 to 2019. He has found that foreign aid and human capital formation have a negative impact on growth, nevertheless, this impact is mitigated by the interaction between human capital formation and foreign aid, which reduces the negative effect of foreign aid on growth.
OPENNESS	Chang and Mendy (2012)	They examine the effects of openness on growth in 36 African countries over the period 1980-2009, by using fixed-effects models. Their results show that openness and investments positively impact growth, with North Africa being the best, while foreign aid, domestic savings, and gross fixed investments show a negative impact.
	Brueckner and Lederman (2015)	They use the instrumental variables approach to estimate the reciprocal effects of openness and growth in SSA discovering that growth has a negative effect on openness while having a positive effect on growth.
	Osei et al. (2019)	They compare the influencing factors of openness in low- and low-middle-income African countries using the GMM approach. They have found that growth robustly enhances openness in low-income countries, while the impact is not robust and is largely negative in low-income countries. This suggests to them that higher growth is associated with less openness. Furthermore, the growth-openness relationship is non-linear and has an inverted U-shape in low-income countries. This means that an increase in the per-capita GDP improves openness, but beyond a given threshold, further increases penalise openness.
	Udeagha and Ngepah (2021)	They use a non-linear ARDL approach for exploiting the relationship between openness and growth in South Africa over the period 1960-2016, by finding that there is a short- and long-run causality from the openness to the growth.
CHINESE	Doku et al. (2017)	They use fixed-effect models and Granger causality tests to examine the effects and causal nexus of Chinese FDIs on African growth over a sample of 20 countries from 2003 to 2012. They have found that Chinese FDIs increase the GDP growth rate in Africa, and all other things being equal, they have found that there is a unidirectional causality between GDP growth and Chinese FDIs in Africa.
	Koomson-	They primarily examine the effects of Chinese FDIs on African growth using ADL models and Granger causality tests on data dating back to the millennium. They discovered that Chinese FDIs have a negative impact on African

INFLUENCE	Abekah and Nwaba (2018)	growth in both the short and long run because their inflows are directed toward capital-intensive activities with a lower impact on employment. They also discovered that FDIs from the United States and Chinese trade had little impact on African growth. The Granger-causality test has confirmed that there is a unidirectional relationship between growth and the other variables, except for human capital formation, which does not show causality. More FDI inflows to labour-intensive activities will, according to the authors, boost African growth by lowering unemployment.
URBANISATION	Bruckner (2012)	He analyses the effects of the value-added growth in the agricultural sector and per-capita GDP growth on the urbanisation rate in African countries over the period 1960-2007. He has found that an increase in the urbanisation rate has a negative effect on the per-capita GDP growth on average, but this does not affect the urbanisation rate. At last, he has found that a decrease in the value-added in agriculture leads to an increase in urbanisation.
	Onjala and K'Akumu (2016)	They found that the relationship between GDP and urbanisation in sub-Saharan African countries differs from that in developed economies. Their results indicate that the traditional thesis is still valid in the SSA countries, in fact, they urbanise without growth. However, new trends emerge when urbanization coexists with growth.
OTHER ADDITIONAL VARIABLES	Seetanah and Rojid (2011)	They analyse the drivers of growth in the selected African COMESA member countries and find that gross fixed investments, openness, and human capital formation are the most important drivers of growth, as well as governance, financial depth, international aid, and spillover effects from foreign capital inflows.
	Mijiyawa (2013)	He explores the drivers of African growth over the period 1995-2005, by finding that investments, access to finance, governance improvements, exports, and the share of value-added from agriculture have positively contributed to the growth.
	Akhmat et al. (2014)	They investigate the relationship between the public health indicators and growth in Africa from 1975 to 2011, by establishing that there exists a moderately bidirectional causality between the variables.
	Elhiraika et al. (2014)	They investigate the role of manufacturing transformations along the global value chains in 50 growing African countries. By using GMM models, they find that GDP increases when human capital formation drives the output growth in manufacturing, at last, this has a positive impact on the GDP growth rate, reducing the volatility.
	Pinkovskiy and Sala-i-Martin (2014)	They look at the recent growth in Africa in relation to poverty. They estimate the income distribution, the poverty rate, and the inequality index in African countries over the period 1990-2011. They show that African poverty is falling rapidly, and the growth that began in the second half of the Nineties has decreased income inequality, even in countries with geographical or historical disadvantages.
	Addison et al. (2016)	They investigate the commodity price shocks in SSA countries dependent on agricultural commodities, by finding that there are inconclusive proofs of unanticipated price variations as responses to variations in per-capita GDP.
	Calderon and Boreux (2016)	They investigate if African growth was accompanied by improved structural and macroeconomic indicators, if African countries had liquidity, and if governments implemented countercyclical policies following the global economic crisis between 1995 and 2008. They have found that improvements in the macroeconomic framework have allowed some African countries to better resist the global crisis.
	Nsiah et al. (2016)	They examine the determinants of growth in 48 African countries from 1980 to 2011, by taking into account the economic impacts of neighbouring countries. They control for some drivers of growth, such as the gross fixed capital investment, openness, aids, and inflation, by finding a significant level for the gross fixed investments and education, as well as, for the spatial linkages across countries. When recessions occur, neighbouring SSA countries with similar growth compete for resources.
	Kedir et al. (2017)	They estimate the additional investments required to achieve the SDGs and reduce poverty in Africa by 2030. They have found that estimates of the required growth rates vary widely across African subregions and countries. Countries and subregions with low initial poverty levels and higher responsiveness to the poverty contrast will need less development assistance.
	Oluwatayo and Ojo (2018)	They examine growth drivers and poverty reduction in African countries, by finding that African development is advancing inequality and poverty. In other words, this is manifested through persistent inequality, poverty, armed conflict, and indiscriminate young people's migration toward developed countries in search of better living conditions.
	Shittu et al. (2020)	They study the impacts of FDIs, globalisation, and governance on the growth of Western Africa over the period of 1996-2016 using ADL models. They discover a positive relationship between globalization, governance, and growth. Even if the findings on the relationship between FDI and growth are inconclusive, governance has a positive impact on FDIs and growth. The other considered drivers of growth are employment, gross fixed capital investment, and government expenditure, whose effects on growth are negative on the first two and positive on the last.
	Franses and Welz (2022)	They propose a forecasting model with a single equation for estimating the GDP growth rate in 52 African countries starting from 1960 and by including lagged growth rates from the other countries. Furthermore, co-integration relationships have been computed to capture potential common stochastic trends.

Source: our elaboration.

Table A.2. Main statistics and description of the used variables, 2010-2019.

Variables	Mean	Standard Deviation		Proxy and source
		Within	Between	
Real per-capita GDP	2,687	963.0	3,330	Middle income per-capita as a proxy of economic growth UNCTAD (USD)
FDI Inflows	4.985	4.606	5.729	FDI inflows as a proxy of activities of international investors UNCTAD (% of GDP)
Inflation	189.7	603.4	372.7	Consumer price index as a proxy of monetary stability UNCTAD (trend % with the annual average growth rate)
Openness	75.96	19.48	41.60	Openness degree by country as a proxy of international integration UNCTAD (% of GDP)
Natural Resources Rent	10.59	5.323	9.637	Available resources rent as a proxy of revenues from raw materials WB-WDI (% of GDP)
Government Expenditure	16.66	4.166	7.443	General government consumption as a proxy of the bureaucracy WB-WDI (% of GDP)
Productivity	91.55	4.312	4.475	Gross value added at factors cost as a proxy of productivity WB-WDI (% of GDP)
External Debt	40.15	13.12	27.04	External debt stock as a proxy of the creditworthiness of the country WB-WDI (% of GNI)
Unemployment	9.149	0.922	7.285	Labour market efficiency

				WB-WDI (% of labour force)
Military Expenditure	3.395	16.18	10.51	Expenditures for keeping the armed forces WB-WDI (% of GDP)
Health Expenditure	6.504	1.403	3.144	Domestic general health expenditure as a proxy of public health care WB-WDI (% of general government expenditure)
Received Remittances	3.591	2.103	4.407	Transfers from the migrant labour force as a proxy of foreign incomes WB-WDI (% of GDP)
Net ODA	8.225	6.361	9.972	Net official development assistance as a proxy of the international aid WB-WDI (% of GNI)
Urban Population	44.77	4.138	18.52	Urban population level as a proxy of urbanisation WB-WDI (% of total population)
Human Capital Formation	39.70	12.89	6.808	Human capital formation as a proxy of the educational level UNDP (%)
Gross Fixed Investments	23.62	5.454	8.258	Internal structural investments as a proxy of infrastructural capital WB-WDI (% of GDP)
ICT diffusion	77.91	15.47	35.60	Mobile cellular subscriptions as a proxy of ICT diffusion WB-WDI (per 100 people)
Governance Climate	35.62	2.363	12.72	Composite index as a proxy for the governance by Scalamonti (2021) our elaboration from WB-WGI (%)
Imports [Exports] from [to] HDCs	46.78 [52.12]	6.338 [10.84]	16.77 [23.34]	Merchandise imports [exports] from [to] high-developed countries (HDCs) WB-WDI (% of total merchandise imports [exports])
Imports [Exports] from [to] LMDCs in Latin America or Caribbean	2.092 [1.136]	0.868 [1.372]	1.928 [2.210]	Merchandise imports [exports] from [to] low- and middle-developed countries (LMDCs) in Latin America or Caribbean WB-WDI (% of total merchandise imports [exports])
Imports [Exports] from [to] LMDCs in Europe or Central-Asia	3.429 [1.347]	1.424 [1.792]	3.068 [1.533]	Merchandise imports [exports] from [to] low- and middle-developed countries (LMDCs) in Europe or Central-Asia WB-WDI (% of total merchandise imports [exports])
Imports [Exports] from [to] LMDCs in Eastern-Asia or Pacific	15.40 [11.85]	4.141 [10.26]	7.087 [14.14]	Merchandise imports [exports] from [to] low- and middle-developed countries (LMDCs) in Eastern-Asia or Pacific WB-WDI (% of total merchandise imports [exports])
Imports [Exports] from [to] LMDCs in Southern-Asia	6.607 [6.655]	4.345 [5.026]	5.896 [10.58]	Merchandise imports [exports] from [to] low- and middle-developed countries (LMDCs) in Southern-Asia WB-WDI (% of total merchandise imports [exports])
Imports [Exports] from [to] LMDCs in North Africa or Middle East	2.380 [2.098]	1.102 [1.941	2.291 [3.559]	Merchandise imports [exports] from [to] low- and middle-developed countries (LMDCs) in North Africa or Middle East WB-WDI (% of total merchandise imports [exports])
Imports [Exports] from [to] LMDCs in Sub-Saharan Africa	21.41 [22.80]	7.088 [7.955]	21.24 [21.02]	Merchandise imports [exports] from [to] low- and middle-developed countries (LMDCs) in Sub-Saharan Africa WB-WDI (% of total merchandise imports [exports])

Source: our elaboration.

Table A.3. The correlation matrix, 2010-2019.

	Real per-capita GDP	FDI Inflows	Inflation	Openness	Natural Resources Rent	Government Expenditure	Productivity	External Debt	Unemployment	Military Expenditure	Health Expenditure	Received Remittances	Net ODA	Urban Population	Human Capital Formation	Gross Fixed Investment	ICT diffusion	Governance Climate	Imports From HDCs	I f

Real per-capita GDP	1.000																			
FDI Inflows	-0.030	1.000																		
Inflation	-0.059	-0.060	1.000																	
Openness	0.349	0.405	-0.066	1.000																
Natural Resources Rent	0.217	0.097	-0.039	-0.049	1.000															
Government Expenditure	0.113	0.161	-0.003	0.271	-0.094	1.000														
Productivity	0.042	-0.082	0.075	-0.099	0.330	-0.065	1.000													
External Debt	0.205	0.301	-0.016	0.492	-0.285	0.150	-0.225	1.000												
Unemployment	0.329	-0.027	0.035	0.413	0.003	0.358	0.126	0.071	1.000											
Military Expenditure	0.144	-0.056	0.009	0.010	0.221	0.058	0.051	-0.080	0.130	1.000										
Health Expenditure	0.210	-0.174	-0.090	-0.034	-0.311	0.203	-0.228	0.110	0.257	-0.087	1.000									
Received Remittances	-0.237	0.139	0.016	0.095	-0.207	0.228	-0.183	0.025	0.044	-0.074	-0.019	1.000								
Net ODA	-0.353	0.198	0.217	0.004	-0.095	0.221	0.032	0.071	-0.173	-0.009	-0.293	0.101	1.000							
Urban Population	0.508	0.076	-0.109	0.318	0.163	0.124	0.104	0.131	0.468	0.155	0.024	-0.099	-0.100	1.000						
Human Capital Formation	-0.046	0.103	-0.039	0.015	-0.082	-0.007	-0.080	0.137	-0.038	0.049	0.070	0.004	-0.030	-0.082	1.000					
Gross Fixed Investments	0.177	0.414	-0.147	0.267	0.112	0.113	-0.001	0.182	0.071	-0.063	0.056	-0.021	-0.218	0.205	0.059	1.000				
ICT diffusion	0.526	-0.049	-0.112	0.134	-0.101	0.042	-0.158	0.206	0.347	0.022	0.416	0.064	-0.451	0.471	0.016	0.185	1.000			
Governance Climate	0.303	0.020	-0.180	0.116	-0.397	0.168	-0.262	0.250	0.098	-0.190	0.573	0.080	-0.314	0.113	0.052	0.253	0.559	1.000		
Imports from HDCs	0.271	0.045	-0.137	0.082	0.155	-0.067	0.037	0.256	-0.032	0.039	-0.030	-0.199	-0.104	0.451	-0.050	0.251	0.113	0.036	1.000	
Imports from LMDCs in Latin America or Caribbean	0.092	-0.066	-0.080	-0.091	0.085	-0.209	0.076	-0.068	0.004	0.004	-0.052	0.060	-0.117	0.372	-0.075	0.057	0.205	0.050	0.234	
Imports from LMDCs in Europe or Central-Asia	0.041	-0.026	-0.023	-0.072	0.143	-0.043	0.019	-0.060	0.050	0.299	-0.135	0.085	0.032	0.245	-0.006	-0.044	0.145	-0.204	0.240	
Imports from LMDCs in Eastern-Asia or Pacific	-0.201	0.082	-0.013	-0.205	0.070	-0.230	-0.048	-0.156	-0.428	-0.002	-0.222	-0.043	0.129	-0.189	-0.029	-0.042	-0.212	-0.150	-0.048	
Imports from LMDCs in Southern-Asia	-0.186	-0.010	-0.018	-0.009	-0.069	-0.187	-0.108	0.149	-0.172	-0.057	-0.140	-0.026	0.065	-0.392	0.040	-0.153	-0.245	-0.090	-0.088	
Imports from LMDCs in North Africa or Middle East	0.052	-0.078	-0.047	0.078	0.114	-0.135	-0.057	0.015	0.170	0.257	-0.112	-0.168	0.001	0.224	0.030	0.025	0.044	-0.348	0.283	
Imports from LMDCs in Sub-Saharan Africa	-0.091	-0.051	0.144	0.045	-0.154	0.283	0.017	-0.134	0.243	-0.075	0.188	0.174	0.035	-0.267	0.031	-0.164	0.023	0.154	-0.784	
Exports to HDCs	0.311	0.197	-0.133	0.187	0.055	0.125	-0.156	0.182	0.033	0.076	0.179	-0.053	-0.024	0.168	-0.031	0.355	0.174	0.161	0.348	
Exports to LMDCs in Latin America or Caribbean	0.123	-0.035	-0.041	0.226	-0.045	0.124	0.131	-0.045	0.188	-0.025	-0.045	-0.043	-0.061	0.337	-0.049	0.100	-0.096	-0.033	0.301	
Exports to LMDCs in Europe or Central-Asia	-0.127	-0.027	-0.029	-0.158	-0.065	-0.067	0.045	-0.059	-0.102	0.005	-0.057	-0.066	0.059	-0.017	-0.050	-0.017	-0.009	-0.051	0.148	
Exports to LMDCs in Eastern-Asia or Pacific	-0.032	-0.018	0.347	-0.108	0.252	-0.043	0.296	-0.044	-0.044	0.056	-0.301	-0.208	0.186	0.133	-0.077	-0.158	-0.194	-0.327	0.003	
Exports to LMDCs in Southern-Asia	-0.135	-0.110	-0.021	-0.193	-0.011	-0.208	0.089	-0.079	-0.201	-0.044	-0.228	0.062	0.015	-0.030	-0.028	-0.234	-0.060	-0.117	0.071	
Exports to LMDCs in North Africa or Middle East	-0.064	-0.019	-0.013	0.206	-0.187	0.042	-0.007	0.101	0.265	-0.010	0.013	0.033	-0.013	0.102	-0.045	0.025	-0.060	-0.108	0.222	
Exports to LMDCs in Sub-Saharan Africa	-0.236	-0.121	-0.085	-0.065	-0.265	0.007	-0.121	-0.157	0.034	-0.097	0.157	0.201	-0.095	-0.306	0.123	-0.147	0.023	0.173	-0.528	

Source: our elaboration.

Table A.4. GMM-sys with x_i exogenous regressor and z_i strictly exogenous instruments. (a)

	Real per-capita GDP													
(a)	*Instruments: Governance Climate, ICT diffusion, Urban Population*[2]													
	Coeff.	*Std.Err.*		Constant	Time Dummies	Standard Error	Regressors Wald-Test (p-value)	Time Dummies Wald-Test (p-value)	AR (2) Test (p-value)	Non-Observa-tions (%)	Observa-tions (%)	Sargan Test (p-value)	Hansen Test (p-value)	Instru-ments
Real per-capita GDP (t-1)	0.994	0.011	***											
FDI Inflows	0.003	0.007												
FDI Inflows (t-1)	0.009	0.007												
				yes	yes	0.111	0.000	0.000	0.510	54 (20)	216 (80)	0.131	0.456	18
Real per-capita GDP (t-1)	0.982	0.013	***											
Inflation	-0.242	0.023	***											
Inflation (t-1)	0.362	0.036	***											
				yes	yes	0.104	0.000	0.000	0.158	54 (20)	216 (80)	0.079	0.648	18
Real per-capita GDP (t-1)	1.001	0.015	***											
Openness	-0.201	0.073	***											
Openness (t-1)	0.219	0.071	***											
				yes	yes	0.108	0.000	0.000	0.144	54 (20)	216 (80)	0.005	0.531	18
Real per-capita GDP (t-1)	0.987	0.013	***											
Natural Resources Rent	0.053	0.046												
Natural Resources Rent (t-1)	-0.069	0.049												
				yes	yes	0.109	0.000	0.000	0.626	54 (20)	216 (80)	0.175	0.386	18
Real per-capita GDP (t-1)	0.991	0.014	***											
Government Expenditure	-0.070	0.062												
Government Expenditure (t-1)	0.089	0.063												
				yes	yes	0.110	0.000	0.000	0.607	54 (20)	216 (80)	0.065	0.525	18
Real per-capita GDP (t-1)	0.990	0.011	***											
Productivity	-0.444	0.235	*											
Productivity (t-1)	-0.302	0.235												
				yes	yes	0.109	0.000	0.000	0.895	54 (20)	216 (80)	0.156	0.411	18
Real per-capita GDP (t-1)	0.997	0.016	***											
External Debt	-0.198	0.054	***											
External Debt (t-1)	0.208	0.051	***											
				yes	yes	0.100	0.000	0.000	0.760	54 (20)	216 (80)	0.000	0.331	18
Real per-capita GDP (t-1)	1.000	0.012	***											
Unemployment	-0.140	0.063	**											
Unemployment (t-1)	0.114	0.061	*											
				yes	yes	0.111	0.000	0.000	0.487	54 (20)	216 (80)	0.124	0.544	18
Real per-capita GDP (t-1)	0.984	0.011	***											
Military Expenditure	0.057	0.062												
Military Expenditure (t-1)	-0.094	0.067												
				yes	yes	0.110	0.000	0.000	0.346	54 (20)	216 (80)	0.052	0.442	18
Real per-capita GDP (t-1)	0.982	0.017	***											
Health Expenditure	0.042	0.041												
Health Expenditure (t-1)	-0.026	0.040												
				yes	yes	0.111	0.000	0.000	0.531	54 (20)	216 (80)	0.079	0.416	18
Real per-capita GDP (t-1)	0.987	0.011	***											
Received Remittance	-0.010	0.006												
Received Remittance (t-1)	0.019	0.007	***											
				yes	yes	0.111	0.000	0.000	0.421	54 (20)	216 (80)	0.269	0.832	18
Real per-capita GDP (t-1)	0.988	0.027	***											
Net ODA	-0.043	0.057												
Net ODA (t-1)	0.052	0.048												
				yes	yes	0.110	0.000	0.000	0.549	54 (20)	216 (80)	0.078	0.367	18
Real per-capita GDP (t-1)	0.992	0.014	***											
Human Capital Formation	-0.004	0.030												
Human Capital Formation (t-1)	0.027	0.030												
				yes	yes	0.112	0.000	0.000	0.5098	54 (20)	216 (80)	0.037	0.395	18
Real per-capita GDP (t-1)	0.989	0.015	***											
Gross Fixed Investment	-0.058	0.051												
Gross Fixed Investment (t-1)	0.082	0.048	*											
				yes	yes	0.111	0.000	0.000	0.522	54 (20)	216 (80)	0.040	0.442	18
Real per-capita GDP (t-1)	0.992	0.015	***											
Constant	0.150	0.108												

				-	yes	0.112	0.000	0.000	0.522	54 (20)	216 (80)	0.038	0.414	16

Table A.4. GMM-sys with x_i exogenous regressor and z_i strictly exogenous instruments. (b)

	Real per-capita GDP													
(b)	*Instruments: Governance Climate, ICT diffusion, Urban Population*^{2}													
	Coeff.	*Std.Err.*		Constant	Time Dummies	Standard Error	Regressors Wald-Test (p-value)	Time Dummies Wald-Test (p-value)	AR (2) Test (p-value)	Non-Observa-tions (%)	Observa-tions (%)	Sargan Test (p-value)	Hansen Test (p-value)	Instru-ments
Real per-capita GDP (t-1)	0.993	0.012	***											
Imports from HDCs	0.247	0.126	**											
Imports from HDCs (t-1)	-0.249	0.123	**											
				yes	yes	0.109	0.000	0.000	0.141	54 (20)	216 (80)	0.027	0.427	18
Real per-capita GDP (t-1)	0.995	0.014	***											
Exports to HDCs	-0.047	0.022	**											
Exports to HDCs (t-1)	0.043	0.018	**											
				yes	yes	0.109	0.000	0.000	0.479	54 (20)	216 (80)	0.018	0.511	18
Real per-capita GDP (t-1)	0.999	0.013	***											
Imports from LMDCs in Latin America or Caribbean	-0.006	0.011												
Imports from LMDCs in Latin America or Caribbean (t-1)	-0.003	0.011												
				yes	yes	0.112	0.000	0.000	0.527	54 (20)	216 (80)	0.049	0.525	18
Real per-capita GDP (t-1)	0.987	0.015	***											
Exports to LMDCs in Latin America or Caribbean	0.002	0.011												
Exports to LMDCs in Latin America or Caribbean (t-1)	0.008	0.011												
				yes	yes	0.111	0.000	0.000	0.520	54 (20)	216 (80)	0.051	0.487	18
Real per-capita GDP (t-1)	0.992	0.013	***											
Imports from LMDCs in Europe or Central-Asia	0.013	0.014												
Imports from LMDCs in Europe or Central-Asia (t-1)	-0.018	0.015												
				yes	yes	0.111	0.000	0.000	0.466	54 (20)	216 (80)	0.027	0.432	18
Real per-capita GDP (t-1)	0.992	0.014	***											
Exports to LMDCs in Europe or Central-Asia	-0.009	0.007												
Exports to LMDCs in Europe or Central-Asia (t-1)	0.011	0.008												
				yes	yes	0.111	0.000	0.000	0.552	54 (20)	216 (80)	0.040	0.414	18
Real per-capita GDP (t-1)	0.990	0.015	***											
Imports from LMDCs in Eastern-Asia or Pacific	0.036	0.054												
Imports from LMDCs in Eastern-Asia or Pacific (t-1)	-0.049	0.060												
				yes	yes	0.111	0.000	0.000	0.447	54 (20)	216 (80)	0.033	0.408	18
Real per-capita GDP (t-1)	0.991	0.014	***											
Exports to LMDCs in Eastern-Asia or Pacific	0.011	0.011												
Exports to LMDCs in Eastern-Asia or Pacific (t-1)	-0.017	0.012												
				yes	yes	0.110	0.000	0.000	0.603	54 (20)	216 (80)	0.034	0.467	18
Real per-capita GDP (t-1)	1.004	0.017	***											
Imports from LMDCs in Southern-Asia	-0.021	0.015												
Imports from LMDCs in Southern-Asia (t-1)	0.033	0.014	**											
				yes	yes	0.112	0.000	0.000	0.572	54 (20)	216 (80)	0.047	0.480	18
Real per-capita GDP (t-1)	0.991	0.014	***											
Exports to LMDCs in Southern-Asia	0.011	0.017												
Exports to LMDCs in Southern-Asia (t-1)	-0.010	0.017												
				yes	yes	0.112	0.000	0.000	0.674	54 (20)	216 (80)	0.033	0.505	18
Real per-capita GDP (t-1)	0.992	0.014	***											
Imports from LMDCs in North Africa or Middle East	-0.013	0.026												
Imports from LMDCs in North Africa or Middle East (t-1)	0.009	0.025												
				yes	yes	0.111	0.000	0.000	0.521	54 (20)	216 (80)	0.018	0.384	18
Real per-capita GDP (t-1)	0.991	0.014	***											
Exports to LMDCs in North Africa or Middle East	-0.005	0.007												
Exports to LMDCs in North Africa or Middle East (t-1)	0.006	0.008												
				yes	yes	0.111	0.000	0.000	0.544	54 (20)	216 (80)	0.053	0.428	18
Real per-capita GDP (t-1)	1.001	0.013	***											
Imports from LMDCs in Sub-Saharan Africa	-0.002	0.031												
Imports from LMDCs in Sub-Saharan Africa (t-1)	0.014	0.031												
				yes	yes	0.112	0.000	0.000	0.491	54 (20)	216 (80)	0.046	0.617	18
Real per-capita GDP (t-1)	0.992	0.011	***											
Exports to LMDCs in Sub-Saharan Africa	0.002	0.019												
Exports to LMDCs in Sub-Saharan Africa (t-1)	0.008	0.018												
				yes	yes	0.112	0.000	0.000	0.533	54 (20)	216 (80)	0.115	0.452	18

*Note: *** significance for α = 0.01 ** significance for α = 0.05 * significance for α = 0.10.*

Source: our elaboration.

Table A.5. Difference-in-Sargan exogeneity test for the variables in Table A.4.

	H_0: *the variable is exogenous*
FDI Inflows	$\chi^2_{(1)}$ = 1.550 - 0.349 = 1.201 (0.273)
Inflation	$\chi^2_{(1)}$ = 2.719 - 2.036 = 0.683 (0.408)
Openness	$\chi^2_{(1)}$ = 3.118 - 2.271 = 0.847 (0.357)
Natural Resources Rent	$\chi^2_{(1)}$ = 3.025 - 0.454 = 2.571 (0.109)
Government Expenditure	$\chi^2_{(1)}$ = 3.256 - 1.563 = 1.693 (0.193)
Productivity	$\chi^2_{(1)}$ = 1.859 - 1.543 = 0.316 (0.574)
External Debt	$\chi^2_{(1)}$ = 2.988 - 0.625 = 2.363 (0.124)
Unemployment	$\chi^2_{(1)}$ = 0.399 - 0.022 = 0.377 (0.539)
Military Expenditure	$\chi^2_{(1)}$ = 0.997 - 0.005 = 0.992 (0.319)
Health Expenditure	$\chi^2_{(1)}$ = 1.871 - 0.195 = 1.676 (0.196)
Received Remittances	$\chi^2_{(1)}$ = 1.221 - 1.218 = 0.003 (0.962)
Net ODA	$\chi^2_{(1)}$ = 0.912 - 0.865 = 0.047 (0.827)
Human Capital Formation	$\chi^2_{(1)}$ = 2.724 - 2.451 = 0.273 (0.601)
Gross Fixed Investments	$\chi^2_{(1)}$ = 1.413 - 0.000 = 1.413 (0.235)
Imports from HDCs	$\chi^2_{(1)}$ = 2.799 - 2.596 = 0.203 (0.652)
Imports from LMDCs in Latin America or Caribbean	$\chi^2_{(1)}$ = 1.378 - 0.294 = 1.084 (0.298)
Imports from LMDCs in Europe or Central-Asia	$\chi^2_{(1)}$ = 2.957 - 0.093 = 2.864 (0.091)
Imports from LMDCs in Eastern-Asia or Pacific	$\chi^2_{(1)}$ = 2.742 - 2.463 = 0.279 (0.597)
Imports from LMDCs in Southern-Asia	$\chi^2_{(1)}$ = 2.313 - 2.221 = 0.092 (0.761)
Imports from LMDCs in North Africa or Middle East	$\chi^2_{(1)}$ = 1.659 - 0.044 = 1.615 (0.204)
Imports from LMDCs in Sub-Saharan Africa	$\chi^2_{(1)}$ = 2.518 - 0.079 = 2.439 (0.118)
Exports to HDCs	$\chi^2_{(1)}$ = 2.793 - 0.201 = 2.592 (0.107)
Exports to LMDCs in Latin America or Caribbean	$\chi^2_{(1)}$ = 2.698 - 2.696 = 0.002 (0.960)
Exports to LMDCs in Europe or Central-Asia	$\chi^2_{(1)}$ = 2.766 - 2.711 = 0.055 (0.814)
Exports to LMDCs in Eastern-Asia or Pacific	$\chi^2_{(1)}$ = 2.168 - 1.517 = 0.651 (0.419)
Exports to LMDCs in Southern-Asia	$\chi^2_{(1)}$ = 1.090 - 0.195 = 0.895 (0.344)
Exports to LMDCs in North Africa or Middle East	$\chi^2_{(1)}$ = 3.387 - 0.763 = 2.624 (0.105)
Exports to LMDCs in Sub-Saharan Africa	$\chi^2_{(1)}$ = 0.623 - 0.543 = 0.080 (0.776)

Source: our elaboration.

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